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Dear TestAS candidate,

You have decided to study in Germany. You are considering which path of study would be the right one for you and how you can make the best of your academic training by studying at a German university.

This process involves important decisions about your future: which subject would you like to study and which university should you choose?

With our brochure, we would like to provide you with advice to help you optimise this process.TestAS can help you and the German universities to make the right choice.

Aptitude tests like the Test for Academic Studies - TestAS - in combination with the marks attained in your university entrance examination allow a particularly precise prediction about your chances of success as a student. This is the reason why many German universities are already implementing TestAS as an objective, reliable and standardised aptitude test in their selection and admission of foreign students.

In those countries where Academic Evaluation Centres (APS) have already been installed - such as in The People's Republic of China or in Vietnam - TestAS is part of the APS procedure. Specially gifted students having a good command of German who can apply for the PASCH programme in many countries via the German Academic Exchange Service (DAAD), also take TestAS.

In this brochure you will find sample questions from the so-called Core Test, which every applicant has to complete, and further tasks from all Subject-Specific Modules of which one module has to be selected according to your chosen field of study.

You will find a lot of helpful tips on how to proceed when solving the tasks. With good results you will increase your chances of getting an attractive ofer from a university that suits your personal goals and interests.

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The DAAD has consigned the ITB Consulting GmbH in Bonn with the development of TestAS and the Society for Academic Study Preparation and Test Development (Gesellschaft für Akademische Studienvorbereitung und Testentwicklung e. V., g.a.s.t.), the TestDaF-Institut, with the worldwide organisation of the test.

Many of you will already be familiar with g.a.s.t. from the Test of German as a Foreign Language (TestDaF) and the TestDaF-Institut. Among others, the portfolio of ITB comprises the Test for Medical Studies (TMS), the TM WISO and the Self-Application Test of the German National Academic Foundation. You may be assured that TestAS will determine your aptitude and competence in an objective, reliable and fair manner.

We do ask you to take the preparation for the test very seriously in order to give yourself the optimum chance of proving your real capabilities. On behalf of the TestAS team we hope you will obtain the university place you are aiming for and furthermore, we wish you success in your studies and hope you will be able to enjoy and profit greatly from studying in Germany.

We wish you great success!

Prof. Dr. Günter Trost
ITB Consulting GmbH

Dr. Hans-Joachim Althaus
g.a.s.t. / TestDaF-Institut

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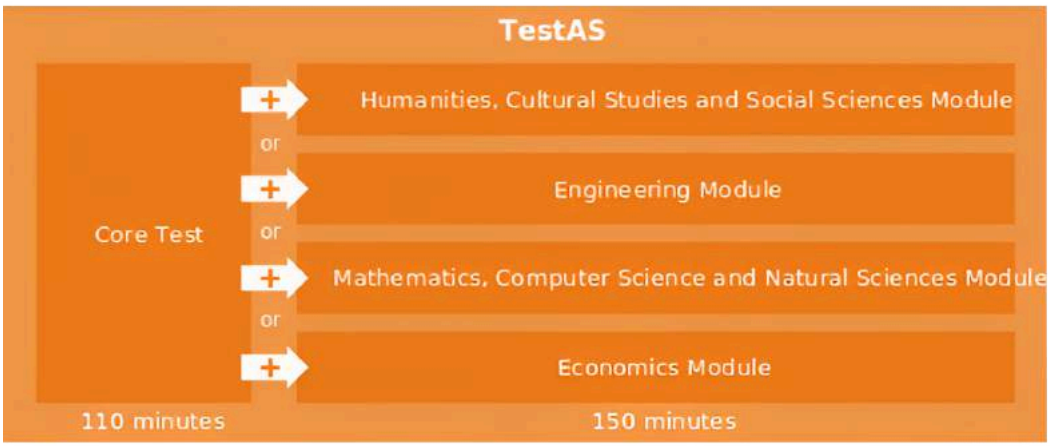
Why should I take TestAS?

TestAS is the most important aptitude test for foreign applicants wishing to study in Germany. TestAS analyses skills necessary for successful studies, e.g. logical thought processes, recognising structures or solving problems. German universities use the TestAS certificate in order to select and admit suitable students for their courses. TestAS increases your chances of obtaining a university place in Germany.

How is TestAS structured?

TestAS is offered both in English and German. When registering you select either the language you are better at or the one the university requires.



The Core Test assesses skills necessary for successful studies in all subjects.
Subsequently you work through the Subject-Specific Module which analyses skills you will need in typical situations in your particular field of study.

The university you have decided to study at will determine which Subject-Specific Module you will be required to take according to your chosen course of studies.
Below you will find some examples of which courses may well suit which Subject-Specific Module.

Humanities, Cultural Studies and Social Sciences	**Engineering**	Mathematics, **Computer Science** and Natural Sciences	**Economics**
German language and literature	Mechanical Engineering	Mathematics	Business Economics
Linguistics	Electrical Engineering	Chemistry	Political Economics
Sociology	Mechatronics	Physics	Management
Politics	Civil Engineering	Computer Science	Business Management
Philosophy	Automotive Engineering	Psychology	Education Management
Historical Science	Environmental Engineering	Pharmacology	Energy and Water Management
Law	Chemical Engineering	Medicine	

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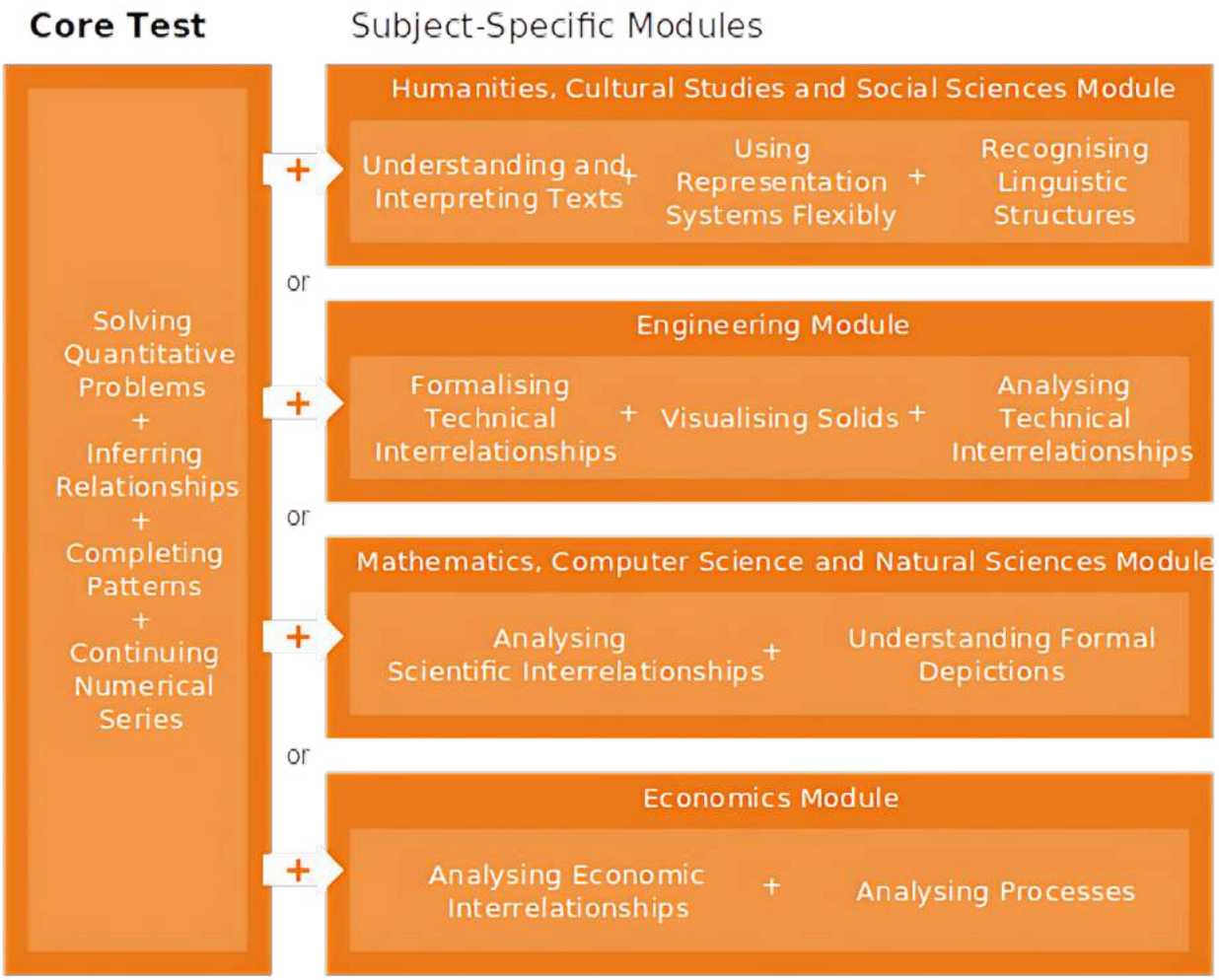
Which tasks will I have to solve?

In the Core Test, as well as in the Subject-Specific Module, you will be required to solve two to four different subtests. You will find these subtests in the table below. You will find more detailed information for each subtest (What is it about? How many tasks are there?)at the beginning of each subtest in this brochure.



In both the Core Test and the Subject-Specific Module you will be answering multiple-choice questions only.

Tips on how to proceed

Organise your working time well:

- **Work quickly but take care.**
  It is very important to read the tasks through carefully. If you read too quickly and hence not thoroughly enough, then you will miss important information.

- **Work through the questions in the given order.**
  The first tasks in any group tend to be easier than later ones. That is why we would suggest that you work through the booklet in the given order. But:

- **If a particular question is too difficult for you, then come back to it later.**
  It is better to use your time on tasks you find easier. On average, test takers solve about half of the tasks.

- **If you are solving mathematical problems, try to find your own solution first.**
  Then check if your answer is among those in the multiple-choice. If you look at the choices first, it may lead to confusion. If you are not able to find a solution, then try to exclude the answers which are most likely going to be false.

- **If you have very little time left...**
  You do not get minus points if the answer is wrong. Enter all solutions onto your answer sheet.

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Sample questions

Core Test

Everyone has to do the Core Test and it has to be completed first.

The Core Test is divided in four different subtests. You have a total of 110 minutes to solve the tasks. In the table below you can see how many tasks there are in each subtest and how much time is allowed.

To prepare for this, there are six tasks to solve for each subtest on the following pages. The tasks at the beginning are easier than those at the end. At the beginning of each subtest there is a short explanation about the type of the tasks, together with instructions on how to solve the tasks.

You can find the solutions starting at page 53.

Subtest	Amount of tasks	Time allowed
Solving Quantitative Problems	22	45 minutes
Inferring Relationships	22	10 minutes
Completing Patterns	22	20 minutes + 5 minutes to read instructions
Continuing Numerical Series	22	25 minutes + 5 minutes to read instructions
Total working time		**110 minutes**

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Preparation Book for the

TestAS

Core Test

- ✓ Improve your performance with more than 290 practice questions
- ✓ Master the test with feedback from experts and successful test takers
- ✓ Practice with dozens of tough questions

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1 ABOUT TESTAS

1.1 WHO SHOULD TAKE THE TESTAS?

TestAS is a standardized test for high school graduates from outside the European Union who would like to study for their bachelor's degree in Germany.
An increasing number of universities in Germany use the Test for Academic Studies (TestAS) as part of their evaluation criteria. They use the test as part of the admissions process and combine the results with other criteria during selection.

The TestAS may be taken either in German or English.

1.2 WHICH UNIVERSITIES ACCEPT TESTAS RESULTS?

In the following, you will find a list of universities (as of February 2017) which recognise this test for foreign students. This list is without guarantee due to the fact that the TestAS and its acceptance at German universities is continuously changing and expanding. Please refer to the websites of the universities for up-to-date information.
In most cases, taking the test as part of the application process is voluntary. In these cases, the participant can decide whether or not the results should be made available to the university on an individual basis (if the results are not as high as desired).

If you have a higher than average TestAS result, the university entrance qualification (HZB) score may be increased. More information about the HZB score can be found online, e.g. at the website of uni-assist e.V.: http://www.uni-assist.de/wissenswertes.html

The test is normally only relevant for non-EU applicants who have not received their HZB score in Germany and who are applying for a Bachelor's programme in Germany.

FOR THE FOLLOWING UNIVERSITIES, TESTAS PARTICIPANTION IS MANDATORY FOR SPECIFIC FIELDS OF STUDY:

The University of Cologne only accepts applications (except in the case of law and teaching education programmes) which contain TestAS results. The TestAS certificate must be submitted along with the application documents and sent to uni-assist e.V.

Applicants must achieve a specific standard score within the TestAS in order to be able to apply. We have listed a few such examples below (as at 03.02.2017). Additional and more up-to-date information can be found on the website of the University of Cologne.

- When applying for the Faculty of Medicine, the average score required for the core test and the specialist module on Mathematics, Information Technology and Natural Sciences is 108.
- When applying for the Faculty of Economic and Social Sciences, the average score required for the core test and the specialist module on Economics is 108.
- When applying for law of for any teacher training programmes, the TestAS is currently not required.

The RWTH Aachen University requires participants to take the TestAS if the participant is applying for the fields of Human Medicine or for the Fast Track Bachelor Admission Programme for Engineering. In the case of Human Medicine, the exam must be taken in German and must include the specialist module “Mathematics, Information Technologies and Natural Sciences” in addition to the core test. In the case of Fast Track Engineering, the specialist module on Engineering Sciences must be taken.

The University of Bremen only accepts applications for business programmes (Business Administration and Economics) when they include the TestAS results.
When applying to other fields of study, the TestAS is voluntary. A significantly higher grade can be achieved by taking the voluntary TestAS. If a participant’s percentile rank within the core test is at least 50%, then the HZB score of the participant is raised by 0.3 points. If the participant achieves a percentile rank of at least 50% in the specialist module, then an additional 0.3 is awarded.

For Human Medicine applications at the Otto von Guericke University of

Magdeburg, the
taking of the TestAS (core test and specialist module on Mathematics, Information Sciences and Natural Sciences test) is mandatory. The exam has to be taken in German. To select

applicants, this university applies a ranking procedure that takes into account HZB and TestAS scores.

The University of Greifswald has made the taking of the TestAS mandatory for applications to the study programme of Human and Dental Medicine. To apply, the university requires a score of at least 100 points on the core test.

UNIVERSITIES WHERE APPLICANTS CAN GREATLY IMPROVE THEIR HZB SCORE DUE TO GOOD RESULTS (MORE THAN 0.5 “ABITUR” SCORE):

The University of Hamburg awards a significant number of bonus points based on the TestAS results.

The Johannes Guttenberg University of Mainz awards bonus points for the HZB score based on the TestAS results. The most recently taken TestAS is the one that applies. The level of bonus points available (up to 0.5 for the core test and up to 0.5 for the specialist module)

UNIVERSITIES WHERE APPLICANTS CAN INCREASE THEIR CHANCES OF ACCEPTANCE WITH GOOD RESULTS:

The University of Heidelberg uses the TestAS as a minor voluntary part of their acceptance criteria.

At the Dresden University of Technology (TU Dresden), the TestAS results are used as additional proof of ability for applications to the study programmes of Human and Dental Medicine.

The University of Ulm adds bonus points to the HZB average score based on the TestAS results for a standard score of at least 100. The HZB score can be improved by up to 0.5 points.

- Standard score below 100 → No bonus Standard score
- between 100 and 110 → Bonus of 0.2 Standard score
- between 111 and 120 → Bonus of 0.3 Standard score
- above 121 and 130 → Bonus of 0.5

The University of Freiburg awards bonus points based on TestAS results. No additional information has yet been made available.

The University of Göttingen uses the TestAS as a voluntary part of their acceptance criteria. Participation in the TestAS for the subject of Natural Sciences may increase your chances of being accepted.

Source: https://www.uni-goettingen.de/de/511340.html; last accessed on 03.02.2017.

The University of Leipzig adds bonus points to the HZB score based on TestAS results if the participant achieves a percentile rank of at least 70%. For a percentile rank higher than 70%, there is a bonus of 0.2. For similar results within the specialist module, an additional 0.2 bonus points are awarded.

The University of Potsdam takes “good” TestAS results into consideration by awarding such applicants an edge over other applicants with the same qualifications and no TestAS results.

The University of Regensburg takes the TestAS results into consideration for programmes in Economic Sciences. By submitting the TestAS results along with the application, the applicant can improves his/her chances of a place at the University of Regensburg.

The Berlin School of Economics and Law gives out bonus points depending on the test results achieved by applicants for Economic Sciences.

The University of Applied Sciences Mittweida assesses an application positively when a TestAS certification is submitted alongside it.

The Technical University of Telecommunications and Informatics Leipzig (HfTL) uses the TestAS as a voluntary part of their application criteria.

UNIVERSITIES WHICH ACCEPT THE TESTAS AS A PROOF OF ABILITY (ADDITIONAL DOCUMENTS ARE REQUIRED):

The University of Wuppertal (BUW) accepts good TestAS results as proof of suitability for a Bachelor's programme and, in such cases, does not require the standard university entrance qualification documents such as a high school diploma. It requires a standard score of at least 76 on the TestAS core test 76 and at least 83 on the specialist module.

The Technical University of Hamburg (TUHH) makes it possible for students with above-average TestAS results to apply for a technical subject that deviates from their HZB score. The applicant must have an adequate HZB score for study programmes in Engineering Sciences and their overall test result for the core test and specialist module in Engineering Sciences must be at least 100 points. Then, the subject-specific HZB may be expanded to a general HZB for the TUHH bachelor programmes.
Example:

“An applicant has university entrance qualification for electrical engineering, but would prefer to study civil and environmental engineering. They have passed the TestAS (core test + specialist module in Engineering Sciences) with an overall result of 106. The applicant is thus awarded the university entrance qualification for civil and environmental engineering on the part of TUHH.” (Quoted from the TUHH website listed below)

The Frankfurt School of Finance & Management accepts applications containing one of the following tests: TestAS, ACT or SAT.

The Goethe University in Frankfurt am Main uses the TestAS as a voluntary part of their acceptance criteria for the one-semester programme “Academic Welcome Program for Highly Qualified Refugees”.

Additionally, there are universities such as the Augsburg University, which recommend taking the TestAS but do not take the results into consideration as part of the application process.

1.3 WHAT ARE THE DIFFERENT SECTIONS OF THE TEST ?

The TestAS exam consists of 3 parts:

- the onScreen Language Test, a 30-minute segment to determine language competency,
- a Core Test lasting 110 minutes and assessing skills necessary for successful studies in all university-level subjects, and
- a Subject-Specific Module pertaining to your chosen field of study and lasting 145-150 minutes.

This book focuses on the Core Test.

The Core Test tests general skills which are required to study at a university. The four subcategories of the Core Test are:

- Solving quantitative problems
- Inferring relations
- Completing patterns
- Continuing numerical series

1.3.1 SOLVING QUANTITATIVE PROBLEMS

22 questions, 45 minutes test time In these questions, brief texts are given from

which relevant information must be
derived for the subsequent questions. These questions measure mathematical thinking and the ability to solve simple calculations using the information given.

EXAMPLE – DEGREE OF DIFFICULTY LOW

A city has 1,500,000 inhabitants in 2015 and grows at the same rate for several years. If the city has 1,650,000 inhabitants in 2018, how many inhabitants will the city have in 2021 if the growth rate does not change?

(A) approx. 1,800,000 (B) approx. 1,815,000

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(C) approx. 2,145,000

(D) approx. 2,240,000

Answer B: approx. 1,815,000 inhabitants

Approach: The 1,500,000 inhabitants grew 10% in 3 years. 1,650,000 × 1.1 = 1,815,000.

1.3.2 INFERRING RELATIONS

22 questions, 10 minutes test time

In these questions, two word pairs with blanks are given which have a relationship. From the answer options, a word pair must be chosen which most logically completes the word pairs.

EXAMPLE – DEGREE OF DIFFICULTY LOW

body: _____ = hand: _____

(A) arm – finger

(B) head – stomach

(C) leg – shoulder

(D) skin – ear

Answer: A

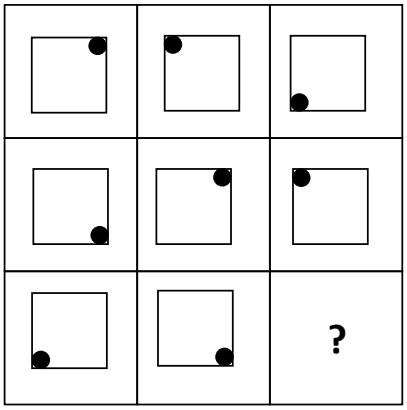
Approach: The arm is a part of the body, and the finger is a part of the hand.

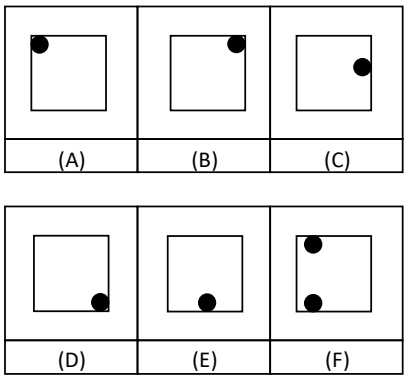
1.3.3 COMPLETING PATTERNS

22 questions, 20 minutes test time

In these questions, patterns are shown in eight out of nine smaller boxes displayed in a square. The task here is to select the correct pattern from the answer options for the ninth box in order to create a logical order. The pattern can be left to right, top to bottom or both.

EXAMPLE – DEGREE OF DIFFICULTY LOW





Answer: B

Approach: From left to right the dot goes from corner to corner anti-clockwise. From top to bottom the dot moves clockwise to the next corner of the square.

1.3.4 CONTINUING NUMERICAL SERIES

22 questions, 25 minutes test time

In these questions, a series of numbers is listed. There is a pattern behind these numbers which has to be determined, and then an additional number must be chosen which corresponds to this pattern.

EXAMPLE – DEGREE OF DIFFICULTY MEDIUM

4 20 16 32 28 44 40 ?

Answer: 56

Approach: Rule: +16, - 4, +16, - 4, etc.

Note: When marking an answer on the answer sheet, please note:

To indicate the correct number you must mark each digit separately. When, for example, the answer "17" should be marked, then 1 and 7 must be ticked off. If the

solution is "71", then the answer must also be marked as 1 and 7. Both answers will look the same on the answer sheet.

	-	0	1	2	3	4	5	6	7	8	9
01	☐	☐	☒	☐	☐	☐	☐	☐	☒	☐	☐

If the number is a negative one, then the minus sign "-" at the far left must be marked.

1.4 IN WHICH LANGUAGE SHOULD I TAKE THE EXAM?

We recommend you take the test in the language in which you can confidently read and interpret complex texts. (Exception: In the case of applications to medicine, it is possible that some universities, such as the RWTH Aachen, explicitly ask for the TestAS in the German language.)
TestAS evaluates cognitive abilities, and to be successful at the test, proficiency in the test language is required. Therefore, we recommend taking the test in the language you feel most confident in, regardless of the language in which you will pursue your studies in Germany.
According to the creators of the TestAS, a language level of B1 is necessary. In cases where there are only a few subtests, such as completing patterns in the core test and visualizing solids in the engineering module, a B1 level may be sufficient.

However, most other sections have lengthy questions that students must read quickly to identify the important parts. Test takers also need to watch out for tricky formulations and nuances in the meaning of a question. Consequently, your language skills will have a very strong and direct impact on your grade.

1.5 WHICH SUBJECT-SPECIFIC MODULE SHOULD I CHOOSE?

For the subject-specific modules, you may choose one of the following four modules:

a) Humanities, Cultural Studies and Social Sciences

b) Engineering

c) Mathematics, Computer Science and Natural Sciences

d) Economics

The universities are free to determine which subject-specific module is required for which major. In the following overview, you can see which module you may choose for your chosen area of study (status June 2015). For the most current version, please visit the official website of the TestAS at www.testas.de.

Humanities, Cultural Studies and Social Sciences	Engineering	Mathematics, Computer Science and Natural Sciences	Economics
German language and literature Historical science	Automotive engineering Chemical	Chemistry	Business economics
	engineering Civil engineering	Computer science	Business management Education
Law		Mathematics	management Energy and water
Linguistics	Electrical engineering Environmental	Medicine	management Management
Philosophy	engineering Mechanical	Pharmacology	
Politics	engineering Mechatronics	Physics	Political economics
Sociology		Psychology	

Quelle: TestAS sample questions download, http://testas.de/en/download_en.htm, 03.09.2015

If you are unsure of the applicable subject-specific module, please consult directly the university to which you are applying to. Universities normally give bonus points to TestAS only if the requested subject module is taken. For example, the curriculum of Industrial Engineering consists of both business administration and engineering. This does not mean that the university will award points to either the Engineering or Economics subject modules. The university will have a clear preference (in this case, probably engineering).

We would like to share with you one example to emphasise how important the correct choice of the subject module is. One of our students applied to the psychology department for the winter semester for 2015/2016 at Universität zu Köln where TestAS is required. She chose the subject-specific module Mathematics, Computer Science and Natural Sciences. uni-

assist e.V. declined the application because Universität zu Köln apparently would have liked to have seen Humanities for the psychology application. The student objected to uni-assist, referencing the table on the TestAS website. Her application was eventually accepted for further evaluation by Universität zu Köln. This example shows that the universities are free to choose which subject test they want to see for which major.

If you are unsure which subject-specific module to take, consult the university directly.

1.6 HOW IS THE EXAM GRADED?

The makers of TestAS only disclose the scores on a normalized scale, comparing you to the reference group (i.e. students who took the same or a similar test). Therefore, we are not able to give you precise conversion tables between the number of correct questions and the final grade.
What we know regarding scoring:

- Each correct question increases your overall score.
- Wrong and omitted answers do not impact your score. (So do not leave questions unanswered even if you have to blindly guess.)

After the exam, each student receives a score based on how well she/he performed compared to the other students who took the exam. Beyond this, there is very little public information regarding how scores are actually determined. In our experience, answering half of the questions correctly in the overall exam should land you at around the average grade of 100.

Many universities have started giving a small number of bonus points for above-average TestAS scores, which is defined as being above 100. The closer you are to the maximum score of 130, the more bonus points you normally receive. Please note that only 2% of students achieve scores of 120 or more.
As with most tests, your goal is to answer as many questions correctly as possible. Wrong answers and blank answers are treated in the same way. If you struggle with a certain question for more than one minute, just make an intelligent guess by eliminating the obviously-wrong answers and go on to the remaining questions. You can always come back if time remains at the end.

1.7 HOW DO I INTERPRET THE CERTIFICATE WITH MY FINAL GRADE

The results of the TestAS can be viewed approximately 4 weeks after taking the test. Every participant can view their results at the TestAS website using their login information (username and password) and subsequently print out a certificate. A sample of the certificate resembles the following:

TestAS
Test für Ausländische Studierende
Test for Academic Studies

Certificate TestAS

Ms.	John Doe
born on	11.11.2011
Candidate No.	12345678

has passed the TestAS

with the modules	Core Test and Engineering Module
on	18.04.2015
in the test centre	Gotham City

with the following results:

	Percentile Rank	Standard Score
Core Test	29	94
Engineering Module	21	92

	GER-Step	Description
Language Screening	B2 or higher	Vantage

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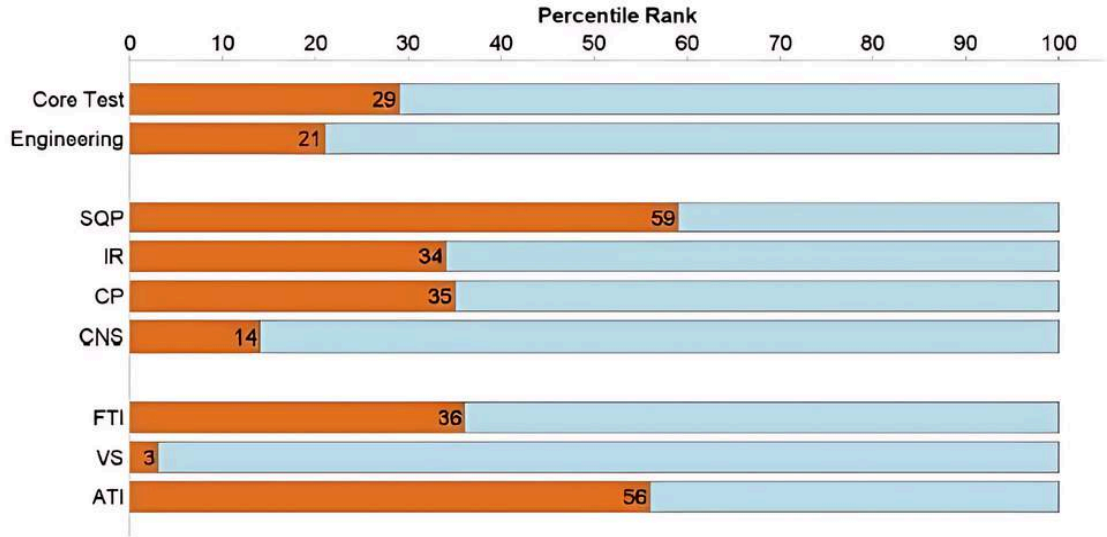
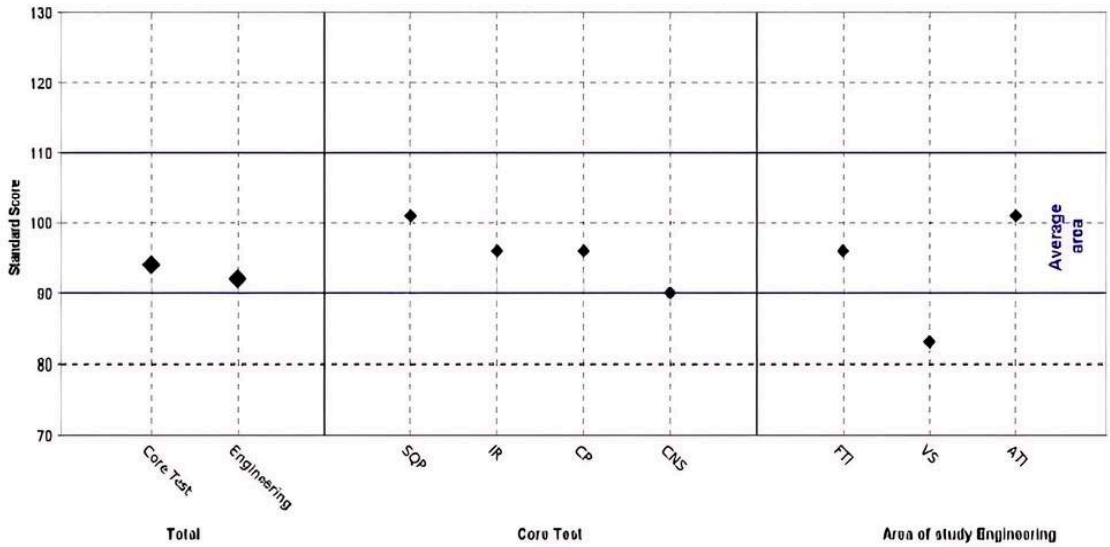
TestAS results in detail: John Doe (12345678)

Subtest/Test Module	Percentile Rank	Standard Score
Solving Quantitative Problems (SQP)	59	101
Inferring Relationships (IR)	34	96
Completing Patterns (CP)	35	96
Continuing Numerical Series (CNS)	14	90
Core Test	**29**	**94**
Formalising Technical Interrelationships (FTI)	36	96
Visualising Solids (VS)	3	83
Analysing Technical Interrelationships (ATI)	56	101
Engineering Module (Engineering)	**21**	**92**

Percentile Ranks



Standard Scores



Information on the TestAS certificate, explanatory notes and assistance for interpretation are to be found on:
http://www.testas.de/information/certificate.html

PERCENTILE RANKS AND STANDARD SCORES

On the certificate, the results are presented in two different ways.

The standard score shows your total score, scaled between 70 and 130 points. Standard scores between 90 and 110 indicate an average performance. Many universities start giving bonus points for TestAS scores above 100. Specifically:

- 14% of test takers score between 70 and 89 points.
- 36% of test takers score between 90 and 100.
- Another 36% score between 100 and 110.
- 14% achieve a result between 111 and 130.

The percentile rank expresses how many students you surpassed with your result. Your percentile rank can be between 1 and 100. A percentile rank between 31 and 70 indicates an average performance.

Let's assume that your percentile rank is 85. This means that 15% of your reference group scored higher than you and that you scored higher than 85% of the reference group. TestAS does not disclose how the reference group is formed. But it is fair to assume that the reference group is formed by students who have taken the same exam, or a similar exam, as you.

HOW TO INTERPRET THE TEST RESULTS?

Your test results are determined based on your performance compared to other participants. For example:

1) An easy question that you and all participants answered correctly will neither have a positive nor a negative influence on your percentile ranking and hence your score.
2) An easy question that most participants answered correctly but you answered incorrectly (or omitted) will have a negative impact on your rating.
3) A difficult question that most participants could not answer correctly but which you answered correctly will have a positive impact on your rating.

The same principle also applies if most participants fail to answer an easy question correctly, while you answer it correctly. However this is not very likely to happen.

HOW DOES THIS KNOWLEDGE BENEFIT YOU?

This explanation sounds self-explanatory, but knowing this is of big importance.

a) If you only have limited time to prepare for the exam and must choose focus areas, it is better to start learning the sections with which many students have problems with. A good example is the subtest "Completing Patterns".

Some students have reported that they thought they performed rather poorly in the subtest "Completing Patterns". Nevertheless, their results were good. The reason for this is that many participants have difficulties with this unique subtest. In case of such questions, by answering just a few more questions correctly than the average student, you will benefit from a big improvement in your grade. Such subtests are true point-bringers because students can achieve relatively much with limited preparation.
The contrary happens in the subtest "Solving Quantitative Problems" - many students find it easy to answer the questions in this section. In order to improve your grade in this subtest, you need to study many topics.

b) It pays off to stay focused during the entire subtest. For example, we were informed that students had become overly confident because they were making very good progress in "Solving Quantitative Problems". They started wasting valuable time on the easy questions, thinking that the entire test would run as smoothly as the beginning. This form of self-confidence can be deceiving. Many students can solve the first questions rapidly and correctly. You should strive to answer every question as quickly and as well as you possibly can.

The opposite situation also occurs, such as when students become discouraged if they're able to answer only half of the questions in the "Completing Patterns" segment. However, this is not necessarily bad since many other students will do poorly in this subtest. Again, one must remain focused on solving the questions, e.g., using the elimination method.

As with most tests, you're simply trying to do better than your fellow students (i.e., the students in your reference group). Since the simpler questions will be answered correctly by most participants, you can get a high score on the exam by getting the difficult questions right. The assumption, of course, is that you have also done well on the easy questions!

2 HOW DO I BEST PREPARE FOR THE TEST AS?

2.1 HOW DO I REGISTER FOR THE TEST AS?

In order to register for the TestAS, you will need to go to the website: https://www.testas.de.

During the online registration process, you will be asked to enter your personal information and provide payment for the exam. (Since 2015, the fee for taking the TestAS has been 80 Euro.) Once you are registered, any important information regarding the exam will be sent to

you by
email. For further details about this process, please visit the TestAS website shown above.

2.2 WHEN AND WHERE CAN I TAKE THE TESTAS?

The TestAS is normally offered three times per year. The next dates are as follows:

22.10.2016 (Sat)

22.02.2017 (Wed)

22.04.2017 (Sat)

28.10.2017 (Sat).

The deadline for registration is often several weeks before the actual test date. It is crucial to register for the test in due time.
For information concerning possible additional dates or date changes, look up the page https://www.testas.de/de/pruefungstermine.htm.
~~The TestAS can be taken in several countries as~~ well as throughout Germany. The complete list of test centres can be found at the following websites:
Worldwide: https://www.testas.de/de/zentren_welt.php

Within Germany: https://www.testas.de/de/zentren_de.php

Internationally, TestAS is offered in only a limited number of cities. If a nearby location is not available, you can try emailing the TestAS team. The administrators of the TestAS and

TestDAF are closely linked. They may be able to find solutions with a TestDAF centre close to you.

Please note that the number of participating test centres may increase, depending on demand, as the test registration period progresses. For instance, initially in Turkey there were no test centres available for the April 2015 test. But over time, one city was added. As a second example, at the beginning of May 2015, the TestAS team announced that a one-off TestAS would be offered on May 31st at the Universität zu Köln.

If you do not find a suitable date or location, please check the TestAS website and/or contact the TestAS team.

2.3 WHAT DO I NEED TO BRING ON THE DAY OF THE TEST?

- A valid photo ID (This should be the same form of identification that was used to register online)
- A copy of the registration email you received from the test centre
- A few ball-point pens with blue or black ink
- Registration information (username and password) from testas.de for the onScreen language test.

It is also highly recommended that you bring drinks and a snack. The test can last up to 6 hours and 15 minutes, so you will want to maintain your energy during the test.
The test centre will provide paper for taking notes.

Finally you may want to consider bringing a simple stopwatch to help you manage your time spent on the questions. (You will not be permitted to use your mobile phone for this.)

IMPORTANT TIP! CONSIDER USING THE LAST 5 MINUTES OF EACH SUBTEST FOR INTELLIGENT GUESSING OF THE UNSOLVED QUESTIONS. A STOPWATCH CAN HELP YOU PAY ATTENTION TO THE LAST 5 MINUTES.-

2.4 HOW DOES THE TEST PROCEED

In total the test lasts 5-6 hours. The exact time varies by the test centre as the break durations can differ.

1.	onScreen Language Test	30 minutes
		Break of 30 minutes
2.	Core Test	110 minutes
		Break of roughly 30-45 minutes
3.	Subject-Specific Modules	145-150 minutes

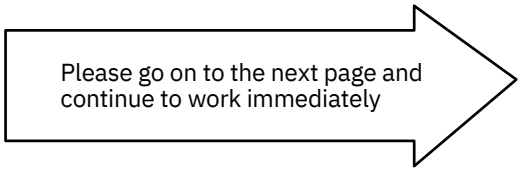
The test begins with the onScreen language test. The onScreen language section is the only part of the test to be taken on the computer. (Some test centres do not offer the language test due to technical reasons. We see this rather as an advantage because you can then start directly with the core test and use your energy and concentration for the questions that impact your grade.)

The Core Test is next. This portion of the test consists of four sections and is designed to measure your overall cognitive ability. For each section, students are given a specific number of minutes. The next group of questions can only be started after you are given the signal to proceed from the test leader.
You will have a break before you move on to the selected subject-specific module.

The Core Test and the specialised module test are both issued in the form of a small exercise book.

SYMBOLS FOUND IN THE EXERCISE BOOK

In the exercise book, at the end of some sections you will see the following symbols:



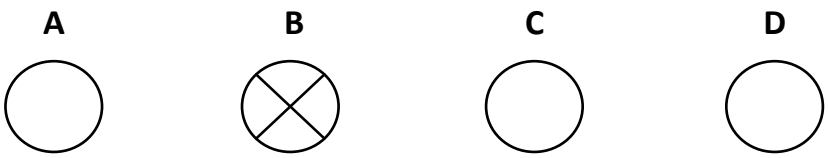
Do not turn the page!
Wait for the sign of the test conductor!

STOP

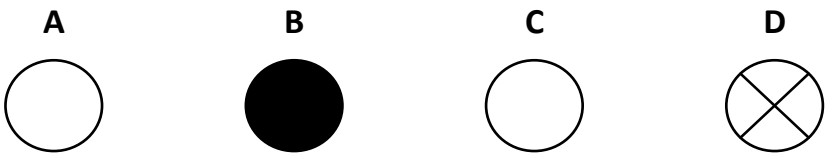
If you see the stop sign, it means that you have reached the end of the test. You may go back to the prior pages, but you may not move ahead to the next section. Do not turn the page here. This would be grounds to disqualify you from the entire test.

2.5 HOW SHOULD I FILL OUT THE ANSWER SHEET?

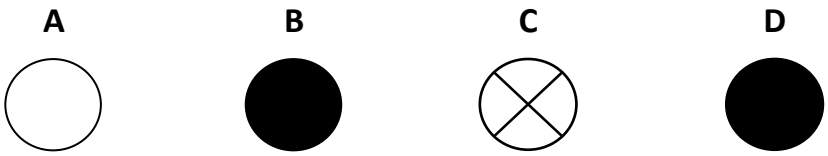
For the core test and the subject specific modules, you will be given a question booklet along with a separate one-page answer sheet. All answers need to be marked on the separate answer sheet using a ball-point pen. Answers that are filled out incorrectly may not be counted toward your score. And the answers in the exercise book will not be evaluated. Use a blue or black pen to fill in the answers. Please do not use a pencil. Your answer choice must be marked with an X. In the example below, B is marked.



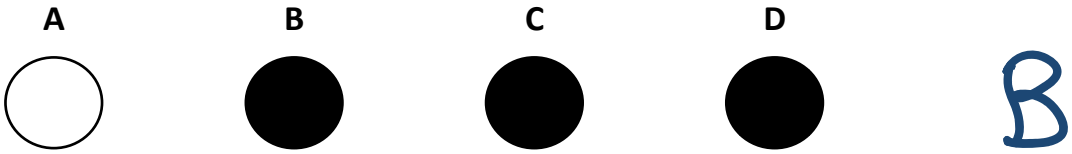
Should you need to change an answer that you have already marked, fill out the entire wrong circle and put an X in your new answer choice. In the example below, D is marked.



In the unlikely event that you would like to make a further change, please fill out the wrong circles and cross the correct answer. In the example below, C is marked.



If you change your mind again and you would like to re-enter an answer which you have already crossed out, you need to fill out the wrong circles and manually write the correct letter (A, B, C, D) at the end of the answer row. In the example below, B is marked.



But given a computer does the grading, we urge you not to make too many corrections on the answer sheet.

Please make sure that all of your answers are in the answer sheet before the time is up.

2.6 CAN I USE ANY AIDS DURING THE TEST?

All aids, such as calculators and dictionaries, are prohibited. The test centre will provide an answer sheet and paper for taking notes. Students are to bring their own ball-point pen to the test.

You are allowed to take notes and make your calculations on the question booklet as well as on the empty sheets of paper provided by the test administrator. However, only the answers crossed in the answer sheet will be graded.

You are free to bring a simple stop watch with you if you would like. There is however normally a clearly visible watch in the room where the test takes place. You are not allowed to use your mobile phone even in offline state.

2.7 WHAT CAN I MEMORISE IN PREPARATION FOR THE EXAM ?

According to the test makers, the TestAS is not designed to test knowledge. Rather it measures cognitive abilities. Cognitive abilities are the different brain-based skills, such as problem solving, decision making, and visual and spatial processing. Many of these skills can be specifically trained.
Certain sections such as *Completing Patterns* are indeed like an IQ test rather than a standard high school test which tests a given knowledge. While you cannot memorise solutions in advance, you can create your own framework for solving the questions in a more structured and controlled way. In this book, we give you a sample framework to approach each question type. By practicing with many questions, you will acquaint your brain with the question format and the approach. This should enable you to answer more questions in less time and result in higher grades for you.

With some question types, especially in the subject-specific modules, prior knowledge can be very helpful. Taking the Natural Science test as an example, it is true that some of the questions can be answered without prior knowledge. For others you need to have understood the main concepts of the different Natural Sciences, such as astronomy, geography, and biology. Students who have already studied these subjects during high school report being able to go through the questions with greater confidence and speed because they are familiar with the content. Many questions may be theoretically solvable without prior knowledge, but given the time pressure, it helps to know the general concepts in advance.

For this reason we list in our books the breadth of different question types that are asked in the TestAS. Solve our questions, identify where you have gaps (e.g., simple probability/combination questions in the Solving Quantitative Problems) and study these before the exam.

2.8 SUGGESTIONS FOR THE DAY OF THE TEST

Please consider the following suggestions while preparing for the test.

1.

- Acquaint yourself with the different question types and how to fill out the answer sheet.Somequestion types, such as Completing Patterns and Identifying Relationships, are quite unique, but they can be learned. Because the answers are marked with a pen (as opposed to pencil), the corrections are quite different from most common exams. It is worth reading our instructions in advance.

2.

- Answer all questions, if needed by taking an educated guess.The average student has time to solve only half of the questions. If you are stuck on a question, determine which answers are definitely wrong and use the process of elimination to guess the correct answer. Do not leave any answers blank.

3.

- Answer the first questions quickly and without hesitation. Each subtest starts with easier questions and increases in difficulty as the test progresses. Some students are surprised by how easy the first questions are and start double-checking every result. The first questions are very easy. Quickly move on so that you will have sufficient time for the more challenging questions.

4.

- Solve our questions without a calculator in order to practise quick and error-free calculating.Two parts of the Core Test and half of the Economics exam require lots of calculations.

5.

- Try to retain your concentration until the end. The test is long and many students have difficulty concentrating in the subject modules. Your grade will be calculated compared to the performance of other students. By performing well when other students are beginning to lose focus, you can positively impact your grade.

6.

- Bring drinks and a snack to keep up your enery. The test can last up to 6 hours and 15 minutes. In most cases you are not allowed to leave the exam area.

7.

- Try to get sufficient sleep the night before.This might seem obvious, but is of great importance because you will need to be able to concentrate for 5-6 hours.

8.

- Last but most importantly -strengthen your language skills as much as possible. Having strong language skills, especially a well-developed vocabulary, is in our view a prerequisite for above-average results. No matter what you read, whether it is fiction, newspapers of school books, you should read a lot in the language you will be taking the test in. The questions in the exam can be wordy and complex, and you will need to be understand them well enough to decide what is relevant to the questions.

3 SOLVING QUANTITATIVE PROBLEMS

3.1 THE QUESTIONS MAY BE EASY TO SOLVE, BUT THE GRADING IS TOUGH

The first subtest "Solving Quantitative Problems" measures the ability to solve basic mathematical problems. In this section, various disciplines found in mathematics are incorporated from algebra to geometry and on to probability and preliminary interest calculation.
You have 45 minutes to solve the 22 questions. Many students find the time to be adequate to go through all the questions.
Overall the difficulty level is rather low compared to other international university entrance exams. Many international students report being comfortable with most of the questions due to their high school studies. The questions are rather wordy to test your ability to recognize what is important in the long text.
In our sample questions, we included questions reflecting the breadth of the question topics. While solving the questions, please make a list of the question types where you tend to make mistakes. And then focus on solving many questions in this type so you can learn how to solve them.
Remember that the TestAS grading is done according to a bell curve, as explained in the grading section above. If an average student solves 18 of the 22 questions correctly, you would need to solve at least 19 questions to achieve an above-average score. The fact that you solved nearly all of the questions (18 of 22) does not benefit your score. What matters is whether you did better than the other students. Consequently, don't be misled by the overall easiness of these arithmetic questions. It just means that you need to be extra careful not to make mistakes unintentionally. In sections like this where the overall rate of correct answers is high, each missed answer can have a major impact on your score.

3.2 LIST OF QUESTION TYPES

Below we listed for you the main question types. All of these question types can be asked in this section of the Core test. If you have an area of weakness, focus on these. You will be sufficiently prepared to pass the exam if you can solve the questions in these categories that

are at a medium level of difficulty. However, what is most important is that you understand the overall approach to solve each question type.

Algebra	– Simplifying expressions – Solving linear equations – Venn diagrams
Arithmetic	– Fractions – Percentages – Ratios and proportions – Elementary combinatorics – Probabilities – Statistics – Decimals – Elementary powers and roots of numbers
Geometry	– Triangles (Perimeter / Area / Angle) – Pythagorean theorem – Rectangles (Perimeter / Area) – Circles (Perimeter / Area) – Volumes – Coordinate geometries
Word problems	– Rate problems – Mixture problems – Elementary interest rate and profit problems – Interpretation of graphs and tables – Discounts.

3.3 PRACTICE EXAMS

You have 45 minutes to solve each test with the 22 questions

3.3.1 EXAM1

1.1.

Joe is planning a party and expecting 300 guests. He would like to serve mini quiches as hors d'oeuvres. He is planning for each guest to have 2 quiches each. The quiches are sold in boxes of 25. How many boxes will Joe need to order to be sure each guest gets 2 mini quiches?

(A) 16

(B) 24

(C) 30

(D) 36

1.2.

In a call centre, 60% of the men and 72% of the women manage to make sales on their calls. How high is this percentage of men who make sales in the entire company when the team consists of 60% the company's men?

(A) 60

(B) 36

(C) 30

(D) 28

1.3. The owners of the Royal Mills complex need to replace the kitchen floors in 2 of their buildings. Each building at Royal Mills consists of 8 identical apartments. Each apartment has 90 m2 of total flooring. The kitchen makes up 1/10th of the flooring in each apartment. What is the total kitchen flooring in the 2 buildings that needs to be replaced?

(A) 144

(B) 100

(C) 72

(D) 9

1.4.

One of the students taking this exam found of the problems to be easy, but were in her opinion hard. What percentage of the problems were for her neither hard nor easy?

(A) 20%

(B) 25%

(C) 35%

(D) 55%

1.5. A rectangular pipe has a length of 50 cm, a width of 3 cm and a height of 20 cm. If the pipe is to be filled with water at a rate of 4 cm3 per second, how many minutes does it take until the pipe is full?

(A) 12.5

(B) 75

(C) 750

(D) 1,000

1.6.

The cinema is open 8 hours every day. It sells 30 tickets every hour Monday through Friday, and 20% of those sales are student tickets. It sells 100 tickets every hour on the weekends, and 30% of those sales are student tickets. If the regular charge for a ticket is 12 Euros Monday through Friday and 15 Euros on the weekends, and student tickets are 10 Euros every day, how many Euros does the cinema make every week?

(A) 13,920

(B) 23,200

(C) 25,200

(D) 35,520

1.7.

Dan is writing a short story for his English class. He writes 30 sentences in the morning before work and 50 sentences every night before bed. He knows he only needs to write 300 more sentences to complete his assignment. If he begins writing Friday morning and writes every day, morning and night, when will he complete his assignment?

(A) Sunday night

(B) Saturday morning

(C) Monday morning

(D) Monday night

1.8.

Maria lives in the U.S. and travels to Germany with 12,100 US dollars (USD) to finance her trip. She spends 50% of her money for her hotel, and her airline tickets cost 30%

of the remaining amount. She spends 900€ on food during her trip. She had no other expenses. On the last day of her trip, she decides to buy souvenirs for her family that cost 500€ each. If during her trip 1€ is equal to 1.10 USD, how many souvenirs can Maria buy for her family?

(A) 6

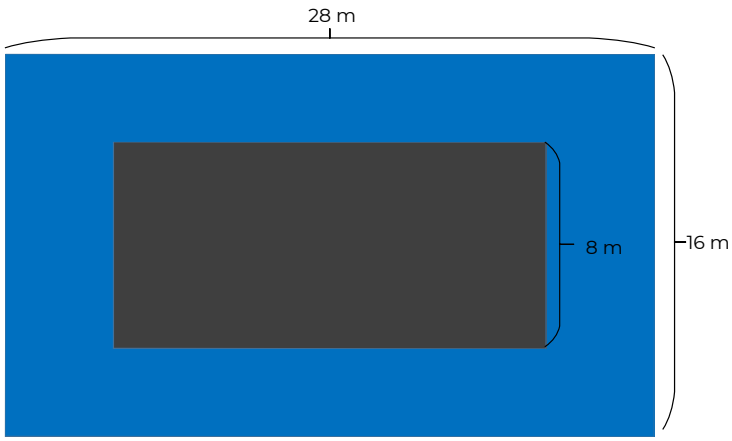
(B) 5

(C) 7

(D) 4

1.9.

The urban beautification committee of the city wants to plant trees along the edges of the city's main park (marked blue in the image below) and the edges of the playground inside (marked grey). If the ratio of the width to length of the park is the same as the ratio of the width to length of the playground. What is the total distance in meters that the beautification committee will plant with trees?



(A) 44

(B) 88

(C) 132

(D) 142

1.10.

Mr. Lothrup created a map of Turkey for his history class but discovered it was too small for his students to read. He enlarged the first map to create a second identical version with the same ratios. Given the measurements of the two maps, how big is x?

(A) 10

(B) __

(C) 15

(D) 20

1.11.

Lisa, who is 160 cm tall, is standing 170 cm from her brother Eric, who is 180 cm tall. They begin to walk toward each other. If one step equals 1/10 of their respective heights, after how many steps will they come face to face?

(A) 2

(B) 3

(C) 4

(D) 5

1.12.

X	Y
2	5
4	10
5	A
6	15
10	25

The table shows the relationship between X and Y. What is the equation between X and Y, and what is A?

(A) 2X = 5Y, A = 6 2X

(B) = 5Y, A = 12.5 5X

(C) = 2Y, A = 12.5 5X

(D) = 2Y, A = 14

1.13.

Petra needs to sell her car. She knows if she sells it for 18,000 Euros, she will lose 20% of her original buying price. If Petra wants to make a 15% profit over her original buying price, how much should she sell her car for?

(A) 25,875

(B) 25,750

(C) 25,300

(D) 25,280

1.14.

There are 6 keys and only 1 of them unlocks the door. What is the probability of unlocking the door on the first try?

(A) —

(B) –

(C) —

(D) –

1.15.

Let P be the point (0,-1) and Q be the point (3,2). In this Cartesian coordinate system, find the point on the line segment PQ that is twice as far from P as from Q.

(A) (3,1)

(B) (2,1)

(C) (2,-1)

(D) (1.5,0.5)

1.16.

Lisa has saved 50 video games, 500 pictures, and 100 songs on her memory stick. She is unable to load more documents on the memory stick because there is no space left. If all the video games are deleted, half of the storage space becomes available. One picture is 5MB (MB= megabytes) and 20 pictures take as much space

as a song. How many pictures can Lisa save on the memory stick if the memory stick is free?

(A) 2,500

(B) 1,000

(C) 5,000

(D) 2,200

1.17.

If Simon gives 2 Euros to Peter, they will have an equal amount of money. If Peter gives 2 Euros to Simon, Simon's money will be five times Peter's money. How many Euros does Peter have?

(A) 4

(B) 6

(C) 8

(D) 10

1.18.

Given that $(3a + b) \times (b - 1) = 17$, what is $a \times b$ (a and b are positive integers)?

(A) 5

(B) 6

(C) 8

(D) 10

1.19.

Bethany owns 3 parrots. Together they weigh 10 kg. The second bird is three times as heavy as the first one, and the third is th lighter than the second one. What do the 3 parrots weigh?

(A) 1.4kg; 4.2kg; 4.4kg

(B) 1.5kg; 4.5kg; 4kg

(C) 1.6kg; 4.8kg; 3.6kg

(D) 1.7kg; 6.1kg; 2.2kg

1.20.

If ≡ − , calculate the equation .

(A) 0.5

(B) 1

(C) 2

(D) 2.5

1.21.

Mary is planning to make a fruit shake. She has watermelon, apple, orange, banana, mango, pineapple, and guava. In how many ways can she mix exactly three fruits for the fruit shake?

(A) 7

(B) 21

(C) 35

(D) 62

1.22.

The Mueller family wants to design a pool that holds 798 cubic meters of water. They have a space 19 meters long and 12 meters wide. How tall do they have to build the pool walls so it holds 798 m3 of water?

(A) 2

(B) 2.5

(C) 3

(D) 3.5

3.3.2 EXAM 2

2.1.

Tammy bought a new camera for her month long holiday in Italy. The camera comes standard with a 16 GB memory card, which can store 10,000 photos. But she doesn't think that will be enough for her whole trip. If she buys a 50 GB memory card instead, how many photos will Tammy be able to store during her vacation?

(A) 25,000

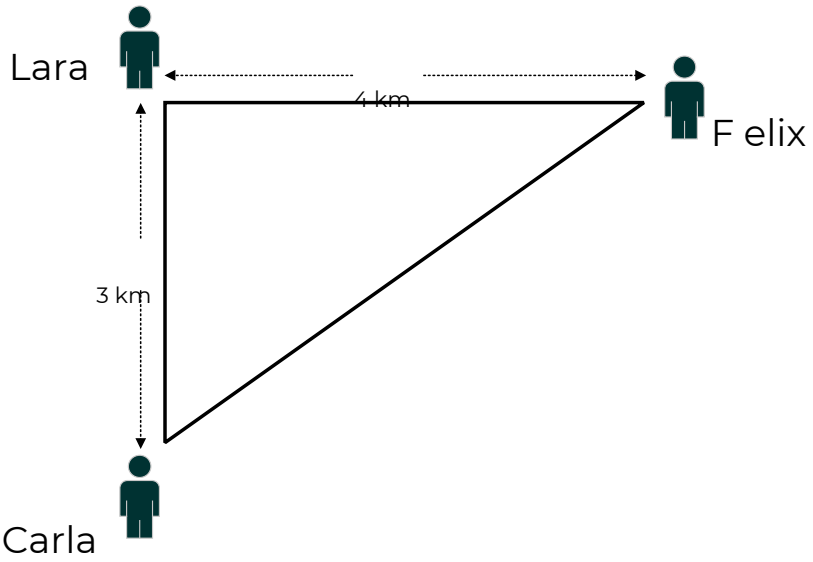
(B) 30,000

(C) 31,250

(D) 35,000

2.2.

Carla is across from Lara and is 3km away. Felix is 4 km to Lara's right. What is the distance between Carla and Felix?



(A) 4√2

(B) 5√2

(C) 5

(D) 7

2.3.

Margarite wants to call a friend in the United States. She knows it costs 8 cents for every 15 seconds of airtime. How many Euros will a 20 minute conversation with her friend cost?

(A) 32

(B) 64

(C) 6.40

(D) 3.20

2.4.

Brigit's café is running a special on strudel and coffee. Coffee requires 0.1 litres of milk, and strudel requires 0.5 litres of milk. If Brigit has orders for 25 cups of coffee and 21 strudels, how many litres of milk will she need?

(A) 11.5

(B) 13

(C) 14

(D) 15.5

2.5.

Herbert wants to tell his friends on Twitter about a new video game he bought. He's figured out that it will take 430 characters to share all the information. If each tweet is restricted to 140 characters, how many tweets will Herbert have to send in order to share his whole message?

(A) 3

(B) 4

(C) 5

(D) 6

2.6.

Ariana reads magazines on her smartphone. The font ratio is 5:2, height to width, respectively. If the height of each letter of the font Ariana has chosen is 15 mm-high, what is the width of the letter?

(A) 3 mm

(B) 6 mm

(C) 15 mm

(D) 37.5 mm

2.7.

Ben is putting new carpet in the office and showroom of his store. Both rooms are rectangular and cover the same area. The office is 12 metres by 30 metres. Ben knows the showroom is 18 metres wide. How long is the showroom?

(A) 13

(B) 15

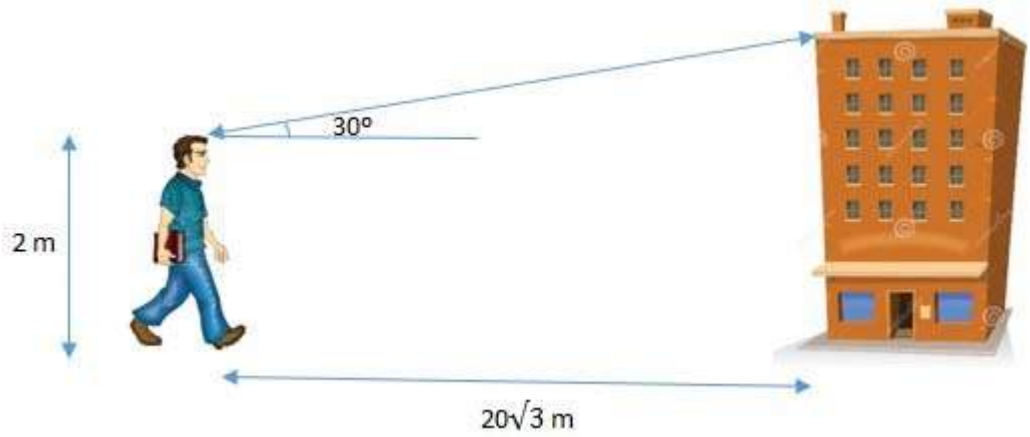
(C) 19

(D) 20

2.8.

John is 2 meters tall and sees a building $20\sqrt{3}$ m away and wants to determine the height of the building. He knows the angle of elevation between the top of the building and the top of his head is 30°, and with a 30-60-90 triangle, the ratio between

hypotenuse: adjacent side: opposite side = 2: √3: 1. What is the height of the building?



(A) 20 m

(B) 22 m

(C) 24 m

(D) 26 m

2.9.

What is the ratio of the area of a large circle to the area of a smaller circle, given that the radius of the larger circle is four times the radius of the smaller circle?

(A) 2

(B) 4

(C) 8

(D) 16

2.10.

The total ages of x children were t last year and will be u after 3 years. What is x in terms of t and u (their ages are greater than 1)?

(A) t - 3u

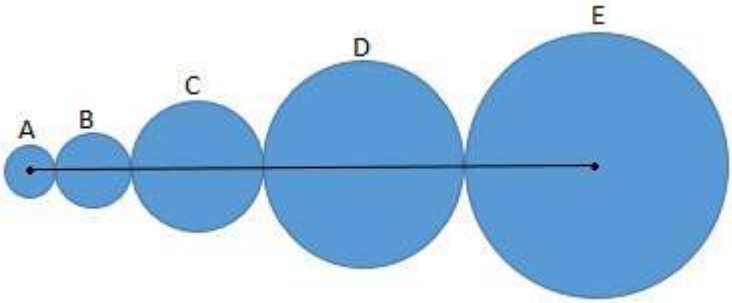
(B) 3u - t

(C) —

(D) —

2.11.

The radius of circle A is r. The circle A is enlarged as A, B, C, D, and E. Ratios between radiuses:



– = –, = –, – = –, and – = –

If the line between the centres of A to E is 82 cm, what is r in cm?

(A) 4

(B) 5

(C) 6

(D) 7

2.12.

A rectangular box has a length of 20 cm, a width of 20 cm, and a height of 10 cm. What is the greatest possible distance between any two points on the box?

(A) $20\sqrt{2}$

(B) $20\sqrt{3}$

(C) 30

(D) 40

2.13.

In Mrs. Harrington's history class, 80% of the students speak English and 60% speak German. There are 30 students who can speak only one language. What is the maximum number of students who may speak both English and German in her class?

(A) 10

(B) 15

(C) 20

(D) 25

2.14.

There are 20 horses on a farm. Ten of them are black, nine have short tails, and twelve have long hair. Only one horse is black and has a short tail and long hair. Three of the horses are black with short tails and short hair. Four of the horses have short tails and long hair but are not black. If all the horses on the farm have at least one of the 3 characteristics mentioned, how many horses are black with long hair but do not have short tails?

(A) 2

(B) 3

(C) 4

(D) 5

2.15.

Jon owns 14,250€ worth of stocks in a soda company. He needs to make some quick money and decides to sell the stocks and makes 75€ profit on each stock he sells. After selling all the soda stocks, he makes 18,600€. How many stocks did Jon originally own?

(A) 55

(B) 56

(C) 57

(D) 58

2.16.

Axel has a box of pens and pencils that he would like to package for the students at the primary school. He tries to bundle 2 pens and 3 pencils in packages but has 3 pencils left over. He tries a second time, bundling 4 pens and 7 pencils per package and now has 6 pens left. How many pencils are in Axel's box?

(A) 28

(B) 56

(C) 77

(D) 84

2.17.

Thomas has a letter he wants to send to his girlfriend. The total perimeter of the blue stamp and envelope together is 50 cm. The ratio between them is 1:4. What is the perimeter of the stamp?

(A) 5

(B) 10

(C) 15

(D) 20

2.18.

There is a group of 4 people. If they regroup in groups of 2, 3 or 4, how many different groups can be formed?

(A) 11

(B) 60

(C) 10

(D) 66

2.19.

Gerda is training for a sports competition. One of her athletic exercises consists of rhythmical walking followed by a standing jump vertically upwards. The length of the

exercise stretch is 37 m. There are flagpoles at the start and end of the stretch. Gerda does the stretch with the following repetitive motion: 2 steps ahead, bounce vertically upwards, one step back, bounce vertically upwards. She repeats this sequence until she reaches the second flagpole at the end. How many steps does it take for Gerda if each step takes 3/4 meters?

(A) 140

(B) 144

(C) 146

(D) 150

2.20.

A swimming pool has a length of 10 m, a width of 8 m, and a height of 3 m. The pool is full with water and it is supposed to be emptied completely. It is drained with a speed of 3 cubic meters per minute. Because of a broken water pipe additional water is flowing at a speed of 270 cubic meters per hour for 30 minutes into the pool while emptying it. How many minutes does it take to empty the pool?

(A) 110

(B) 125

(C) 130

(D) 135

2.21.

Lenard is tossing two coins. Find the probability that he gets at least one head.

(A) 0.25

(B) 0.5

(C) –

(D) 0.75

2.22.

A class is going to elect a President and a Vice-President of their Mathematics Society. If the class has 15 students, in how many ways can they elect these top 2 positions?

(A) 225

(B) 29

(C) 58

(D) 210

3.3.3 EXAM3

3.1.

Farmer Jane just bought a ranch and now would like to stock it with animals. She knows it takes 200 hectares to raise 500 sheep, 200 cows, and 300 chickens. She has purchased 500 hectares. How many animals will Jane be able to raise?

(A) 2,100

(B) 2,250

(C) 2,400

(D) 2,500

3.2.

Karin has two friends who love to play chess and she'd like to make each of them a wooden chessboard for their birthday. Each square requires 10 cm2 of wood. If a chessboard has 64 squares, how many m2 of wood will Karin need to make 2 chessboards?

(A) 0.064

(B) 6.4

(C) 0.128

(D) 1.28

3.3.

Philip just won 240,000 Euros in the lottery. The bank pays a yearly interest rate of 10%. How much is Philip making in interest each quarter during the first year?

(A) 2,000

(B) 6,000

(C) 8,000

(D) 12,000

3.4.

Brigitte is replacing her kitchen floor. She is ordering rectangular tiles that are 12 cm by 25 cm. Her kitchen floor is 600 m^2. How many tiles does Brigitte need to order to replace the whole floor?

(A) 2

(B) 200

(C) 2,000

(D) 20,000

3.5.

The price policy of a translation agency is given below:

Up to 1000 words	€50
Each extra word	€2

Analise and Ana have written their research papers in French but need to have them translated to German for their science professor. The papers have 1,011 and 550 words, respectively. What is the total price the two women will pay to the agency?

(A) €112

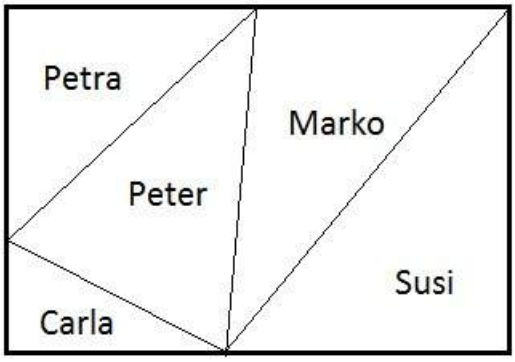
(B) €122

(C) €100

(D) €132

3.6.

Five friends own a piece of rectangular land which is 50 meters broad and 40 meters long. Petra's land is 300 m2, Marko's 580 m2, Carla's 150 m2 and Susi's 500 m2. How big is Peter's piece of land?



(A) 630

(B) 580

(C) 470

(D) 450

3.7.

Nora rides her horse, Oscar, 175 m, while Paula rides her horse, Query, 105 m in the same amount of time. If they continue to ride at the same speed, how many meters does Nora ride when Paula rides 126 m?

(A) 210

(B) 232

(C) 246

(D) 258

3.8.

For every 2.5 Euros that Lars has, Marina has 4.5 Euros. When added together, their total is 133 Euros. How many Euros does Marina have?

(A) 85.5

(B) 81.5

(C) 79.5

(D) 87.5

3.9.

Alice is a years old. What is the sum of her ages after b + a years and before b - a years (a<b)?

(A) a +b

(B) 2a

(C) 4a

(D) 4b

3.10.

Irmi is traveling on her motorbike from Heidelberg to Frankfurt to visit her brother at university. The trip takes a total of 4 hours and 45 minutes if she travels a constant speed of 84 km per hour. After 3 hours and 20 minutes, she stops at her favourite restaurant for some burgers and fries. How much farther does Irmi still have to travel to get to the University?

(A) 113

(B) 119

(C) 121

(D) 128

3.11.

Given P = 2L+2W, find the value of L.

(A) – W

(B) ___

(C) 2P 4W

(D) ___

3.12.

Melanie works at the lawn mower plant. She can complete her first lawn mower in 30 minutes. As she tires, it takes her twice as long as the previous one to assemble a lawnmower. If she works an 8 hour shift each day, how many lawnmowers can she complete in one shift?

(A) 2

(B) 3

(C) 4

(D) 5

3.13.

A firm of consultants in the USA looks at the TV ratings for a particular channel. The prime time, from 20:00 to 23:00, brings the channel 100,000 dollars of advertising revenue per hour. During the rest of the day, the channel earns 50,000 dollars of

advertising revenue per hour. How many dollars of advertising revenue does the TV channel earn in a day?

(A) 300,000

(B) 1,000,000

(C) 1,050,000

(D) 1,350,000

3.14.

Lara has 4 notebooks: two of these have pages with gridlines; the other two are without gridlines. If she wants the first notebook to have a gridline, how many different combinations of notebook sequences could she have?

(A) 6

(B) 12

(C) 16

(D) 24

3.15.

The average of , , and A is . Find A.

(A)

(B)

(C) 2

(D)

3.16.

A small foundation gives a total of 960 Euros per month in scholarships to students, distributed equally among the recipients. Four students lose their qualification for the scholarship and will not receive a scholarship starting this month. The amount of money available as a result will be shared among the other students equally. In this way, the other students will get 40 Euros more per month. How many students were originally given scholarships?

(A) 12

(B) 8

(C) 10

(D) 14

3.17.

We are given an equation B =

Which of the following correctly reflects the value of e?

(A) — 1.5

(B)

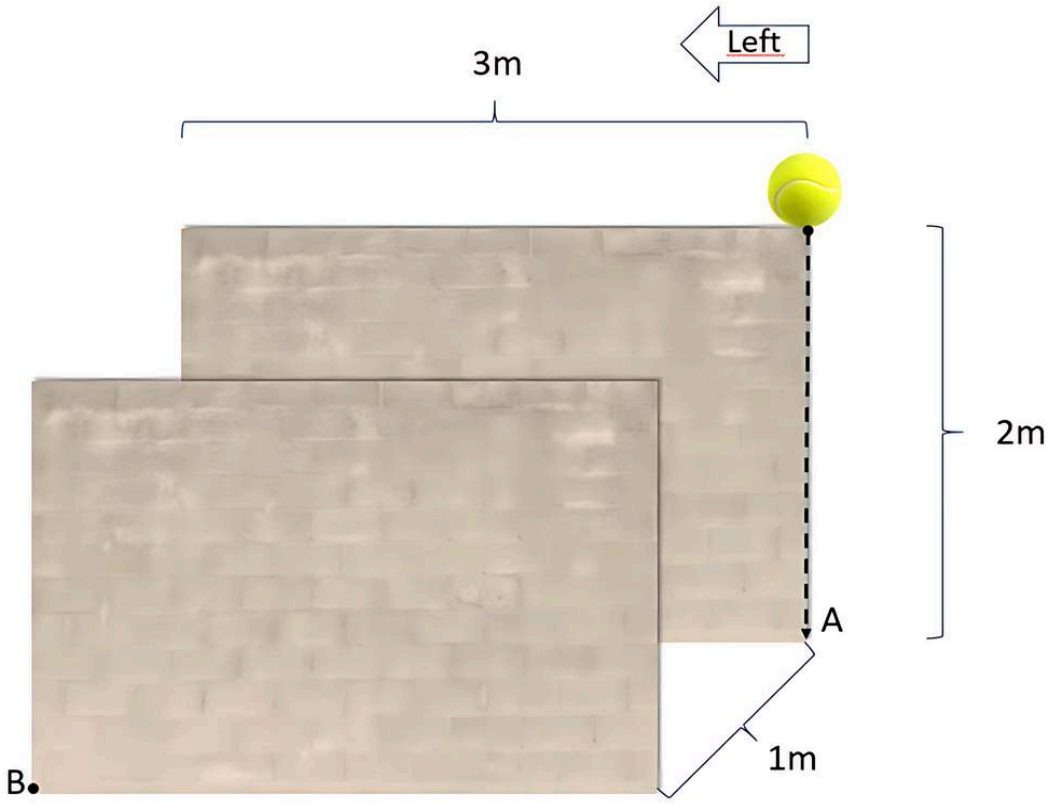
(C) – -1.5

(D) 0.5

3

3.18.

A tennis ball is thrown from a 2m-high wall vertically down and strikes the ground at point A. After that, the ball repeatedly bounces off the ground. After each impact, the ball bounces exactly 2 cm to the left and 10 cm forward towards another wall. What will be the distance from Point B when the ball hits the 1 m distant, opposite wall? (We assume that there is no friction and that each time the ball bounces the same distance.)



(A) 20 cm

(B) 100 cm

(C) 200 cm

(D) 280 cm

3.19.

Maria has a small business. She is– times as old as the youngest apprentice, Ida.

Maria is — as old as her colleague, Gene. If you add Maria, Ida, and Gene's ages they equal 87 years. How old is Ida?

(A) 17

(B) 18

(C) 21

(D) 22

3.20.

If Zelda bikes m metres in s seconds, how many metres does she bike in Y minutes?

(A) —

(B) —

(C) —

(D) —

3.21.

Michael and Jackson are playing dice. Michael is to throw the dice after Jackson throws it. Jackson wins if the sum of the first and the second throws of the dice is 4. Find the probability that Jackson wins.

(A) –

(B) –

(C) —

(D) —

3.22.

A vocal coach must choose three amateurs from 8 singers. How many different ways can he choose the amateurs?

(A) 336

(B) 112

(C) 64

(D) 56

3.4 ANSWER KEY

Exam 1		Exam 2		Exam 3	
Question	Answer	Question	Answer	Question	Answer
1.1.	B	2.1.	C	3.1.	D
1.2.	B	2.2.	C	3.2.	C
1.3.	A	2.3.	C	3.3.	B
1.4.	C	2.4.	B	3.4.	D
1.5.	A	2.5.	B	3.5.	B
1.6.	D	2.6.	B	3.6.	C
1.7.	D	2.7.	D	3.7.	A
1.8.	B	2.8.	B	3.8.	A
1.9.	C	2.9.	D	3.9.	C
1.10.	B	2.10.	C	3.10.	B
1.11.	D	2.11.	A	3.11.	A
1.12.	C	2.12.	C	3.12.	C
1.13.	A	2.13.	C	3.13.	D
1.14.	D	2.14.	A	3.14.	B
1.15.	B	2.15.	D	3.15.	C
1.16.	C	2.16.	D	3.16.	A
1.17.	A	2.17.	B	3.17.	B
1.18.	D	2.18.	A	3.18.	D
1.19.	B	2.19.	C	3.19.	B
1.20.	C	2.20.	B	3.20.	D
1.21.	C	2.21.	D	3.21.	C
1.22.	D	2.22.	D	3.22.	D

3.5 DETAILED ANSWERS

3.5.1 EXAM 1

1.1.

Joe is planning a party and expecting 300 guests. He would like to serve mini quiches as hors d'oeuvres. He is planning for each guest to have 2 quiches each. The quiches are sold in boxes of 25. How many boxes will Joe need to order to be sure each guest gets 2 mini quiches?

(A) 16

(B) 24

(C) 30

(D) 36

Answer: B

Multiply the total number of guests coming by 2 to determine the total number of mini quiches Joe must order. 300 × 2 = 600 total quiches needed. Divide the total number of quiches by the number in each box to determine the number of boxes Joe must order — = 24 boxes.

1.2.

In a call centre, 60% of the men and 72% of the women manage to make sales on their calls. How high is this percentage of men who make sales in the entire company when the team consists of 60% the company's men?

(A) 60

(B) 36

(C) 30

(D) 28

Answer: B

Determine how many men make sales.

Assuming the company has 100 employees, 60 would be men.

Of those 60 men, 60% make sales.

This means — × 60 = 36 men of the 100 employees make sales.

This equals 36%.

1.3. The owners of the Royal Mills complex need to replace the kitchen floors in 2 of their buildings. Each building at Royal Mills consists of 8 identical apartments. Each apartment has 90 m2 of total flooring. The kitchen makes up 1/10th of the flooring in each apartment. What is the total kitchen flooring in the 2 buildings that needs to be replaced?

(A) 144

(B) 100

(C) 72

(D) 9

Answer: A

Determine the number of m2 of flooring in each building: 90m2 × 8 = 720 m2 total in each building.

If—th of that is kitchen floor, then 720 × — = 72 m2 is kitchen flooring in each building.

Multiple total kitchen flooring by 2 to get total m2 in 2 buildings: 72 m2 × 2 = 144 m2.

1.4.

One of the students taking this exam found of the problems to be easy, but were in her opinion hard. What percentage of the problems were for her neither hard nor easy?

(A) 20%

(B) 25%

(C) 35%

(D) 55%

Answer: C

Determine how many problems were both hard and easy: – + = —.

Determine how many exercises were neither hard nor easy: 1 – — = — – — = —.

— = 35% of the problems were neither hard nor easy.

1.5. A rectangular pipe has a length of 50 cm, a width of 3 cm and a height of 20 cm. If the pipe is to be filled with water at a rate of 4 cm3 per second, how many minutes does it take until the pipe is full?

(A) 12.5

(B) 75

(C) 750

(D) 1,000

Answer: A

The volume of the rectangular pipe is given by 50 × 3 × 20 = 3,000 cm3.

Thus, the pipe will be filled with water in —— = 750 seconds.

In minutes: — = 12.5 minutes.

1.6.

The cinema is open 8 hours every day. It sells 30 tickets every hour Monday through Friday, and 20% of those sales are student tickets. It sells 100 tickets every hour on the weekends, and 30% of those sales are student tickets. If the regular charge for a ticket is 12 Euros Monday through Friday and 15 Euros on the weekends, and student tickets are 10 Euros every day, how many Euros does the cinema make every week?

(A) 13,920

(B) 23,200

(C) 25,200

(D) 35,520

Answer: D

Determine how many total tickets are sold each day Monday – Friday:

30 × (20 ÷ 100) = 6 student tickets and 24 normal tickets will be sold in an hour.

(6 × 10) + (12 × 24) = 60 + 288 = 348 Euros per hour

348 × 8 × 5 = 13,920 Euros

Weekends:

100 × (30 ÷ 100) = 30 student tickets and 70 normal tickets will be sold in an hour.

(30 × 10) + (70 × 15) = 300 + 1050 = 1,350 Euros per hour

1,350 × 8 × 2 = 21,600 Euros

Total: 13,920 + 21,600 = 35,520 Euros

1.7.

Dan is writing a short story for his English class. He writes 30 sentences in the morning before work and 50 sentences every night before bed. He knows he only needs to write 300 more sentences to complete his assignment. If he begins writing Friday morning and writes every day, morning and night, when will he complete his assignment?

(A) Sunday night

(B) Saturday morning

(C) Monday morning

(D) Monday night

Answer: D

Determine the number of sentences Dan writes each day: 30 + 50 = 80 sentences in one day. Friday, Saturday, and Sunday he writes: 80 × 3 = 240 sentences.

By Monday morning he still has: 300 - 240 = 60 sentences left to write.

He will only write 30 in the morning and still have: 60 - 30 = 30 sentences left to write.

Monday night he can write 50 sentences before bed. He will finish Monday night.

1.8.

Maria lives in the U.S. and travels to Germany with 12,100 US dollars (USD) to finance her trip. She spends 50% of her money for her hotel, and her airline tickets cost 30% of the remaining amount. She spends 900€ on food during her trip. She had no other expenses. On the last day of her trip, she decides to buy souvenirs for her family that cost 500€ each. If during her trip 1€ is equal to 1.10 USD, how many souvenirs can Maria buy for her family?

(A) 6

(B) 5

(C) 7

(D) 4

Answer: B

Determine the total number of Euros Maria has:

1 Euro = 1.10 Dollars

1 ÷ 1.10 Euro = 1 USD

12,100 USD × (1 ÷ 1.10) = 11,000 Euros

50% goes to hotel: 11,000 × (50 ÷ 100) = 5,500 for hotel

30% of remaining goes to airline tickets: 5,500 × (30 ÷ 100) = 1,650 Euros for tickets

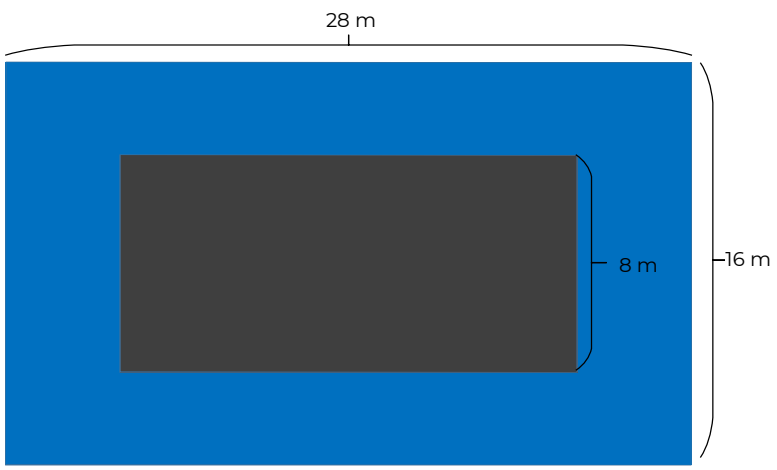
Determine how much Maria has left after her costs:

11,000 – (5,500 + 1,650 + 900) = 2,950 Euros left (after cost of hotel, tickets, food)

If each souvenir costs 500 Euros, then: 2,950 ÷ 500 = 5.9; so she can buy 5 souvenirs.

1.9.

The urban beautification committee of the city wants to plant trees along the edges of the city's main park (marked blue in the image below) and the edges of the playground inside (marked grey). If the ratio of the width to length of the park is the same as the ratio of the width to length of the playground. What is the total distance in meters that the beautification committee will plant with trees?



(A) 44

(B) 88

(C) 132

(D) 142

Answer: C

The ratios are:

— = –

Cross multiply to solve for x: 16x = 28 × 8

x = 224 ÷ 16 x = 14m

Determine parameters of playground and grassy area:

(14 × 2) + (8 × 2) = 44 m for playground

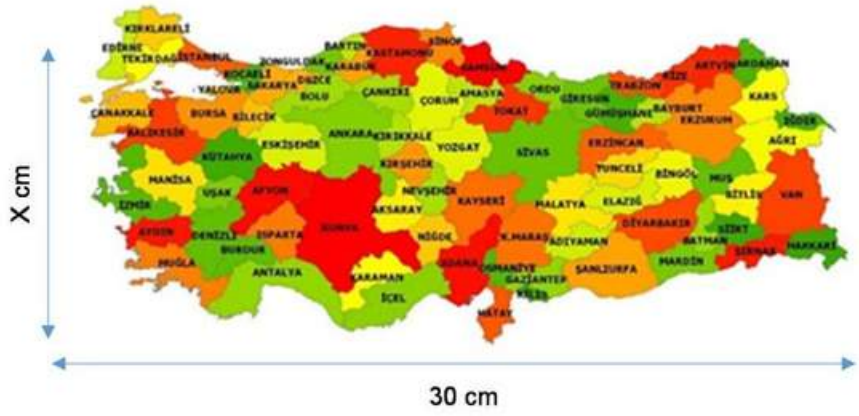
(28 × 2) + (16 × 2) = 88 m for grassy area

Find total area to be planted:

44 + 88 = 132 m will be planted.

1.10.

Mr. Lothrup created a map of Turkey for his history class but discovered it was too small for his students to read. He enlarged the first map to create a second identical version with the same ratios. Given the measurements of the two maps, how big is x?



(A) 10

(B) __

(C) 15

(D) 20

Answer: B

The ratio is: — = –

Cross multiply to solve for x: 12x = 5 × 30:

x = ___

Reduce the fraction:

x = — cm

1.11.

Lisa, who is 160 cm tall, is standing 170 cm from her brother Eric, who is 180 cm tall. They begin to walk toward each other. If one step equals 1/10 of their respective heights, after how many steps will they come face to face?

(A) 2

(B) 3

(C) 4

(D) 5

Answer: D

Determine the length of Lisa's steps: 160 ÷ 10 = 16 cm.

Determine the length of Eric's steps: 180 ÷ 10 = 18 cm.

Each combined step moves them: 16 + 18 = 34 cm.

Determine the total number of steps to reach the same point: 170 ÷ 34 = 5 steps.

1.12.

X	Y
2	5
4	10
5	A
6	15
10	25

The table shows the relationship between X and Y. What is the equation between X and Y, and what is A?

(A) 2X = 5Y, A = 6 2X

(B) = 5Y, A = 12.5 5X

(C) = 2Y, A = 12.5 5X

(D) = 2Y, A = 14

Answer: C

When X = 2, Y = 5 => 5X=10 and 2Y=10 so the equation between them is 5X=2Y.

When X=5, A=12.5.

1.13.

Petra needs to sell her car. She knows if she sells it for 18,000 Euros, she will lose 20% of her original buying price. If Petra wants to make a 15% profit over her original buying price, how much should she sell her car for?

(A) 25,875

(B) 25,750

(C) 25,300

(D) 25,280

Answer: A

The 20% loss means that 18,000 Euros is 80% of the selling price. 18,000 × 100 ÷ 80 = 22,500 Euros is the original selling price of the car. To make a profit, she needs to sell the car for 15% over the selling price:

22,500 + [22,500 × (15 ÷ 100)] = 25,875 Euros is the selling price that would give a 15% profit.

1.14.

There are 6 keys and only 1 of them unlocks the door. What is the probability of unlocking the door on the first try?

(A) —

(B) –

(C) —

(D) –

Answer: D
There is a probability that the correct key is picked at the first attempt.

–

1.15.

Let P be the point (0,-1) and Q be the point (3,2). In this Cartesian coordinate system, find the point on the line segment PQ that is twice as far from P as from Q.

(A) (3,1)

(B) (2,1)

(C) (2,-1)

(D) (1.5,0.5)

Answer: B

On a segment, a point that is twice as far from one end as the other is – the distance from one end. The points (0,-1), (1,0), (2,1) and (3,2) are on segment PQ, and they divide the segment into three intervals. Hence, (2,1) is the point on the line segment PQ that is twice as far from P as from Q.

1.16.

Lisa has saved 50 video games, 500 pictures, and 100 songs on her memory stick. She is unable to load more documents on the memory stick because there is no space left. If all the video games are deleted, half of the storage space becomes available. One picture is 5MB (MB= megabytes) and 20 pictures take as much space as a song. How many pictures can Lisa save on the memory stick if the memory stick is free?

(A) 2,500

(B) 1,000

(C) 5,000

(D) 2,200

Answer: C

Since the video games are taking up half the space on the memory stick:

50 video games = 500 pictures + 100 songs (from the second sentence)

Since 20 pictures (at 5MB each) takes the same space as one song:

20 × 5 = 100MB (one song)

Therefore:

100 × 100 = 10,000MB (for all the songs)

500 × 5 = 2,500MB (for the pictures)

(10,000 + 2,500) × 2 = 25,000MB is the capacity of this memory stick

25,000 ÷ 5 = 5,000 pictures can be stored

1.17.

If Simon gives 2 Euros to Peter, they will have an equal amount of money. If Peter gives 2 Euros to Simon, Simon's money will be five times Peter's money. How many Euros does Peter have?

(A) 4

(B) 6

(C) 8

(D) 10

Answer: A

Let Simon's money = s and Peter's money = p

Then: s – 2 = p +2

s = p + 4

And we know: 5 × (p – 2) = s + 2

5p – 10 = s + 2

Substitute Simon's money equation for "s" and solve: 5p – 10 = (p + 4) + 2

5p – 10 = p + 6

4p = 16

p = 4 Euros

1.18.

Given that (3a + b) × (b - 1) = 17, what is a × b (a and b are positive integers)?

(A) 5

(B) 6

(C) 8

(D) 10

Answer: D

Since 17 is a prime number, it is divisible by only 1 and 17.

So, 3a + b can be either 1 or 17. a and b are positive integers, so the solution =1 is ruled out.(For 3a + b to be equal to 1, either a or b would need to be negative or a number between 0 and 1. But according the question statement, a and b are positive integers.)

3a + b = 17

b - 1 = 1, then b = 2

3a = 15

a = 5 and a × b =10

1.19.

Bethany owns 3 parrots. Together they weigh 10 kg. The second bird is three times as heavy as the first one, and the third is th lighter than the second one. What do the 3 parrots weigh?

(A) 1.4kg; 4.2kg; 4.4kg

(B) 1.5kg; 4.5kg; 4kg

(C) 1.6kg; 4.8kg; 3.6kg

(D) 1.7kg; 6.1kg; 2.2kg

Answer: B

Let the weight of the first parrot be Y kg

Step 1: Determine the weight of the 2nd parrot in terms of Y: 3Y.

Step 2: Determine the weight of the 3rd parrot in terms of Y: 3Y - (3Y ×).

= 3Y – – We can replace 3Y mit —— to facilitate the subtraction.

= (9Y –Y) ÷ 3

= —

Step 3: Determine the weight of all 3 parrots in terms of Y: Y + 3Y + —.

Which is equal to 10 kg: Y + 3Y + — = 10

Step 4: Solve for Y: Y + 3Y + — = 10:

4Y + — = 10

(12Y + 8Y) ÷ 3 = 10

20Y = 30

Y = 1.5 kg

Step 5 and the Answer: Determine the weight of each parrot:

Weight of 1st parrot = Y = 1.5 kg

Weight of 2nd parrot = 3Y = 3 × 1.5 = 4.5 kg

Weight of 3rd parrot =— = 8 × 1.5 ÷ 3 = 4 kg

1.20.

If ≡ – ——.

, calculate the equation

(A) 0.5

(B) 1

(C) 2

(D) 25

Answer: C

Look at the left equation. One possible combination of q and y is q=2; y=5.

If you use this solution solving the right equation, it will become (2 × 5 – 2) ÷ 2 × 2 = (10 – 2) ÷ 4 = 8 ÷ 4 = 2.

1.21.

Mary is planning to make a fruit shake. She has watermelon, apple, orange, banana, mango, pineapple, and guava. In how many ways can she mix exactly three fruits for the fruit shake?

(A) 7

(B) 21

(C) 35

(D) 62

Answer: C

Mary can choose 3 fruits from 7 choices. She can choose the first fruit from the seven choices. Since one is already chosen, the second fruit can only be chosen from the 6. Then, the third fruit can be chosen from the remaining 5. The number of ways of doing this is 7 × 6 × 5. Now, the order of the 3 chosen fruits does not matter. Such ordering can be done in 3 × 2 × 1 = 6 ways. Hence, there are 7 × 6 × 5 ÷ 6 = 35 ways of choosing 3 fruits if there are 7 choices.

1.22.

The Mueller family wants to design a pool that holds 798 cubic meters of water. They have a space 19 meters long and 12 meters wide. How tall do they have to build the pool walls so it holds 798 m3 of water?

(A) 2

(B) 2.5

(C) 3

(D) 3.5

Answer: D

Let h = the height of the pool walls

Volume = Length × Width × Height

So h = Volume ÷ (Length × Width)

Step 1: Use the equation to solve for h: h = 798m3 ÷ (19m × 12m):

h = 798 m3 ÷ 228 m2

h = 3.5 m

3.5.2 EXAM2

2.1.

Tammy bought a new camera for her month long holiday in Italy. The camera comes standard with a 16 GB memory card, which can store 10,000 photos. But she doesn't think that will be enough for her whole trip. If she buys a 50 GB memory card instead, how many photos will Tammy be able to store during her vacation?

(A) 25,000

(B) 30,000

(C) 31,250

(D) 35,000

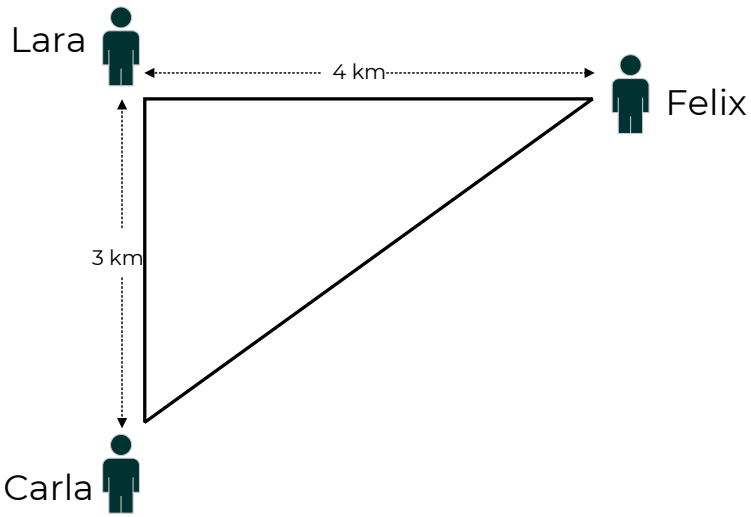
Answer: C

Divide the total number of photos by the number of GB on card to determine how much memory each photo requires: 10,000 ÷ 16 = 625 photos per GB memory unit.

Now multiply the number of photos per GB memory unit by the total number of GB on the larger memory card. 625 × 50 = 31,250 photos.

2.2.

Carla is across from Lara and is 3km away. Felix is 4 km to Lara's right. What is the distance between Carla and Felix?



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(A) $4\sqrt{2}$

(B) $5\sqrt{2}$

(C) 5

(D) 7

Answer: C

Let x be the distance between Felix and Carla.

Using the Pythagorean Theorem, x2=32+42.

Thus x2=25 and x=5.

2.3.

Margarite wants to call a friend in the United States. She knows it costs 8 cents for every 15 seconds of airtime. How many Euros will a 20 minute conversation with her friend cost?

(A) 32

(B) 64

(C) 6.40

(D) 3.20

Answer: C

Step 1: Determine how much each minute of airtime costs:

If 15 sec => 8 cents, in one minute 15 sec × 4 => 8 cents × 4

60 sec => 32 cents/minute

Step 2: Calculate how much a 20 min conversation will cost:

20 × 32 = 640 cents = 6.40 Euros

It will cost Margarite 6.40 Euros for a 20 minute conversation.

2.4.

Brigit's café is running a special on strudel and coffee. Coffee requires 0.1 litres of milk, and strudel requires 0.5 litres of milk. If Brigit has orders for 25 cups of coffee and 21 strudels, how many litres of milk will she need?

(A) 11.5

(B) 13

(C) 14

(D) 15.5

Answer: B

Determine the amount of milk needed for the coffee by multiplying total litres required by the number of coffees ordered: 0.1 litres × 25 coffees = 2.5 litres of milk.

Determine the amount of milk need for the strudels by multiplying total litres required by the number of strudels ordered: 0.5 litres × 21 strudels = 10.5 litres.
Now add the total milk needed for coffees to the total needed for strudel: 2.5 + 10.5 = 13 litres.

2.5.

Herbert wants to tell his friends on Twitter about a new video game he bought. He's figured out that it will take 430 characters to share all the information. If each tweet is restricted to 140 characters, how many tweets will Herbert have to send in order to share his whole message?

(A) 3

(B) 4

(C) 5

(D) 6

Answer: B

Divide the total characters by the number in each tweet: 430 ÷ 140 = 3.07 tweets. Since the characters won't fit in 3 tweets, he will have to write a 4th tweet to share all the information.

2.6.

Ariana reads magazines on her smartphone. The font ratio is 5:2, height to width, respectively. If the height of each letter of the font Ariana has chosen is 15 mm-high, what is the width of the letter?

(A) 3 mm 6

(B) mm 15

(C) mm 37.5

(D) mm

Answer: B

The ratio is: —— = = —

Cross multiply: 5x = (2 × 15)

5x = 30

x = 6 mm width

2.7.

Ben is putting new carpet in the office and showroom of his store. Both rooms are rectangular and cover the same area. The office is 12 metres by 30 metres. Ben knows the showroom is 18 metres wide. How long is the showroom?

(A) 13

(B) 15

(C) 19

(D) 20

Answer: D

Step 1: Determine how much area is in the office:

Area = width × length

= 12m × 30m = 360 m2

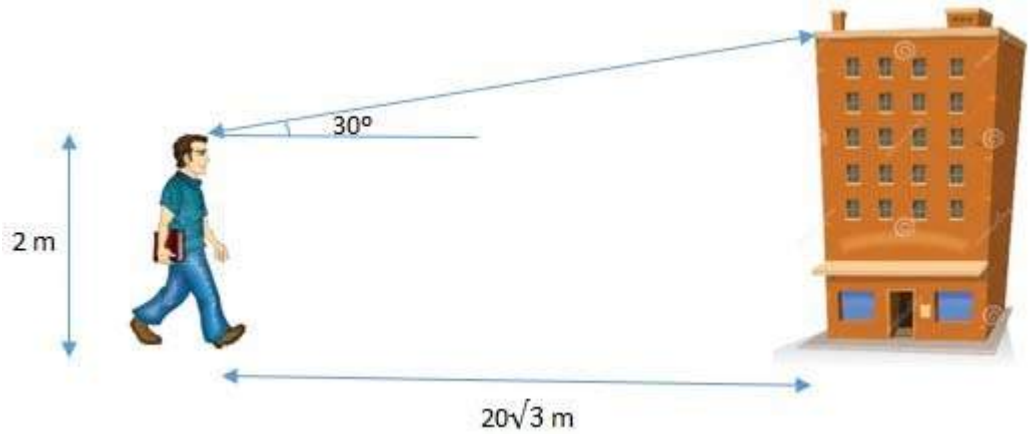
Step 2: Determine the length of the showroom:

Length = Area ÷ width

= 360 m2 ÷ 18 m = 20

2.8.

John is 2 meters tall and sees a building 20√3 m away and wants to determine the height of the building. He knows the angle of elevation between the top of the building and the top of his head is 30°, and with a 30-60-90 triangle, the ratio between hypotenuse: adjacent side: opposite side = 2: √3: 1. What is the height of the building?



(A) 20 m

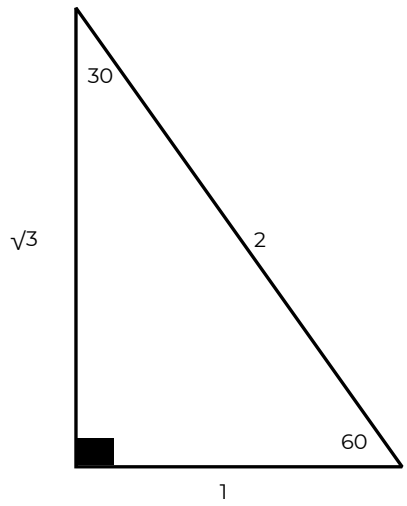
(B) 22 m

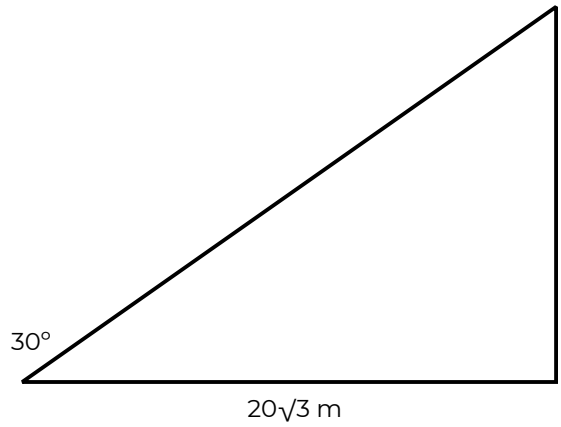
(C) 24 m

(D) 26 m

Answer: B

This is a 30-60-90 triangle. The rule is that the shortest side of the triangle is across from the 30° corner, and the relationship between the sides are: H: LL: SL = 2: √3: 1.





Given the long leg is 20√3, the short leg is 20.

The height of the building: 20 + 2 (=height of the man) = 22 m.

2.9.

What is the ratio of the area of a large circle to the area of a smaller circle, given that the radius of the larger circle is four times the radius of the smaller circle?

(A) 2

(B) 4

(C) 8

(D) 16

Answer: D

The area of a circle is A = π × r × r = π × r2.

Let the radius of the smaller circle be r, and the larger circle, 4r.

Small circle: A= π × r × r = πr2

Large circle: A= π × 4r × 4r = π16r2 = 16 × πr2

The ratio of the area will be (16 × π × r2) ÷ (π × r2) = 16.

2.10.

The total ages of x children were t last year and will be u after 3 years. What is x in terms of t and u (their ages are greater than 1)?

(A) t - 3u

(B) 3u - t

(C) —

(D) —

Answer: C

t represents last year's summation, so this year the x children will be 1 year older:

t + 1 × x

u represents the summation 3 years later, so this year the x children will be 3 years younger:

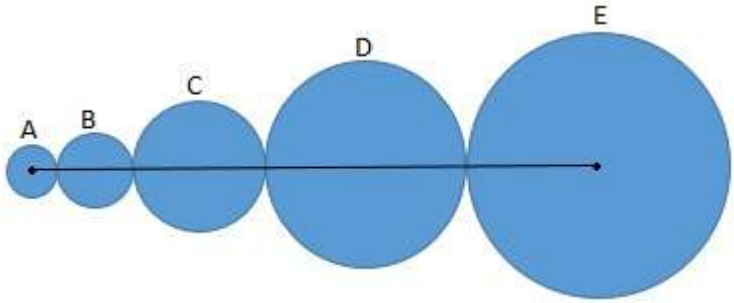
u - 3 × x

t + 1 × x = u - 3 × x and then u - t = 4 × x, x =

—

2.11.

The radius of circle A is r. The circle A is enlarged as A, B, C, D, and E. Ratios between radiuses:



– = – , = – , – = – , and – = –

If the line between the centres of A to E is 82 cm, what is r in cm?

(A) 4

(B) 5

(C) 6

(D) 7

Answer: A

The radius of A is r (given in the question).

From ratios (place values in equations and cross multiply them):

rB = 2r, rC = 2 ×– r = 2,5r, rD = 3r, rE = 4.5r

The line can be shown mathematically:

rA + 2 rB + 2 rC + 2 rD + rE = r + 4r + 5r + 6r + 4.5r = 20.5 r

20.5r = 82 cm

r = 4 cm

2.12.

A rectangular box has a length of 20 cm, a width of 20 cm, and a height of 10 cm. What is the greatest possible distance between any two points on the box?

(A) 20√2

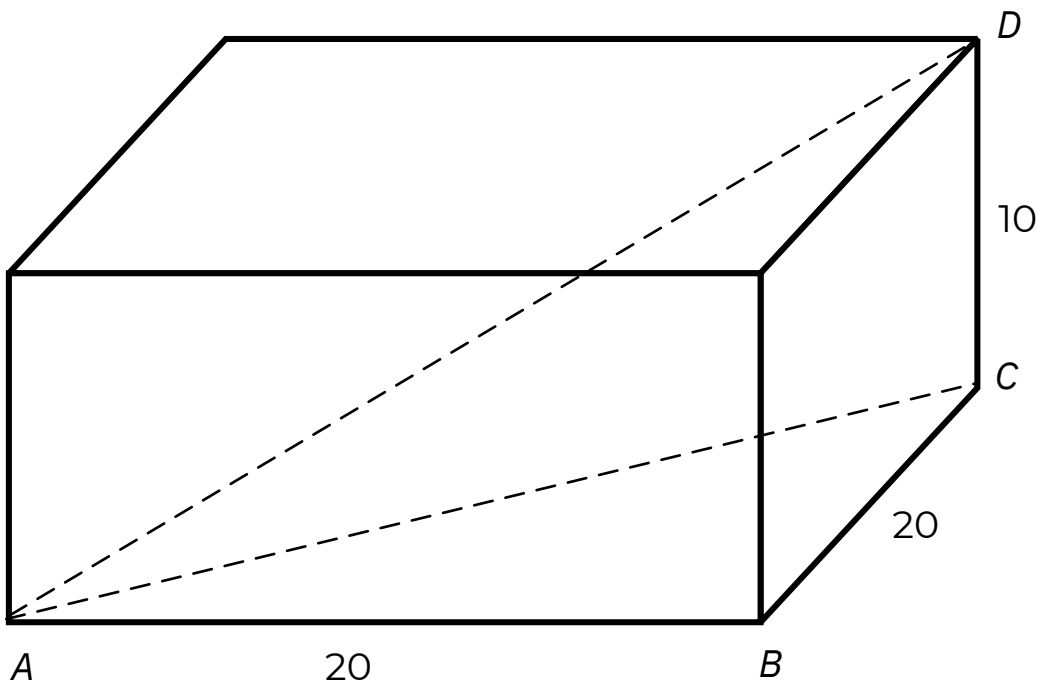
(B) 20√3

(C) 30

(D) 40

Answer: C

The greatest possible distance between any two points in a rectangular solid is the space diagonal (AD) of the rectangular solid as shown below.



To compute the length of AD, the Pythagorean Theorem must be used twice as follows:

Triangle ABC:

$$20 \quad 20 = 800$$

$$AC = 20\sqrt{2}$$

Triangle ACD:

$$(\quad -$$

$$20\sqrt{2} = 900 - 10$$

AD = 30

2.13.

In Mrs. Harrington's history class, 80% of the students speak English and 60% speak German. There are 30 students who can speak only one language. What is the maximum number of students who may speak both English and German in her class?

(A) 10

(B) 15

(C) 20

(D) 25

Answer: C

We must figure out first how many total students are in Mrs. Harrington's class. Since we know 30 students speak only one language, let's assume 30 is 60% of the whole class, because 20% do not speak English and 40% do not speak German. Therefore, 60% of the class are not bilingual as they do not speak the other language. 30 ÷ 0.6 = 50 total students in the class. Since 30 out of the total know only one language, the maximum number of students who could speak both English and German is 50-30 = 20.

2.14.

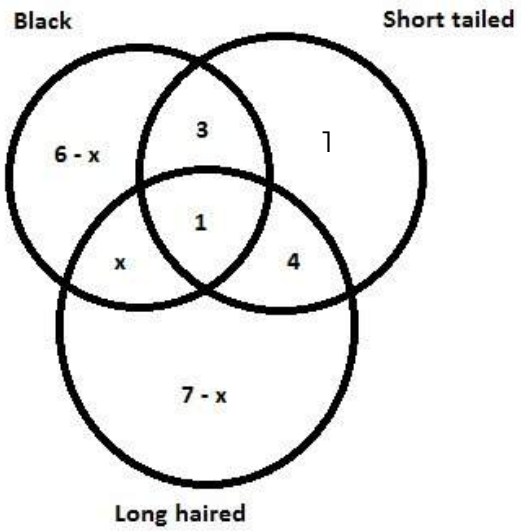
There are 20 horses on a farm. Ten of them are black, nine have short tails, and twelve have long hair. Only one horse is black and has a short tail and long hair. Three of the horses are black with short tails and short hair. Four of the horses have short tails and long hair but are not black. If all the horses on the farm have at least one of the 3 characteristics mentioned, how many horses are black with long hair but do not have short tails?

(A) 2

(B) 3

(C) 4

(D) 5



Answer: A

The total number of horses is 20.

(6-x) + 3 + 1 + x + 1 + 4 + (7-x) = 20

22 - x = 20

x = 2

2.15.

Jon owns 14,250€ worth of stocks in a soda company. He needs to make some quick money and decides to sell the stocks and makes 75€ profit on each stock he sells. After selling all the soda stocks, he makes 18,600€. How many stocks did Jon originally own?

(A) 55

(B) 56

Buyer: Yahia Transac Alktion adri (yh ID: 0713
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(C) 57

(D) 58

Answer: D

Step 1: Total profit: = 18,600€ - 14,250€

= 4,350€ profit

Step 2: No. of stocks he had: = Total profit/profit per lot

= 4,350€ ÷ 75€

= 58 stocks

Jon originally owned 58 stocks.

2.16.

Axel has a box of pens and pencils that he would like to package for the students at the primary school. He tries to bundle 2 pens and 3 pencils in packages but has 3 pencils left over. He tries a second time, bundling 4 pens and 7 pencils per package and now has 6 pens left. How many pencils are in Axel's box?

(A) 28

(B) 56

(C) 77

(D) 84

Answer: D

2 pens 3 pencils	+ 3 pencils	(x packages) so, 2 × pens and 3 x + 3 pencils
4 pens 7 pencils	+ 6 pens	(y packages) so, 4y + 6 pens and 7y pencils

Since the number of pens and pencils is the same we can use the two equations to determine the number of each.

Pens: $2x = 4y + 6$

$2x - 4y = 6$ (multiply by 3*) => (I)

Pencils: $3x + 3 = 7y$

$3x - 7y = -3$ (multiply by -2*) => (I)

* Multiplying with 3 or -1 converts the equation to a format where we can solve for y easily.

Now add the resulting two equations: $6x - 12y = 18$ (I)

$-6x + 14y = 6$ (II)

And simplify: (I) + (II): $2y = 24$

$y = 12$ (and $x = 27$)

Determine the number of pencils: $7y = 84$ pencils

2.17.

Thomas has a letter he wants to send to his girlfriend. The total perimeter of the blue stamp and envelope together is 50 cm. The ratio between them is 1:4. What is the perimeter of the stamp?

(A) 5

(B) 10

(C) 15

(D) 20

Answer: B

Let the width of the stamp be x. Then the width of the envelope will be 4x.

Let the height of the stamp be y. Then the height of the envelope will be 4y.

Perimeter of stamp: 2x + 2y

Perimeter of envelope: 8x + 8y

Total perimeters: 10x + 10y = 50 (divide both sides by 10)

x + y = 5 cm, 2x+2y will be 10 cm

2.18.

There is a group of 4 people. If they regroup in groups of 2, 3 or 4, how many different groups can be formed?

(A) 11

(B) 60

(C) 10

(D) 66

Answer: A

Let's name the 4 people a, b, c and d. Possible combinations are: a

b a c a d b c b d c d

a b c a b d a c d b c d a b c d There

are 11 possible combinations.

2.19.

Gerda is training for a sports competition. One of her athletic exercises consists of rhythmical walking followed by a standing jump vertically upwards. The length of the exercise stretch is 37 m. There are flagpoles at the start and end of the stretch. Gerda does the stretch with the following repetitive motion: 2 steps ahead, bounce vertically upwards, one step back, bounce vertically upwards. She repeats this sequence until she reaches the second flagpole at the end. How many steps does it take for Gerda if each step takes 3/4 meters?

(A) 140

(B) 144

(C) 146

(D) 150

Answer: C

You have to look at the movement sequence to determine the total number of steps Gerda takes: 2 steps forward and 1 step back (the jumps are irrelevant for the calculation). So every 3rd step Gerda does one step backwards. The distance she covers in one sequence is:

1st step (forwards): 0.75 m

2nd step (forwards): 0.75 m + 0.75 m = 1.5 m

3rd step (backwards): 0.75 m + 0.75 m - 0.75 m = 0.75 m

Thus with one sequence she effectively just makes one step = 0.75 m forwards, although she makes 3 steps. Thereafter, the movement starts again from the beginning:

4th step (forward): 0.75 m + 0.75 m - 0.75 m + 0.75 m = 1.5 m followed by a step forwards and one step backwards, etc.
Here one must note that the sequence ends once she passed the 37 m. At the end of the 37 meters, the final step could be the first or the second step of the motion sequence. This means that Gerda can make 0.75 m with the first step of the sequence or 1.5 meters with the first two steps without the third step backwards.
So we need to determine how many complete movements can be completed within the 37 meters. This can be determined by dividing 37 m by 1.5 m. This equals 24 2/3. Thus Gerda can make complete sequences in the first 24 × 1.5 m = 36 m.

<u>Calculation:</u>

Part 1: Determine the number of steps Gerda takes to move 36 m.

Number of ¾ m in 36 m = 36 ÷ 0.75 = 48

48 × 3 = 144 steps

Part 2: When Gerda is at the point of 36 m, she should take 2 steps forward and then she will reach the end point. So, the total steps Gerda should take to reach 37 m: 144 + 2 = 146 steps.

2.20.

A swimming pool has a length of 10 m, a width of 8 m, and a height of 3 m. The pool is full with water and it is supposed to be emptied completely. It is drained with a speed of 3 cubic meters per minute. Because of a broken water pipe additional water is flowing at a speed of 270 cubic meters per hour for 30 minutes into the pool while emptying it. How many minutes does it take to empty the pool?

(A) 110

(B) 125

(C) 130

(D) 135

Answer: B

First, we have to get the volume of the swimming pool. It is 10 × 8 × 3 = 240 cubic meters. Since the pool will be drained with a speed of 3 cubic meters per minute, it will take

240 cubic meters ÷ 3 cubic meters per minute = 80 minutes

to drain the pool.

Because of the defective pipe water is flowing at a speed of 270 m^3/h back into the pool, which has to be emptied too. In the 30 minutes
270 $m^3/h \times 0.5h = 135\ m^3$

of additional water will be in the pool. It takes

$135\ m^3 \div 3\ m^3/min = 45$ min

to drain it. Thus, it will take

80 min + 45 min = 125 min

to drain the pool of it is full of water.

2.21.

Lenard is tossing two coins. Find the probability that he gets at least one head.

(A) 0.25

(B) 0.5

(C) _

(D) 0.75

Answer: D

Tossing two coins results in the following: Head Head, Head Tail, Tail Head, Tail Tail. Among these results, the following have at least one head: Head Head, Head Tail, Tail Head. Hence, the probability of getting at least one head when tossing two coins is ¾= 0.75.

2.22.

A class is going to elect a President and a Vice-President of their Mathematics Society. If the class has 15 students, in how many ways can they elect these top 2 positions?

(A) 225

(B) 29

(C) 58

(D) 210

Answer: D

The class can elect the President from the 15 members.

After they elected the President, they can elect the Vice-President from the 14.

Thus, there are 15 × 14= 210 ways of electing the top 2 positions.

3.5.3 EXAM3

3.1.

Farmer Jane just bought a ranch and now would like to stock it with animals. She knows it takes 200 hectares to raise 500 sheep, 200 cows, and 300 chickens. She has purchased 500 hectares. How many animals will Jane be able to raise?

(A) 2,100

(B) 2,250

(C) 2,400

(D) 2,500

Answer: D

Add the total number of animals she can raise on 200 hectares: 500 + 200 + 300 = 1,000.

Determine how much larger her ranch is by dividing 500 ÷ 200 = 2.5 times larger.

Multiply 2.5 × 1,000 = 2,500 total animals on his ranch.

or

200 hectares can support a maximum of 500 + 200 + 300 = 1,000 animals.

We then calculate how many animals can be raised on 1 hectare: 1,000 ÷ 200 = 5.

Now multiply the number of animals per hectare by the total number of hectares: 5 × 500 = 2,500.

3.2.

Karin has two friends who love to play chess and she'd like to make each of them a wooden chessboard for their birthday. Each square requires 10 cm2 of wood. If a chessboard has 64 squares, how many m2 of wood will Karin need to make 2 chessboards?

(A) 0.064

(B) 6.4

(C) 0.128

(D) 1.28

Answer: C

Determine the total number of cm2 required for each board: 64 × 10cm2 = 640 cm2.

Two boards require 2 × 640 cm2 = 1280 cm2.

If each cm2 is 1/10,000 of a m2 then 1280 cm2 × (1/10,000) m2 = 0.128 m2.

3.3.

Philip just won 240,000 Euros in the lottery. The bank pays a yearly interest rate of 10%. How much is Philip making in interest each quarter during the first year?

(A) 2,000

(B) 6,000

(C) 8,000

(D) 12,000

Answer: B

Step 1: Determine the yearly interest: (10 ÷ 100) × 240,000 = 24,000€.

Step 2: Convert the yearly into a monthly charge: 24,000 ÷ 12 = 2,000€.

Step 3: A quarter consists of 3 months: 2,000 × 3 = 6,000€.

3.4.

Brigitte is replacing her kitchen floor. She is ordering rectangular tiles that are 12 cm by 25 cm. Her kitchen floor is 600 m^2. How many tiles does Brigitte need to order to replace the whole floor?

(A) 2

(B) 200

(C) 2,000

(D) 20,000

Answer: D

Determine the area of one tile = 12 × 25 = 300cm2 = 0.03m2

Determine how many tiles to cover her floor. Area = 600 ÷ 0.03 = 20,000 tiles.

3.5.

The price policy of a translation agency is given below:

Up to 1000 words	€50
Each extra word	€2

Analise and Ana have written their research papers in French but need to have them translated to German for their science professor. The papers have 1,011 and 550 words, respectively. What is the total price the two women will pay to the agency?

(A) €112

(B) €122

(C) €100

(D) €132

Answer: B

Ana will pay the flat fee of 50 Euros since her paper is under 1000 words.

Analise will pay 50 Euros for the first 1,000 words and will pay 2 Euros per extra word.

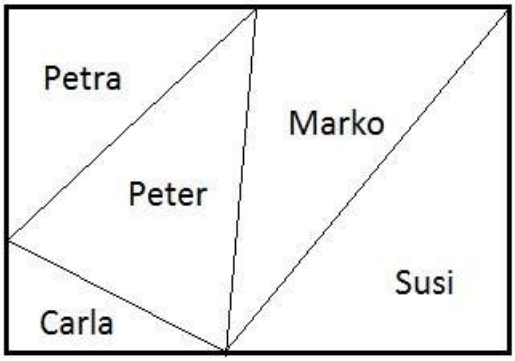
1,011 – 1,000 = 11 extra words

2 × 11 = 22 Euros

Together they will pay: 50 + 50 + 22 = €122.

3.6.

Five friends own a piece of rectangular land which is 50 meters broad and 40 meters long. Petra's land is 300 m2, Marko's 580 m2, Carla's 150 m2 and Susi's 500 m2. How big is Peter's piece of land?



(A) 630

(B) 580

(C) 470

(D) 450

Answer: C

The area of the rectangular land is 50 × 40 = 2,000 m2.

Let Y be the area of Peter's piece.

Then 300 + 580 + 150 + 500 + Y = 2.000 ⇒ Y = 470.

Thus, Peter's piece is 470 m2.

3.7.

Nora rides her horse, Oscar, 175 m, while Paula rides her horse, Query, 105 m in the same amount of time. If they continue to ride at the same speed, how many meters does Nora ride when Paula rides 126 m?

(A) 210

(B) 232

(C) 246

(D) 258

Answer: A

Step 1: Determine the ratio of the distances they ride: Nora's : Paula's = 175:105 = 5:3.

Step 2: Determine how many meters Nora rides when Paula rides 126m:

Let x = the distance Nora rides when Paula rides 126m

So the proportion would be — = –

3x = 5 × 126

3x = 630

x = 210 m

3.8.

For every 2.5 Euros that Lars has, Marina has 4.5 Euros. When added together, their total is 133 Euros. How many Euros does Marina have?

(A) 85.5

(B) 81.5

(C) 79.5

(D) 87.5

Answer: A

Let x = the number of 2.5 Euros that Lars has

Marina has 4.5x Euros

Step 1: Write an equation to solve for x: 2.5x + 4.5x = 133

7x = 133

x = 19

Step 2: Use the value of x to calculate Marina's Euros = 19 × 4.5

= 85.5

3.9.

Alice is a years old. What is the sum of her ages after b + a years and before b - a years (a<b)?

(A) a + b

(B) 2a 4a

(C) 4b

(D)

Answer: C

After b + a years, Alice is a + b + a = 2a + b years old.

After a - b years, Alice is a - (b - a) = 2a - b years old.

The sum of her ages is 2a + b + 2a - b = 4a years.

3.10.

Irmi is traveling on her motorbike from Heidelberg to Frankfurt to visit her brother at university. The trip takes a total of 4 hours and 45 minutes if she travels a constant speed of 84 km per hour. After 3 hours and 20 minutes, she stops at her favourite restaurant for some burgers and fries. How much farther does Irmi still have to travel to get to the University?

(A) 113

(B) 119

(C) 121

(D) 128

Answer: B
Step 1: Determine how much more time Irmi still needs to travel: Time Left = 4 h 45 min – 3h 20 min

= 285 min – 200 min

= 85 min = 1 hour and 25 minutes

Step 2: Determine how far Irmi would travel in 1 hour 25 minutes:

If Speed = Distance ÷ Time, then Distance = Speed × Time

Distance = (84 x 85) / 60 = 119 km

3.11.

Given P = 2L+2W, find the value of L.

(A) – W

(B) ___

(C) 2P 4W

(D) ___

Answer: A

P = 2L+2W P 2W = 2L

——— = L – — L – = L.

–

3.12.

Melanie works at the lawn mower plant. She can complete her first lawn mower in 30 minutes. As she tires, it takes her twice as long as the previous one to assemble a lawnmower. If she works an 8 hour shift each day, how many lawnmowers can she complete in one shift?

(A) 2

(B) 3

(C) 4

(D) 5

Answer: C

Melanie completes the first lawn mower in 30 minutes.

The second lawn mower takes 2 × 30 minutes = 60 minutes (1 hour).

She is now 1 hour and 30 minutes into her shift.

The third one takes: 2 × 1 hour = 2 hours (3 hours, 30 min into her shift).

The fourth takes: 2 × 2 hours = 4 hours (7 hours, 30 min into her shift).

Melanie does not have time to complete a fifth lawn mower, so only 4 are completed at the end of her shift.

3.13.

A firm of consultants in the USA looks at the TV ratings for a particular channel. The prime time, from 20:00 to 23:00, brings the channel 100,000 dollars of advertising revenue per hour. During the rest of the day, the channel earns 50,000 dollars of advertising revenue per hour. How many dollars of advertising revenue does the TV channel earn in a day?

(A) 300,000

(B) 1,000,000

(C) 1,050,000

(D) 1,350,000

Answer: D

Determine how much money the channel makes in prime time:

3 × 100,000 = 300,000 dollars

Determine how much money is made during the rest of the day:

24 – 3 = 21 hours

21 × 50,000 = 1,050,000 dollars

Add total advertising revenues: 300,000 + 1,050,000 = 1,350,000 dollars.

3.14.

Lara has 4 notebooks: two of these have pages with gridlines; the other two are without gridlines. If she wants the first notebook to have a gridline, how many different combinations of notebook sequences could she have?

(A) 6

(B) 12

(C) 16

(D) 24

Answer: B

Let's name the books B1, B2, B3, and B4. Let's assume that B1 and B2 have gridlines. According to the instructions, B1 or B2 have to be at the starting point.

The quickest way to solve this question is with the permutation formula. If B1 is at the beginning of the sequence, the remaining 3 notebooks can be combined in 3! ways. 2 × 3 = 6.

If B2 is at the beginning, the combination is also 6: 3! = 2 × 3 = 6.

Consequently, the total permutations are 6 + 6 = 12.

But you can also simply write out the different combinations. The questions in this section of TestAS generally do not require the knowledge of a formula. The possible sequences are:

1. B1 □ B2 □ B3 □ B4 B1
2. □ B2 □ B4 □ B3 B1 □
3. B3 □ B2 □ B4 B1 □ B3
4. □ B4 □ B2 B1 □ B4 □
5. B3 □ B2 B1 □ B4 □ B2
6. □ B3
7. B2 □ B1 □ B3 □ B4 B2
8. □ B1 □ B4 □ B3 B2 □
9. B3 □ B1 □ B4 B2 □ B3
10. □ B4 □ B1 B2 □ B4 □
11. B3 □ B1 B2 □ B4 □ B1
12. □ B3

3.15.

The average of, , , and A is . Find A.

(A)

(B) (C) (D)

Answer: C
The average of (2

+ + A) equals . Thus:

(+ + + A) ÷ 4 =

Lowest common multiple of 2, 3, 4, and 6 is 12.

(— — + — + A) ÷ 4 = —

(— — + — + A) = —

A = — - — = — = 2

3.16.

A small foundation gives a total of 960 Euros per month in scholarships to students, distributed equally among the recipients. Four students lose their qualification for the scholarship and will not receive a scholarship starting this month. The amount of money available as a result will be shared among the other students equally. In this way, the other students will get 40 Euros more per month. How many students were originally given scholarships?

(A) 12

(B) 8

(C) 10

(D) 14

Answer: A

Given the complex math, it may be the quickest to plug in the solutions to determine which could be the right one. For example: If there were 12 scholarship recipients at the beginning, each would receive 960 EUR/12 students = 80 EUR. After the 4 students leave the group, 80 EUR per student x 4 students = 320 EUR needs to be distributed to the remaining recipients. Each student would receive now an additional 320 EUR/8 students = 40 EUR. 12 students were initially awarded the scholarship.

But if you would like to calculate, the solution is as follows. There are at the beginning A students and then A-4 students.

— — 40 —— - ——— = 40

960A-960A+3840 = 40(A2-4A) 40A2 – 160A – 3.840 = 0

A2 – 4A – 96 =0 (A - 12) (A + 8) = 0

A = 12

While this question type may occur in the TestAS, the numbers are more likely to be significantly easier to calculate. We included difficult numbers to show that it is sometimes faster to plug in the answers to determine the correct choice than going through a complex calculation.

3.17.

We are given an equation B =

Which of the following correctly reflects the value of e?

(A) — 1.5

(B) (C) (D)

Answer: B

– -1.5

0.5

3

B = ——

B(2e+3) = f

2e+3 = _

2e = – – 3

e = — –

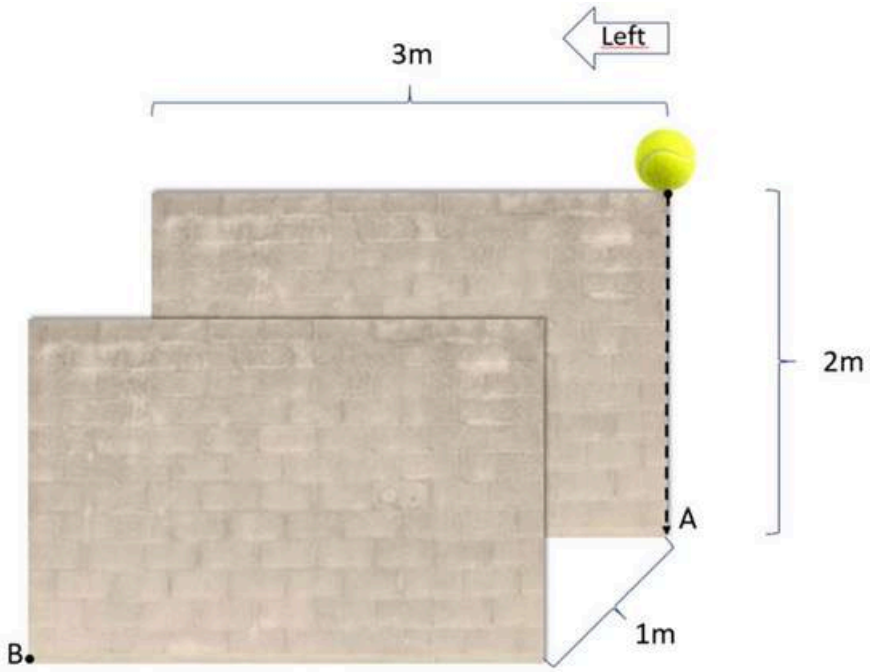
We are looking for permutations of e = — – =>

e = — — = ——

 (B) is the correct answer.

3.18.

A tennis ball is thrown from a 2m-high wall vertically down and strikes the ground at point A. After that, the ball repeatedly bounces off the ground. After each impact, the ball bounces exactly 2 cm to the left and 10 cm forward towards another wall. What will be the distance from Point B when the ball hits the 1 m distant, opposite wall? (We assume that there is no friction and that each time the ball bounces the same distance.)



(A) 20 cm

(B) 100 cm

(C) 200 cm

(D) 280 cm

Answer: D

Determine the total bounces to travel 1 m: (1 m = 100 cm) 100 cm 10 cm = 10 bounces.

Each bounce the ball goes 2 cm left: 10 2 cm = 20 cm makes it reach the other wall.

If 3 m width = 300 cm, then: 300 cm – 20 cm = 280 cm from A.

3.19.

Maria has a small business. She is_ times as old as the youngest apprentice, Ida.

Maria is — as old as her colleague, Gene. If you add Maria, Ida, and Gene's ages they equal 87 years. How old is Ida?

(A) 17

(B) 18

(C) 21

(D) 22

Answer: B

Let Y = Maria's age

Step 1: Write equations for Ida and Gene's ages: Ida = Y _ = —

Gene = Y (—) = —

Step 2: Use the equations to solve for Y (Maria's age):

Y + — + — = 87

(15Y + 6Y + 8Y)15 = 87

— = 87

Y = 45

Step 3: Use Maria's age to determine the age of Ida (and Gene):

Ida = = (2 45) 5 = 18

(Gene = — = (8 45) 15 = 24)

3.20.

If Zelda bikes m metres in s seconds, how many metres does she bike in Y minutes?

(A) —

(B) (C) (D)

Answer: D

Step 1: Write an equation expressing Zelda's speed: Speed = distance ÷ time.

Then Zelda travels a speed of meter per second.

—

Step 2: Convert time to minutes: 1 sec. = — min.

—— = —— = —— =>

— × (60 sec/min) = 60 —

meter per minute Step 3: Write an equation to express how far she bikes in Y minutes:

Distance = Speed × time

= 60 — × Y

= ——

3.21.

Michael and Jackson are playing dice. Michael is to throw the dice after Jackson throws it. Jackson wins if the sum of the first and the second throws of the dice is 4. Find the probability that Jackson wins.

(A) –

(B) –

(C) —

(D) —

Answer: C

Let the first component and the second component of the ordered pairs be the result of the first and second throwing of the dice. We have the following pairs with sum equal to 4: (1,3), (3,1), (2,2). There are 6

getting a sum of 4 is 3 6 = 36 ways of throwing the dice twice. Thus, the probability of 36 = —. This is the probability that Jackson wins.

3.22.

A vocal coach must choose three amateurs from 8 singers. How many different ways can he choose the amateurs?

(A) 336

(B) 112

(C) 64

(D) 56

Answer: D

The vocal coach can choose one singer from 8 choices. The second can be chosen from the remaining 7, and the third from the remaining 6. The number of ways of doing this is 8 7 6. Now, the order of the 3 singers does not matter. Such ordering can be done in 3 2 1 = 6 ways. Hence, there are 8 7 6 6 = 56 ways of choosing 3 amateurs if there are 8 choices.

4 INFERRING RELATIONSHIPS

4.1 INTRODUCTION

In the subtest Inferring Relationships you are asked to detect analogies between two pairs of words. In each question, two pairs of words are given with two missing words. The gaps must be filled so both pairs of words on each side of the "=" have an analogous relationship to each other.

EXAMPLE

dark : _____ = quiet : _____

Here the two gaps are filled in as follows:

dark : bright = quiet : loud

The logical connection and analogy between the word pair on the left and the word pair on the right have to be the same. In the example above this connection is the opposite of each other (quiet is the opposite of loud and dark is the opposite of bright).

In the real questions you will have to choose between 4 possible answers.

IMPORTANT: whether a word stands before or after the colon ":" is crucial for solving the analogy. For example:

hand : finger = _____ : _____

hand : finger = foot : toe

The finger is part of the hand as the toe is part of the foot. In this case the logical connection of "toe : foot" would be wrong, because the foot is not a part of the toe.

IMPORTANT: all verbs are written as "to" plus the infinitive, for example "to drive".

If a word can be either a noun or a verb and is expressed without "to", the noun form is meant, e.g. "balance" stands for "a state of equilibrium or equipoise" and not for "to bring to or hold in equilibrium".

4.2 PAY ATTENTION TO TIME MANAGEMENT

In this section you have 22 questions and 10 minutes to solve them. That means, 27 seconds per question. Pay attention to time management. Most students run out of time in this section.

Given the time limitation, it is best not to waste time on the first couple of questions. Quickly solve them and move on so you have time for the later, harder questions.
If you cannot solve a question easily, make a guess and move on. It often helps to pay attention to the vocabulary types. If the given word pairing is a verb and an adjective, you can eliminate the answer choices that are not first verb and then adjective. After that, take a guess, mark it in your answer sheet and keep moving. You can mark the questions on your text booklet, so you can return to it if time allows.

4.3 TYPES OF LOGICAL CONNECTIONS

The logical connection between a word pair can be categorised in different types. Here is a list of the most frequent ones with some examples.

Type	Examples	
Opposites	absent – present	ancient – modern
	single – married	smooth – rough
	wide – narrow	cheap – expensive
	deep – shallow	offer – refuse
	male – female	accidental – intentional
	active – lazy	
Synonyms	almost – nearly	applicable – relevant
	beat – defeat	bizarre – weird
	class – lesson	dedicated – committed
	exactly – precisely	foolish – silly

Type	Examples	
	extra – additional	missing – lost
	noon – midday	notify – inform
	overseas – abroad	accomplish – achieve
	answer – reply	select – choose
Please note: synonyms are words that carry the same meaning. However, very rarely do you find exact synonyms. They mostly exist when comparing language varieties like American English and British English, for example trash – rubbish. Besides across language varieties, synonymous words often bear a different connotation. For example: you can order a "pizza with extra cheese" but it would sound rather odd ordering "additional cheese" even though "extra" and "additional" are synonymous in their relation. Bear this in mind when solving the test.		
Minor and superordinate term	France – country	saw – tool
	California – state	football – sport
	Ferrari – car	German – language
	pizza – food ring	Rome – city
	– jewellery	dog – pet
Part-Whole-Relationship	day – hour	minute – seconds
	flower – petals	tree – branches
	garden – flowers	family – children
	continent – countries	TV channel – programs
	society – communities	language – words
	army – soldiers	forest – tree
	sheep – flock	player – team
	ship – fleet	card – pack

Type	Examples	
	singer – choir	student – class
	musician – band	island – chain
	star – galaxy	person – crowd
	staff – employee	face – nose
	wheel – bike	
Analogy – things that go together	love – marriage	shoes – socks
	window – curtain	belt – trousers
	wardrobe – clothes	money – wallet
	pen – paper	hammer – nail
	fire – smoke	shirt – tie plug
	horse – carriage	– socket
Analogy – object and related object	chicken – egg	father – son
	mother – daughter	horse – foal
	frog – tadpole	husband – wife
	brother – sister	duck – duckling
	elephant – calf	bear – cub
	boyfriend – girlfriend	
Analogy – object and a characteristic	water – wet	flame – hot
	ice – cold	lemon – bitter
	sugar – sweet	flower – pretty

Type	Examples	
	city – noisy	sky – blue
	ant – small	professor – intelligence
	storm – windy	sprinter – speed
	soldier – bravery	
Analogy – object and location	clothes – wardrobe	milk – refrigerator
	bird – nest	book – library
	paper – folder	skyscraper – city
	train – station	painting – gallery
	tooth – mouth	cow – farm
	money – wallet	
Analogy – object and function	door – open	oven – bake
	soap – wash	movie – watch
	pencil – draw	football – play
	cup – drink	car – drive
	phone – call	trumpet – blow
	fan – cool	telescope – observe
Analogy – performer and action	horse – gallop	postman – post
	judge – judge	dog – barks
	sailor – sail	chef – cooks
	lion – hunt	footballer – plays

Type	Examples	
	marksman – shoot	skier – ski
	athlete – run	baby – cry
	soldier – fight	
Analogy – verb tenses	fight – fought	sleep – slept
	laugh – laughed	run – ran
	keep – kept	use – used
	sit – sat	dig – dug
	do – did	drink – drank
	like – liked	
Analogy – cause and effect	work – tired	study – learn
	eat – full	shoot – kill
	chase – catch	throw – hit
	wash – clean	work – earn
	sew – repair	hit – hurt
	stretch – reach	pull – break
	dust – clean	argue – fight
	rest – heal	teach – learn
Analogy – problem and solution	sick – cure	dirty – clean
	tense – relax	late – hurry
	excited – calm	lost – find

Type	Examples	
	wet – dry	confused – ask
	frozen – melt	loose – fasten
	scattered – gather	mistake – correct
Analogy – degrees of a characteristic	dangerous – fatal	scared – petrified
	pretty – stunning	happy – blissful
	dirty – filthy	loud – deafening
	witty – hilarious	attractive – gorgeous
	good – awesome	storm – hurricane
	smart – shrewd	sad – devastated

4.4 PRACTICE EXAMS

You have 10 minutes to solve the 22 questions.

4.4.1 EXAM 1

1.1.

tall : small = _____ : _____

(A) (B) (C) (D) thirsty – hungry happy – sad summery – warm exhausted – feeble

1.2.

letter : _____ = chapter : _____

(A) word – book story –

(B) book newspaper –

(C) paper vocabulary –

(D) question

1.3.

_____ : _____ = clock : time

(A) hour – latitude

(B) thermometer – temperature

(C) weather – climate

(D) tide – moon

1.4.

chair : _____ = eagle : _____

(A) sofa – mammal

(B) arm chair – nest

(C) sit – fly

(D) furniture – bird

1.5.

_____ : island = _____ : oasis

(A) water – palm tree

(B) bus – camel

(C) ocean – desert

(D) village – nomadic people

1.6.

_____ : _____ = safe : money

(A) preserve – animals

(B) fridge – food

(C) flatter – compliments

(D) review – document

1.7.

_____ : field = theatre : _____

(A) players – spectators

(B) lawn – opera

(C) stadium – stage

(D) football – performance

1.8.

shark : _____ = bee : _____

(A) animal –fly

(B) octopus – flower

(C) ocean – tree

(D) bite – sting

1.9.

_____ : villa = branch : _____

(A) roof – apple tree

(B) house – fruit

(C) door – bough

(D) street – trunk

1.10.

arc : circle = _____ : _____

(A) edge – triangle

(B) segment – cube

(C) tangent – circumference

(D) circle – cube

1.11.

_____ : motor = human : _____

(A) airplane – sneakers

(B) exhaust – lung

(C) fuel – blood

(D) car– heart

1.12.

school : _____ = _____ : trainer

(A) secondary school – sports club

(B) teacher – sports club

(C) student – team

(D) classroom – stadium

Buyer: Yaha Alkadr Tra ns ac tio in ID :

1.13.

cotton : soft = _____ : _____

(A) bird – feathers

(B) fish – swim

(C) iron – hard

(D) parasol – cool

1.14.

blind : _____ = _____: ear

(A) glasses – hearing

(B) pupil – hard of hearing

(C) eye – deaf

(D) vision – deafness

1.15.

difference : _____ = doubtful : _____

(A) discrepancy – speculative

(B) nuance – undoubted

(C) inequality – determined

(D) dissimilarity – questionable

1.16.

_____ : music = _____ : language

(A) tone – word

(B) note – voice

(C) composer – writer

(D) song – book

1.17.

_____ : happiness = _____ : bicycle

(A) emotion – wheels

(B) luck – speed

(C) love – sports

(D) feeling – vehicle

1.18.

Kilogram : _____ = _____ : distance

(A) scale – ruler

(B) pounds – range

(C) mass – kilometre

(D) force – meter

1.19.

rain : _____ = fire : _____

(A) wind – temperature

(B) storm – cold

(C) wet – hot

(D) freeze – sweat

1.20.

_____ : _____ = important : essential

(A) central – major

(B) enthusiastic – fanatical

(C) unimportant – insignificant

(D) amorous – devoted

1.21.

_____ : colour = _____ : nail

(A) painting – nail polish

(B) paint brush – hammer

(C) canvas – screw

(D) mix – paint

1.22.

_____ : boredom = _____ : confrontation

(A) interest – agreement

(B) monotony – calm

(C) concern – conflict

(D) fascination – calm

4.4.2 EXAM2

2.1.

baseball glove : ball = _____ : _____

(A) stadium – seats

(B) winter – weather

(C) game – pennant

(D) hook – fish

2.2.

_____ : ship = _____ : car

(A) steamboat – police car

(B) marine – automobile

(C) fleet – coach

(D) vehicular – transport

2.3.

_____ : _____ = fast : slow

(A) thirsty – hungry

(B) soft – comfortable

(C) something – nothing

(D) happy – sad

2.4.

steak : to cook = _____ : _____

(A) bread – to bake

(B) food – to sell

(C) wine – to drink

(D) sugar – to sweet

2.5.

_____ : _____ = house : brick

(A) meadow – playground

(B) concrete – skyscraper

(C) plant – cell mother –

(D) child

2.6.

orchid : _____ = _____ : fruit

(A) blossom – food

(B) flower – apple

(C) stem – branch

(D) plant – produce

2.7.

_____ : _____ = picture : frame

(A) shelf – book

(B) bedstead – mattress

(C) book – book cover

(D) pot – lid

2.8.

_____ : snow = _____ : rain

(A) flakes – drops

(B) winter – summer

(C) cold – warm

(D) avalanche – ocean

2.9.

mother : _____ = _____ : chick

(A) father – rooster

(B) child – hen

(C) woman – bird

(D) family – chicken

2.10.

caterpillar : butterfly = _____ : _____

(A) cow – barn

(B) frog – tadpole

(C) insect – mosquito

(D) maggot – fly

2.11.

appliance : television = _____ : _____

(A) dessert – ice cream

(B) milk – baby

(C) sweet – sugar

(D) basketball – competitive

2.12.

_____ : _____ = to creep : to crawl

(A) to hop – to jump

(B) rain – thunderstorm

(C) to swim – to drift

(D) to fly – to glide

2.13.

_____ : water = _____ : tree

(A) rain – wood

(B) shower head – park

(C) rain – forest

(D) to fall – to plant

2.14.

_____ : bread = _____ : jam

(A) brown – sweet

(B) dough – sugar

(C) slice – glass

(D) flour – fruit

2.15.

_____ : river = _____ : highway

(A) pond – road

(B) water – people

(C) stream – path

(D) coast – crossing

2.16.

plum : _____ =: _____ : seed

(A) stem – flower

(B) stone – pear

(C) cake – cereals

(D) fruit – wheat

2.17.

_____ : decade = season : _____

(A) month – weather

(B) year – year

(C) period – year

(D) century – climate

2.18.

_____ : seldom = nothing : _____

(A) oftentimes – scarce

(B) never ever – always

(C) often – everything

(D) never – few

2.19.

library : _____ = _____ : artefact

(A) to borrow – to inspect

(B) book – museum

(C) bookstore – exhibition

(D) to borrow – to analyse

2.20.

meadow : _____ = jungle : _____

(A) grass – trees

(B) green area – bushes

(C) flowers – insects

(D) lawn – trees

2.21.

_____ : merchandise = pharmacy : _____

(A) Disney – Bayer

(B) credit card – insurance

(C) credit card – prescription

(D) department store – medicine

2.22.

solution : _____ = key : _____

(A) work – door

(B) problem – lock

(C) to answer – to open

(D) knowledge – password

4.4.3 EXAM3

3.1.

_____: *camel* =_____ : wagon

(A) oasis – workshop

(B) desert – station

(C) caravan – train

(D) water – locomotive

3.2.

concert : _____ = _____ : director

(A) conductor – film

(B) music – actor

(C) song – role

(D) opera – theatre

3.3.

maple : _____ = _____ : vegetables

(A) plant – fruits

(B) crown – stem

(C) tree – tomato

3.4.

_____ : bed = _____ : glass

(A) table – room

(B) to sleep – to drink

(C) blanket – water

(D) pillow – plate

3.5.

flower : _____ = _____ : microwave

(A) rose – electrical device

(B) grass – kitchen

(C) water – electricity

(D) fragrant – practical

3.6.

window : house = _____ : _____

(A) boat – sea

(B) water gate – river

(C) farm – animals

(D) cliff – sea

3.7.

composer : _____ = architect : _____

(A) concert – site

(B) notes – building

(C) symphony – plan

(D) singer – stone

3.8.

_____ : _____ = tulip : flower

(A) flower – tree

(B) blossom – stem

(C) birch – tree

(D) monkey – human

3.9.

athlete : _____ = _____ : professor

(A) competition – lecture

(B) stadium – university

(C) trainer – student

(D) gymnastics – profession

3.10.

to run : _____= to sing : _____

(A) to jump – to make music

(B) shoes – sound

(C) to run – to scream

(D) stadium – opera house

3.11.

_____ : _____= politician : eloquence

(A) comedian – fun priest –

(B) religion superstar –

(C) sophistication gymnast –

(D) agility

3.12.

_____ : thoughtful = brave : _____

(A) worrying – brave

(B) cruel – coward

(C) careful – kind

(D) considerate – courageous

3.13.

_____ : disease = sweat : _____

(A) fever – exercise

(B) tablet – deodorant

(C) doctor – sauna

(D) medicine – shower

3.14.

banana : peel = _____ : _____

(A) mattress – bedstead

(B) cake – icing

(C) literature – book

(D) pot – lid

3.15.

_____ : heart = tempo : _____

(A) pulse – conductor

(B) circulation – rhythm

(C) pump – metronome

(D) surgeon – bandmaster

3.16.

circle : _____ = square : _____

(A) radius – angle

(B) curve – line segment

(C) round – area

(D) oval – quadrate

3.17.

legitimate : _____ = _____ : confident

(A) legal - certain

(B) authentic – controlled

(C) valid – fearless

(D) appropriate – assured

3.18.

life : youth = _____ : _____

(A) century – epoch

(B) work – retirement

(C) age – birth

(D) year – spring

3.19.

_____ : _____ = to laugh : to cry

(A) bright – dull

(B) triumph – anger

(C) fog – sun

(D) jokey – serious

3.20.

_____ : pot = _____ : money box

(A) to eat – to save

(B) soup – money

(C) kitchen – bank

(D) cook – insert

3.21.

language : _____ = math : _____

(A) alphabet – number

(B) letter – terms

(C) words – formulas

(D) mouth – brain

3.22.

_____ : _____ = gram : pound

(A) kilometre – meter

(B) atom – molecule

(C) inch – mile

(D) litre – gallon

4.5 ANSWER KEY

Exam 1		Exam 2		Exam 3	
Question	Answer	Question	Answer	Question	Answer
1.1.	B	2.1.	D	3.1.	C
1.2.	A	2.2.	A	3.2.	A
1.3.	B	2.3.	D	3.3.	C
1.4.	D	2.4.	A	3.4.	B
1.5.	C	2.5.	C	3.5.	A
1.6.	B	2.6.	B	3.6.	B
1.7.	C	2.7.	C	3.7.	C
1.8.	D	2.8.	A	3.8.	C
1.9.	A	2.9.	B	3.9.	C
1.10.	A	2.10.	D	3.10.	D
1.11.	C	2.11.	A	3.11.	D
1.12.	B	2.12.	A	3.12.	D
1.13.	C	2.13.	C	3.13.	A
1.14.	C	2.14.	D	3.14.	B
1.15.	D	2.15.	C	3.15.	A
1.16.	A	2.16.	B	3.16.	B
1.17.	D	2.17.	B	3.17.	A
1.18.	C	2.18.	C	3.18.	D
1.19.	C	2.19.	B	3.19.	D
1.20.	B	2.20.	A	3.20.	B
1.21.	B	2.21.	D	3.21.	C
1.22.	A	2.22.	B	3.22.	D

4.6 DETAILED ANSWERS

4.6.1 EXAM 1

1.1.

tall : small = _____ : _____

(A) thirsty – hungry

(B) happy – sad

(C) summery – warm

(D) exhausted – feeble

Answer: B

Opposite

Tall is the opposite of small. Happy is the opposite of sad.

1.2.

letter : _____ = chapter : _____

(A) word – book story –

(B) book newspaper –

(C) paper vocabulary –

(D) question

Answer: A

Part-Whole-Relationship

A letter is part of a word like a chapter is part of a book.

1.3.

_____ : _____ = clock : time

(A) hour – latitude

(B) thermometer – temperature

(C) weather – climate

(D) tide – moon

Answer: B

Analogy

A clock measures time, just like a thermometer measures temperature.

1.4.

chair : _____ = eagle : _____

(A) sofa – rabbit

(B) arm chair – nest

(C) sit – fly

(D) furniture – bird

Answer: D

Minor and superordinate term

The chair is a piece of furniture, the eagle is a bird.

Attention: answer C is not correct as the verbs do not describe the action of the objects. An eagle flies but a chair does not sit.

1.5.

_____ : island = _____ : oasis

(A) water – palm tree

(B) bus – camel

(C) ocean – desert

(D) village – nomadic people

Answer: C

Analogy

An island lies in the middle of the ocean, an oasis lies in the middle of the desert.

1.6.

_____ : _____ = safe : money

(A) preserve – animals

(B) fridge – food

(C) flatter – compliments

(D) review – document

Answer: B

Analogy

A safe is a storage for money, just as a fridge is for food.

1.7.

_____ : field = theatre : _____

(A) players – spectators

(B) lawn – opera

(C) stadium – stage

(D) football – performance

Answer: C

Part-Whole-Relationship

The field is part of a stadium. The stage is part of a theatre.

1.8.

shark : _____ = bee : _____

(A) animal –fly

(B) octopus – flower

(C) ocean – tree

(D) bite – sting

Answer: D

Analogy

The shark would bite if it feels threatened. The bee would sting if it feels threatened.

1.9.

_____ : villa = branch : _____

(A) roof – apple tree

(B) house – fruit

(C) door – bough

(D) street – trunk

Answer: A

Part-Whole-Relationship

The roof is part of the villa and the branch is part of the apple tree.

1.10.

arc : circle = _____ : _____

(A) edge – triangle

(B) segment – cube

(C) tangent – circumference

(D) circle – cube

Answer: A
Part-Whole-Relationship

An arc is part of a circle, just as an edge is part of a triangle.

1.11.

_____ : motor = human : _____

(A) airplane – sneakers

(B) exhaust – lung

(C) fuel – blood

(D) car– heart

Answer: D

Analogy

The motor powers the car like the heart powers the human.

1.12.

school : _____ = _____ : trainer

(A) secondary school – sports club

(B) teacher – sports club

(C) student – team

(D) classroom – stadium

Answer: B

Analogy

The teacher teaches at the school, just as the trainer teaches at the sports club.

1.13.

cotton : soft = _____ : _____

(A) bird – feathers

(B) fish – swim

(C) iron – hard

(D) parasol – cool

Answer: C

Analogy

Cotton is soft and iron is hard.

1.14.

blind : _____ = _____: ear

(A) glasses – hearing

(B) pupil – hard of hearing

(C) eye – deaf

(D) vision – deafness

Answer: C

Analogy

Being blind is a malfunction of the eyes, like being deaf is a malfunction of the ears..

1.15.

difference : _____ = doubtful : _____

(A) discrepancy – speculative

(B) nuance – undoubted

(C) inequality – determined

(D) dissimilarity – questionable

Answer: D

Synonym

Difference and dissimilarity are synonyms and so are doubtful and questionable.

1.16.

_____ : music = _____ : language

(A) tone – word

(B) note – voice

(C) composer – writer

(D) song – book

Answer: A

Minor and superordinate term

A tone is a part of music, just as a word is a part of language.

1.17.

_____ : happiness = _____ : bicycle

(A) emotion – wheels

(B) luck – speed

(C) love – sports

(D) feeling – vehicle

Answer: D

Minor and superordinate term

Happiness is a type of feeling. Bicycle is a type of vehicle.

1.18.

Kilogram : _____ = _____ : distance

(A) scale – ruler

(B) pounds – range

(C) mass – kilometre

(D) force – meter

Answer: C

Analogy

Kilogram is a unit to specify the mass. Kilometre is a unit to indicate the distance.

1.19.

rain : _____ = fire : _____

(A) wind – temperature

(B) storm – cold

(C) wet – hot

(D) freeze – sweat

Answer: C

Analogy

Rain is wet, whereas fire is hot.

1.20.

_____ : _____ = important : essential

(A) central – major

(B) enthusiastic – fanatical

(C) unimportant – insignificant

(D) amorous – devoted

Answer: B

Analogy

Essential suggests an increased level of importance, just as fanatical suggests an increased level of enthusiasm.

1.21.

_____ : colour = _____ : nail

(A) painting – nail polish

(B) paint brush – hammer

(C) canvas – screw

(D) mix – paint

Answer: B

Analogy

Both paint brush and hammer are instruments - the paint brush is the instrument to apply paint. The hammer is used for hitting nails, for instance, into wood.

1.22.

_____ : boredom = _____ : confrontation

(A) interest – agreement

(B) monotony – calm

(C) concern – conflict

(D) fascination – calm

Answer: A

Analogy

An interest in something is a solution to boredom, just as agreement is a solution to confrontation.

4.6.2 EXAM2

2.1.

baseball glove : ball = _____ : _____

(A) stadium – seats

(B) winter – weather

(C) game – pennant

(D) hook – fish

Answer: D

Analogy

The baseball glove is used to catch a ball, and the hook is used to catch fish.

2.2.

_____ : ship = _____ : car

(A) steamboat – police car

(B) marine – automobile

(C) fleet – coach

(D) vehicular – transport

Answer: A

Minor and superordinate term

A steamboat is a type of ship, just as a police car is a type of car.

2.3.

_____ : _____ = fast : slow

(A) thirsty – hungry

(B) soft – comfortable

(C) something – nothing

(D) happy – sad

Answer: D

Opposite

Fast is the opposite of slow. Happy is the opposite of sad.

2.4.

steak : to cook = _____ : _____

(A) bread – to bake

(B) food – to sell

(C) wine – to drink

(D) sugar – to sweet

Answer: A

Analogy

Steak needs to be cooked and bread needs to be baked before you can consume it.

2.5.

_____ : _____ = house : brick

(A) meadow – playground

(B) concrete – skyscraper

(C) plant – cell mother –

(D) child

Answer: C

Part-Whole-Relationship

A brick is a component of a house, just as a cell is a component of a plant.

2.6.

orchid : _____ = _____ : fruit

(A) blossom – food

(B) flower – apple

(C) stem – branch

(D) plant – produce

Answer: B

Minor and superordinate term

An orchid is a kind of flower. An apple is a kind of fruit.

2.7.

_____ : _____ = picture : frame

(A) shelf – book

(B) bedstead – mattress

(C) book – book cover

(D) pot – lid

Answer: C

Part-Whole-Relationship

The frame is the outer part to protect a picture, just as the book cover is the outer part to protect a book.

2.8.

_____ : snow = _____ : rain

(A) flakes – drops

(B) winter – summer

(C) cold – warm

(D) avalanche – ocean

Answer: A

Analogy

Snow consists of flakes, just as rain consists of drops.

2.9.

mother : _____ = _____ : chick

(A) father – rooster

(B) child – hen

(C) woman – bird

(D) family – chicken

Answer: B

Analogy

The mother gives birth to the child, just as the hen gives birth to the chick.

2.10.

caterpillar : butterfly = _____ : _____

(A) cow – barn

(B) frog – tadpole

(C) insect – mosquito

(D) maggot – fly

Answer: D

Analogy

A caterpillar becomes a butterfly, just like a maggot becomes a fly. Attention: (B) is not correct because a frog does not turn into a tadpole - consider the sequence of the words.

2.11.

appliance : television = _____ : _____

(A) dessert – ice cream

(B) milk – baby

(C) sweet – sugar

(D) basketball – competitive

Answer: A

Minor and superordinate term

A television is a type of an appliance, and ice cream is a type of dessert.

2.12.

_____ : _____ = to creep : to crawl

(A) to hop – to jump

(B) rain – thunderstorm

(C) to swim – to drift

(D) to fly – to glide

Answer: A

Synonyms

"*To creep*" *and* "*to crawl*" *as well as* "*to hop*" *and* "*to jump*" *are synonyms.*

2.13.

_____ : water = _____ : tree

(A) rain – wood

(B) shower head – park

(C) rain – forest

(D) to fall – to plant

Answer: C

Part-Whole-Relationship

Water is a part of rain. A tree is a part of a forest.

2.14.

_____ : bread = _____ : jam

(A) brown – sweet

(B) dough – sugar

(C) slice – glass

(D) flour – fruit

Answer: D

Analogy

The main ingredient of bread is flour. The main ingredient of jam is fruit. Answer (B) is not correct, because sugar is an ingredient of jam. Whereas dough is not an ingredient of bread, but is the result when one mixes the various ingredients such as flour, salt and water.

2.15.

_____ : river = _____ : highway

(A) pond – road

(B) water – people

(C) stream – path

(D) coast – crossing

Answer: C

Analogy

A stream is smaller than a river, just as a path is smaller than a highway. The function however is the same.

2.16.

plum : _____ =: _____ : seed

(A) stem – flower

(B) stone – pear

(C) cake – cereals

(D) fruit – wheat

Answer: B

Analogy

A plum has a stone, just as a pear has seeds within.

2.17.

_____ : decade = season : _____

(A) month – weather

(B) year – year

(C) period – year

(D) century – climate

Answer: B

Part-Whole-Relationship

A decade can be divided into years. A year can be divided into seasons.

2.18.

_____ : seldom = nothing : _____

(A) oftentimes – scarce

(B) never ever – always

(C) often – everything

(D) never – few

Answer: C

Opposite

Seldom is the opposite of "often", and nothing is the opposite of "everything".

2.19.

library : _____ = _____ : artefact

(A) to borrow – to inspect

(B) book – museum

(C) bookstore – exhibition

(D) to borrow – to analyse

Answer: B

Analogy

In a library books are preserved. In a museum artefacts are preserved..

2.20.

meadow : _____ = jungle : _____

(A) grass – trees

(B) green area – bushes

(C) flowers – insects

(D) lawn – trees

Answer: A

Analogy

The meadow consists of grass. The jungle consists of trees.

2.21.

_____ : merchandise = pharmacy : _____

(A) Disney – Bayer

(B) credit card – insurance

(C) credit card – prescription

(D) department store – medicine

Answer: D
Department store is a large shop selling different types of merchandise. Pharmacy is a shop where medicines are prepared and sold..

2.22.

solution : _____ = key : _____

(A) work – door

(B) problem – lock

(C) to answer – to open

(D) knowledge – password

Answer: B

Analogy

A problem and a lock both depict a barrier for which an instrument is needed to overcome it. A solution solves a problem and a key opens a lock.

4.6.3 EXAM3

3.1.

_____: *camel* =_____ : wagon

(A) oasis – workshop

(B) desert – station

(C) caravan – train

(D) water – locomotive

Answer: C

Part-Whole-Relationship

A camel is part of a caravan. A wagon is part of a train.

If you do not know the meaning of a word, such as caravan, try eliminating the wrong answers to end with the one correct answer.

3.2.

concert : _____ = _____ : director

(A) conductor – film

(B) music – actor

(C) song – role

(D) opera – theatre

Answer: A

Analogy

A conductor directs a concert. A director directs a film (movie in American English).

3.3.

maple : _____ = _____ : vegetables

(A) plant – fruits

(B) crown – stem

(C) tree – tomato

(D) fruit tree – weed

Answer: C

Minor and superordinate term

The maple is a type of tree. The tomato is a vegetable.

3.4.

_____ : bed = _____ : glass

(A) table – room

(B) to sleep – to drink

(C) blanket – water

(D) pillow – plate

Answer: B

Analogy

One sleeps in bed. One drinks out of a glass.

3.5.

flower : _____ = _____ : microwave

(A) rose – electrical device

(B) grass – kitchen

(C) water – electricity

(D) fragrant – practical

Answer: A

Minor and superordinate term

The rose is a flower. The microwave is an electrical device.

3.6.

window : house = _____ : _____

(A) boat – sea

(B) water gate – river

(C) farm – animals

(D) cliff – sea

Answer: B

Part-Whole-Relationship

A window is part of a house. A water gate is part of a river.

3.7.

composer : _____ = architect : _____

(A) concert – site

(B) notes – building

(C) symphony – plan

(D) singer – stone

Answer: C

Analogy

A composer composes symphonies. An architect draws out plans.

3.8.

_____ : _____ = tulip : flower

(A) flower – tree

(B) blossom – stem

(C) birch – tree

(D) monkey – human

Answer: C

Superordinate and minor term

The tulip is a flower. The birch is a tree. If you do not know the meaning of a word, such as birch, look at the other answers and eliminate as much as possible.

3.9.

athlete : _____ = _____ : professor

(A) competition – lecture

(B) stadium – university

(C) trainer – student

(D) gymnastics – profession

Answer: C

Analogy

An athlete is instructed by a trainer, as a student is by a professor.

3.10.

to run : _____= to sing : _____

(A) to jump – to make music

(B) shoes – sound

(C) to run – to scream

(D) stadium – opera house

Answer: D

Analogy

A stadium is a building for public events of sports such as running. An opera house is a building for events where singing is involved, such as operas.

3.11.

_____ : _____= politician : eloquence

(A) comedian – fun priest –

(B) religion superstar –

(C) sophistication gymnast –

(D) agility

Answer: D

Analogy

A politician has eloquence - the ability to speak in an elegant and persuasive way. A gymnast has agility – the ability to move quickly and easily.

3.12.

_____ : thoughtful = brave : _____

(A) worrying – brave

(B) cruel – coward

(C) careful – kind

(D) considerate – courageous

Answer: D

Synonym

Considerate and thoughtful have a similar meaning as brave and courageous.

3.13.

_____ : disease = sweat : _____

(A) fever – exercise

(B) tablet – deodorant

(C) doctor – sauna

(D) medicine – shower

Answer: A

Analogy

A disease may lead to fever. Physical exercise may result in sweating.

3.14.

banana : peel = _____ : _____

(A) mattress – bedstead

(B) cake – icing

(C) literature – book

(D) pot – lid

Answer: B

Part-Whole-Relationship

The peel is the outer part of a banana. The icing is the outer part of a cake.

3.15.

_____ : heart = tempo : _____

(A) pulse – conductor

(B) circulation – rhythm

(C) pump – metronome

(D) surgeon – bandmaster

Answer: A

Analogy

The heart determines the pulse as the conductor determines the tempo of the music that the orchestra is playing.

3.16.

circle : _____ = square : _____

(A) radius – angle

(B) ellipse – rectangle

(C) round – area

(D) curve – line

Answer: B

Analogy

The circle is a special shape of the ellipse. The square is a special form of the rectangle.

3.17.

legitimate : _____ = _____ : confident

(A) legal - certain

(B) authentic – controlled

(C) valid – reasonable

(D) appropriate – assured

Answer: A

Synonym

Legitimate is a synonym for legal. Certain is a synonym for confident.

3.18.

life : youth = _____ : _____

(A) century – epoch

(B) work – retirement

(C) age – birth

(D) year – spring

Answer: D

Part-Whole-Relationship

Youth is an early part of life. Spring is an early part of the year.

3.19.

_____ : _____ = to laugh : to cry

(A) bright – dull

(B) triumph – anger

(C) fog – sun

(D) jokey – serious

Answer: D

Opposite

To laugh is the opposite of to cry, and jokey is the opposite of serious.

3.20.

_____ : pot = _____ : money box

(A) to eat – to save

(B) soup – money

(C) kitchen – bank

(D) cook – insert

Answer: B

Analogy

You make soup in a pot, and you save money in a money box.

3.21.

language : _____ = math : _____

(A) alphabet – number

(B) letter – terms

(C) words – formulas

(D) mouth – brain

Answer: C

Analogy

Language consists of words, and math consists of formulas.

3.22.

_____ : _____ = gram : pound

(A) kilometre – meter

(B) atom – molecule

(C) inch – mile

(D) litre – gallon

Answer: D

Superordinate and minor term

Litre and gallon are each units of different measurement systems for volume. And grams and pounds are each units of different measurement systems for weight. 3.8 litres is equal to a gallon, and 453.6 grams is equal to a pound.

5 COMPLETING PATTERNS

5.1 INTRODUCTION

The subtest Completing Patterns evaluates your ability to identify patterns by interpreting graphically depicted rules. This question type is usually not a part of the international high school curricula and is rarely encountered in the international university entrance examinations. Consequently, many students are not trained for this subtest and perceive this section to be the most difficult in the core test.

According to our research, an average student solves roughly 9 questions out of the 22 questions correctly. By solving only a few questions more, you can get a great score in this subtest. Please study the following guidelines carefully and also experiment with intelligent guessing.
You will have 5 minutes to read the instructions. After that, the test administrator will announce the start of the 20 minutes, during which you need to solve the 22 questions. According to our research most students run out of time in this section.

There are nine boxes shown for every question. Within eight boxes, symbols and figures are depicted. The symbols and figures given can be lines, circles, triangles and other geometric figures which are arranged in a certain order. In the last box (bottom right), there is a question mark. You have to identify the rule and, using the rule, find the correct answer for the field with the question mark. You need to choose from the 6 given possible answers.

To solve the question you will need to apply one, two or three rules.

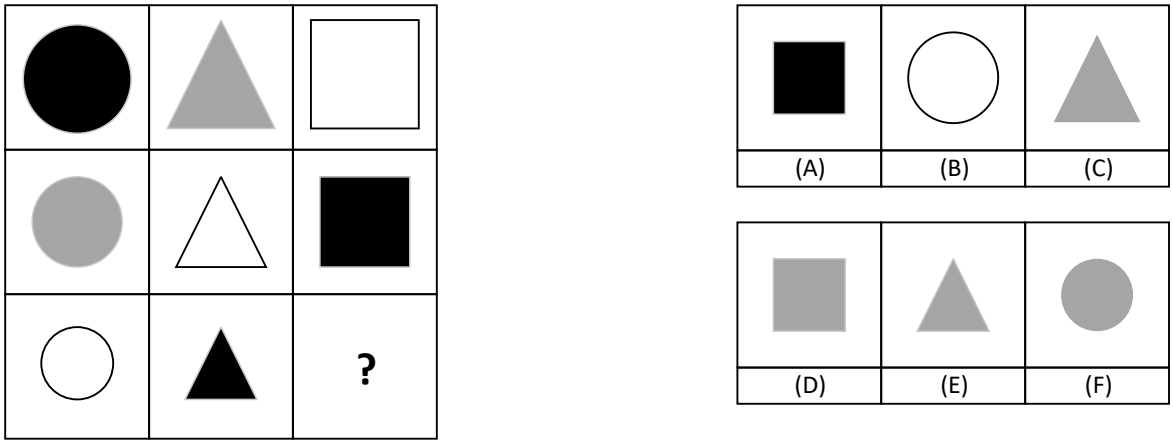
The rules can occur in the following directions:

- from left to right,
- from top to bottom, or
- both from left to right and from top to bottom.

Other directions for the rules such as diagonal are not possible.

It is possible that one rule is applied horizontally and another rule is applied vertically.

EXAMPLE



The rule in this question is applied from top to bottom. (There is also a rule from left to right: namely, in all of the boxes from left to right there are no repeating symbols and no repeating colours. But the rule from the top to bottom is sufficient to solve the problem.)

In all of the boxes from top to bottom, the same symbol can be found in declining size, and there are no repeating colours.
From the 6 possible solutions, 5 are incorrect because they do not adhere to this rule. Only solution D follows the rule. D is the correct answer.

5.2 HOW TO GO ABOUT SOLVING THE QUESTIONS

First have a good look at what is illustrated: forms, colours, numbers, directions, etc.

Next you can compare: What looks the same and what looks different in the images from left to right and/or from top to bottom? In order to recognise the rules and to solve the questions, you have to look for patterns, as well as commonalities and differences among the boxes.

If you see a pattern repeating, this is probably the rule. In most of the questions, the following relations between the fields can be seen:

- Colours (e.g. black, white, grey, striped, etc.)
- Forms (e.g. circle, triangle, square, rhombus, etc.)
- Order (e.g. left, right, top, bottom, middle, etc.)
- Position in relation to other elements (outer, inner, etc.)

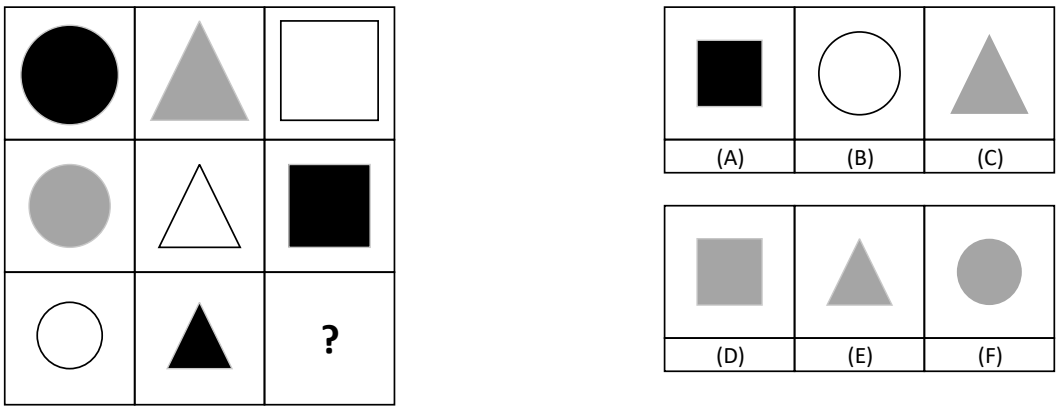
- Direction (e.g. arrow tip up, to the top left, to the right, to the bottom right, etc.)
- Size of the forms (e.g. small circle, large circle, etc.)
- Number of elements (one, two, three, etc.)

If you get stuck, look at the answers. You may be able to figure the rule out given the answers.
If you do not progress, eliminate the obviously wrong answers and guess from the remaining answer choices.

5.3 FREQUENTLY ENCOUNTERED RULES

All different

Each row has different forms, colours, directions, etc.
EXAMPLE



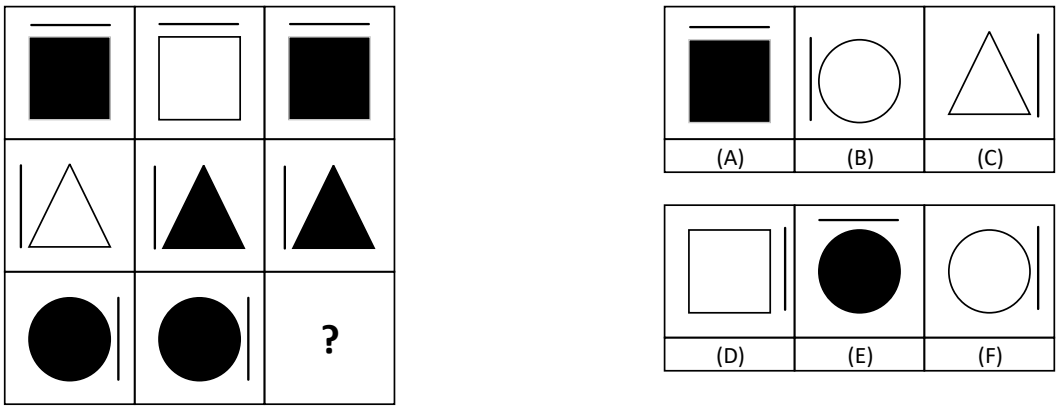
Answer: D

The rule is from top to bottom. The colour differs in each column and the size of the shape diminishes. (Additionally, there is a left to right rule that can be applied to derive the same solution.)

All same

Each row must have the same forms, colours, directions, etc.

EXAMPLE



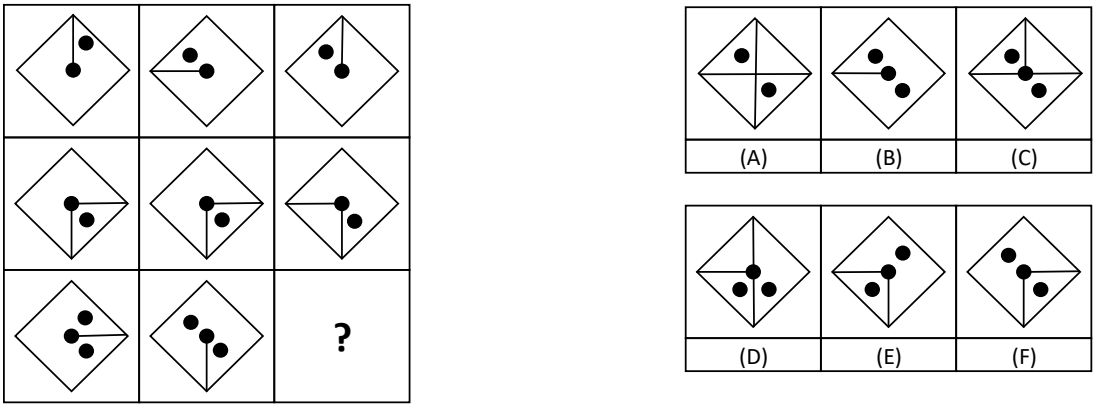
Answer: F

The rule is from left to right. The position of the line and the form are the same in each row. The colour variates: 2x black, 1x white.

Same same different

In each row, 2 elements have the same properties and 1 element has a different property. (The exact number can change, e.g., 1 property is uniform among the boxes and 2 properties differ.)

EXAMPLE



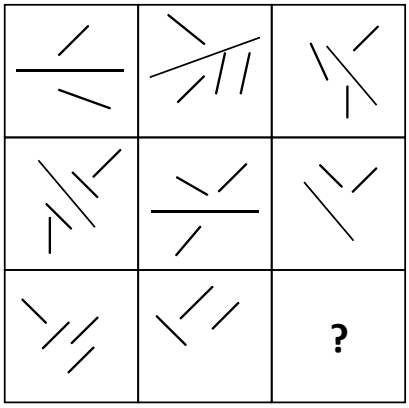
Answer: B

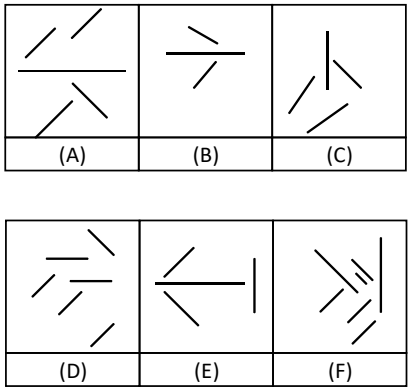
The rule is from top to bottom. The number of dots are 2:2:3. The number of lines are 1:2:1.

Changing number

The number of elements has a pattern (e.g. 2-3-4 elements). The number of elements can also be in the order 2-4-3 or 3-2-4.

EXAMPLE





Answer: A

The rule is from top to bottom. In each column there is a box with 3 lines, one box with 4 lines and 1 box with 5 lines.

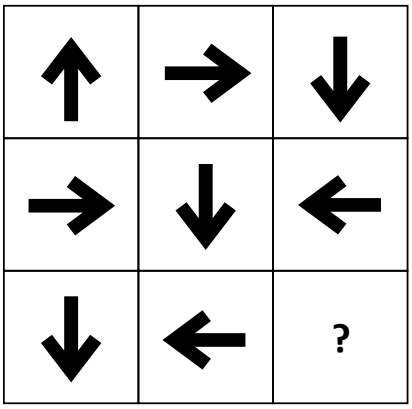
Rotation

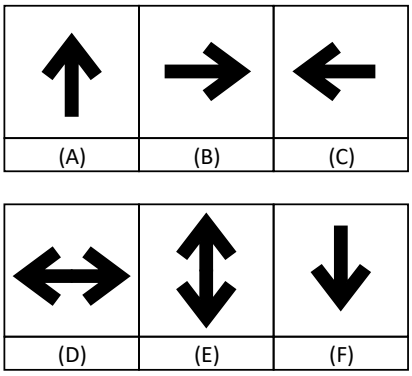
One element rotates. The direction of the rotation (clockwise, anti-clockwise) and the degree of the rotation (e.g. 45 degrees, 90 degrees etc.) is important.

Whenever you see an arrow, check for rotation. Most arrows have some rotational rule.

It can be that the degree of the rotation varies when compared from one box to another.

EXAMPLE





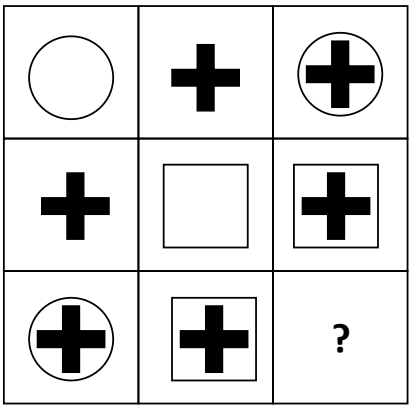
Answer: A

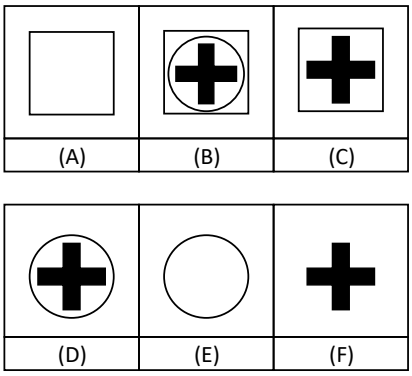
The same rule applies from top to bottom and from left to right. The arrow changes its direction clockwise.

Addition

The elements from the first image and the elements from the second image are added. This means that the third element will depict the elements from both the first and the second image.

EXAMPLE





Answer: B

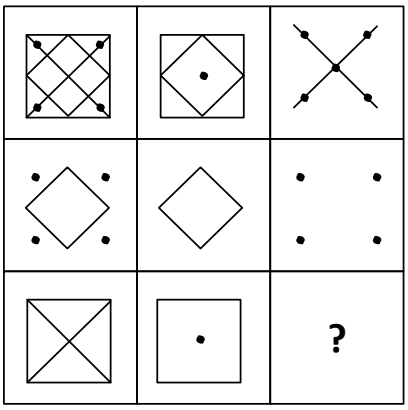
The rule is from left to right. The 1st and 2nd form are placed on top each other.

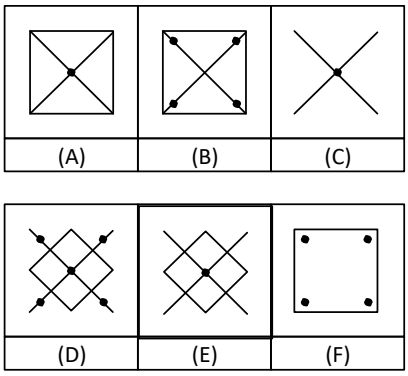
Subtraction

The elements from the first image and the elements from the second image are subtracted. When there are elements at the same position in both image 1 and image 2, these will not be depicted in image 3. The images that do not repeat in the 1st and 2nd image will be displayed in the 3rd.

It can be that a category of objects is subtracted and another category of objects is added.

EXAMPLE





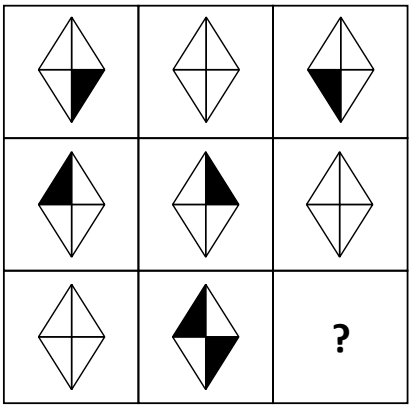
Answer: C

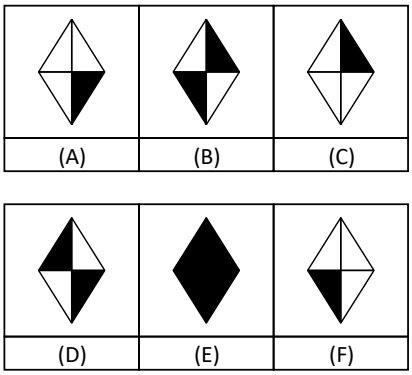
The same rule applies left to right and from top to bottom. In the last image, one sees what is not repeated in the 1st and 2nd image.

Mirroring

Objects are *mirrored*.

EXAMPLE





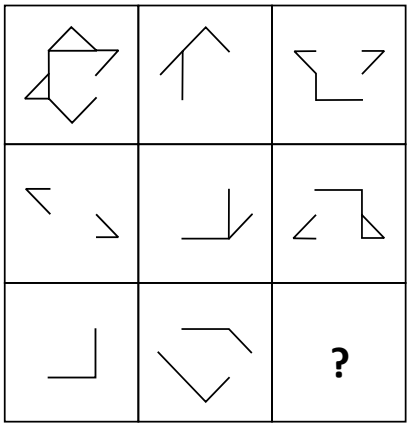
Answer: B

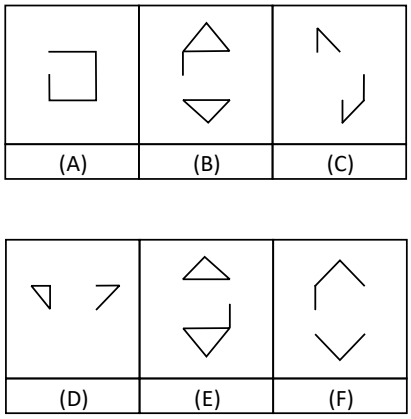
The rule is left to right. In each row, there is one empty parallelogram. The remaining 2 images are mirror images of each other. In the 1st row, for instance, the 1st image is turned front to back to derive the 3rd image.

Puzzle

All of the forms from one direction form a figure together.

EXAMPLE





Answer: F

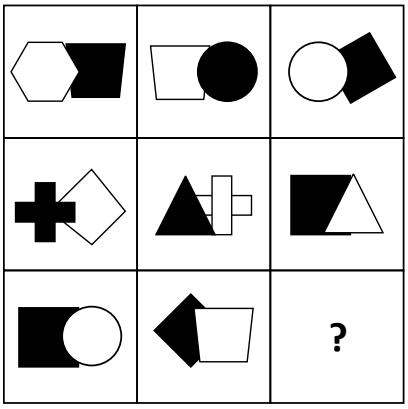
The rule is from top to bottom. The images in each column render the figure below.

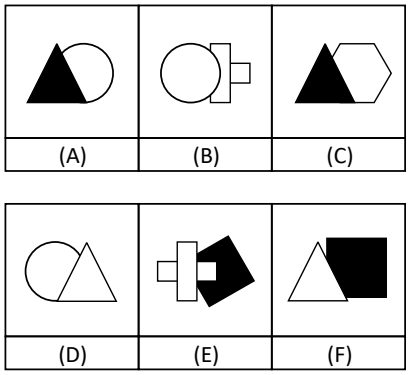
Target figure:

Elimination

There are complex questions which have to be solved using the process of elimination of the given answer.

EXAMPLE





Answer: C

The rule is from left to right. In each row every image has to be unique – colour and shape-wise.

If you cannot identify a rule quickly, always check the answers to see whether they help you determine the right rule.

5.4 MOST STUDENTS RUN OUT OF TIME

In this subtest you have 20 minutes to solve the 22 questions. This means you have about 54 seconds per question. The questions become increasingly difficult. This means that the questions start out being very easy and, in the end, are quite difficult. Answer the first questions quickly in order to have more time later for the more difficult questions.
In this section, time management and intelligent guessing are key. In our student interviews we did not encounter anyone who could finish in time. If you cannot answer a question immediately, eliminate and guess. Points are not deducted for wrongly marked answers. You can mark the question in your test booklet and come back and solve it later if time allows.
In this subtest each correct answer (and each correct guess) will have a strong impact on your score. Solve our questions while tracking the time and practice guessing.

5.5 SUGGESTED APPROACH TO SOLVE THE DIFFICULT QUESTIONS

Using the following guidelines, you can discover the most common rules step-by-step.
Check the following points for each difficult question:

- Direction: What direction is the rule using?
- Form: What forms are there? Do they stay the same or do they change?
- Orientation: Does the orientation change, for example, by rotating or mirroring?
- Colour: Which colours are used? Do they stay the same or do they change?

- Size: Does the size stay the same or does it change?
- Quantity: How many elements are there? Does the amount stay the same? How do they change?

Our suggestion with the harder questions is to divide and conquer. If you cannot identify a rule quickly, look at each element separately using the criteria above.
And if this yields no result, eliminate the obviously wrong ones, guess, and move on.

5.6 SECTION SUMMARY

1) Rules follow one of these three directions:

- from left to right,
- from top to bottom, or
- both from left to right and from top to bottom.

2) Other directions such as diagonal are not possible/relevant.

3) Look for patterns, as well as commonalities and differences among the boxes in order to discover the rules.

4) The most common rules affect the following:

- Colours (e.g. black, white, grey, striped)
- Forms (e.g. circle, triangle, square, rhombus)
- Order (e.g. left, right, top, bottom, middle)
- Position in relation to other elements (outer, inner, etc.)
- Direction (e.g. arrow tip up, to the top left, to the right, to the bottom right)
- Size of the forms (e.g. small circle, large circle)
- Number of elements (one, two, three)

5) One, two or three rules can be true.

6) One rule can be applied horizontally and simultaneously, while another rule can be applied vertically.

7) Some questions can only be solved using the *process of elimination*.

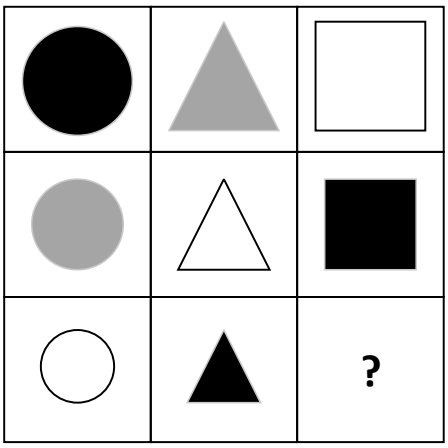
8) If you are stuck, do not waste time. Eliminate the obviously wrong answers, guess and move on.

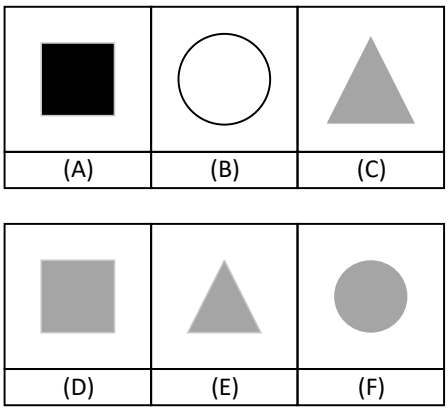
5.7 PRACTICE EXAMS

You have 20 minutes to solve the 22 questions in each test.

5.7.1 EXAM 1

1.1.





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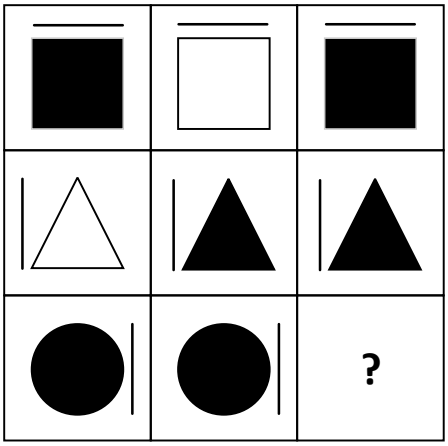

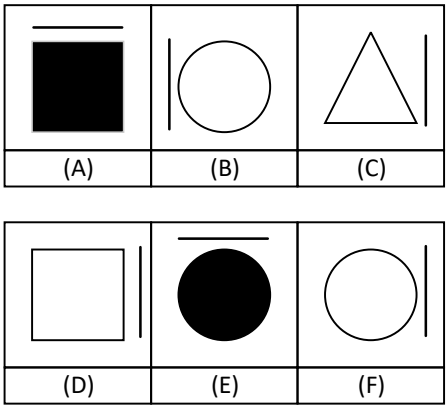

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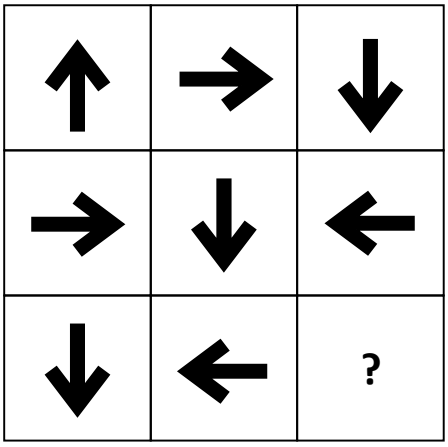

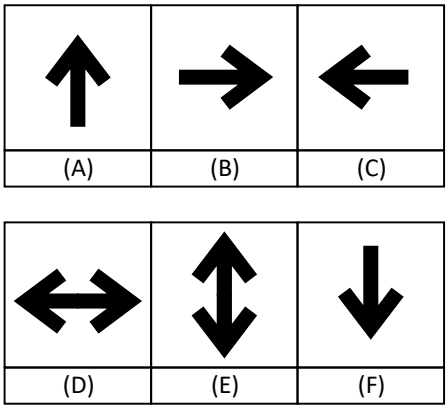

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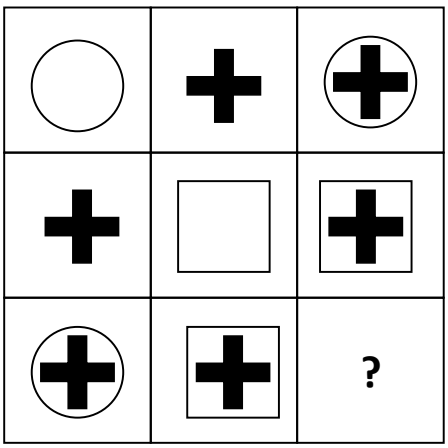

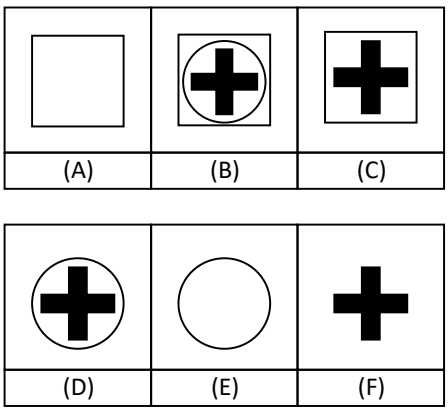

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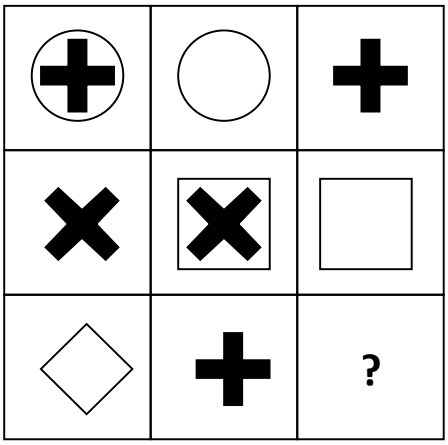

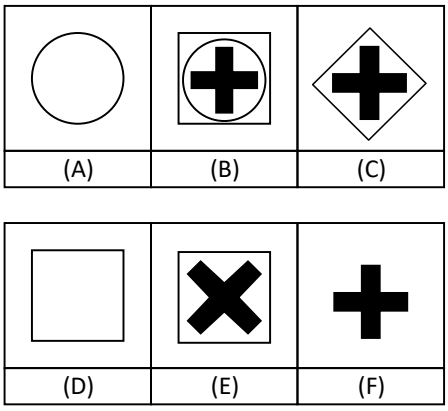

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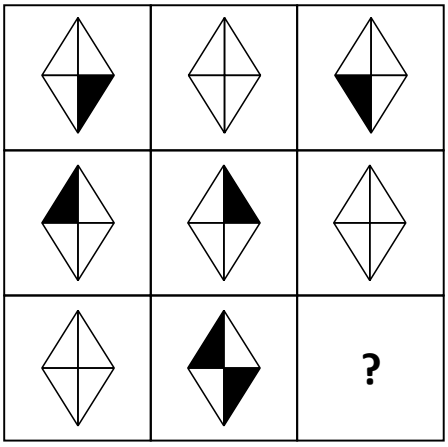
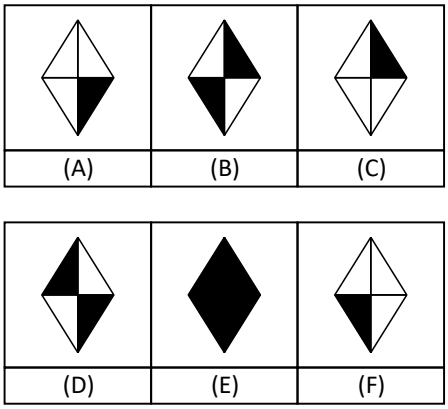
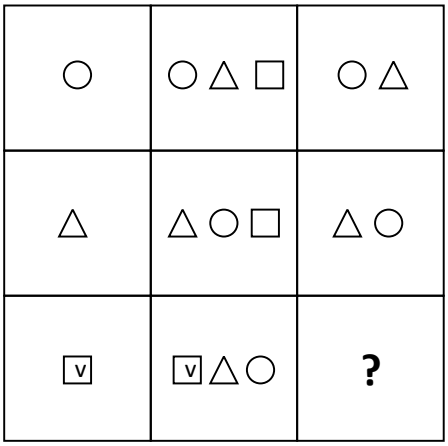
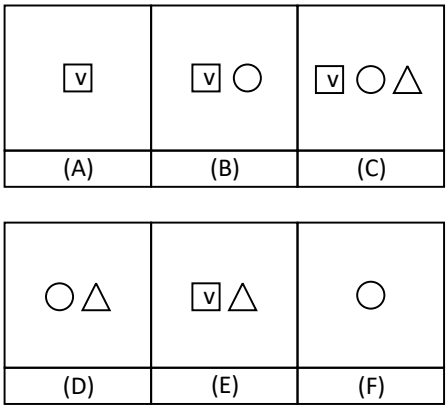




1.7.





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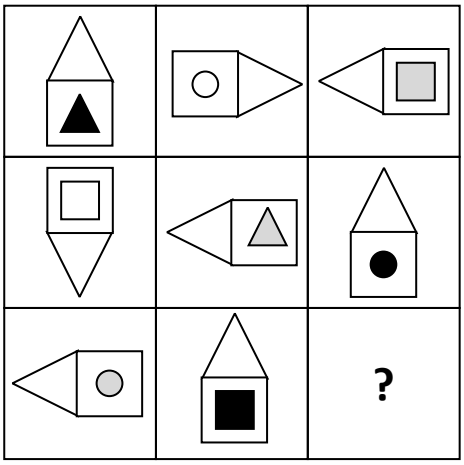

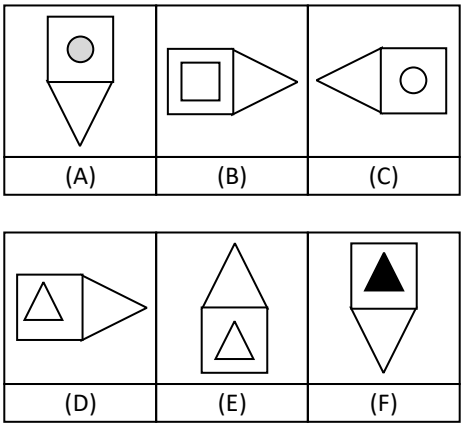

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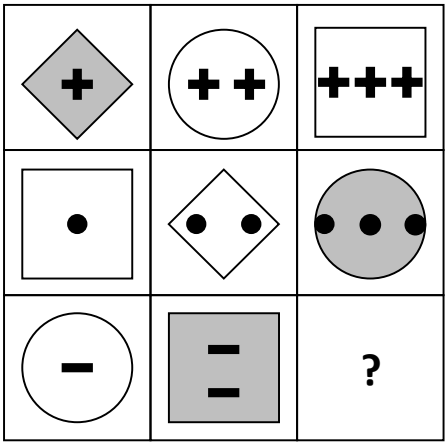

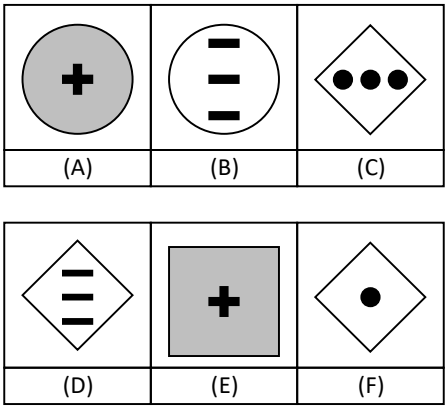

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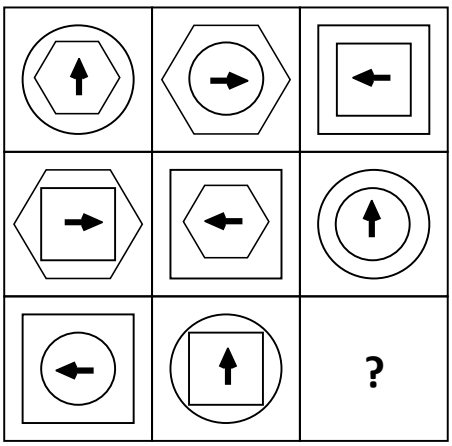

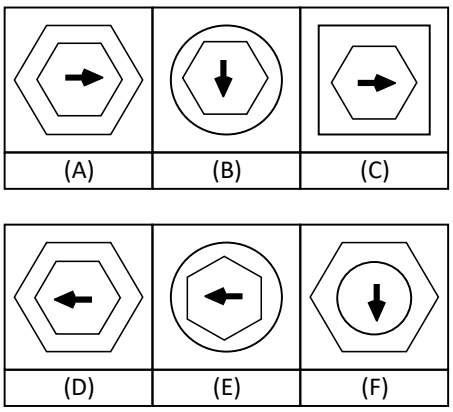

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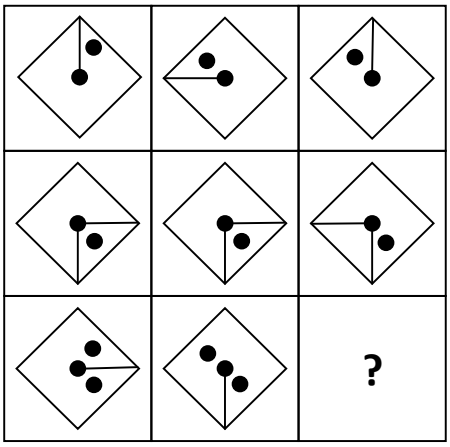

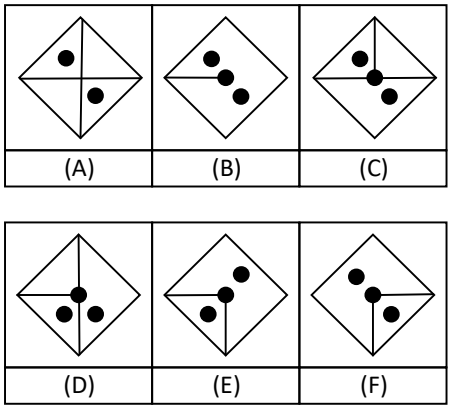

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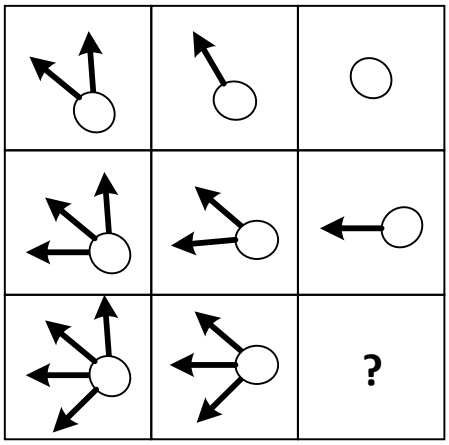

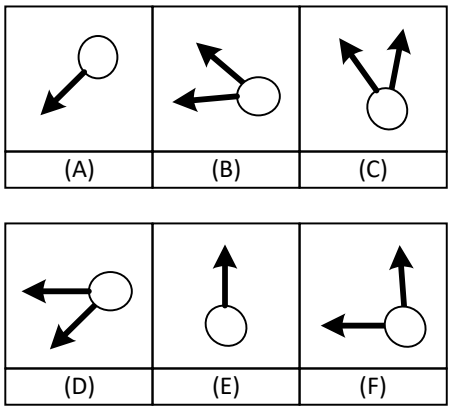

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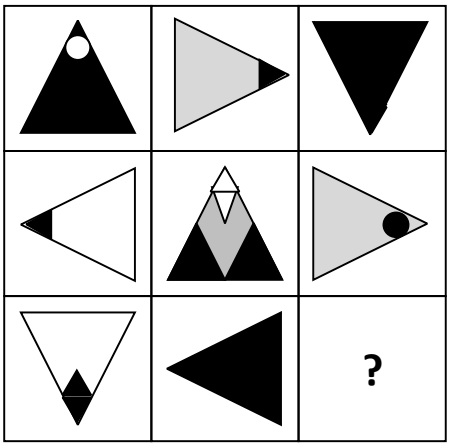

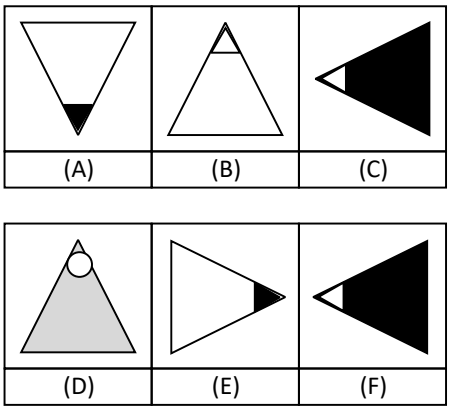

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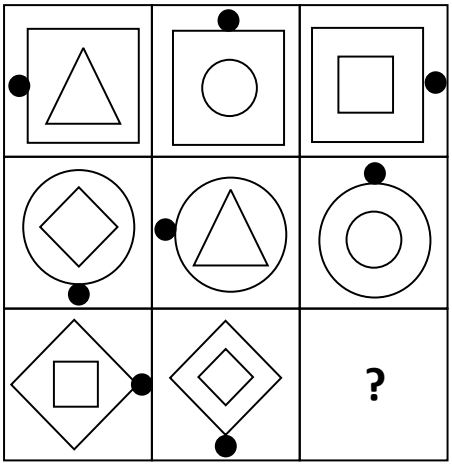

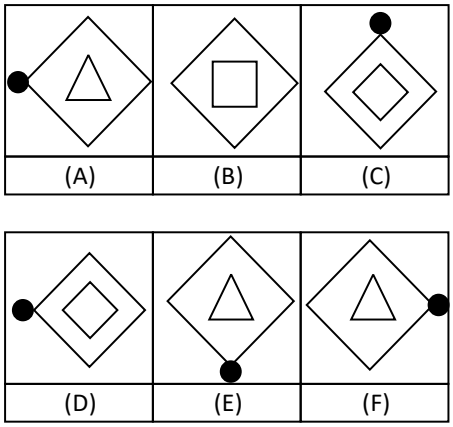

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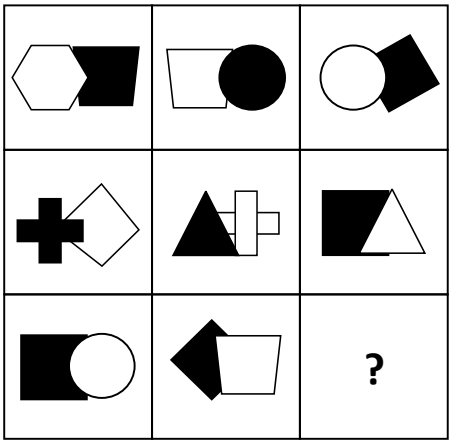

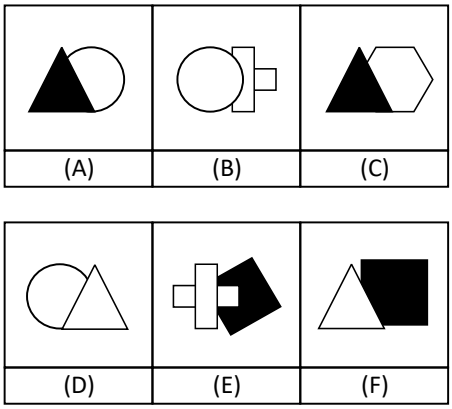

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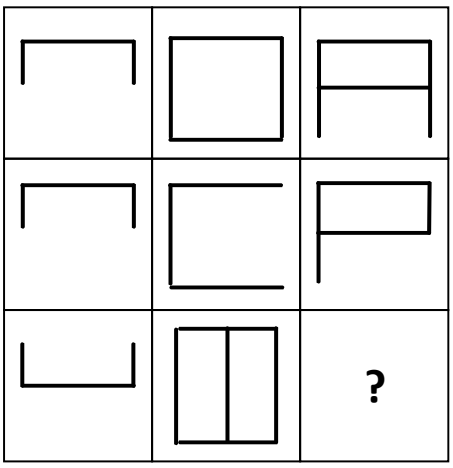

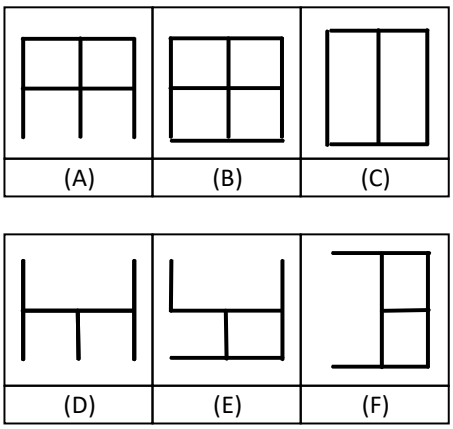

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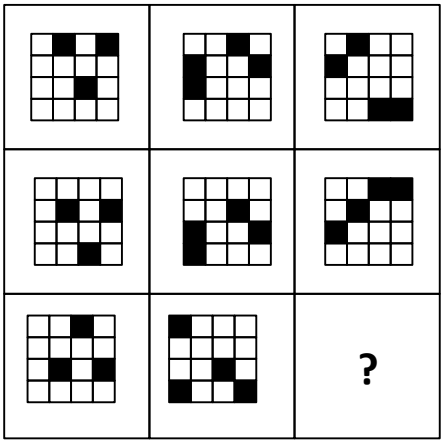

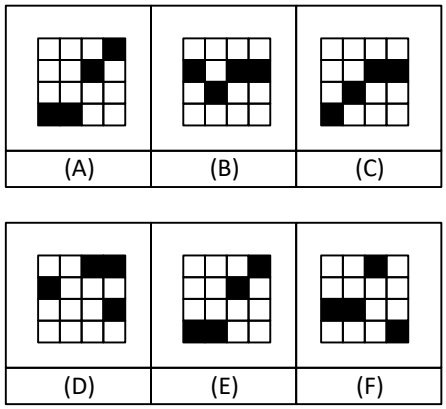

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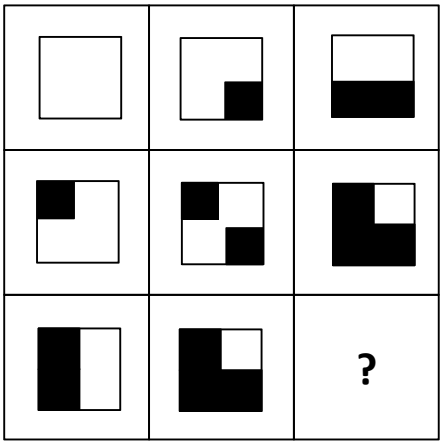

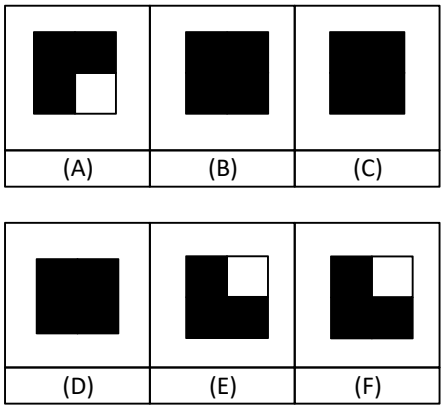

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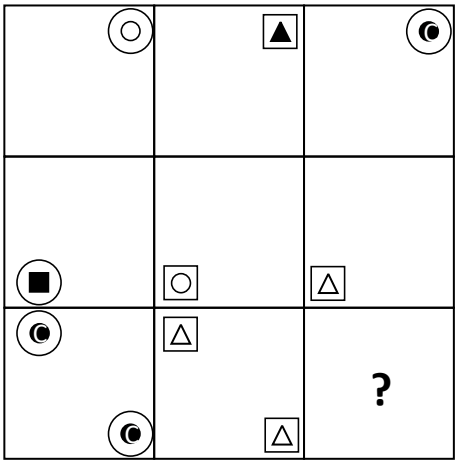
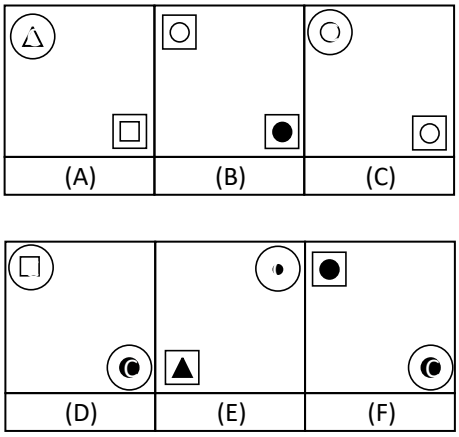
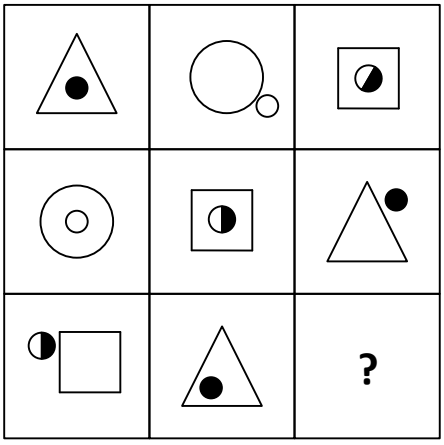
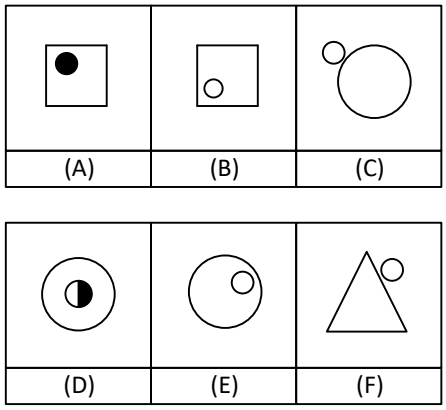




1.20.





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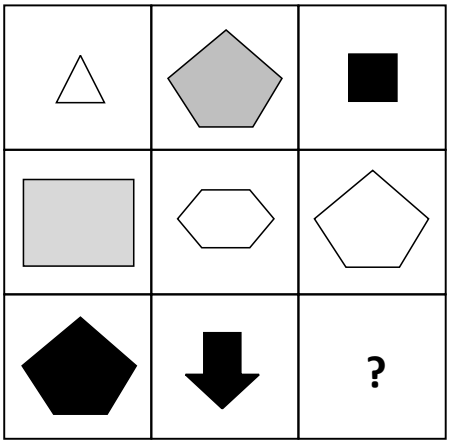

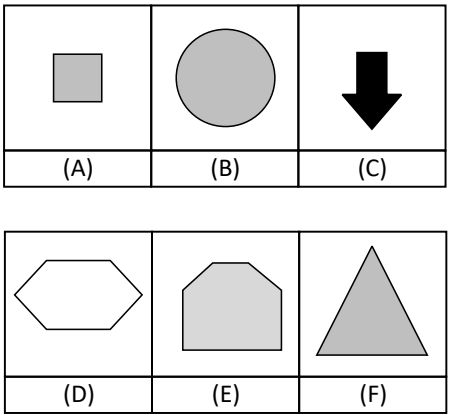

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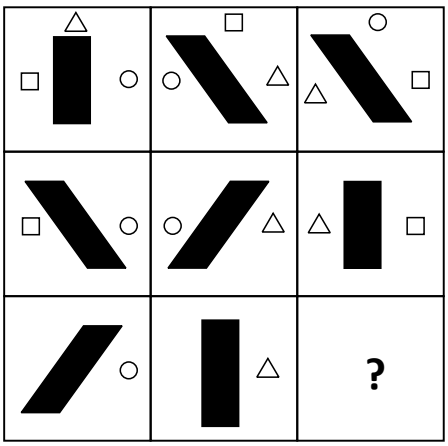

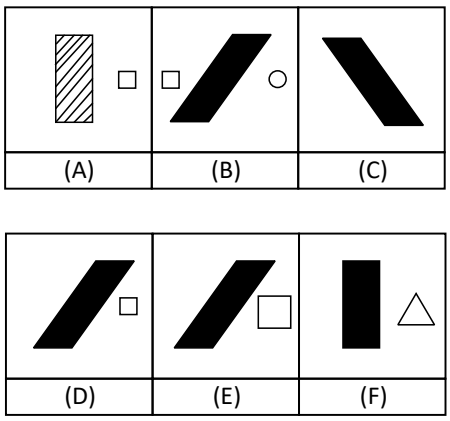

5.7.2 EXAM2

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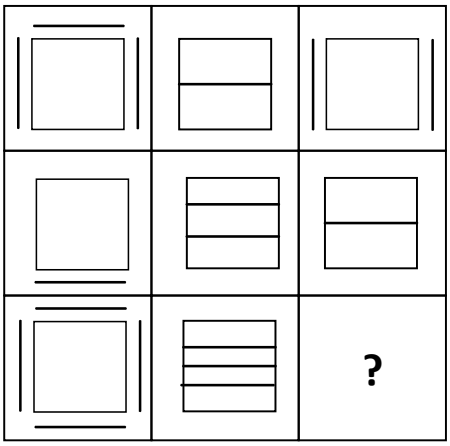

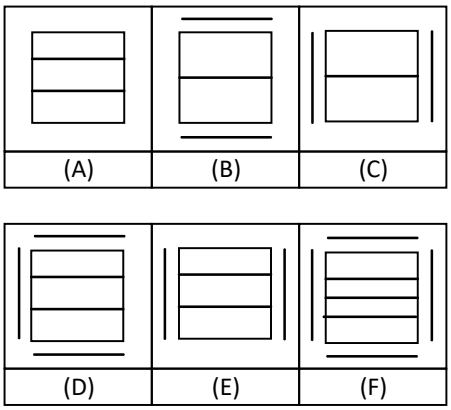

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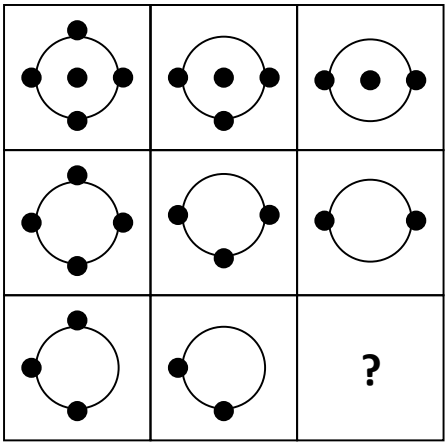

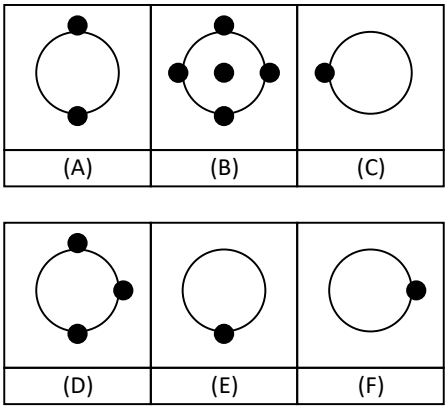

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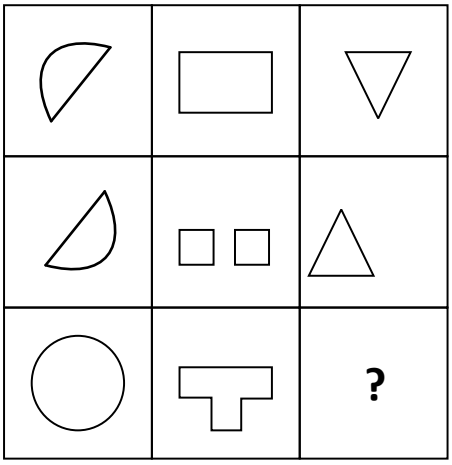

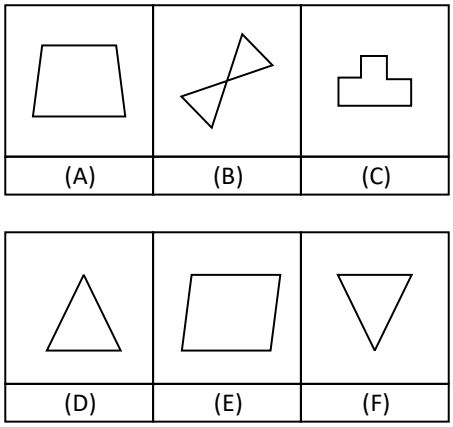

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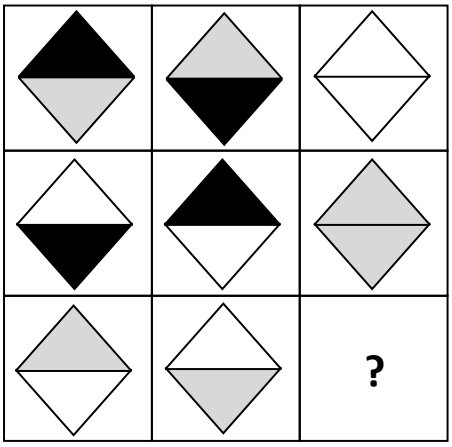

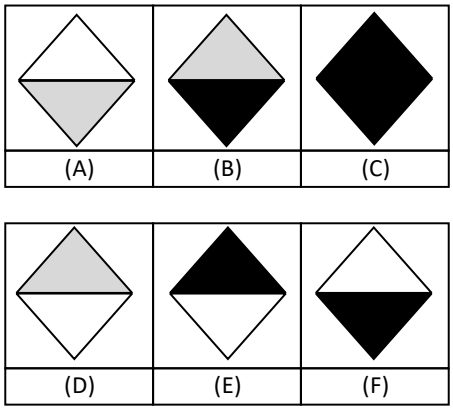

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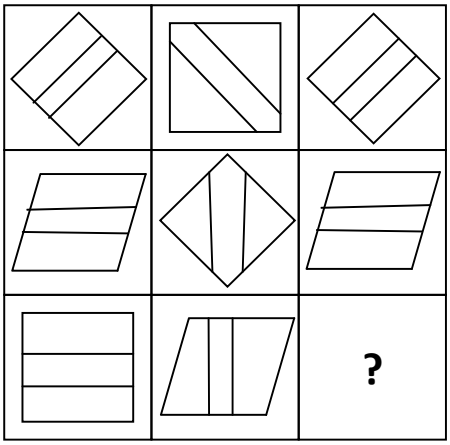

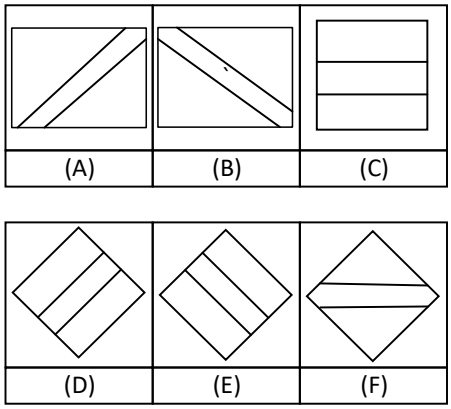

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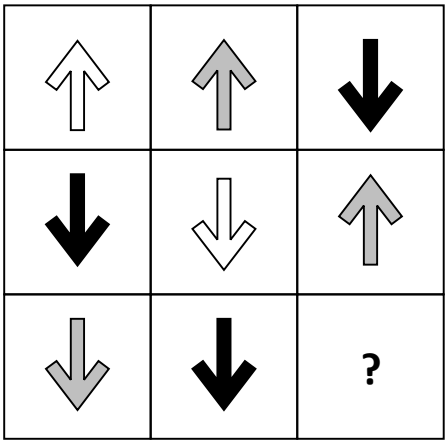

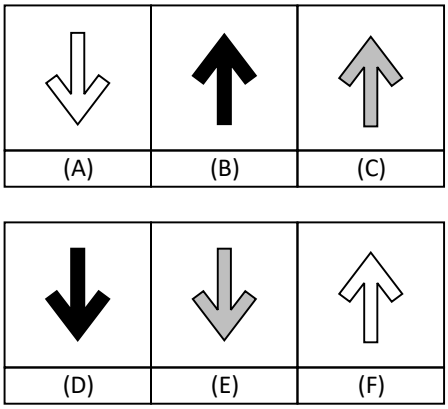

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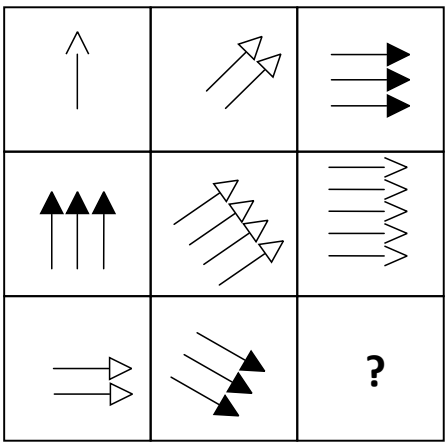

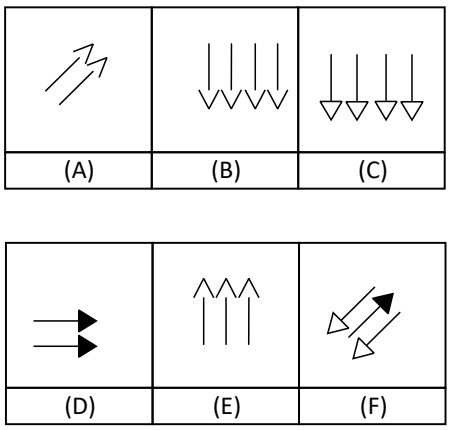

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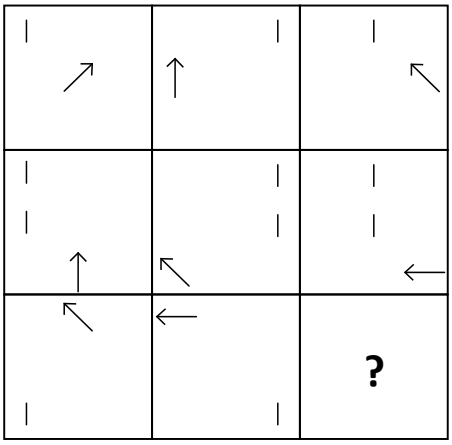

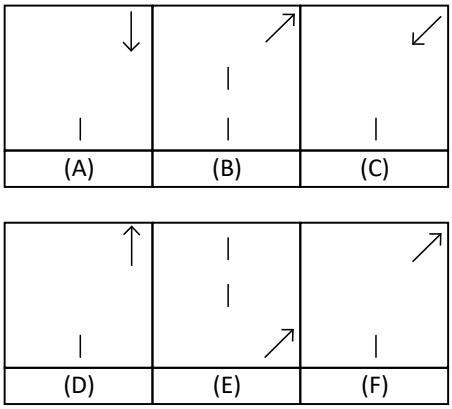

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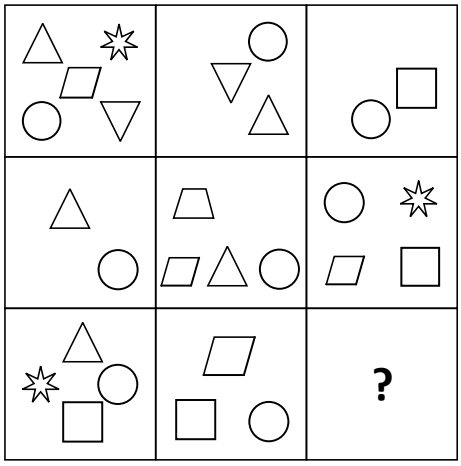

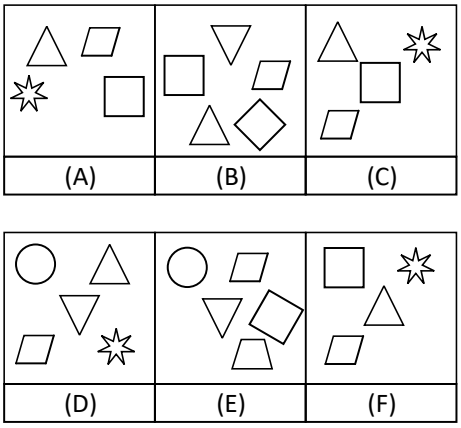

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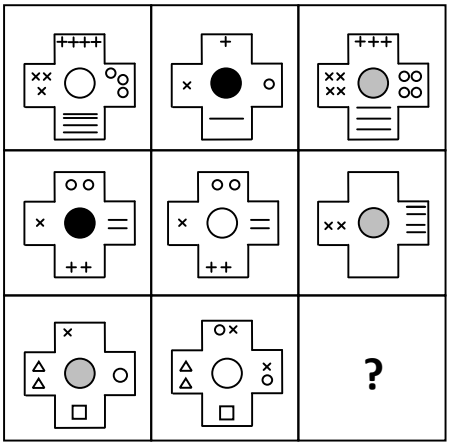

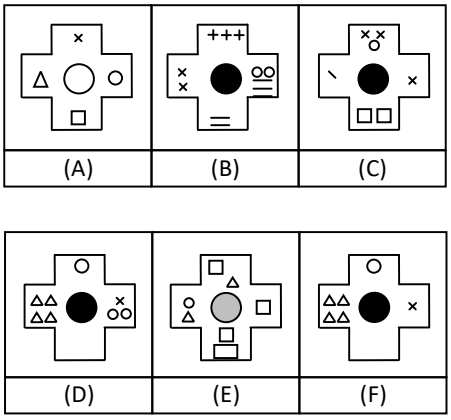

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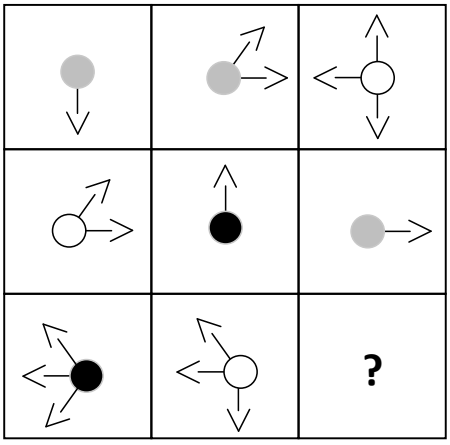

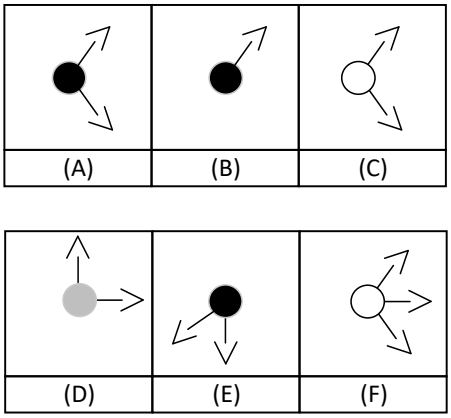

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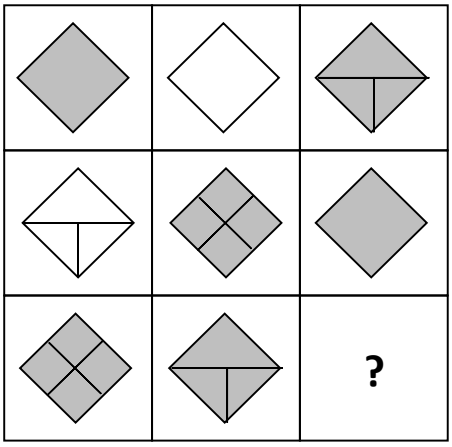

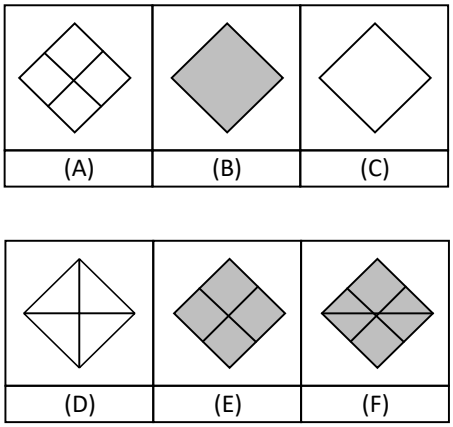

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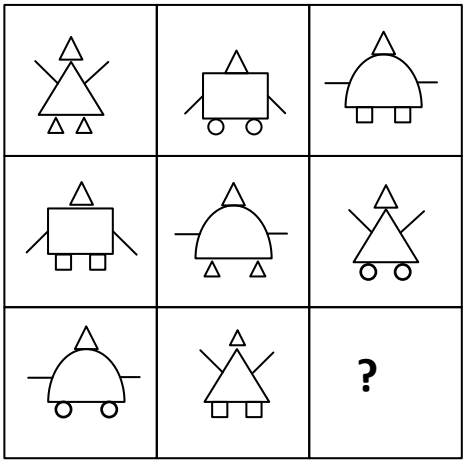

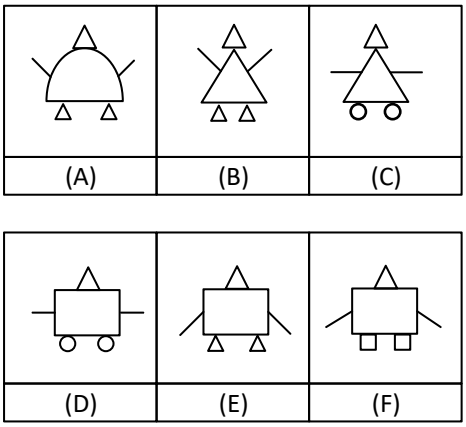

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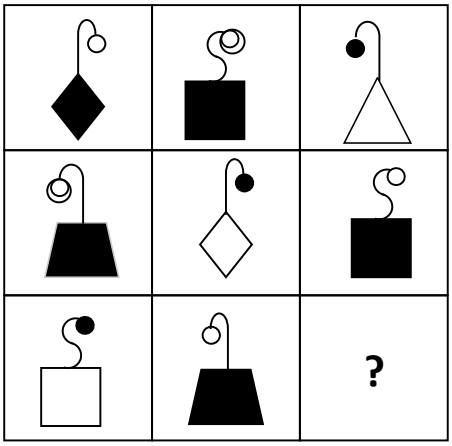

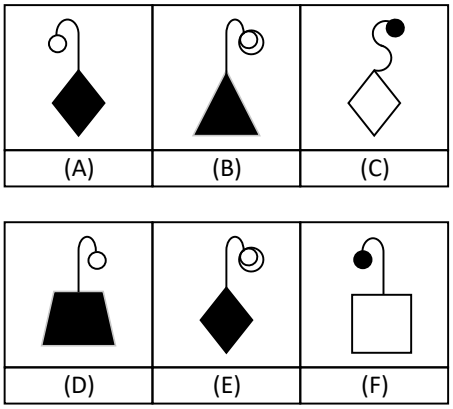

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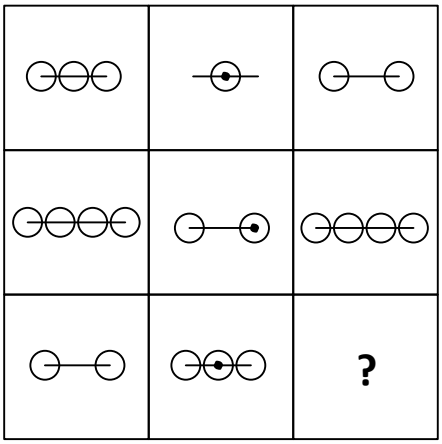

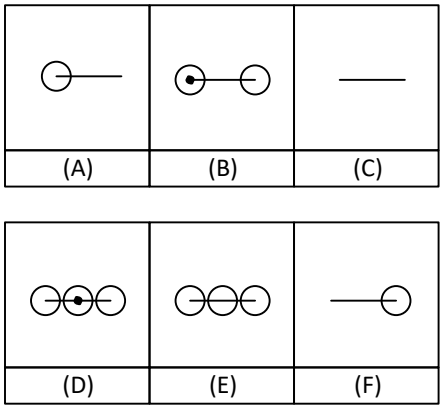

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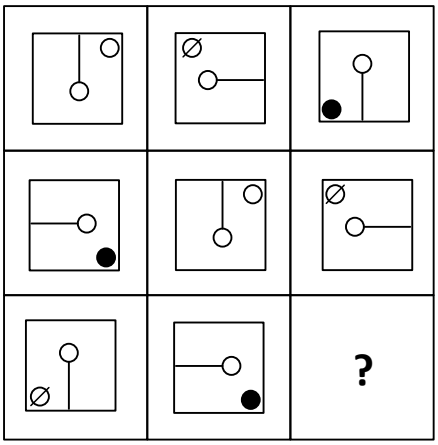

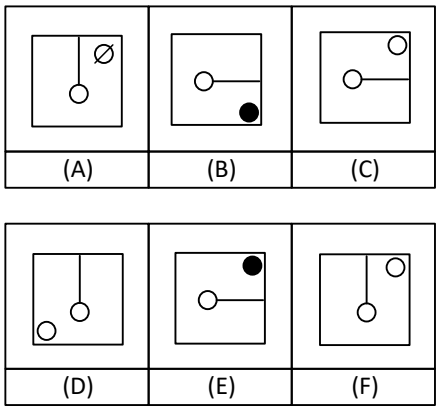

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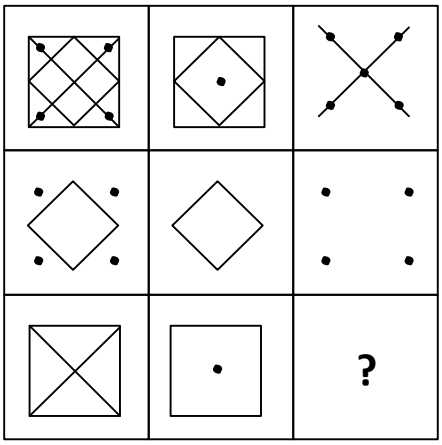

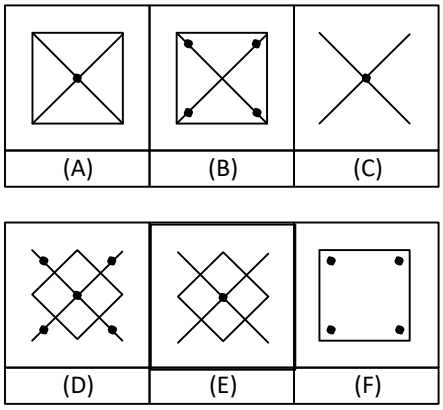

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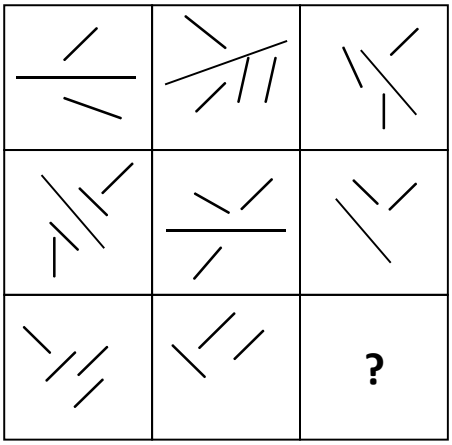

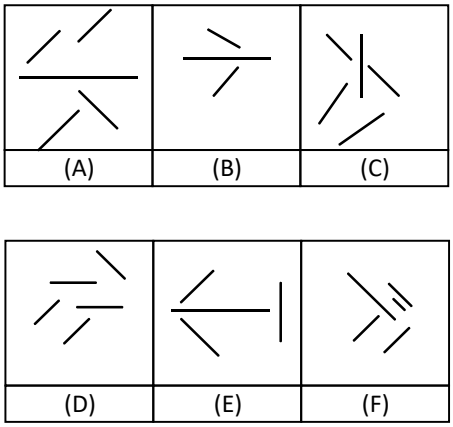

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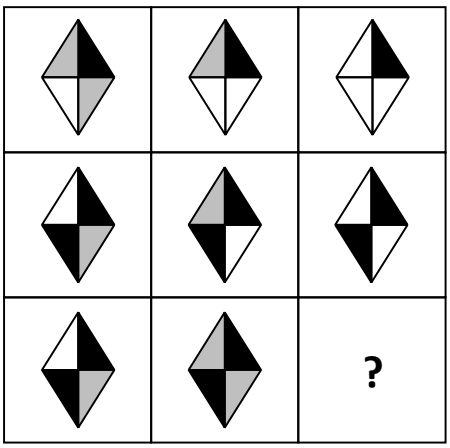

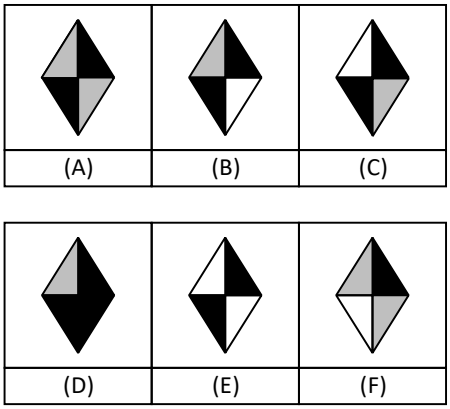

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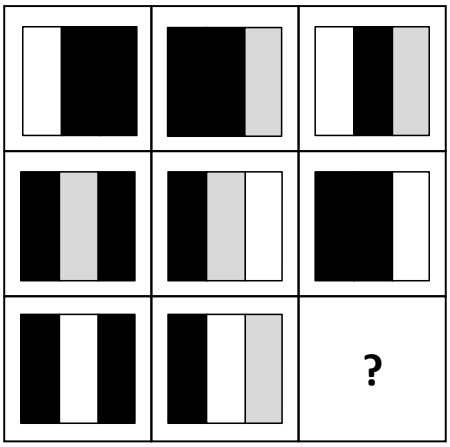

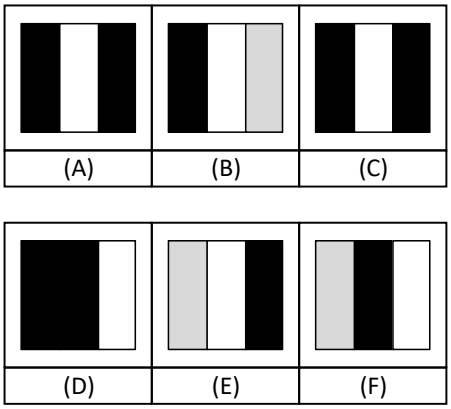

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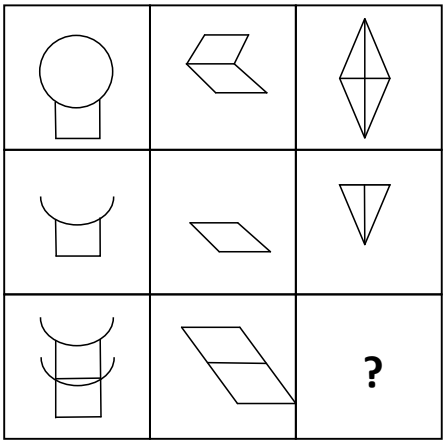

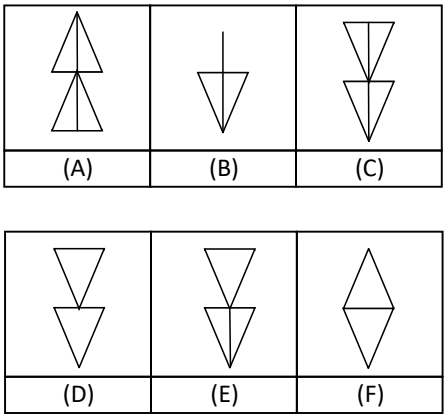

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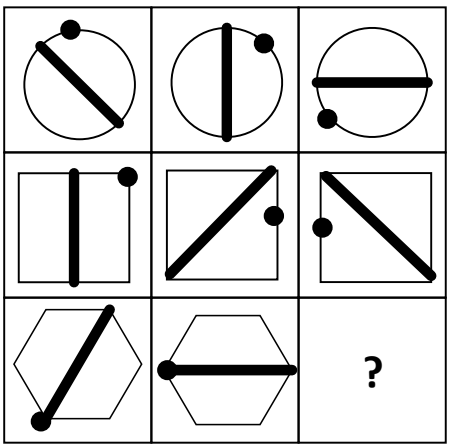

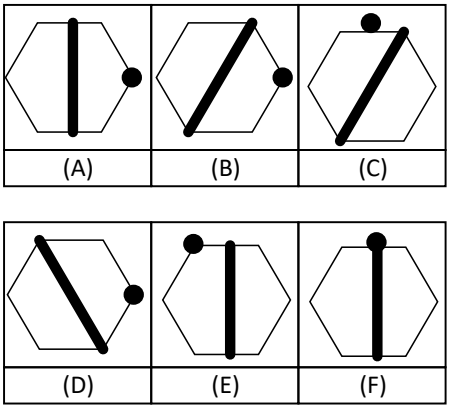

5.7.3 EXAM3

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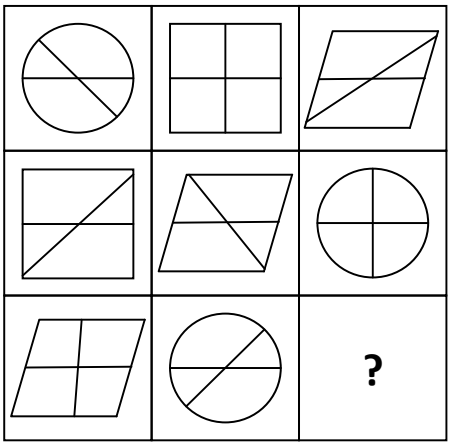
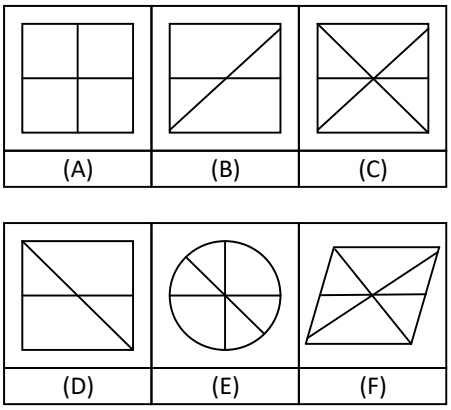
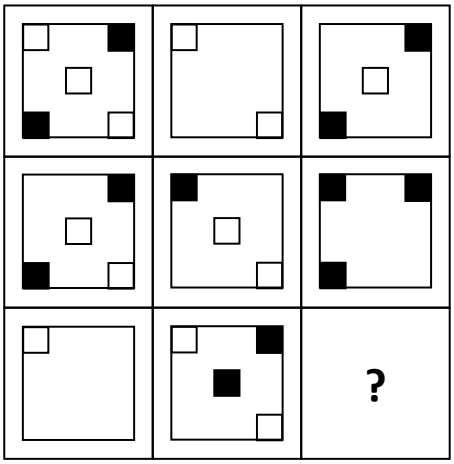
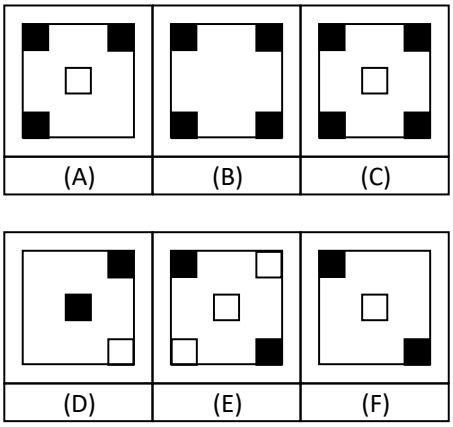




3.2.





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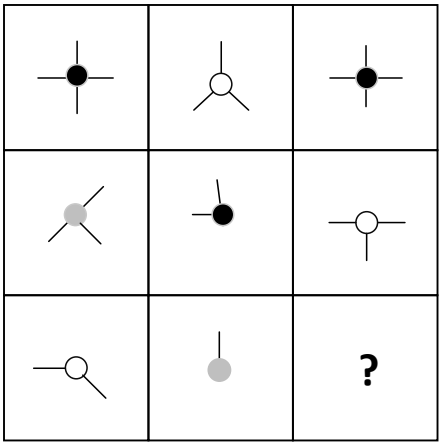

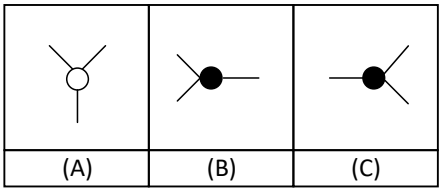

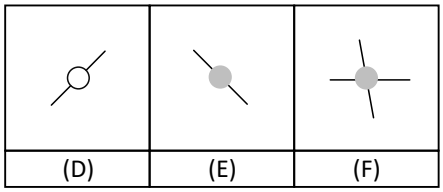

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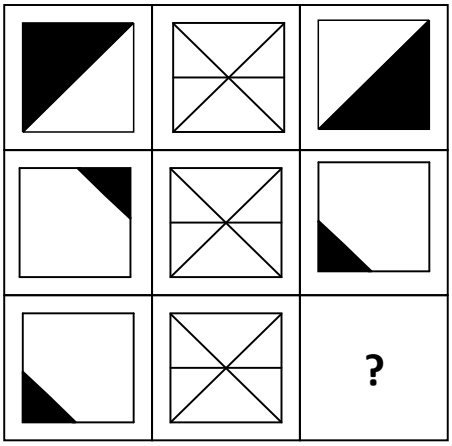

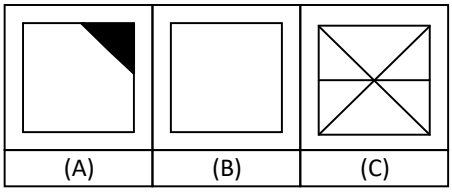

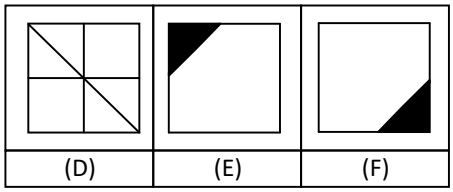

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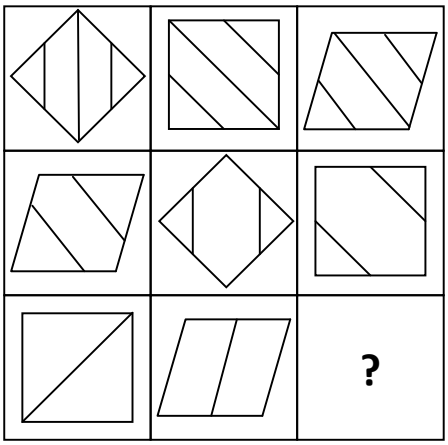

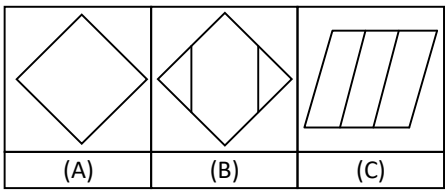

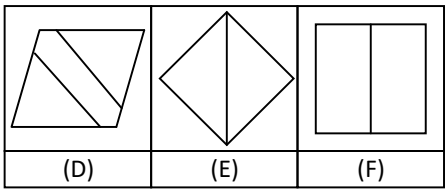

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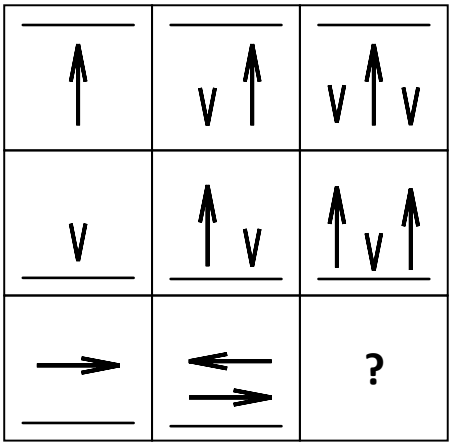

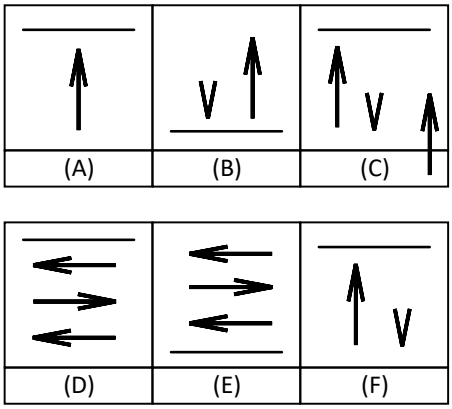

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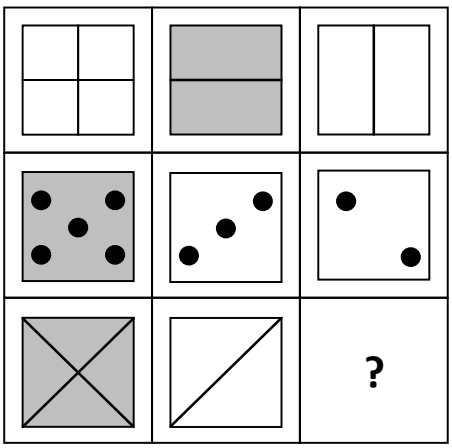

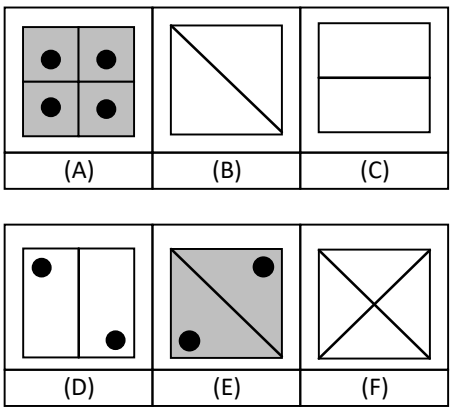

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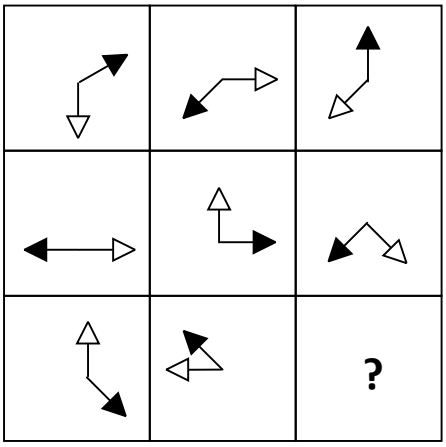

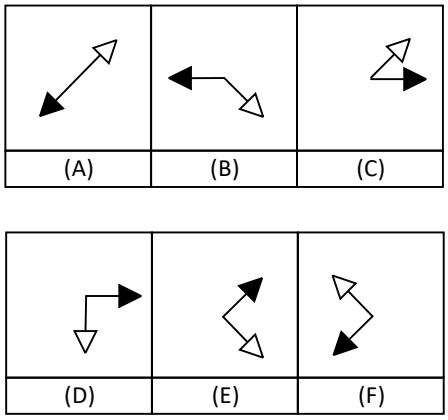

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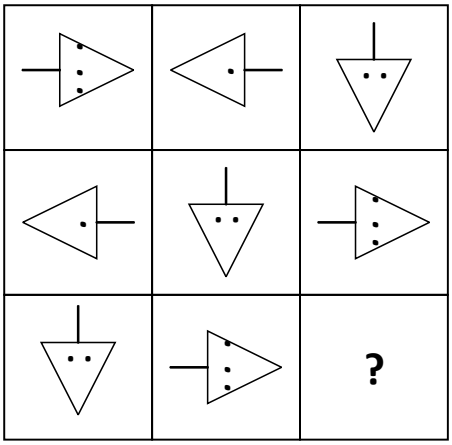

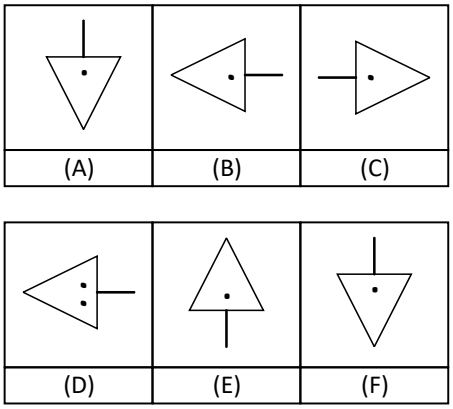

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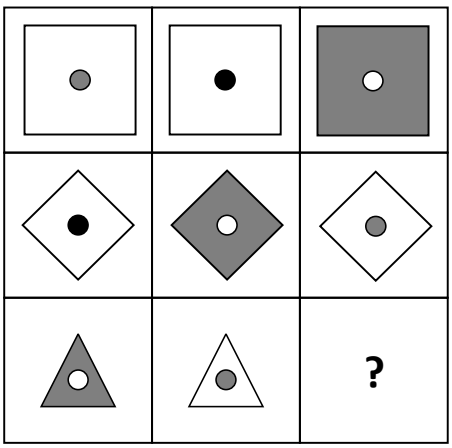

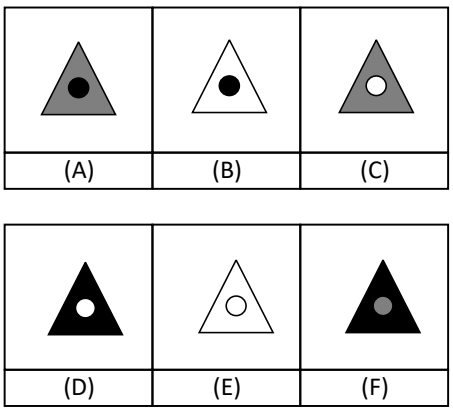

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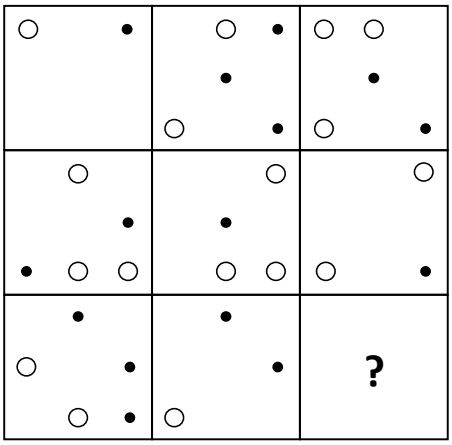

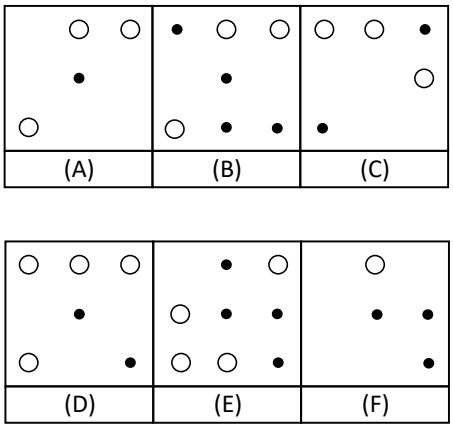

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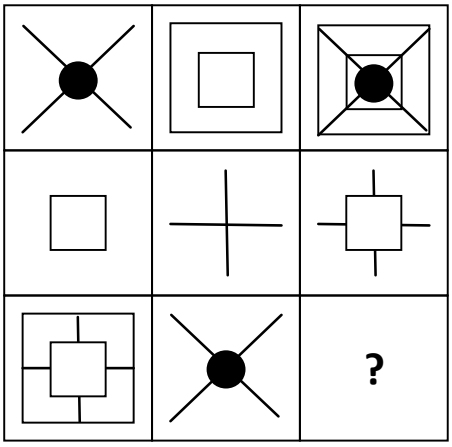

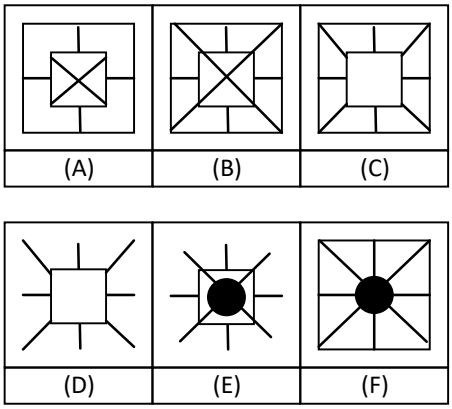

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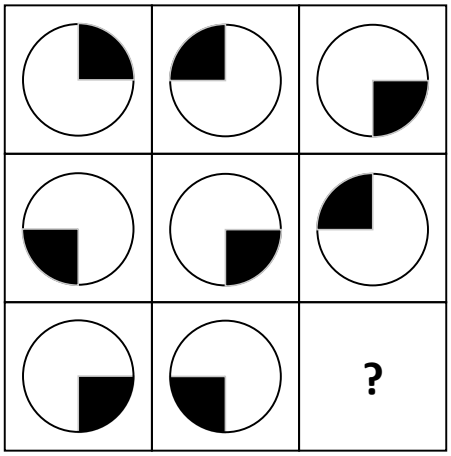

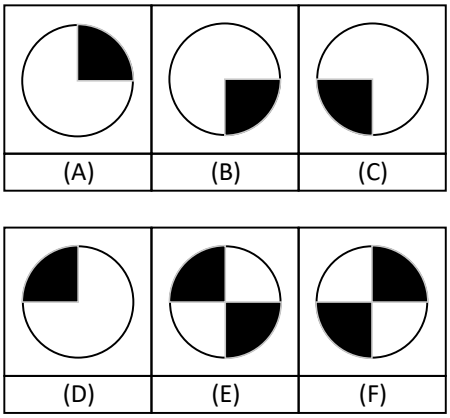

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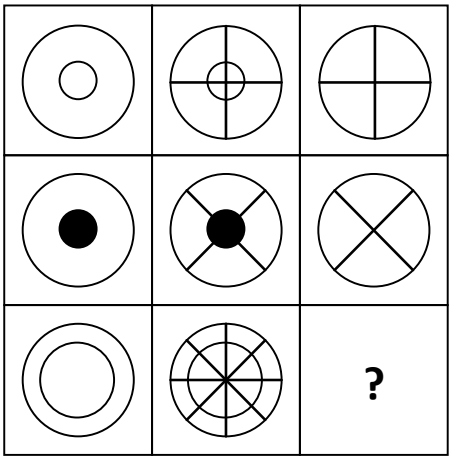

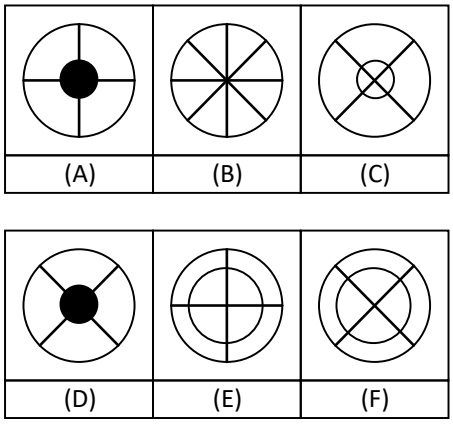

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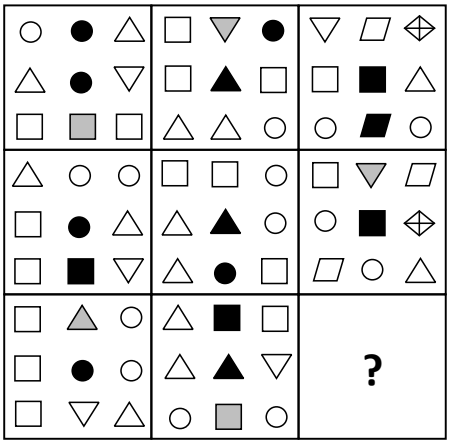

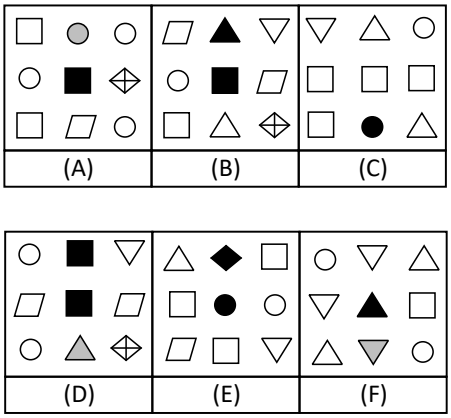

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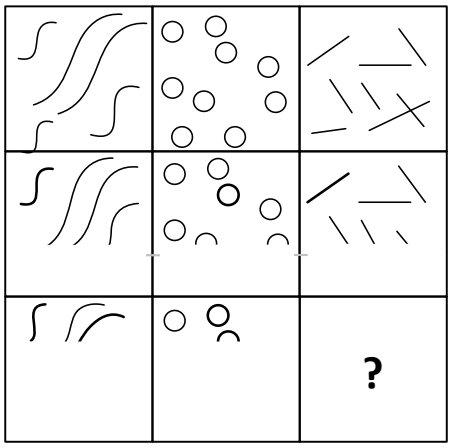

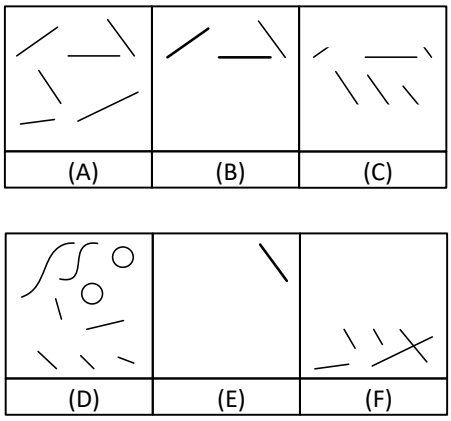

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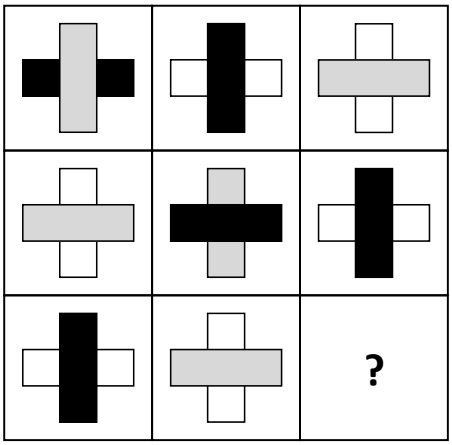

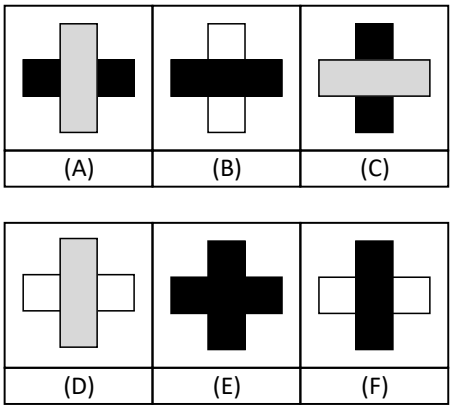

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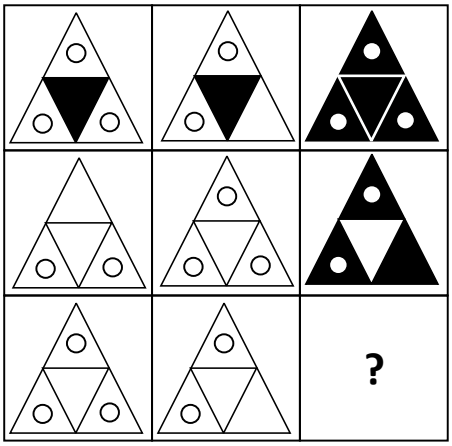

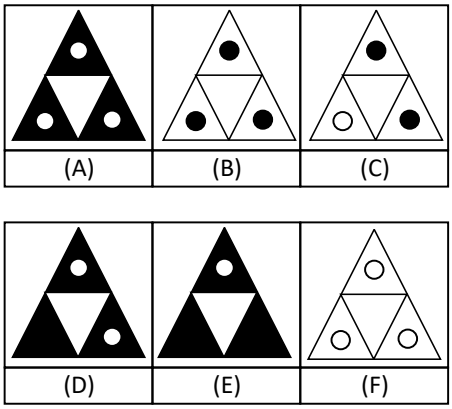

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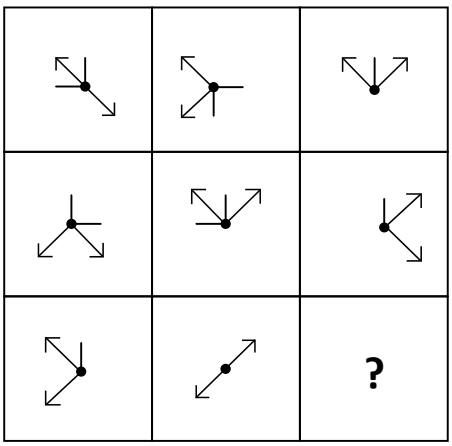

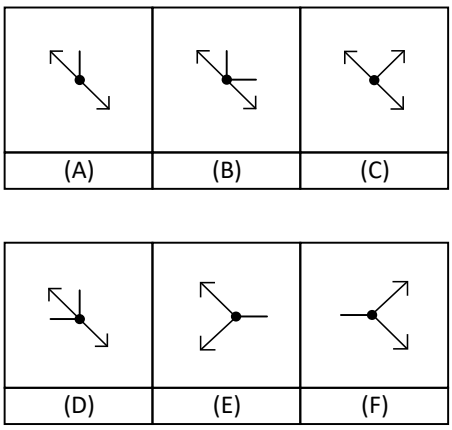

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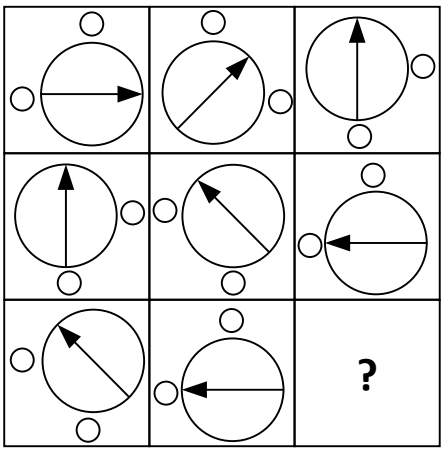

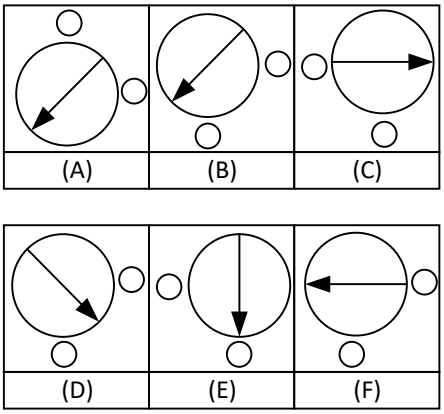

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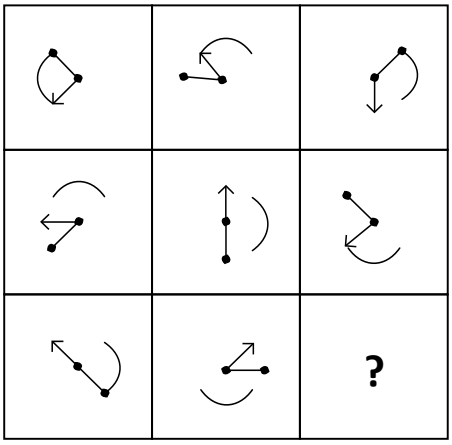

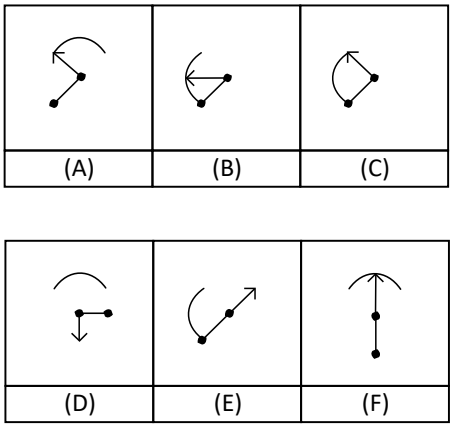

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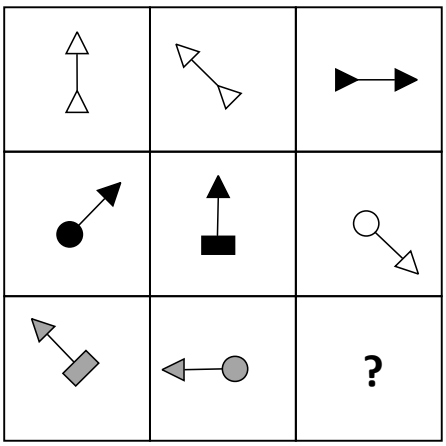
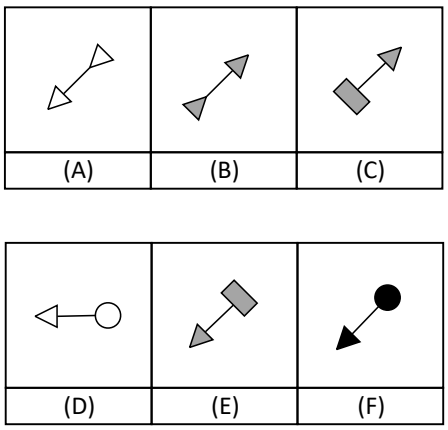




5.8 ANSWER KEY

Exam 1	
Question	Answer
1.1.	D
1.2.	F
1.3.	A
1.4.	B
1.5.	C
1.6.	B
1.7.	E
1.8.	D
1.9.	D
1.10.	A
1.11.	B
1.12.	D
1.13.	B
1.14.	A
1.15.	C
1.16.	D
1.17.	C
1.18.	F
1.19.	C
1.20.	E
1.21.	E
1.22.	D

Exam 2	
Question	Answer
2.1.	C
2.2.	C
2.3.	E
2.4.	C
2.5.	C
2.6.	F
2.7.	B
2.8.	C
2.9.	E
2.10.	D
2.11.	A
2.12.	A
2.13.	E
2.14.	E
2.15.	E
2.16.	F
2.17.	C
2.18.	A
2.19.	E
2.20.	B
2.21.	C
2.22.	A

Exam 3	
Question	Answer
3.1.	D
3.2.	D
3.3.	E
3.4.	A
3.5.	E
3.6.	E
3.7.	B
3.8.	C
3.9.	B
3.10.	B
3.11.	F
3.12.	C
3.13.	A
3.14.	B
3.15.	D
3.16.	B
3.17.	A
3.18.	A
3.19.	A
3.20.	A
3.21.	B
3.22.	C

5.9 DETAILED ANSWERS

In order to acquaint you with the common rule types and help you approach the questions in a structured way, we provided detailed explanations below. Especially with the difficult questions, it is useful to approach the questions in a structured way using the below criteria.

Overall our suggestion in this section is to divide and conquer. If you cannot identify a rule quickly, look at each element separately, ignoring the rest of the elements. Does the direction of the arrows change in a certain way? Do the colours variate in a particular way?

You can watch out for the following criteria:

Direction:

Form: Body:

Orientation:

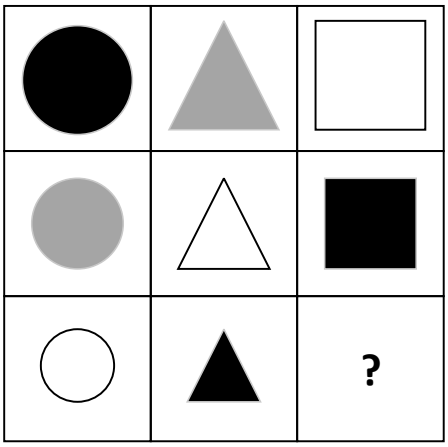
Colour: Size:

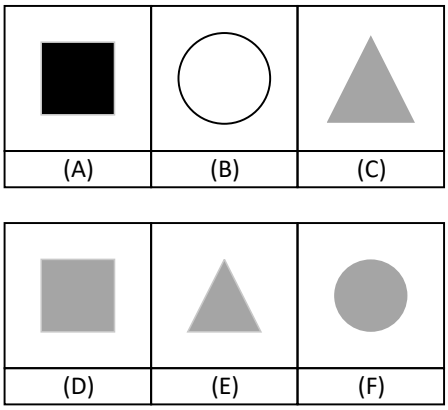
Quantity:

In the explanations, we describe only the properties that are important for the rule. A "-" means that there are no changes or differences for this property or that they are not relevant for the rule. For example, "*Form:* - " means that the objects, with regard to the rule, all have the same form or that the form does not help you derive the answer.

5.9.1 EXAM1

1.1.





Answer: D

Direction: both from left to right and from top to bottom →↓

Form: circle, triangle, square

Orientation: -

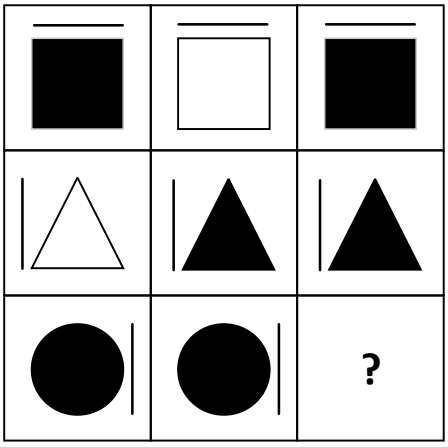
Colour: black, grey, white

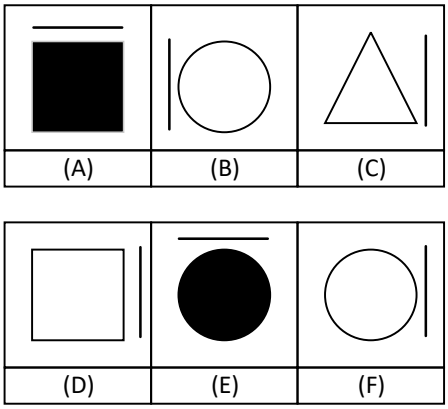
Size: constant (→) and getting smaller (↓)

Quantity: -

In the rows from left to right and from top to bottom, each colour is used just once. In the rows from left to right, each form is used just once, and from top to bottom they are always the same. This means that at the bottom right, there has to be a grey square.

1.2.





Answer: F

Direction: from left to right

Form: -

Orientation: -

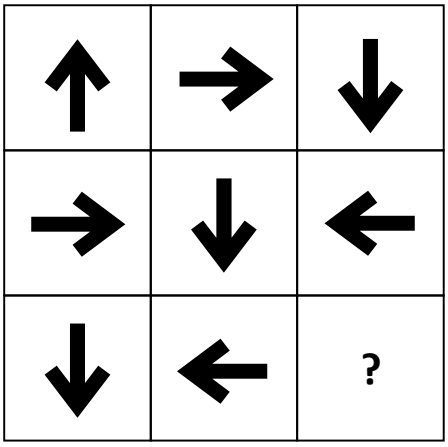
Colour: twice black, once white

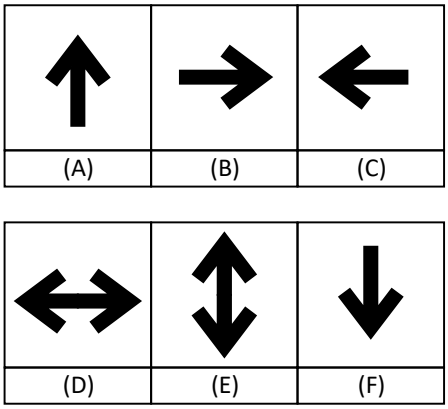
Size: -

Quantity: -

From left to right, there is always the same form. The line stays at the same position. Here, the rule is that the form is twice black and once white. This means that the bottom right has to be a white circle with a line to the right.

1.3.





Answer: A

Direction: both from left to right and from top to bottom ↓

Form: -

Orientation: arrows rotate by 90 °

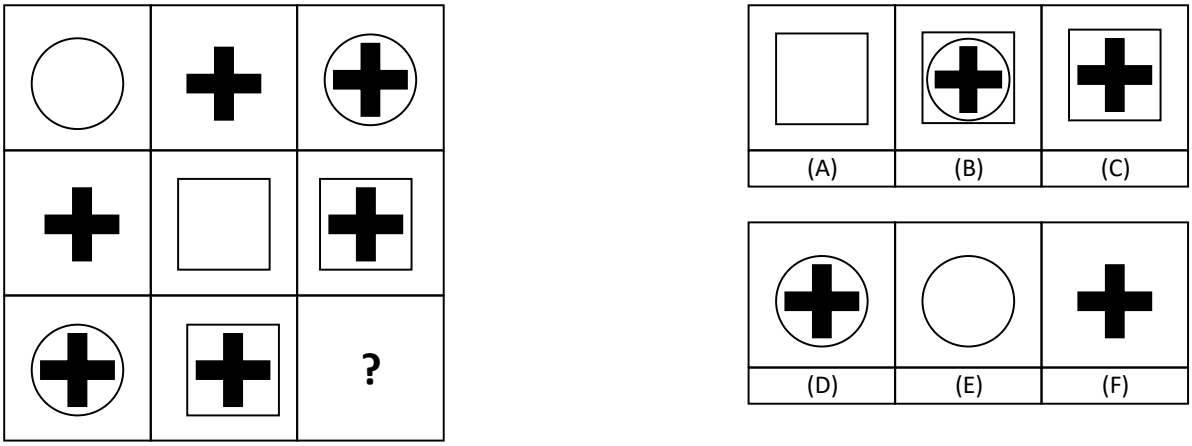
Colour: -

Size: -

Quantity: -

The arrows always rotate clockwise by 90 degrees. At the bottom right, the tip of the arrow should be facing up.

1.4.



Answer: B

Direction: both from left to right and from top to bottom →↓

Form: 1st form + 2nd form = 3rd form

Orientation: -

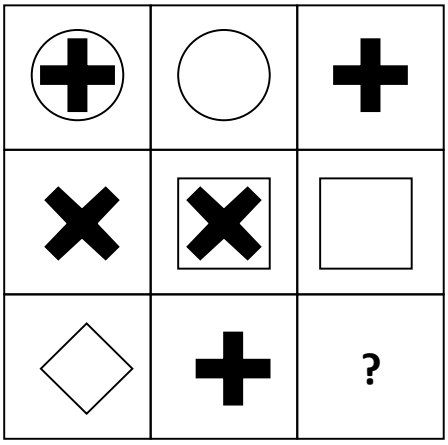
Colour: -

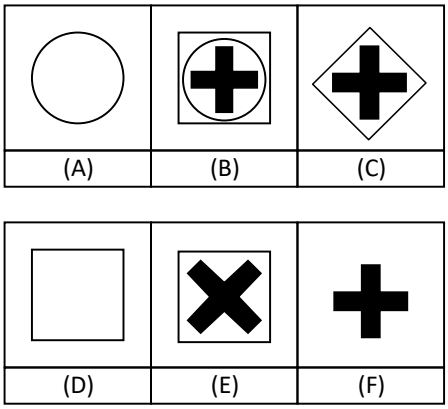
Size: -

Quantity: -

The third field is derived by putting the first and the second image over one another (added).

1.5.





Answer: C

Direction: from left to right

Form: when certain elements overlap, these are removed. If new elements appear, then these are added.
Orientation: -

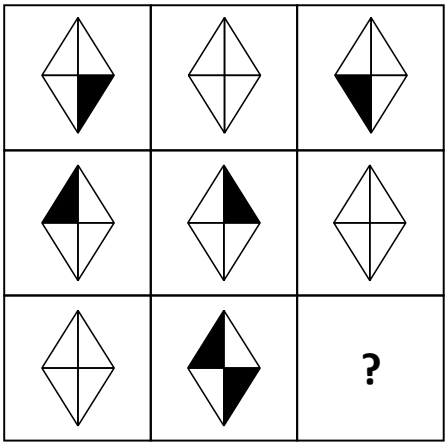
Colour: -

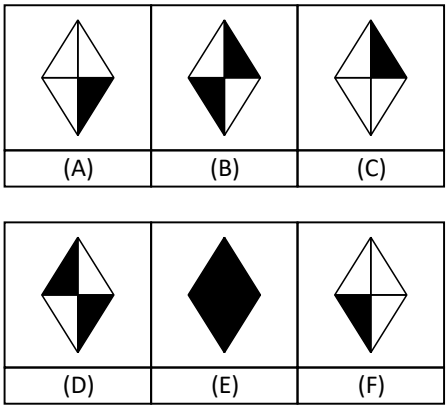
Size: -

Quantity: -

The third field is derived by leaving out the forms that appear in the same space in both the first and the second box (same form and same position, as in the circle in the top row) while the other elements remains (e.g. the square in the second row). At the bottom right, there should be a diamond from the first box as well as a plus from the second box.

1.6.





Answer: B

Direction: from left to right

Form: -

Orientation: -

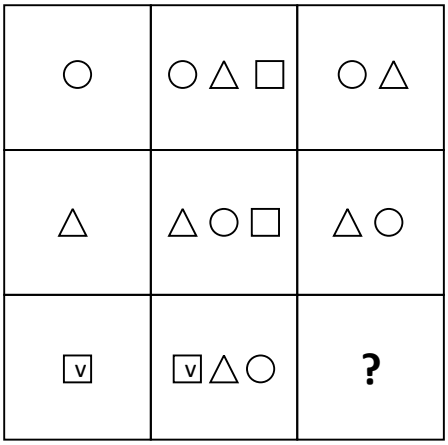
Colour: twice black and once white; symmetric changing of the black areas

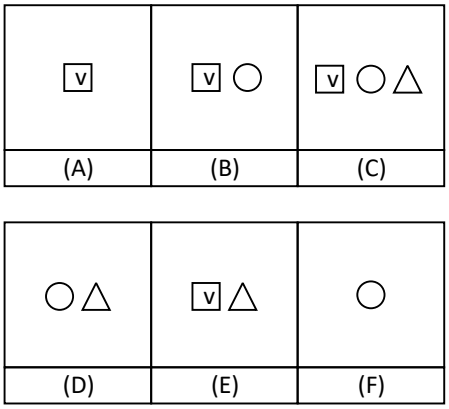
Size: -

Quantity: -

In each row, from left to right, there is one rhombus without any black areas as well as two rhombi with black areas. The black fields of both of these rhombi are mirrored (e.g. top row: in the first image at the bottom right and in the third image at the bottom left). In the image at the bottom right, there should be a rhombus with black areas at the bottom left and top right.

1.7.





Answer: E

Direction: from left to right

Form: see "Number"

Orientation: -

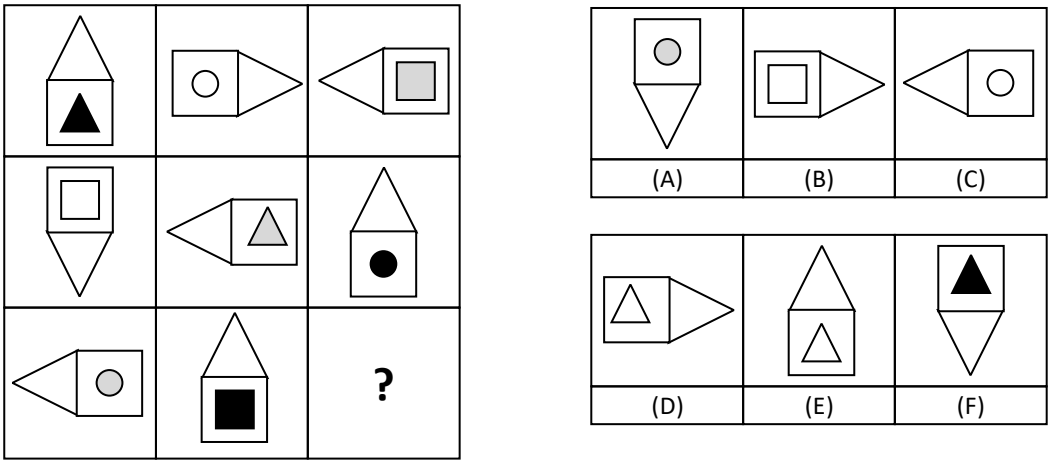
Colour: -

Size: -

Quantity: 3-2-1

From top to bottom, the number of objects is always the same. The image at the bottom right needs to have two symbols. From left to right, the order of the symbols does not change (e.g. top row: circles are always to the far left and triangles are always to the right of the circle). At the bottom right, there should be two symbols with the same order as the image to the left, meaning a square and a triangle.

1.8.



Answer: D

Direction: both from left to right and from top to bottom □↓

Form: inside circle, triangle and square (no repetition)

Orientation: outer element in any direction (no repetition)

Colour: inner element white, grey and black (no repetition)

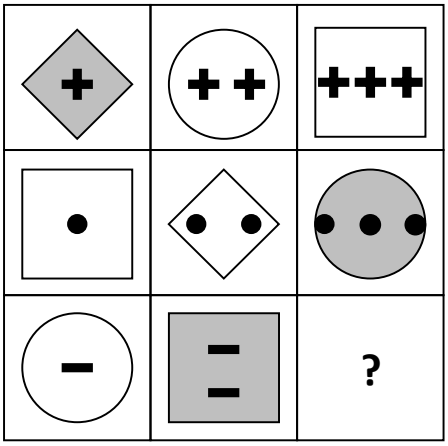
Size: -

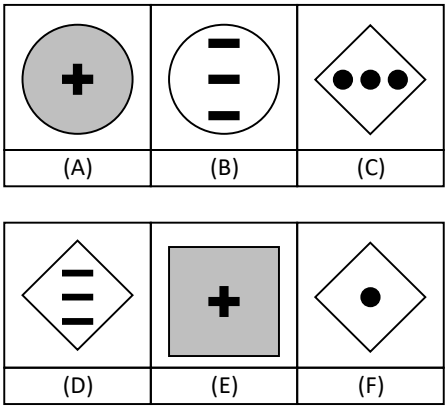
Quantity: -

Per row (left-right) and column (top-bottom), every inner form is presented just once and is either a circle, triangle or square (no order). The inner forms are either white, grey or black (no repetition, no order). The outer element (the top of the triangle) can point in any direction without repetition or order.

In the bottom right, there should thus be in the middle a white triangle and the top of the outer triangle should be pointing to the right or the bottom.

1.9.





Answer: D

Direction: from left to right

Form: square, circle, rhombus

Orientation: -

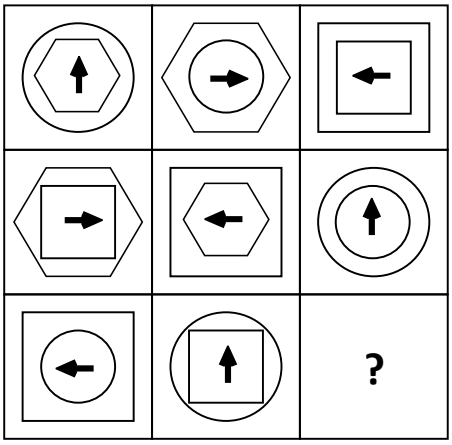
Colour: twice white, once time grey

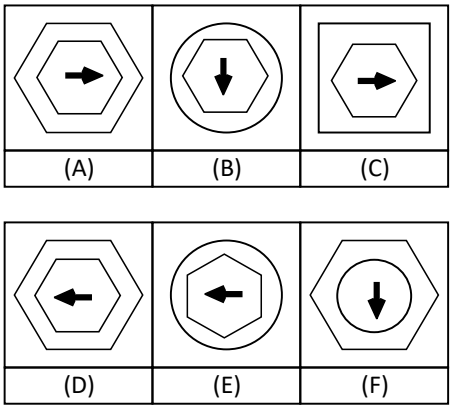
Size: -

Quantity: inner elements 1st form + 2nd form = 3rd form

In all of the rows (left-right and top-bottom), every form is present just once. There are always two forms in white and one form in grey. From left to right, the form of the inner elements (e.g. a plus in the top row and a dot in the middle row) are always the same, but there is always one more. Therefore, the image at the bottom right should have a white diamond with three lines.

1.10.





Answer: A

Direction: both from left to right and from top to bottom □ ↓

Form: inner as well as outer form is either a square, hexagon or circle (no repetition) □

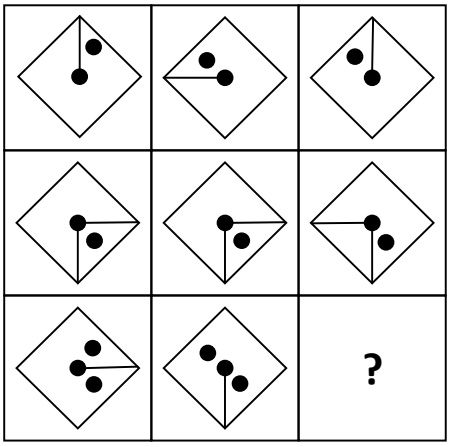
Orientation: arrows change their direction once facing up and twice in opposite directions (to the left and right)
Colour: -

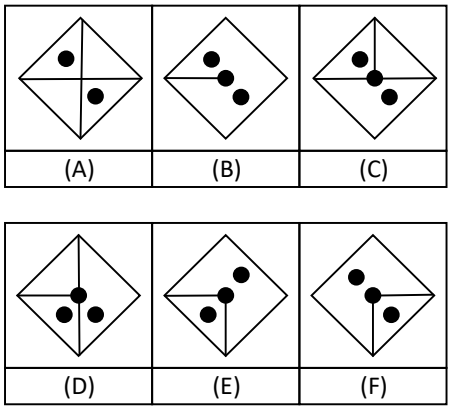
Size: -

Quantity: -

There are three forms: circles, hexagons and squares. Within the third box, there is always two of the same form (e.g. two squares in the top row), which is not present in the first two boxes. The arrows are never facing the same direction as in the images to the left. The arrows point towards the lift, right and up without repetition or order. Therefore, in the bottom right, there are two hexagons, and the arrow does not face left (because the arrow is already facing left in the first image in the row). It can only be answer A.

1.11.





Answer: B

Direction: from top to bottom ↓

Form: see "Number"

Orientation: see "Number"

Colour: -

Size: -

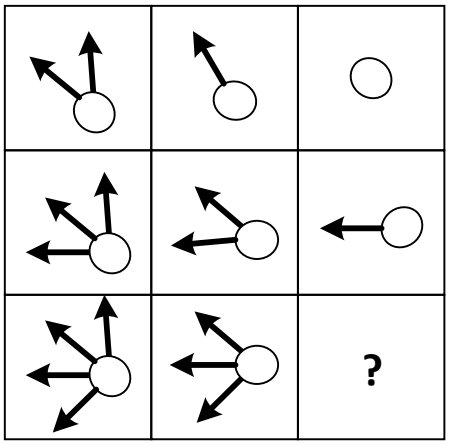
Quantity: Lines 1-2-1 and dots 2-2-3

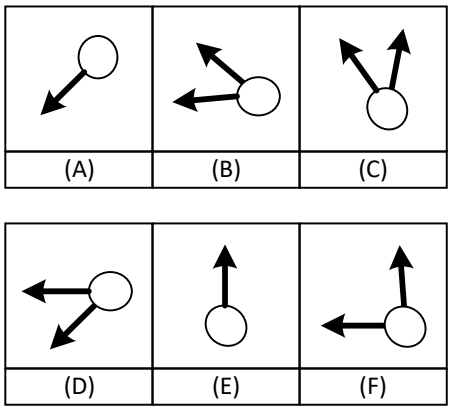
For the dots: In the lowest image, the dots from BOTH images are used (from top to bottom).

For the lines: In the first image it is 1, in the middle it is 2, and in the bottom box again one line. The position of the line is determined by adding the line of Figure 1 plus the two lines in Figure 2 and by keeping only the middle line. Thus, in the bottom right, there are three dots in a line from the top left to the bottom right, and the image has exactly one line, which points to the left corner of the diamond.

The answer can only be B.

1.12.





Answer: D

Direction: from top to bottom ↓

Form: see "Number"

Orientation: see "Number"

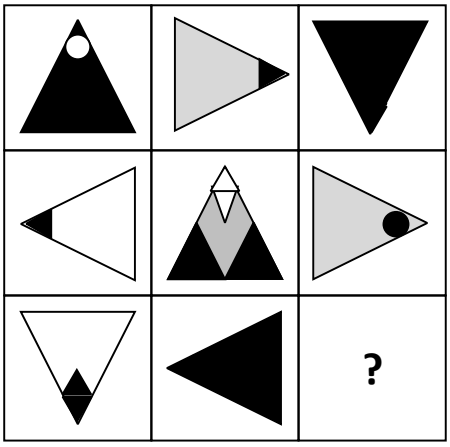
Colour: -

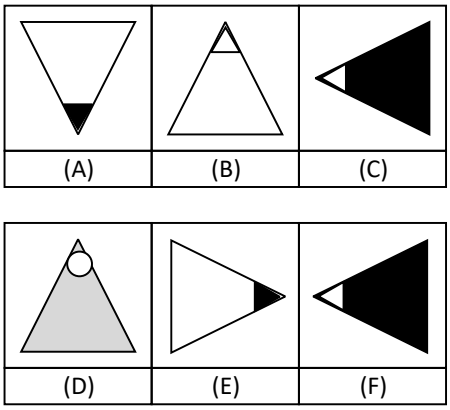
Size: -

Quantity: an arrow is added in an anti-clockwise order

The number of arrows changes in every image. From top to bottom an arrow is always added to the next box (and from left to right, there is always one arrow less). The additional arrows added from top to bottom are added in an anti-clockwise order. In the bottom right, there should thus be a circle with two arrows; one with the tip facing left and another with the tip facing to the bottom left. The answer can, therefore, only be D.

1.13.





Answer: B

Direction: both from left to right and from top to bottom □↓

Form: inner element is either a circle, rhombus or triangle (no repetition)

Orientation: rotation by 90 degrees (left-right clockwise, top-bottom anti-clockwise)

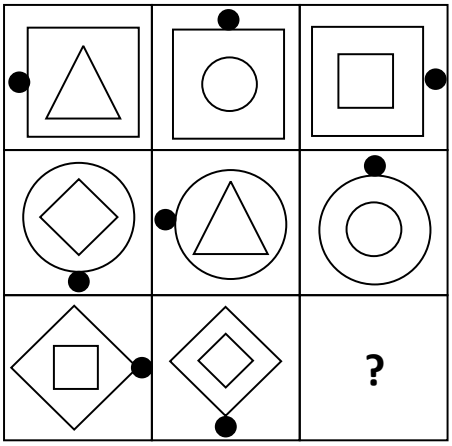
Colour: inner smaller elements □ twice black, once white; outer could be any colour

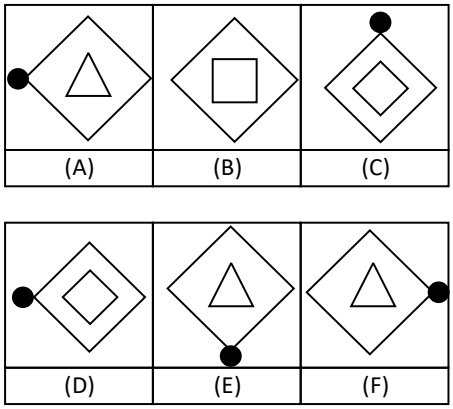
Size: -

Quantity: -

In each row (left-right, top-bottom) the following is true: The element in the tip of the triangle (dot, smaller triangle and rhombus) cannot repeat itself within the images. Furthermore, the larger triangles, from left to right, each rotate by 90 degrees. For this reason, answer B is the solution for the bottom right box.

1.14.





Answer: A

Direction: both from left to right and from top to bottom↓

Form: horizontal same form on the outside, dot changes its position (see "Orientation"), inner from varies (no repetition); vertical outer and inner form varies (no repetition), dot changes its position (see "Orientation")

Orientation: horizontal dot moves by 90°in a clockwise motion; vertical dot moves 90°in an anti-clockwise motion
Colour: -

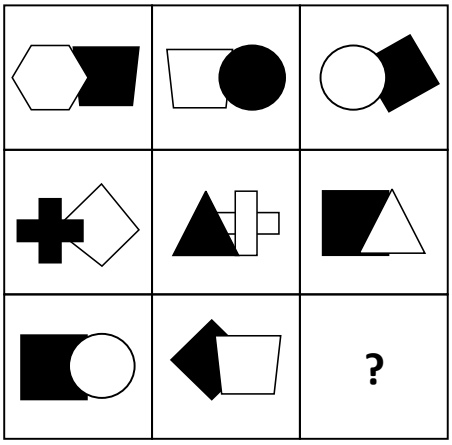
Size: -

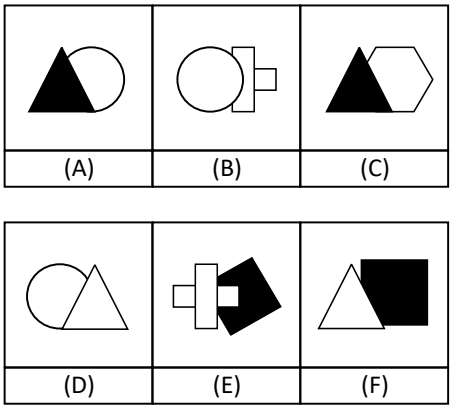
Quantity: -

From left to right: The outer forms stay the same. The inner forms always change. The dots move by 90°in a clockwise motion.

In the bottom right, there should be a diamond, a triangle on the inside and a dot at the left-hand side. The answer must be A.

1.15.





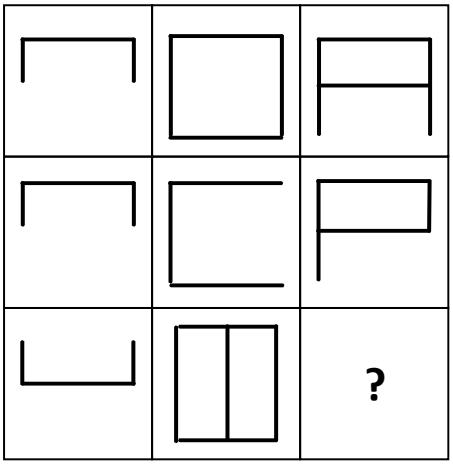
Answer: C

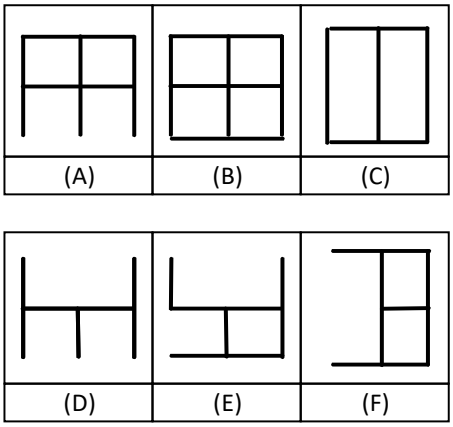
Direction: both from left to right (or from top to bottom)

Form+Colour: The same form in same colour cannot repeat in the row (or in the column).

ATTENTION: Due to the complexity of this question, the process of elimination must be applied ("possible" or "not possible")

1.16.

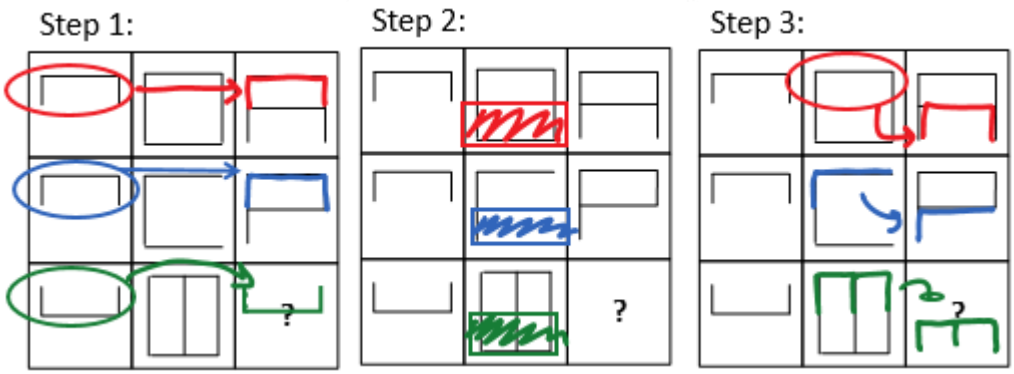




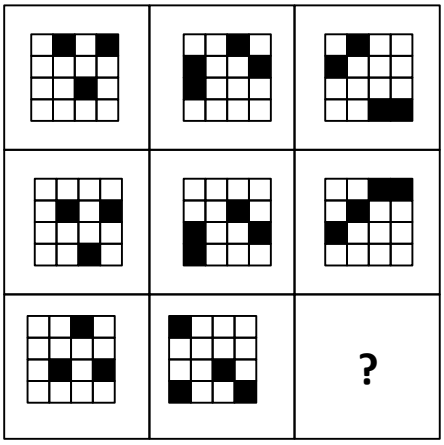
Answer: D

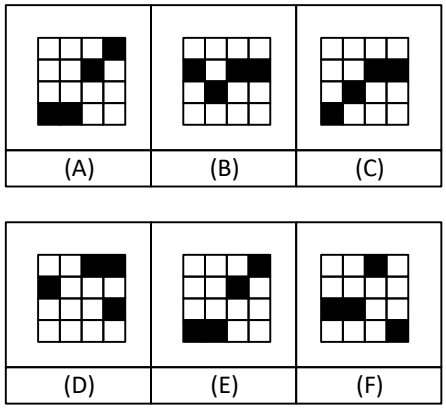
Direction: from left to right

Form: the 1st form is placed over the 2nd form. The bottom part of the 2nd form is "removed".



1.17.





Answer: C

Direction: from top to bottom ↓

Form: each of the black elements shifts down one box

Orientation: -

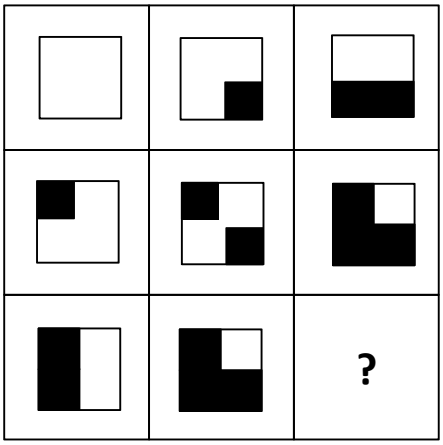
Colour: -

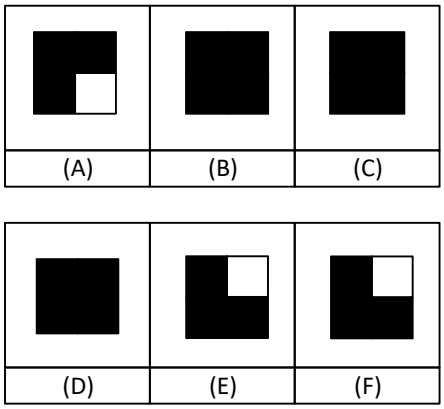
Size: -

Quantity: see Form " "

From top to bottom, the black boxes always shift down one box. When they have reached the bottom, they reappear at the top in the same row. At the bottom right, you have the same pattern as in the image directly above only that the black boxes have all shifted down one box.

1.18.





Answer: F

Direction: from top to bottom ↓

Form: first a striped square is added at the top left, then at the bottom left (lines from the bottom left to the top right)
Orientation: -

Colour: pattern can be overlaying

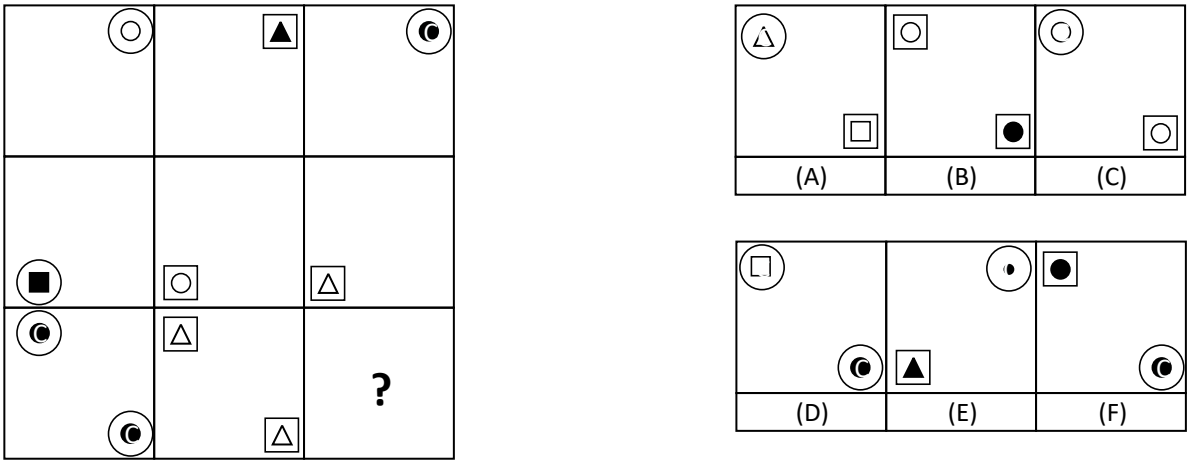
Size: -

Quantity: see Form

" "

From top to bottom, a box with small stripes (direction: from bottom left to top right) is added. The first box shifts to the top left corner. The second shifts to the bottom left corner. At the bottom right, you have the same form as in the image directly above it plus a striped box in the bottom left corner. (Important: The direction of the small lines)

1.19.



Answer: C

Direction: from top to bottom ↓

Form: inner forms vary; the 3rd form is the same as the first

Orientation: 1st and 2nd form are mirrored along the middle axis

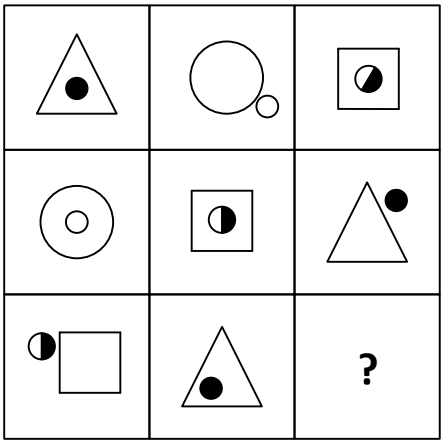
Colour: the filling of the 2rd inner form is also used for the 3rd form

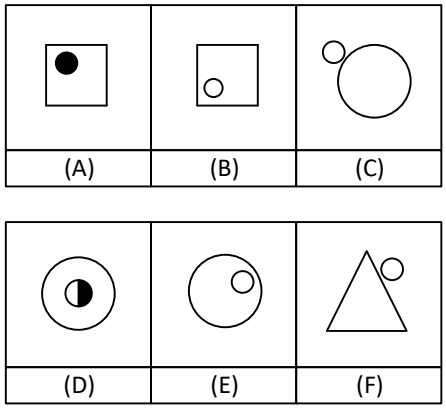
Size: -

Quantity: see Form " "

Rule from top to bottom: The outer forms remain the same. The inner forms from the 1st and the 3rd image are identical, the colours of the inner objects are identical in the 2nd and 3rd image. The position of the objects in the 3rd image is a mirrored version of the objects in the 1st and the 2nd image.

1.20.





Answer: E

Direction: both from left to right and from top to bottom □↓

Form: outer elements only triangles, circles and squares

Orientation: 2 inner circles, 1 outer circle

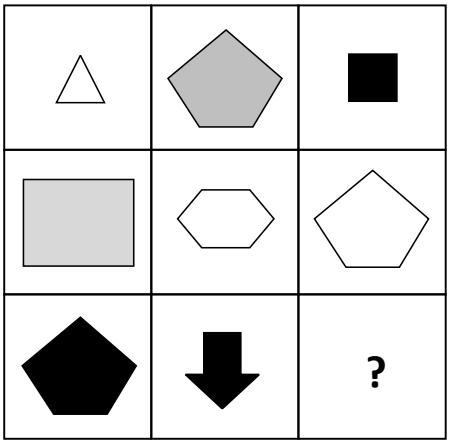
Colour: small elements: white, black and black-white

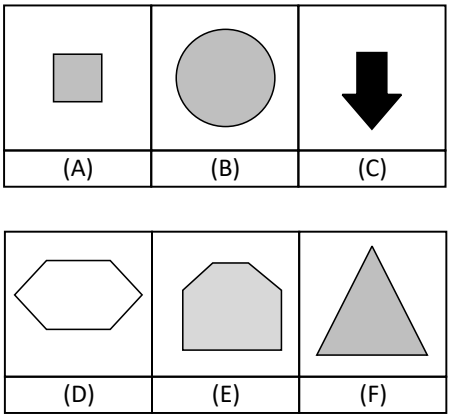
Size: -

Quantity: -

The rule is the same for both from left to right as well as from top to bottom. The larger form (triangle, circle and square) is always white and should not repeat itself (from left to right as well as from top to bottom). Thus, the larger form must be a white circle. The smaller form is always a smaller circle whose colour cannot repeat and which must be found inside the larger form twice as well as once outside the larger form (true for left to right as well as top to bottom). Therefore, the small form has to be a white circle which lies within the larger form.

1.21.





Answer: E

Direction: from top to bottom ↓

Form: see "Number"

Orientation: -

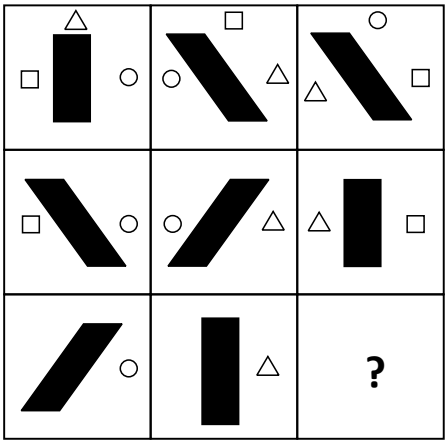
Colour: white, grey, black

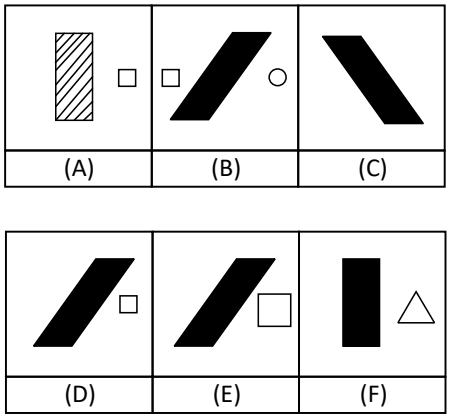
Size: twice large, once small

Quantity: + one additional side

From top to bottom, the following is true: Of the 3 colours white, grey and black, each occurs only once. The number of sides (corner) for the objects increases by 1 compared to the object found directly above.

1.22.





Answer: D

Direction: from top to bottom ↓

Form: 3 different forms no repetition

Orientation: outer smaller forms 1st image = top, left, right; 2nd image = left, right and 3rd image = right

Colour: 3 different fillings/patterns no repetition

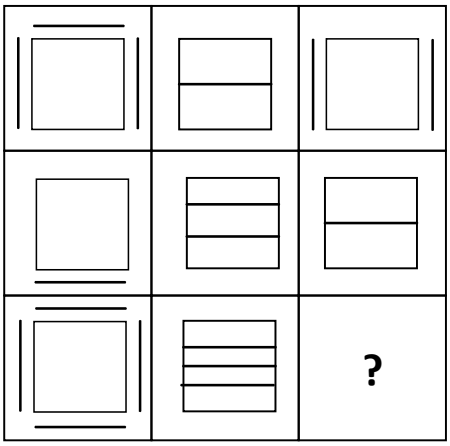
Size: -

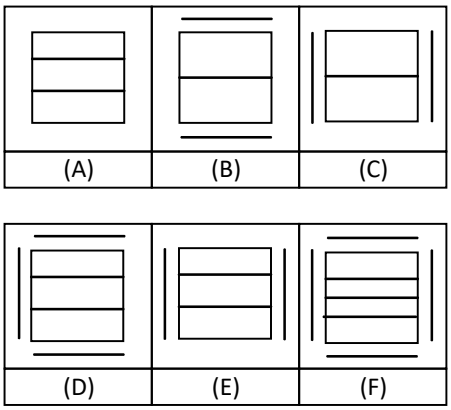
Quantity: 3 - 2 - 1

From top to bottom, the following is true: The number of smaller objects decreases every time by one, and the form of the remaining objects remains the same as the image found directly above. The larger objects in the middle of each image all have a different pattern as well as a different form.

5.9.2 EXAM2

2.1.





Answer: C

Direction: from top to bottom ↓

Form: 1st form + 2nd form = 3rd form

Orientation: -

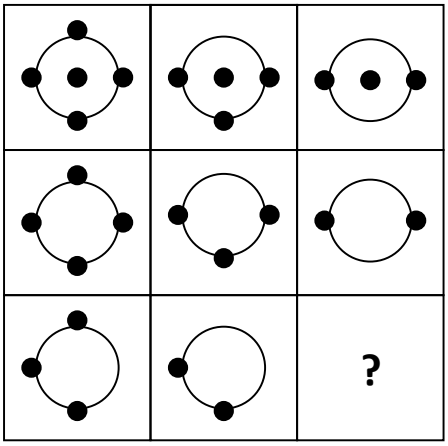
Colour: -

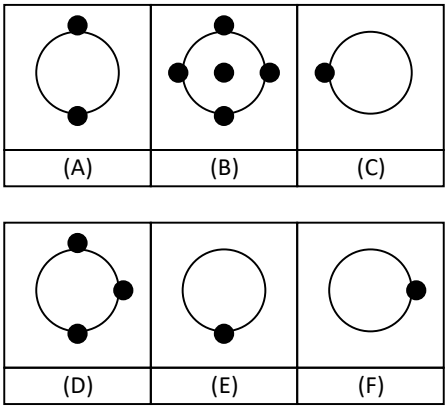
Size: -

Quantity: -

From top to bottom: The first and second image laid over each other result in the third image. Thus, at the bottom right, there is a square with a horizontal line on the inside and two vertical lines to the left and right of the square.

2.2.





Answer: C

Direction: both from left to right and from top to bottom □↓

Form: Horizontal □ 2nd form = 1st form – top dot □ 3rd form = 2nd form – bottom dot; vertical □ 2nd form = 1st form – middle dot □ 3rd form = 2nd form – right dot
Orientation: -

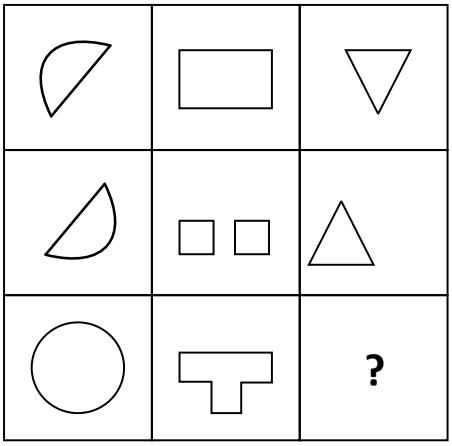
Colour: -

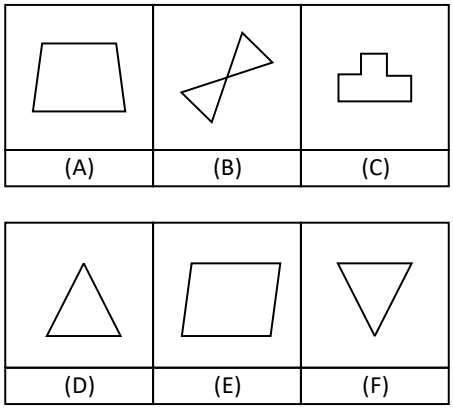
Size: -

Quantity: see Form
" "

From the left to right, there is always one dot less. The dots disappear in the following order: 1st top dot, 2nd bottom dot.
(It is the same principle from top to bottom. The only difference here is the order: 1st middle dot, 2nd right dot.) Therefore, the bottom right is a circle with only one dot at the left.

2.3.





Answer: E

Direction: from top to bottom ↓

Form: 1st form + 2nd form = 3rd form, overlapping elements are removed

Orientation: -

Colour: -

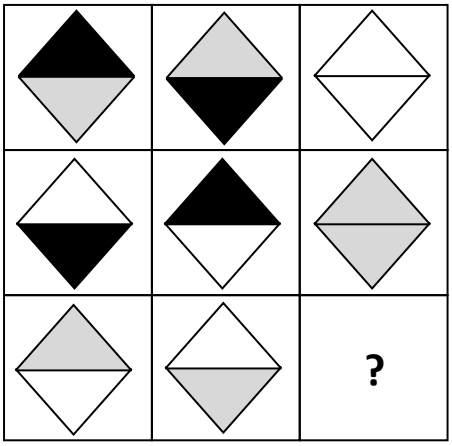
Size: -

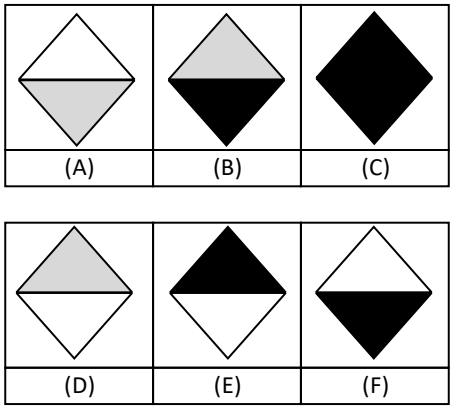
Quantity: -

From left to right, there is no rule.

From top to bottom: The first image and the second image are put together. All lines that overlap are removed. Therefore, at the bottom right there are two triangles next to each other without the middle line a parallelogram as found in answer E.

2.4.





Answer: C

Direction: both from left to right and from top to bottom □ ↓

Form: -

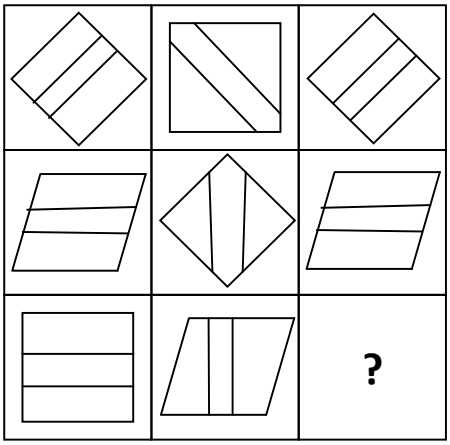
Orientation: -

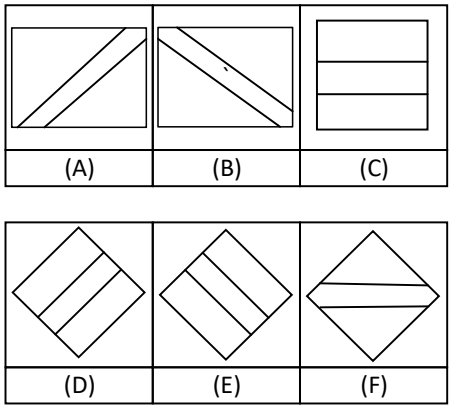
Colour: black, white and grey; the top and bottom parts of the form cannot repeat themselves, neither horizontally nor vertically
Size: -

Quantity: -

There are three colours: black, white and grey. The colours may not be repeated in the triangle (upper and lower triangle is considered separately). In both of the first images, from left to right, two colours are always used (only mirrored), and in the third image the remaining colour is used. Then the whole form at the bottom right is black because white and grey have already been used.

2.5.





Answer: C

Direction: from left to right ->

Form: 1st and 3rd form are always the same

Orientation: -

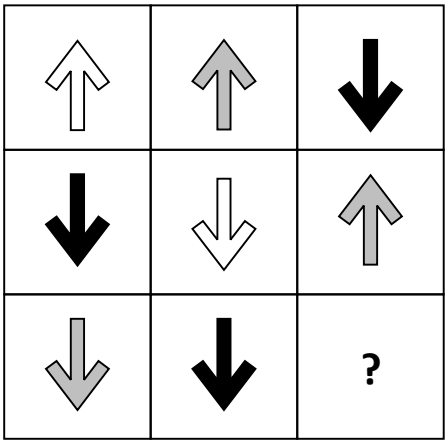
Colour: -

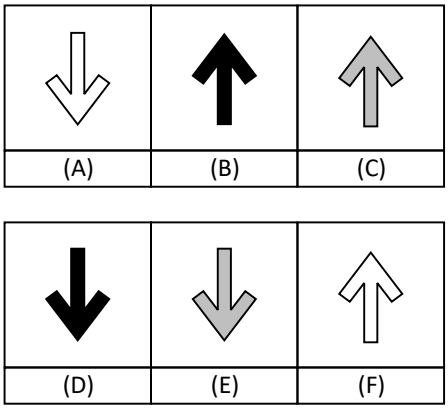
Size: -

Quantity: -

The first and the third image (from left to right) are identical. Therefore, the bottom right is the same image as the one found at the bottom left.

2.6.





Answer: F

Direction: from left to right

Form: -

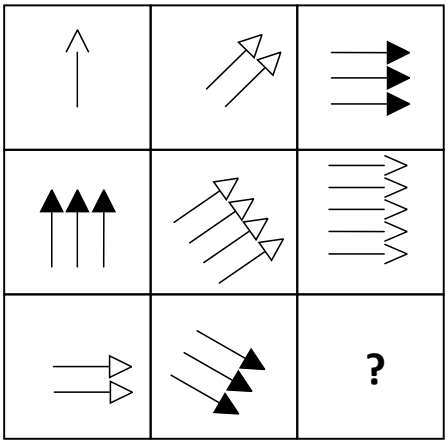
Orientation: The first two arrows point in the same direction, the 3rd points in the opposite direction
Colour: black, white, grey, cannot repeat

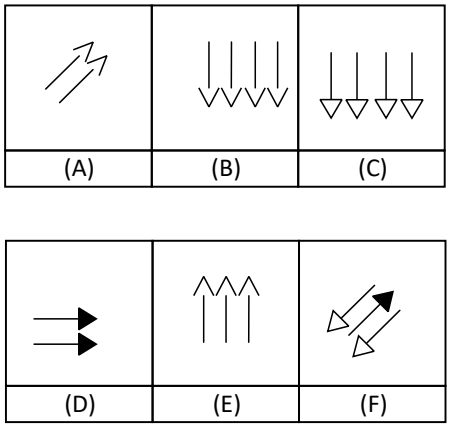
Size: -

Quantity: -

From left to right, two arrows point in the same direction, and another points in the other direction. The colours grey, black and white occur only once in every row. Thus, the arrow has to point up and has to be white in the bottom right box.

2.7.





Answer: B

Direction: from left to right

Form: 3 different arrows

Orientation: rotate clockwise by 45 °

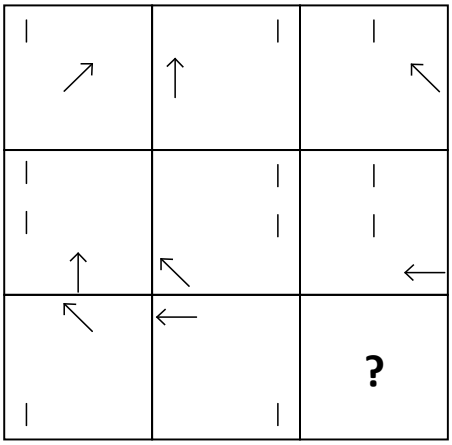
Colour: see "Form"

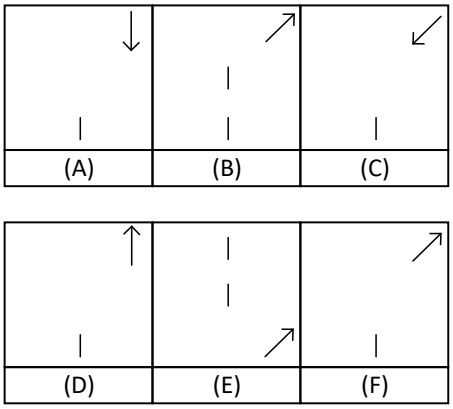
Size: -

Quantity: add 1

From left to right, the following is true: the arrows all rotate clockwise by 45°. The number of arrows increases by one per image. The colour is black once, white once and at one time the arrow tips consist of only 2 lines instead of 3.

2.8.





Answer: C

Direction: From top to bottom (also from left to right, but with other rules) ↓

Form: see "Orientation" and "Number"

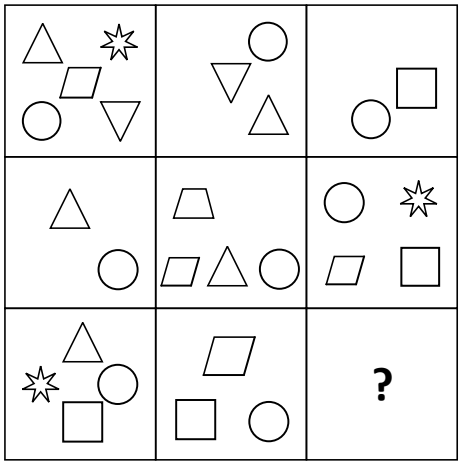
Orientation: The arrow rotates anti-clockwise by 45 ˚and simultaneously shifts in the order of middle-bottom-top
Colour: -

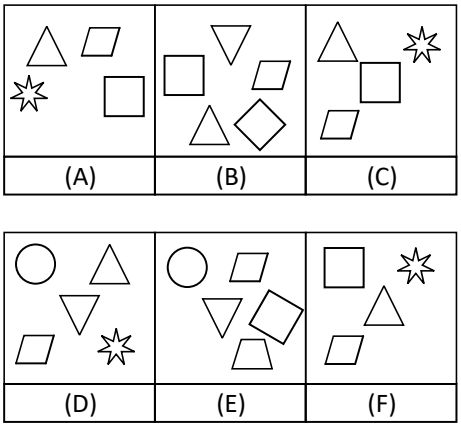
Size: -

Quantity: Lines 1-2-1

The arrows always rotate anti-clockwise by 45 degrees. From left to right, the lines are always at the same height (on a horizontal line). The same is true for the arrows. From top to bottom, the lines are always located below one another, meaning on a vertical line. Again, the same is true for the arrows. Therefore, the bottom right box has a line in the middle at the bottom as well as an arrow facing down left, and the arrow itself is in the top right corner.

2.9.





Answer: E

Direction: from left to right

Form: 1 star per row; 1 circular element per image

Orientation: -

Colour: -

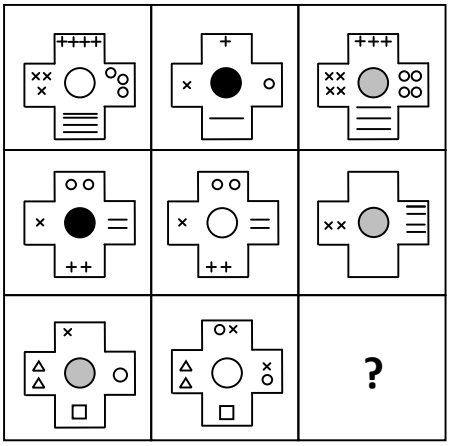
Size: -

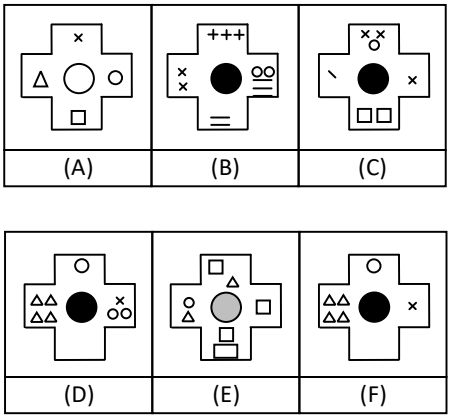
Quantity:

There is exactly 1 star in every row from left to right and there is one circle in each image.

Following the pattern would mean that answer E should be in the bottom right box.

2.10.





Answer: D

Direction: from left to right

Form: Objects in the cross at the left and right from both the first and second box are added, objects in the cross at the top and bottom are subtracted
Orientation: -

Colour: inside of the circle: black, white and grey no repetition.

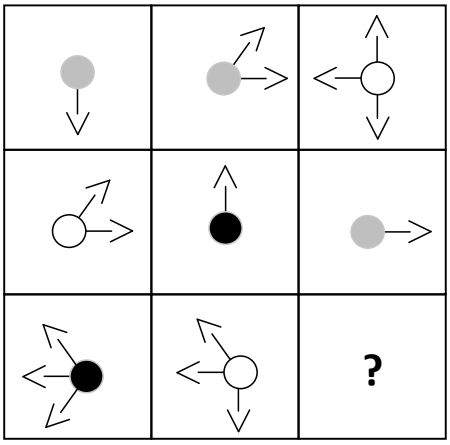
Size: -

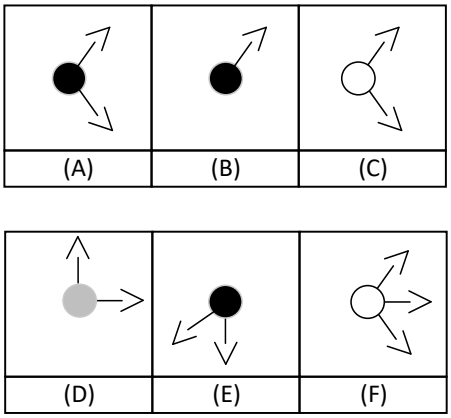
Quantity: -

From left to right, the following is true: The colour inside the circle is only black, white or grey once. Now let's look at the objects within the cross to the left and right from the 1st and the 2nd image that are at the same position. These are added and result in the objects seen in the 3rd image.

Next we look at the objects within the cross at the top and bottom from the 1st and the 2nd image that are at the same position. These are subtracted and are not shown in the 3rd image.

2.11.





Answer: A

Direction: from top to bottom ↓

Form: -

Orientation: arrows cannot point in the same direction

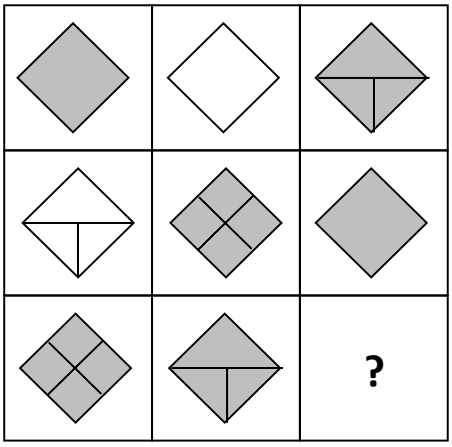
Colour: circle in the middle has 3 different colours no repetition

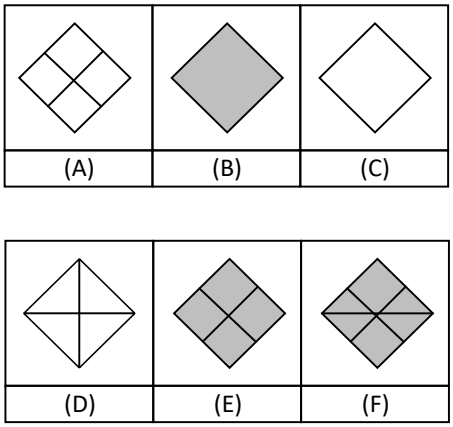
Size: -

Quantity: 1 – 2 – 3 arrows (order does not matter)

From top to bottom, the following is true: The circles in the middle cannot have the same colour. The number of arrows and the direction of the arrows cannot be the same.

2.12.





Answer: A

Direction: from top to bottom ↓

Form: always one without an inner form, one with a cross and one with an X

Orientation: -

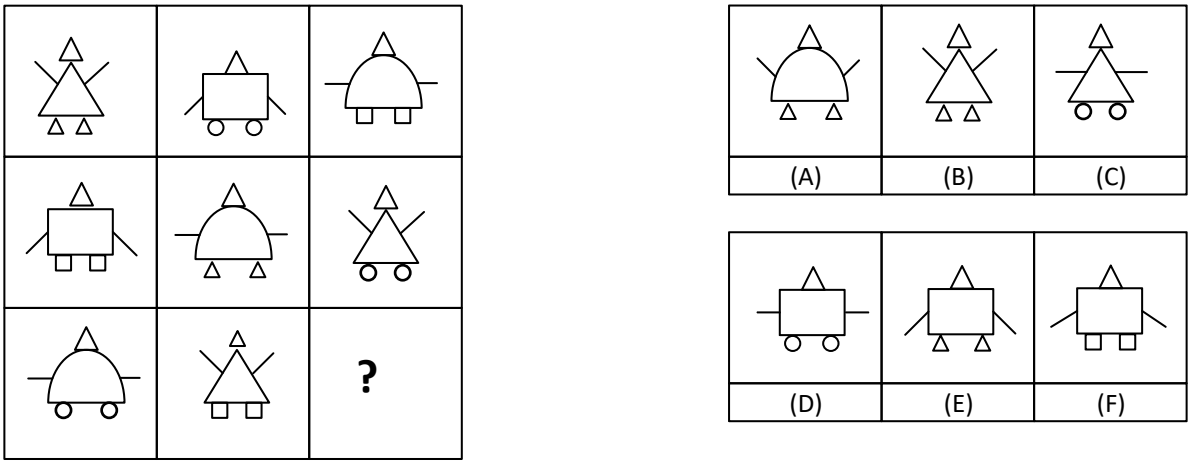
Colour: twice grey, once white

Size: -

Quantity: -

From top to bottom, two squares are grey, and one square is white. On the inside, one shows nothing, one shows a cross and one an X. Therefore, in the bottom right, there needs to be a white form and, because no X appears in the images above from top to bottom, there needs to be an X.

2.13.



Answer: E

Direction: both from left to right and from top to bottom □↓

Form: other than the top triangle ("head"), the other individual elements of the form cannot repeat themselves
Orientation: -

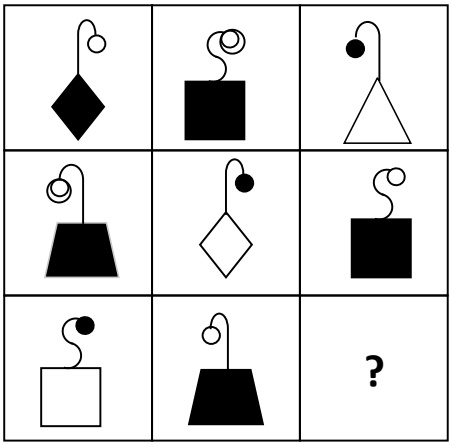
Colour: -

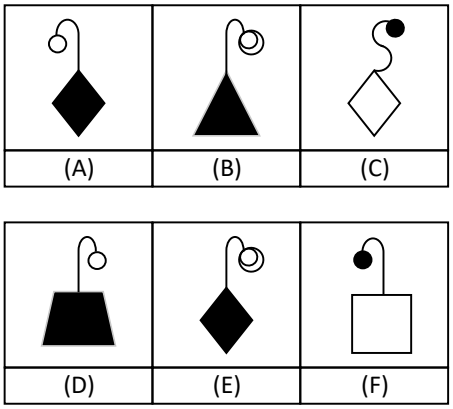
Size: -

Quantity: -

The "head" of the figure is always a triangle. All other elements ("body", "arms" and "feet") have to be different both from top to bottom and left to right. At the bottom right, there should be a figure with a triangle "head", square "body", triangle "feet" and the "arms" should be pointing downwards.

2.14.





Answer: E

Direction: both from left to right and from top to bottom □↓

Form: individual elements of the form cannot repeat themselves

Orientation: -

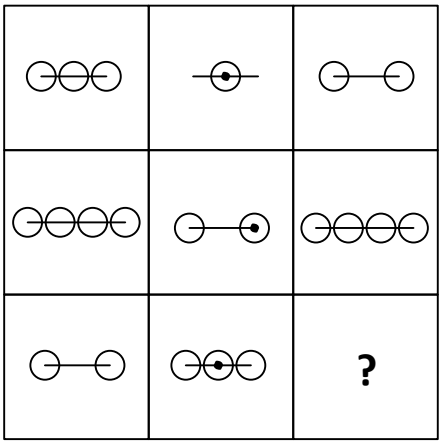
Colour: colour and pattern of the elements cannot repeat themselves

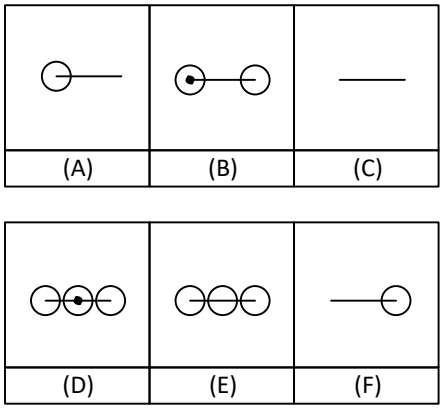
Size: -

Quantity: -

In total, there are four forms: rhombus, square, triangle and trapezium. The forms can be either black, white or striped. Above the form, there is either one line with one white circle, two white circles or one black circle. Rule: No element can repeat itself, neither from left to right nor from top to bottom. Thus, a black rhombus with one line and two white circles above it should be in the bottom right.

2.15.





Answer: E

Direction: from top to bottom ↓

Form: the number of circles are consecutive numbers.

Orientation: -

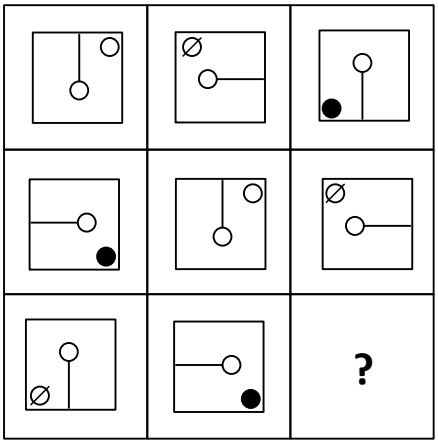
Colour: -

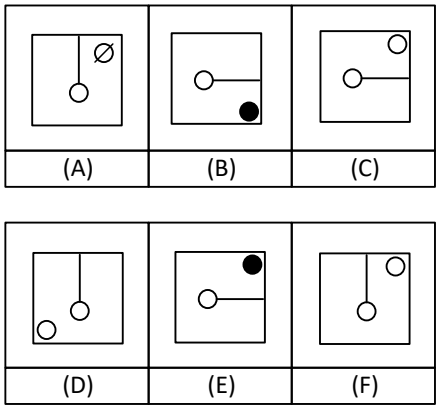
Size: -

Quantity: see Form

In the left and right rows from top to bottom, the circles do not have any dots. In the middle row from top to bottom one circle has a dot in each box. The number of circles in the rows from top to bottom are consecutive numbers without an order. Here: in the left row from top to bottom are 3-4-2 circles in the middle row 1-2-3 circles in the right row from top to bottom, the number of circles are 2-4 meaning that the last image needs to have 3 circles (2-4-3 circles). None of the circles should have any dots.

2.16.





Answer: F

Direction: from left to right

Form: see "Orientation" and "Colour"

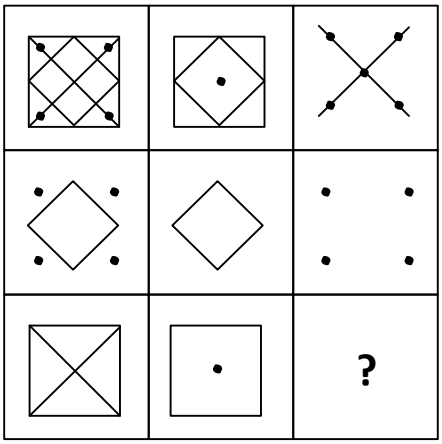
Orientation: element "line with circle" rotates clockwise by 90°; element "single circle" rotates anti-clockwise from corner to corner
Colour: The single circles have only 3 fillings (no repetition)

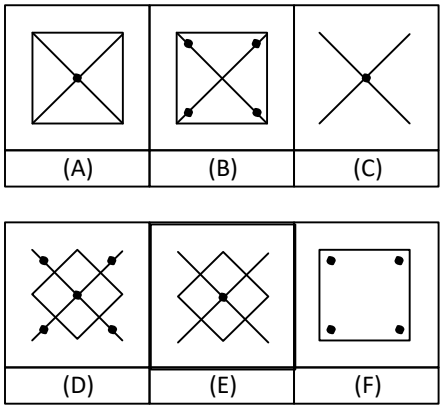
Size: -

Quantity: -

The line of the middle circle always rotates clockwise by 90 degrees from left to right. The dot in the corner always rotates anti-clockwise to the next corner. In every row, there is exactly only one white, one black, and one white dot with a line through the middle. In the bottom right, there should be a long line from the middle dot pointing up, and there should be a white dot in the top right corner.

2.17.





Answer: C

Direction: both from left to right and from top to bottom □ ↓

Form: The elements that are present in the 1st box but not the 2nd are shown in the 3rd box.

Orientation: -

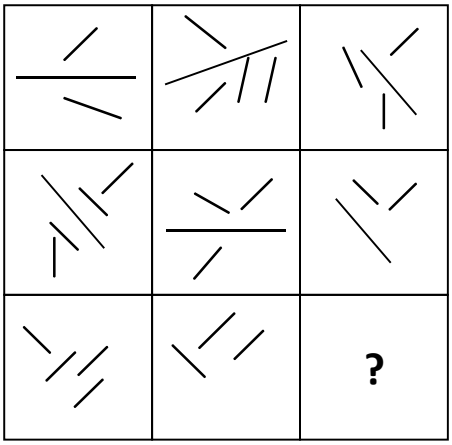
Colour: -

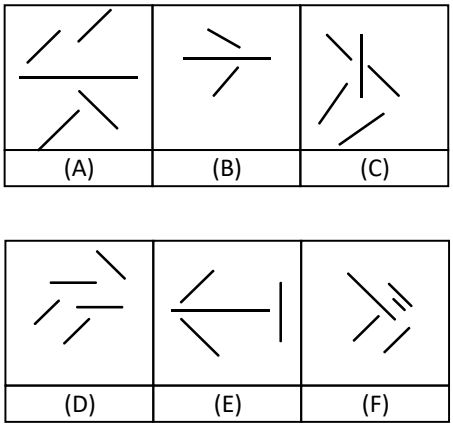
Size: -

Quantity: see Form „ „

From left to right and from top to bottom, the following is true: All of the *same* elements found in the first and the second image at the same position are *not* found in the third image. All of the *different* elements found in the first and the second image are displayed together in the third image. In the bottom right, the square should be *deleted* and a cross from the first image and the dot from the second image should be displayed. □ Answer C

2.18.





Answer: A

Direction: both from left to right and from top to bottom □↓

Form: see "Orientation" and "Colour"

Orientation: only the horizontal lines are important; one per row

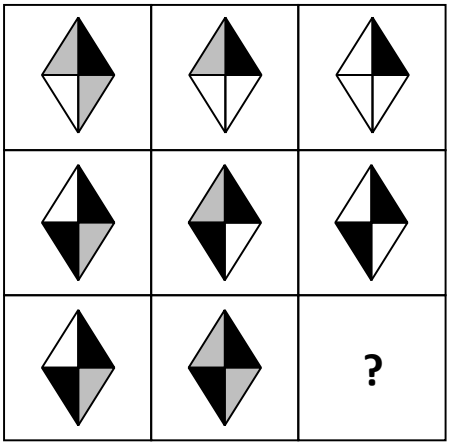
Colour: -

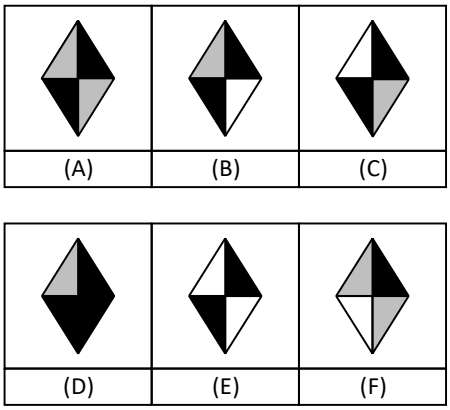
Size: -

Quantity: 3-4-5 (order does not matter)

In the row from left to right and from top to bottom, there is always exactly one long horizontal line (in the first form of the 1st line and the second form of the 2nd line). The number of lines, from top to bottom, are always 3-4-5 lines in which the order does not matter (e.g. left row: 3-5-4). Thus, the answer must have one long horizontal line, and in total there must be 5 lines.

2.19.





Answer: E

Direction: from left to right

Form: see "Colour"

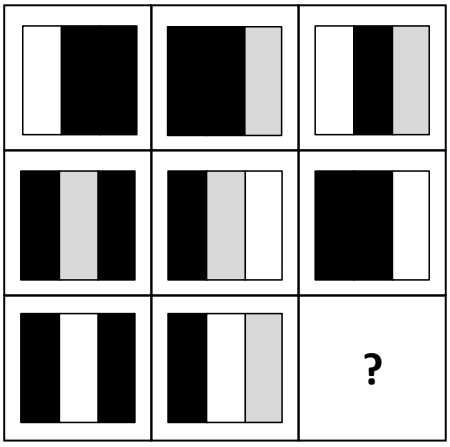
Orientation: -

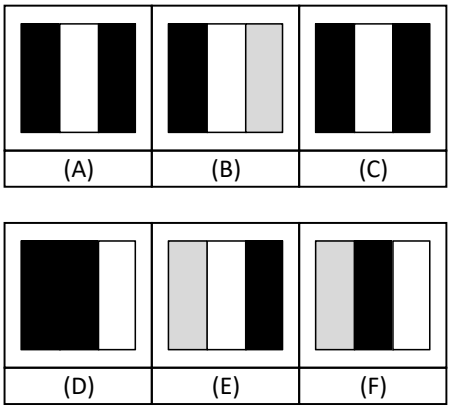
Colour: change on the inside grey and white become white in the 3rd form; striped and black stay the same
Size: -

Quantity: -

In the third form (from left to right), all of the fields that were white or grey before are now white; the other fields keep their colour. In the bottom right, the black fields have to be the same as in the image to the left, and all of the grey fields from the left image are now white.

2.20.





Answer: B

Direction: from left to right

Form: -

Orientation: -

Colour: within any object, there need to be 3 different colours/pattern; there are two variations No.1 of the 1st object is No.1 for the 3rd object. No.3 of the 2nd object stays No.3 of the 3rd object.

Size: -

Quantity: -

Each image consists of three vertical rectangles with 5 different colours (white, black, grey, horizontal stripes or diagonal stripes). The rectangles at the far left in the first images (example in the top row: white) are again found in the far left in the third images. In the second image, a new colour is added in the far right (example in the top row: grey); this is also found at the same place in the third image.

Therefore, the rectangles at the far left are diagonally striped and the far right is grey in the bottom right image Answer B

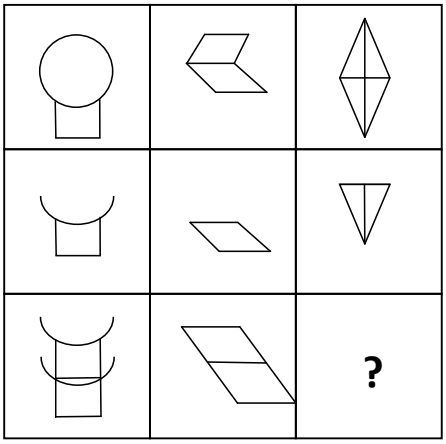
Attention: Another rule which could be found from the eight given images: *No.3 of the 1st object is No.2 for the 3rd* (or in each row must be exactly 3 horizontally striped rectangles/bars at different positions). According to this rule the middle rectangle should have horizontal stripes. However, considering the possible answers, there isn't a clear solution, but two possible solutions (D) and (F).

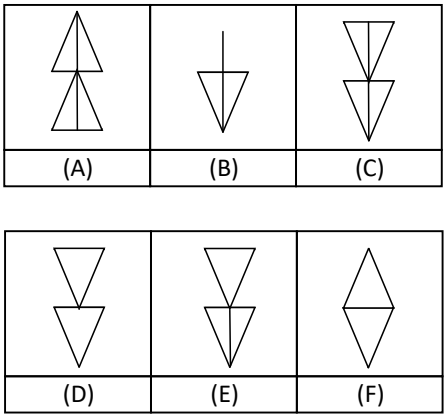
Now you must search for other rules to identify an answer. One should notice the order of colours/patterns, which follow the rule mentioned at the beginning: *within any object, there need to be 3 different colours/pattern; there are two variations No.1 of the 1st object is No.1 for the 3rd object. No.3 of the 2nd object stays No.3 of the 3rd object.*

Since answer (B) doesn't have horizontal stripes in the middle rectangle and none of the other answer options have diagonal stripes to the left and grey to the right, we must conclude that the rule *No.3 of the 1st object is No.2 for the 3rd* doesn't apply here.

Note: Especially in the difficult questions, if there are obvious and simple rules, one should have a closer look and question whether it is a rule or not.

2.21.





Answer: C

Direction: from top to bottom ↓

Form: 2nd form is the bottom half of the 1st form; 3rd form is the 2nd form doubled and overlapped
Orientation: -

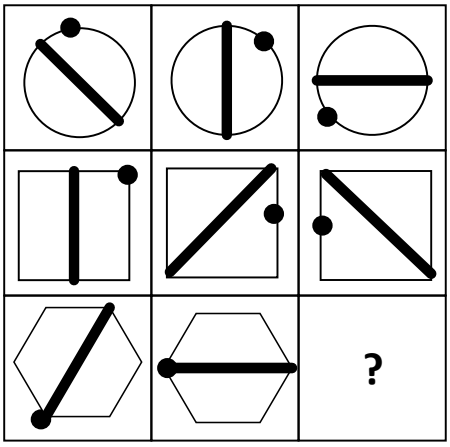
Colour: -

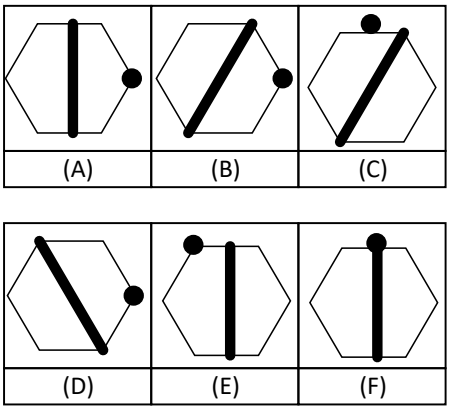
Size: -

Quantity:

The rule is true for top to bottom. The 2nd image evolves by cutting the 1st image in half. The 3rd image is the result of doubling the 2nd image and putting both parts on top of each other.

2.22.





Answer: A

Direction: from left to right

Form: see "Orientation"

Orientation: lines and dots rotate clockwise; initially by 45° and then by 90° (line) and 180° (dot)
Colour: -

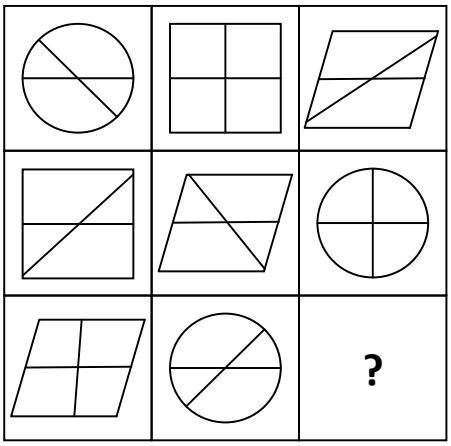
Size: -

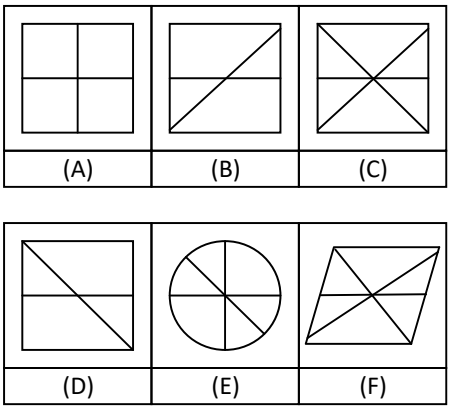
Quantity: -

The line, from left to right, initially rotates clockwise by 45° and then, from the second to the third image by 90°. The dot, from left to right, initially rotates clockwise by 45° and then, from the second to the third image, by 180° (opposite side of the form). In the bottom right, there should be a vertical line, and the dot should be on the right side.

5.9.3 EXAM3

3.1.





Answer: D

Direction: both from left to right and from top to bottom □↓

Form: circle, triangle, parallelogram; 3 possible directions for the vertical line

Orientation: the vertical line is only possible in 3 directions

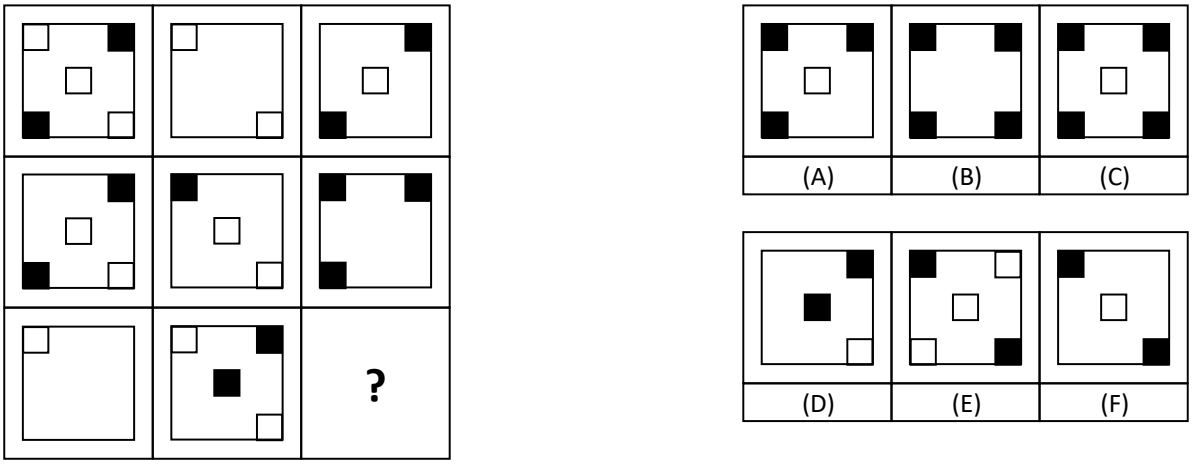
Colour: -

Size: -

Quantity: -

In each row, a form (circles, triangle, and parallelogram) only occurs once. Furthermore, a right-slanted, left-slanted and vertical line each occur only once. In the bottom right box, there should be a square with a line slanting from top left to bottom right.

3.2.



Answer: D

Direction: from left to right

Form: inner form changes 1st form – 2nd form = 3rd form + all of the elements that do not overlap
Orientation: -

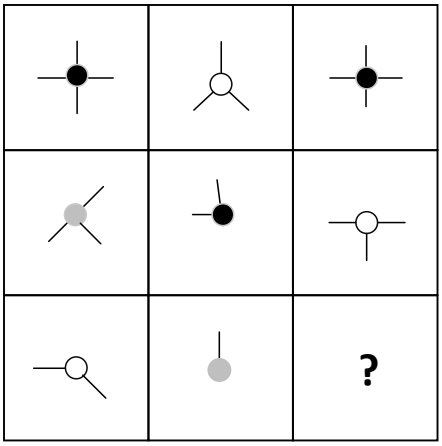
Colour: -

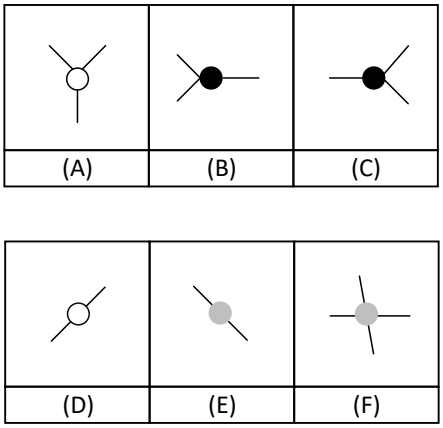
Size: -

Quantity: see Form
" "

From left to right: In the third image, you will find all of the elements from the first and second image that DO NOT overlap. Therefore in the bottom right, there is a black square in the middle and at the top right as well as a white square at the bottom right.

3.3.





Answer: E

Direction: from top to bottom ↓

Form: -

Orientation: -

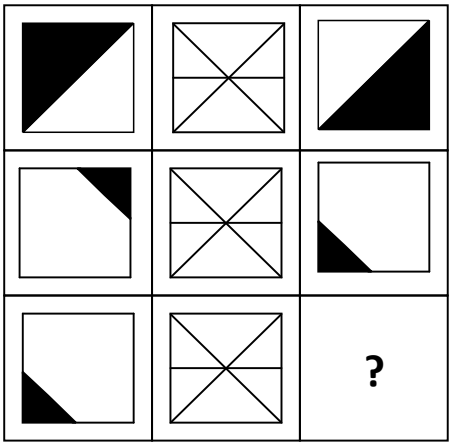
Colour: the colours of the inner circle are black, grey and white □ no repetition

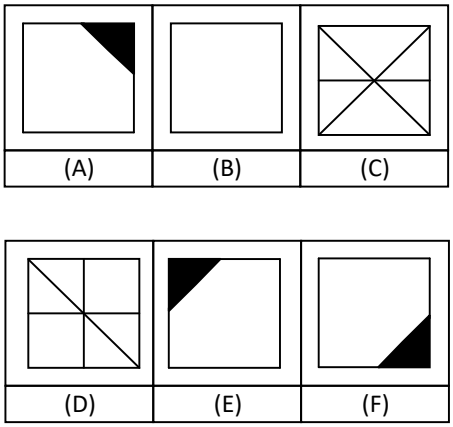
Size: -

Quantity: number of lines decreases by 1 in each box

From top to bottom: In each column each colour (black, grey and white) only occurs once. The number of lines decreases by 1 in each box. The direction/position of the line is not relevant.

3.4.





Answer: A

Direction: from left to right

Form: 1st form mirrored = 3rd form

Orientation: -

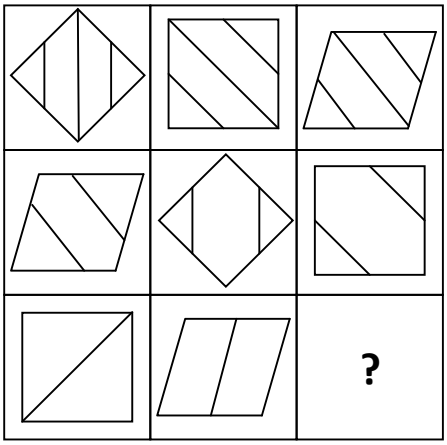
Colour: -

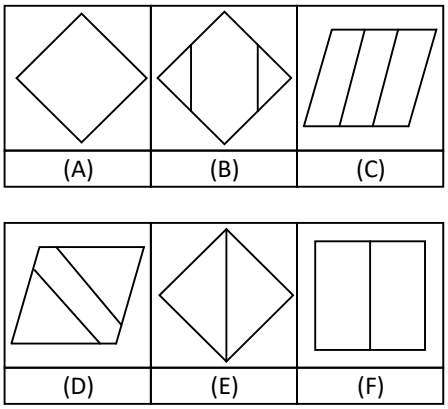
Size: -

Quantity: -

From left to right: The first image is a horizontally mirrored version of the third image. Thus, the answer for the bottom right box has to be A.

3.5.





Answer: E

Direction: both from left to right and from top to bottom □↓

Form: square, rhombus, leaning parallelogram; number of inner lines changes as well as their direction
Orientation: -

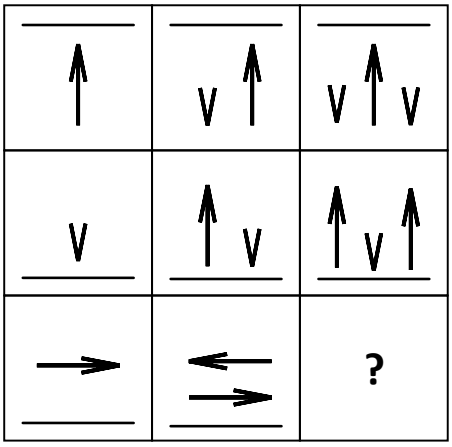
Colour: -

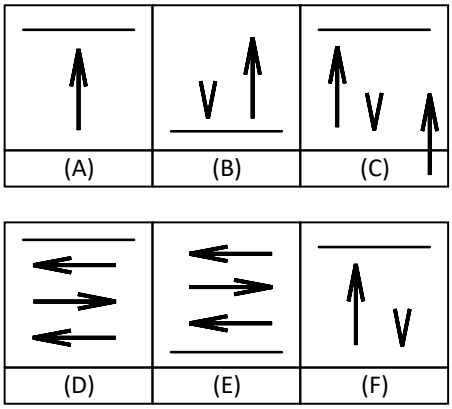
Size: -

Quantity: inner lines vertical 3-2-1 and horizontal the same number

In every row (left-right) and column (top-bottom), each form (leaning parallelogram, square, and rhombus) occurs just once. The number of lines is always the same from left to right. In the bottom right, there should be a rhombus with one line.

3.6.





Answer: E

Direction: from left to right

Form: see "Number"

Orientation: -

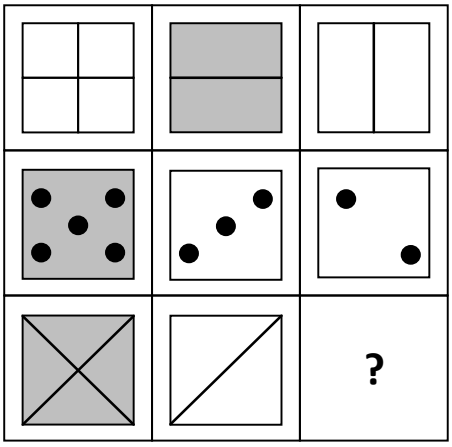
Colour: -

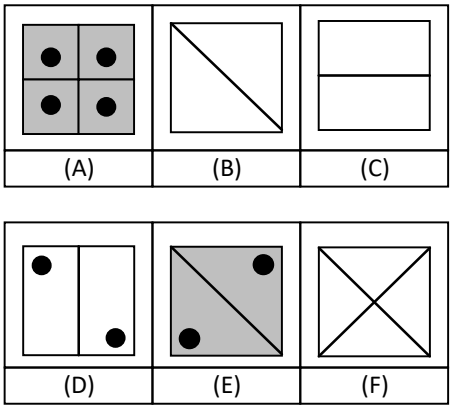
Size: -

Quantity: one arrow is added

From left to right, the next image gets an additional arrow. The horizontal line remains in the same position. Thus, in the bottom right box there should be three (horizontal) arrows as well as one horizontal line at the bottom.

3.7.





Answer: B

Direction: from left to right

Form: see "Number"

Orientation: -

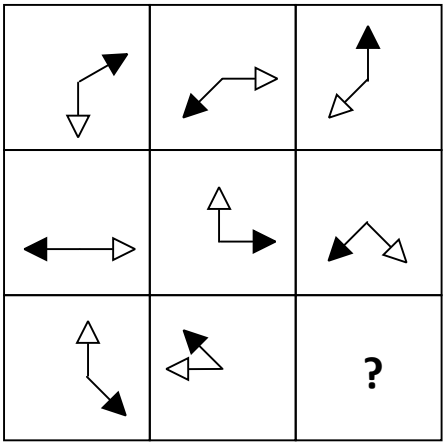
Colour: twice white, once grey

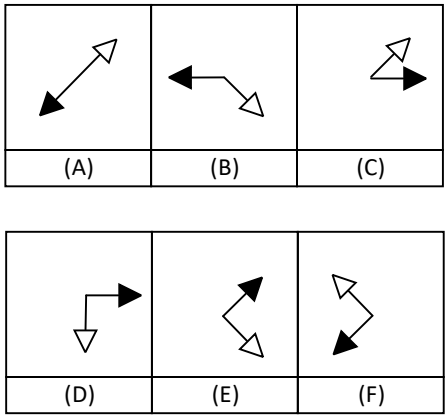
Size: -

Quantity: inner elements 1st form - 2nd form = 3rd form

From left to right: There are always two white boxes and one grey box. All of the same elements found at the same position in both the first and second image are removed. Therefore, there should be one white square with one line slanting from top left to bottom right.

3.8.





Answer: C

Direction: from top to bottom ↓

Form: -

Orientation: black arrow rotates clockwise by 135˚; white arrow rotates anti-clockwise by 90 ˚

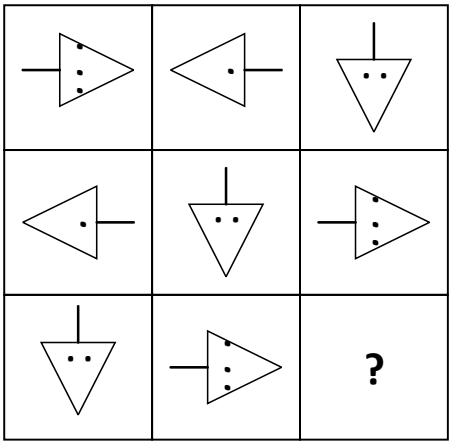
Colour: -

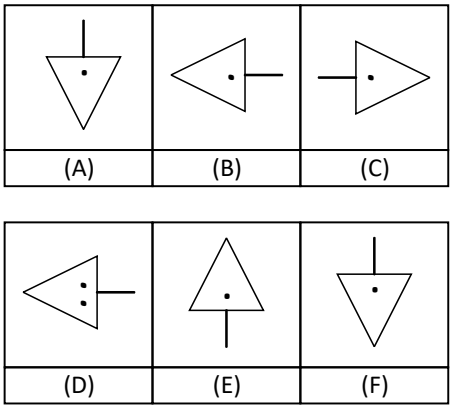
Size: -

Quantity: -

The rule for top to bottom is: The white arrow rotates from the first to the second and from the second to the third image by 90° anti-clockwise each, while the black arrow rotates at 135° clockwise.

3.9.





Answer: B

Direction: both from left to right and from top to bottom□ ↓

Form: see "Number" and "Orientation"

Orientation: left, right, downwards (no repetition)

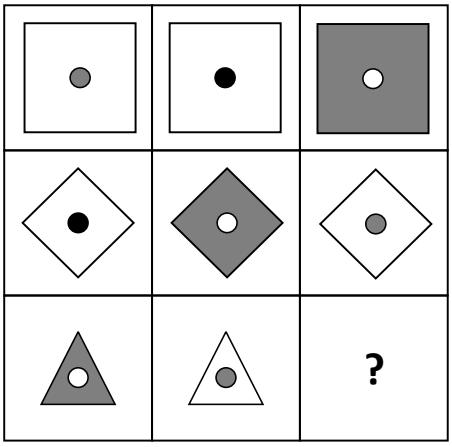
Colour: -

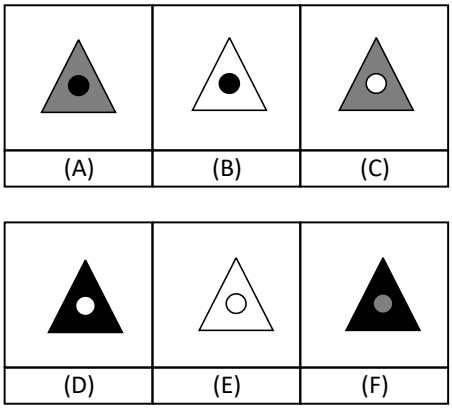
Size: -

Quantity: inner elements □ *1-2-3 (order does not matter)*

In all of the rows, one arrow points downwards, one arrow points right and one arrow points left. The number of dots in the middle are 1-2-3 in every row, but the order does not matter. In the bottom right, there should be an arrow with the tip pointing to the left and one dot in the middle.

3.10.





Answer: B

Direction: from left to right

Form: -

Orientation: -

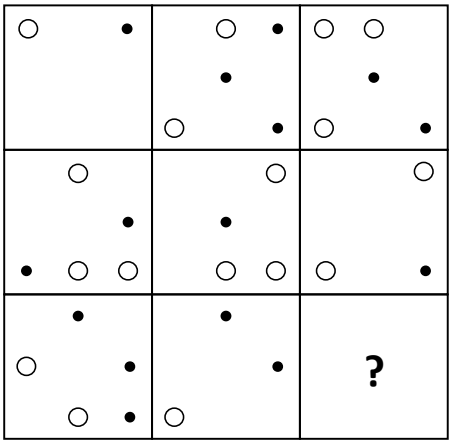
Colour: outside once grey and twice white, inside changes between black, grey and white (no repetition)
Size: -

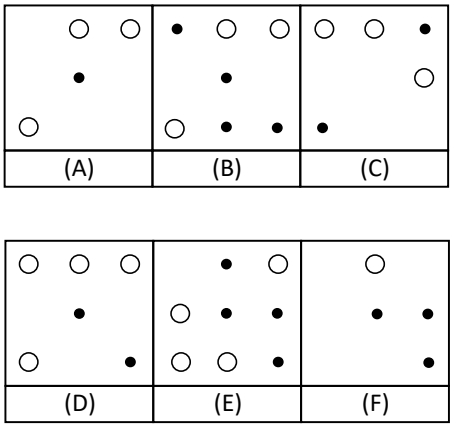
Quantity: -

In each row, from left to right, there is always the same form (square, rhombus, and triangle). This form is white in two of the images and grey in the other one. The colour of the middle dot is black, grey and white exactly once per row.

In the bottom right, there needs to be one white triangle with one black dot.

3.11.





Answer: F

Direction: from top to bottom ↓

Form: see "Number"

Orientation: -

Colour: -

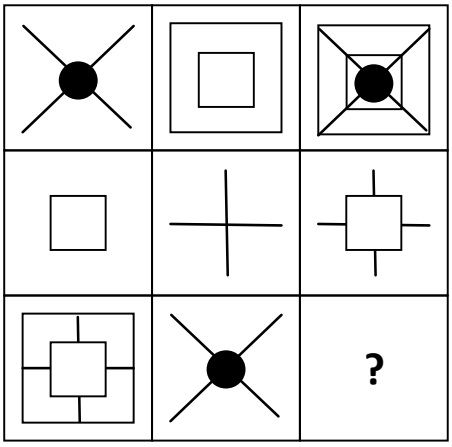
Size: -

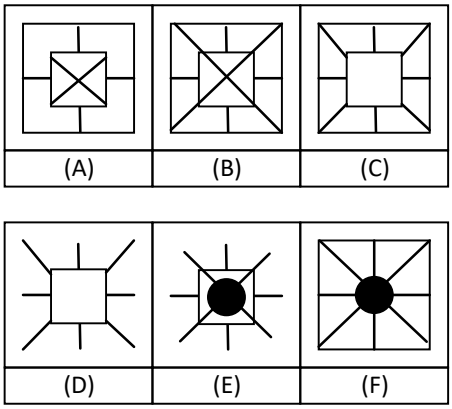
Quantity: large and small dots of 1-2-3 (order does not matter)

In every row, from top to bottom, there are white and black dots so that there is one in one of the boxes, two in another box and three in the remaining box.

Therefore, in the bottom right box, there should be three black dots and one white dot.

3.12.





Answer: C

Direction: from left to right

Form: 1st form is placed over the 2nd form = 3rd form

Orientation: -

Colour: -

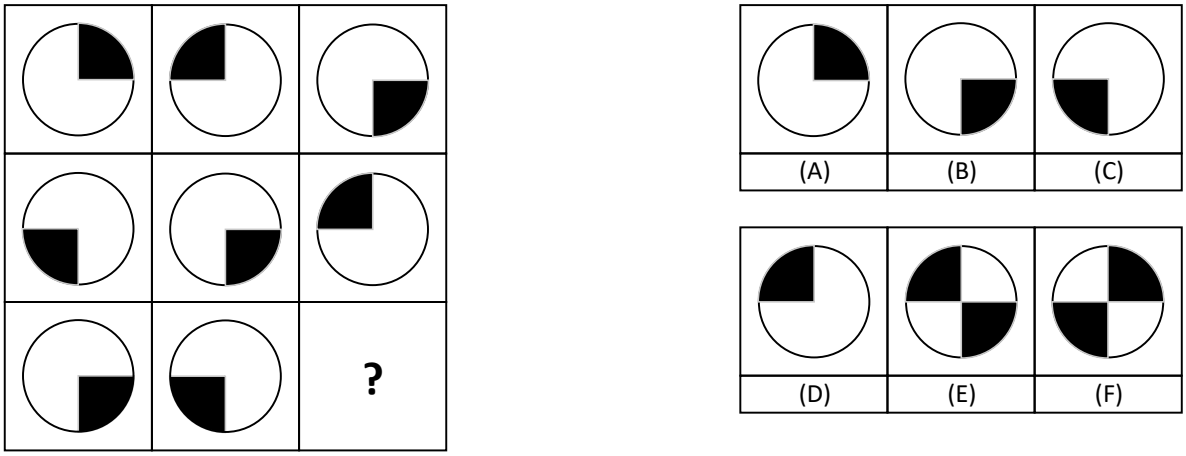
Size: -

Quantity: -

From left to right: Here, the first image is placed in front of the second image.

Looking at the second row, we see that the first element is put on top of the second element (and not vice versa). In the case of the forms outside of the square in the 1st image, this can be either a surface or just lines. If it were a surface, the solution would look like the 1st image from the 3rd row, because it would completely cover the second image
However, from the possible solutions, you will realize that the forms outside the squares have to be just lines (and not a surface.) Therefore, the answer can only be C.

3.13.



Answer: A

Direction: both from left to right and from top to bottom↓

Form: see "Orientation"

Orientation: Segmented circles each twice toward the bottom and once toward the top (↓) as well as twice toward the top and once toward the bottom (); placement varies (no repetition)

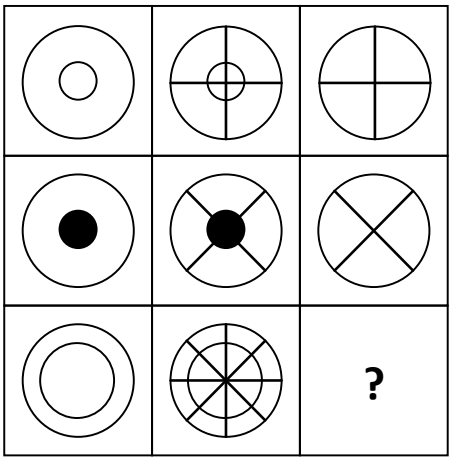
Colour: -

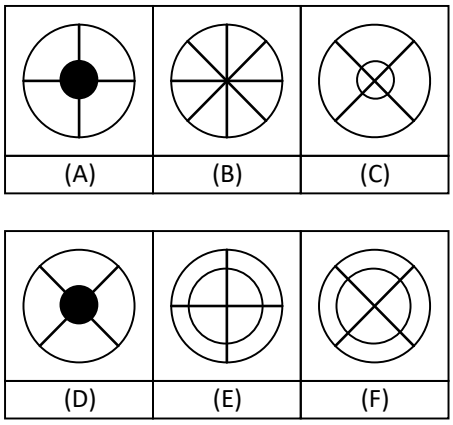
Size: -

Quantity: -

From left to right: The first image being mirrored results in the second image, the black segment then appears on the exact opposite side of the circle. Thus, in the bottom right, there should be a circle with a black element in the top right corner of the box.

3.14.





Answer: B

Direction: From left to right

Form: 2nd form – 1st form = 3rd form; outer circle remains

Orientation: -

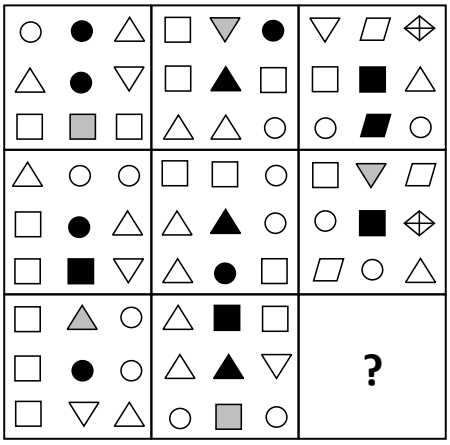
Colour: -

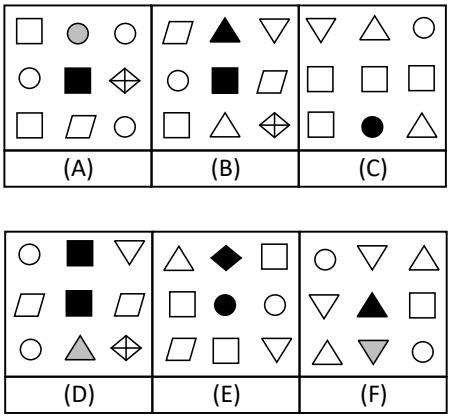
Size: -

Quantity: -

From left to right: The circle in the first image contains a dot or circle in the middle. The second image also contains this circle as well as a cross X pattern. In the third image, only the outer circle and the cross X pattern from the second image remain. Therefore, the bottom right has to have a circle with a cross and X pattern.

3.15.





Answer: D

Direction: from top to bottom ↓

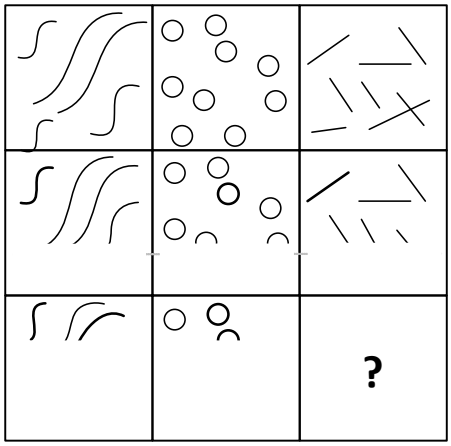
Form: see "Orientation"

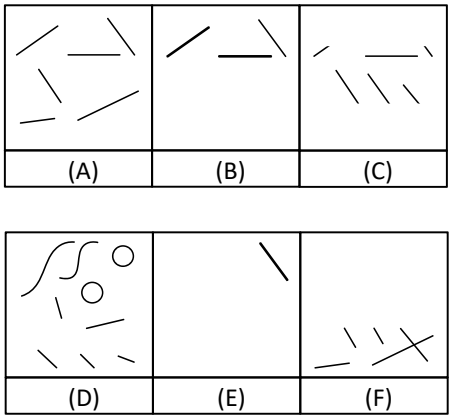
Orientation: outer forms rotate clockwise by one position, only the inner element remains the same
Colour: the two elements on top and at the bottom in the middle are each 1x black, 1x white, 1x grey (without order)
Size: -

Quantity: -

Viewed from top to bottom ↓, in each column remains the element in the middle unchanged (shape and colour). The 8 elements thereabout each rotate one position clockwise. The two elements in the middle above and below the centre must each have once the colour black, white and grey (without order).

3.16.





Answer: B

Direction: from top to bottom ↓

Form: -

Orientation: -

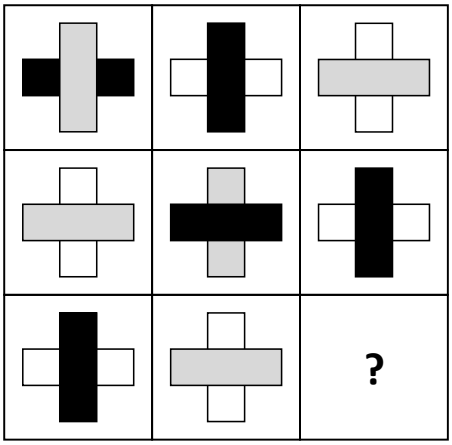
Colour: -

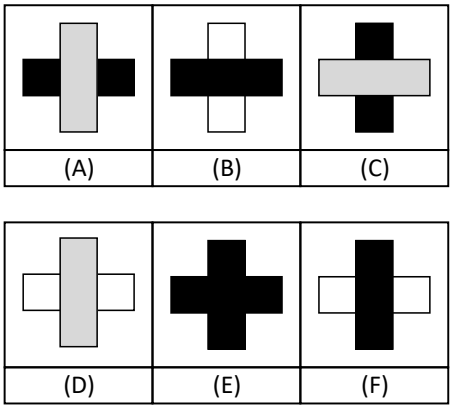
Size: -

Quantity: of the entire surface is removed from the bottom and then the centre

In every row, from top to bottom ↓, the image is the same as the one above it except that 1/3 of the entire surface has been removed from the bottom. Therefore, the bottom right must be B.

3.17.





Answer: A

Direction: both from left to right and from top to bottom↓

Form: -

Orientation: -

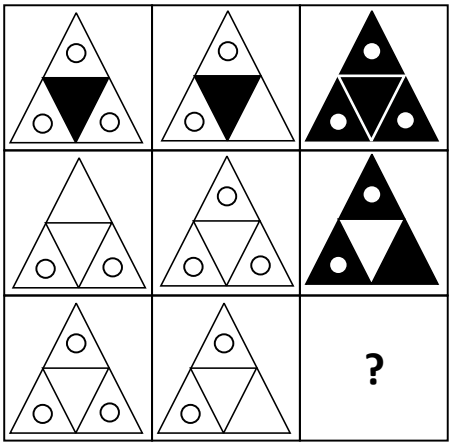
Colour: individual elements black, grey and white (no repetition)

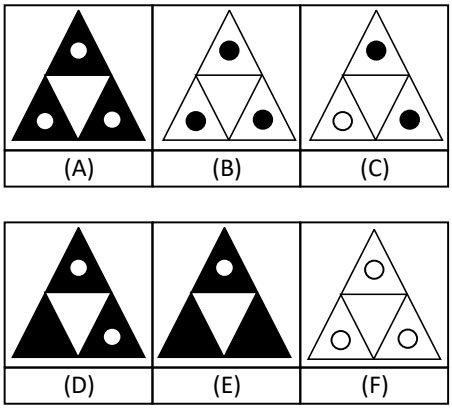
Size: -

Quantity: -

In each row (left-right, top-bottom), there is exactly one line with the same orientation and the same colour. This means that a line in the same position (horizontal/vertical) and with the same colour only occurs once within each row. This is why one black horizontal and one grey vertical line need to be in the bottom right.

3.18.





Answer: A

Direction: both from left to right and from top to bottom □↓

Form: see "Number"

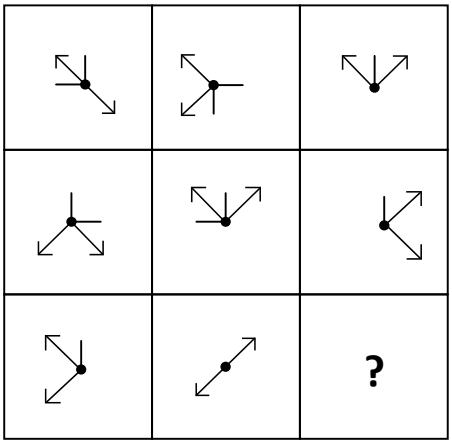
Orientation: -

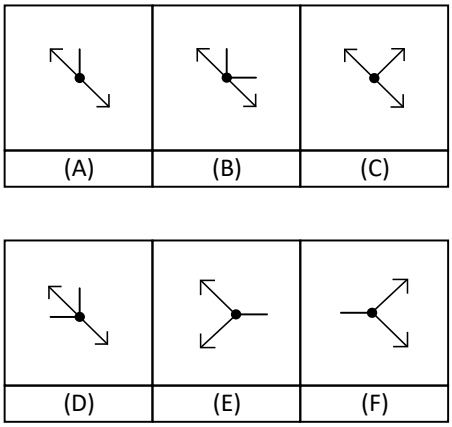
Colour: horizontal: outside twice white, once black, inside is the same (□); vertical: outside is the same, inside twice white, once black (↓)
Size: -

Quantity: either 2 or 3 dots

From left to right: The triangle consists of four smaller triangles. The triangle in the middle always has the same colour. In the third image, all of the outer triangles are black. In the outer triangles, there are always 2 or 3 white dots with black circles. If there are 2 dots in the first image, then there are 3 dots in the middle image and 2 dots again in the third image. If the first image has 3 dots, then the second image has 2 dots and the third image again has 3 dots. Thus, in the bottom right, the three outer triangles need to be black, and there needs to be a total of 3 white dots.

3.19.



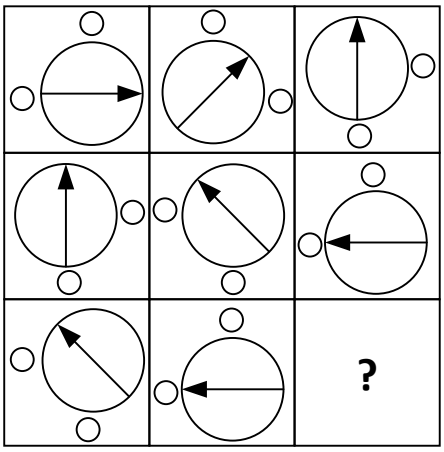


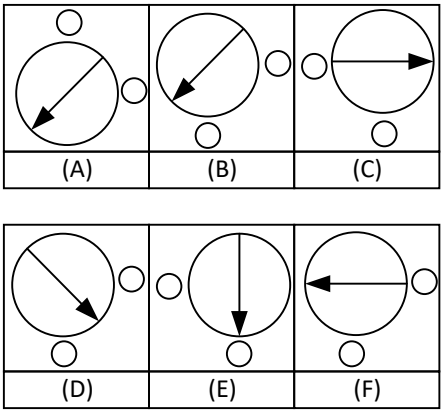
Answer: A

In the row, from top to bottom, the following is true: If two arrows, found in the first and second image, are in the same position, then it does not reappear in the third image (otherwise it does). If two lines, found in the first and second image, are in the same position, then it does reappear in the third image (otherwise it does not).

Within the image in the bottom right, there should be an arrow facing to the top left, an arrow facing to the bottom right as well as a vertical line facing upwards.

3.20.





Answer: A

Direction: from left to right

Form: see "Orientation"

Orientation: arrows rotate anti-clockwise by 45°; small circles rotate clockwise by 90°.

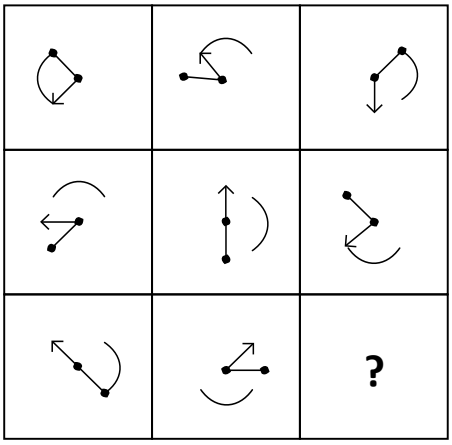
Colour: -

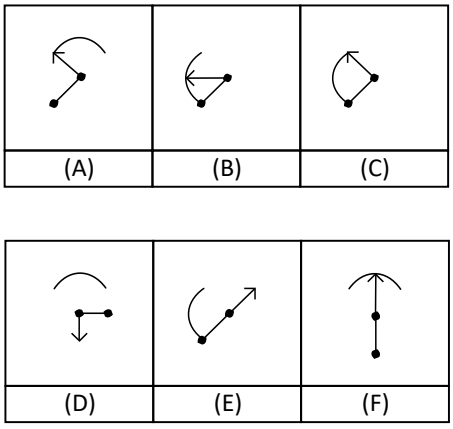
Size: -

Quantity: see Form

From left to right, the arrow tips each rotate anti-clockwise by 45 degrees, and the smaller circles rotate by a quarter circle clockwise. Therefore, in the bottom right, the arrow within the larger circle points to the bottom left, and there is one smaller circle at the top as well as one to the right.

3.21.





Answer: B

Direction: from top to bottom ↓

Form: -

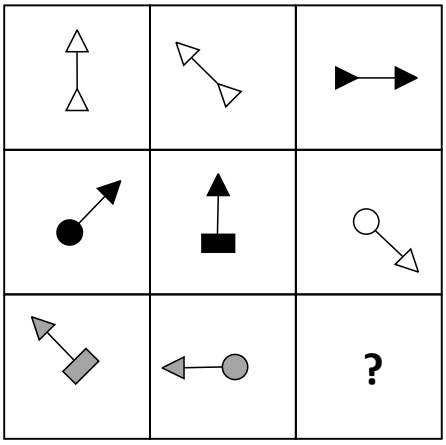
Orientation: the line with the dot element rotates anti-clockwise by 90°. The arrow element rotates clockwise by 45° and the quarter circle rotates clockwise by 90°.
Colour: -

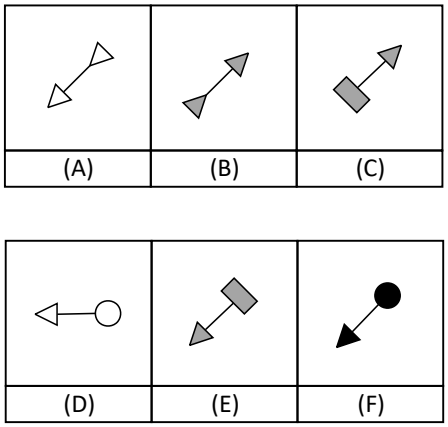
Size: -

Quantity: -

There are three different elements: quarter circle, dot-line-dot and arrow. From top to bottom the following is true: The quarter circle rotates its position clockwise by 90 degrees. The dot-line-dot element rotates its position anti-clockwise by 90 degrees. The arrow rotates its position clockwise by 45 degrees. In the image at the bottom right, the quarter circle is to the left, the arrow points to the left and the dot-line-dot runs from the bottom left to the middle.

3.22.





Answer: C

Direction: from top to bottom ↓

Form: 3 different arrow tails

Orientation: 2nd form rotates clockwise by 45˚; 3rd form rotates anti-clockwise 90 ˚

Colour: 3 different colours

Size: -

Quantity: -

There are three different arrow tails: a triangle, circle and rectangle.

In the 3rd column, triangle and circle arrow tails are used, so in the bottom right square, the arrow tail should be a rectangle.
The position of the form in the second row of the third column is to the bottom right. Since from the second to third row, it rotates its position anti-clockwise 90˚, the correct answer must be C.

6 CONTINUING NUMERICAL SERIES

6.1 INTRODUCTION

In this section, you are given a sequence of six numbers and need to calculate the 7th number based on the relationship among the first 6 numbers. You need to be able to use elementary arithmetic, such as addition, subtraction, multiplication, and division.

You have 5 minutes to read the instructions. After that, the test leader will announce the start of the 25 minutes, during which you need to solve the 22 questions. The questions are in increasing order of difficulty.

If the numbers have decreased from the previous term, then the possible operations are subtraction and division. On the other hand, if the number has increased from the previous term, then the possible operations are addition and multiplication.

While answering the questions, please keep the following in mind:

1) In most cases (roughly 20 out of 22), the relationship is with the next number in the sequence. In the last few questions, which are the most difficult questions, the relationship can be with a further number in the sequence. For instance, the 1st, 4th and 7th number have a relationship as do the 2nd and 5th numbers.

2) The solution is always a whole number. (If you calculated a decimal, solve the question again.)
The solution can be positive, negative or zero.

3) Any digit in the solution can only occur once. For instance, the answer cannot be 33, 77 or 200. This is because of the answer sheet which we will explain below. If you calculated 414 for the answer, you must have made a calculation mistake.

4)

6.2 OVERVIEW OF THE RULE TYPES

This question type is encountered in the math exams in some countries, and students tend to find the rules to be straightforward, except for a few rules which we will explain in detail.

Same relationship among all numbers

EXAMPLE

2	4	6	8	10	12	?

The rule:

+2	+2	+2	+2	+2	+2

Notice that the first term of the sequence is 2 and the second number is 4. It seems that the second term is obtained by adding 2 to the first term. Moving on the third term, it also seems that it can be obtained by adding 2 to the second term. The pattern continues and we get the value of the 7th number to be 14.

EXAMPLE

1	3	7	15	31	63	?

The rule:

×2+1	×2+1	×2+1	×2+1	×2+1	×2+1

The answer is 63 × 2 + 1 = 127.

The very first questions can be this simple. Solve these quickly and move on to the harder ones. (You can also derive the solution with an alternative formula: You always add twice the prior number: first 2, then 4, then 8, etc.)

Multiple rules in the number sequence

In most sequences the rule between two numbers differs as the sequence progresses. For instance, the 1st and 2nd have an addition relationship; 2nd and 3rd have subtraction, 3rd and 4th have multiplication. 4th and 5th would then again have an addition relationship, 5th and 6th subtraction and 6th and 7th multiplication.

EXAMPLE

5 6 12 4 0 5 ?

The rule is:

+1 ×2 ÷3 -4 +5 ×6

In this example, the first and second term figures are 5 and 6, respectively. The second term is acquired by adding 1 to 5. The third term is obtained by multiplying the second term by 2 and dividing the fourth term by 3. The next term can be calculated by subtracting 4 from the previous term. All the basic operations are used in generating the entire sequence. The numbers being added, subtracted, multiplied and divided are following a pattern also, e.g. 1, 2, 3, 4 and so on. In this example, the solution would be 30.

EXAMPLE

15 14 28 25 100 95 ?

The rule is:

-1 ×2 -3 ×4 -5 ×6.

Using this rule, the last number in the sequence is 570.

Relationship to a further number in the sequence

In the examples given already, the numerical series is formed by checking the pattern among two consecutive numbers. In the more difficult questions, there are instances where the relationship is not with the immediately following number, but with a number further down the sequence. In the last few questions of the test, please check for this kind of relationship if you do not see a relationship with the next number in the sequence.

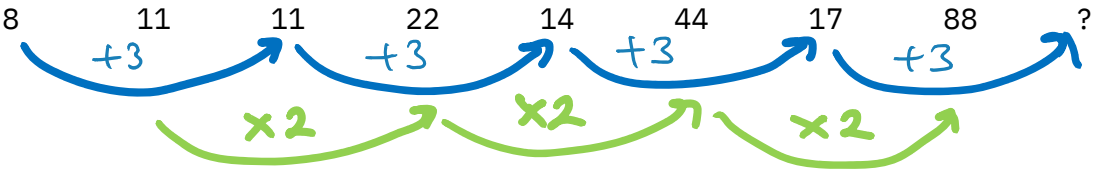
EXAMPLE

8 11 11 22 14 44 17 88 ?

In this task, the relationship is between the 1st, 3rd, 5th, 7th and 9th number and between the 2nd, 4th, 6th and 8th number. The rule is:

+3 ×2 +3 ×2 +3 ×2.

8 11 11 22 14 44 17 88 ?



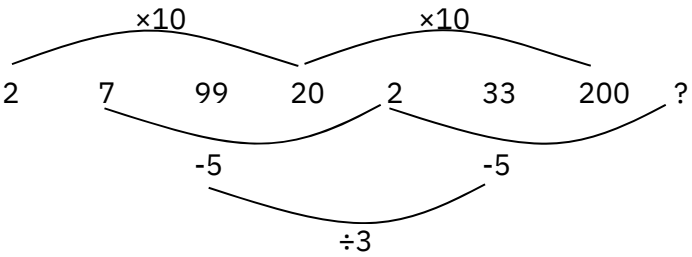
The answer is: 17 + 3 = 20.

EXAMPLE

2 7 99 20 2 33 200 ?

If you look at the relationship between the 1st, 2nd, 3rd, 4th, 5th, 6th and 7th number or at the relationship between the 1st, 3rd, 5th and 7th number and between the 2nd, 4th and 6th number, there will be no rule to be identified.

Looking at the next set of numbers shows us the relationship:



The rule for this numerical series: ×10 -5 ÷3 ×10 -5 ÷3 ...

Here, the rule/relationship is alternating. 1st, 4th and 7th numbers have a relationship. 2nd, 5th and 8th numbers have a relationship. And 3rd, 6th and 9th numbers have a relationship. For 1st, 4rd and 7th (every third figure starting with the 1st) multiply by 10. For 2nd, 5th and 8th (every third figure starting with the 2nd) subtract 5. And for 3rd and 6th (every third figure starting with the 3rd) divide by 3.

The answer is: 2 – 5 = -3.

6.3 APPROACH FOR SOLVING THESE QUESTIONS

In the first easy questions, you will have no problem seeing the relationship of the numbers at the first glance. As the sequences become more complex, the rule might be too complex and confusing to identify by just looking at the numbers. In that case make written notes on the possible relationship. By writing out the possible relationships, you will be able to pick up on relationship patterns more quickly. So let's say you have the following sequence:

45 41 82 78 156 152 304 ?

Between each two numbers, write out all the possible relationships between each number. If the numbers have decreased from the previous number, then a subtraction or a division is possible. If the number has increased, addition or multiplication is possible.

First write out all the subtraction and addition possibilities.

45 41 82 78 156 152 304 ?

-4 +41 -4 +78 -4 +152

We see that a subtraction of 4 is repeating. That is likely part of the rule.

The addition seems irregular (41, 78, 152) and we need to look further. Now we write out the possible multiplication and division relationships.

45 41 82 78 156 152 304 ?

-4 +41 -4 +78 -4 +152

×2 ×2 ×2

The ×2 multiplication gives us the missing rule.

The rule is: -4 ×2 -4 ×2 -4 ×2 -4

The answer is 304 – 4 = 300

EXAMPLE

35 34 34 32 64 61 183 ?

To solve this, we write out the possible relationships. First, focus on the addition and subtraction. And next the possible multiplication and division relationships.

35 34 34 32 64 61 183 ?

-1 +0 -2 +32 -3 +122

×1 ×2 ×3

We see that the subtraction is repeating as well as the multiplication.

The rule is: -1 ×1 -2 ×2 -3 ×3 -4

The answer is 183 – 4 = 179.

If the approach described above does not yield an answer between a number and the next one, please check for a relationship with the 2nd or 3rd number to follow.

EXAMPLE

(Relationship between 1st, 3rd, 5th, 7th... and between 2nd, 4th, 6th...)

7 17 14 23 28 29 56 ?

We first write out the possible relations.

7 17 14 23 28 29 56 ?

+10 -3 +9 +5 +1 +27

$+3^2$ $+3^3$

×2+3 ×2-5 ×2-1

No rule can be identified. So we have to look at the relationship between the 1st, 3rd, 5th and 7th number and between the 2nd, 4th and 6th number.

+6 +6 +6

7 17 14 23 28 29 56 ?

×2 ×2 ×2

The rule for this numerical series: ×2 +6 ×2 +6 ×2 +6

Here, the rule/relationship is alternating. Notice that for the 1st, 3rd, 5th and 7th (every second figure starting with the 1st) the rule is to multiply by 2. For the 2nd, 4th, 6th and 8th (every second figure starting with the 2nd) the rule is to add 6. The answer is: 29 + 6 = 35

6.3.1 ALTERNATIVE APPROACH

You can also try using the following approach when solving continuing numerical series. It is quite time consuming, but some students find this useful for the hard questions. You write the following table on an empty sheet of paper.

	+		×	÷
...				
...				
...				
...				
...				
...				
...				
?				

You place the numbers from the question in the left column and write the relationship type in each column. For instance, if there is an addition, you enter the relationship in the "+" column.

EXAMPLE

35 34 34 32 64 61 183 ?

	+	-	×	÷
35	-	1	-	-

34	0	0	1	1
34	-	2	-	-
32	32	-	2	-
64	-	3	-	-
61	122	-	3	-
183				
?				

If you look at the "+" and the "÷" box, you won't find a rule. However, if you check the "-" and the "×" box, you might notice that the numbers are increasing in every second field with 1.

Therefore we can assume the rule to be -1 ×1 -2 ×2 -3 ×3 etc.

The answer therefore is 183 - 4 = 179.

EXAMPLE

56 56 58 59 61 65 65 74 ?

Let's do the same procedure as before.

	+	-	×	÷
56	0	0	1	1
56	2	-	-	-
58	1	-	-	-
59	2	-	-	-
61	4	-	-	-
65	0	0	1	1
65	9	-	-	-
74				
?				

Here you won't find a rule in the boxes "-", "×" and "÷". But even if you look at the numbers in the box "+", you won't find a rule of addition; the numbers seem to be just chosen randomly.

In this case, you should check whether there are rules between the 1st and the 3rd and between the 2nd and the 4th number.

	+	-	×	÷
56	2	0	1	1
56	3	-	-	-
58	3	-	-	-
59	6	-	-	-
61	4	-	-	-
65	9	0	1	1
65		-	-	-
74				
?				

Actually we can find a rule if we look at the task in this way. The rule is:

1st -> 3rd -> 5th -> 7th ...number: +2, +3, +4, +5 ...

2nd -> 4th -> 6th -> 8th ...number: +3, +6, +9, +12 ....

6.4 FILLING OUT THE ANSWER SHEET

During the TestAS exam, you need to mark the correct answer in the answer sheet in a particular way.

	-	1	2	3	4	5	6	7	8	9	0
01	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐

This indicates the question number

On the answer sheet, mark the digits that appear in the solution number. If the number is negative, please mark the "-" on the answer sheet as well as the digits. The order of the digits does NOT matter.

EXAMPLE 10

For the number "17" or "71", mark the "1" and the "7".

	-	1	2	3	4	5	6	7	8	9	0
	☐	☒	☐	☐	☐	☐	☐	☒	☐	☐	☐

EXAMPLE 11

For the number "-759", mark the "-", "5", "7" and the "9".

	-	1	2	3	4	5	6	7	8	9	0
	☒	☐	☐	☐	☐	☒	☐	☒	☐	☒	☐

To get comfortable with this answer sheet we added an empty one on the next page for you to print and use for our practice questions.

ANSWER SHEET

	-	0	1	2	3	4	5	6	7	8	9
0	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
1	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
0	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
2	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
0	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
3	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
0	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
4	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
0	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
5	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
0	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
6	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
0	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
7	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
0	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
8	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
0	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
9	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
1	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
0	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
1	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
1	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐

1
2
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2

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6.5 PRACTICE EXAMS

You have 25 minutes for the 22 questions in each test.

In the TestAS you will be given 6 numbers and will need to calculate the 7th one. In our examples, we also have a few questions where 5 or 7 numbers are given.

6.5.1 EXAM 1

1.1.

-9 -6 -7 -4 -5 -2 ?

Solution:

	-	1	2	3	4	5	6	7	8	9	0
	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐

1.2.

-81 -98 -81 -97 -81 -96 ?

Solution:

	-	1	2	3	4	5	6	7	8	9	0
	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐

1.3.

31 32 34 35 37 38 ?

Solution:

	-	1	2	3	4	5	6	7	8	9	0
	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐

1.4.

76 77 79 82 86 91 ?

Solution:

	-	1	2	3	4	5	6	7	8	9	0
	◻	◻	◻	◻	◻	◻	◻	◻	◻	◻	◻

1.5.

200 50 54 216 220 55 59 ?

Solution:

	-	1	2	3	4	5	6	7	8	9	0
	◻	◻	◻	◻	◻	◻	◻	◻	◻	◻	◻

1.6.

180 171 684 676 2,704 2,697 10,788 ?

Solution:

	-	1	2	3	4	5	6	7	8	9	0
	◻	◻	◻	◻	◻	◻	◻	◻	◻	◻	◻

1.7.

101 108 106 106 112 109 218 223 ?

Solution:

	-	1	2	3	4	5	6	7	8	9	0
	◻	◻	◻	◻	◻	◻	◻	◻	◻	◻	◻

1.8.

-11 -22 -19 -38 -34 -68 ?

Solution:

	-	1	2	3	4	5	6	7	8	9	0
	◻	◻	◻	◻	◻	◻	◻	◻	◻	◻	◻

1.9.

0 2 6 3 6 18 14 18 ?

Solution:

	-	1	2	3	4	5	6	7	8	9	0
	◻	◻	◻	◻	◻	◻	◻	◻	◻	◻	◻

1.10.

75 74 72 69 65 60 ?

Solution:

	-	1	2	3	4	5	6	7	8	9	0
	◻	◻	◻	◻	◻	◻	◻	◻	◻	◻	◻

1.11.

44 48 42 46 41 45 ?

Solution:

	-	1	2	3	4	5	6	7	8	9	0
	◻	◻	◻	◻	◻	◻	◻	◻	◻	◻	◻

1.12.

16 17 20 25 32 41 ?

Solution:

	-	1	2	3	4	5	6	7	8	9	0
	◻	◻	◻	◻	◻	◻	◻	◻	◻	◻	◻

1.13.

16 80 79 395 393 1,965 ?

Solution:

	-	1	2	3	4	5	6	7	8	9	0
	◻	◻	◻	◻	◻	◻	◻	◻	◻	◻	◻

1.14.

16 48 42 14 8 24 18 ?

Solution:

	-	1	2	3	4	5	6	7	8	9	0
	◻	◻	◻	◻	◻	◻	◻	◻	◻	◻	◻

1.15.

-10 0 0 10 20 30 ?

Solution:

	-	1	2	3	4	5	6	7	8	9	0
	◻	◻	◻	◻	◻	◻	◻	◻	◻	◻	◻

1.16.

110 55 115 60 120 65 ?

Solution:

	-	1	2	3	4	5	6	7	8	9	0
	◻	◻	◻	◻	◻	◻	◻	◻	◻	◻	◻

1.17.

150 147 441 437 1,748 1,743 ?

Solution:

	-	1	2	3	4	5	6	7	8	9	0
	◻	◻	◻	◻	◻	◻	◻	◻	◻	◻	◻

1.18.

24 36 72 108 216 324 ?

Solution:

	-	1	2	3	4	5	6	7	8	9	0
	◻	◻	◻	◻	◻	◻	◻	◻	◻	◻	◻

1.19.

45 41 82 77 154 148 ?

Solution:

	-	1	2	3	4	5	6	7	8	9	0
	◻	◻	◻	◻	◻	◻	◻	◻	◻	◻	◻

1.20.

24 8 55 27 11 58 30 ?

Solution:

	-	1	2	3	4	5	6	7	8	9	0
	◻	◻	◻	◻	◻	◻	◻	◻	◻	◻	◻

1.21.

14 84 78 390 385 1,540 ?

Solution:

	-	1	2	3	4	5	6	7	8	9	0
	◻	◻	◻	◻	◻	◻	◻	◻	◻	◻	◻

1.22.

16 18 27 19 38 20 ?

Solution:

	-	1	2	3	4	5	6	7	8	9	0
	◻	◻	◻	◻	◻	◻	◻	◻	◻	◻	◻

6.5.2 EXAM2

2.1.

-8 -6 -4 -2 0 2 ?

Solution:

	-	1	2	3	4	5	6	7	8	9	0
	◻	◻	◻	◻	◻	◻	◻	◻	◻	◻	◻

2.2.

-29 -25 -22 -11 -7 -4 -2 ?

Solution:

	-	1	2	3	4	5	6	7	8	9	0
	◻	◻	◻	◻	◻	◻	◻	◻	◻	◻	◻

2.3.

-2 -4 -8 -16 -32 -64 ?

Solution:

	-	1	2	3	4	5	6	7	8	9	0
	◻	◻	◻	◻	◻	◻	◻	◻	◻	◻	◻

2.4.

-110 -121 -134 -145 -158 -169 ?

Solution:

	-	1	2	3	4	5	6	7	8	9	0
	◻	◻	◻	◻	◻	◻	◻	◻	◻	◻	◻

2.5.

412 402 404 808 798 800 1,600 ?

Solution:

	-	1	2	3	4	5	6	7	8	9	0
	◻	◻	◻	◻	◻	◻	◻	◻	◻	◻	◻

2.6.

-13 -12 -10 -13 -9 -4 -10 ?

Solution:

	-	1	2	3	4	5	6	7	8	9	0
	◻	◻	◻	◻	◻	◻	◻	◻	◻	◻	◻

2.7.

1 2 6 18 23 92 ?

Solution:

	-	1	2	3	4	5	6	7	8	9	0
	◻	◻	◻	◻	◻	◻	◻	◻	◻	◻	◻

2.8.

201 152 110 75 47 26 ?

Solution:

	-	1	2	3	4	5	6	7	8	9	0
	◻	◻	◻	◻	◻	◻	◻	◻	◻	◻	◻

2.9.

615 564 512 459 405 ?

Solution:

	-	1	2	3	4	5	6	7	8	9	0
	◻	◻	◻	◻	◻	◻	◻	◻	◻	◻	◻

2.10.

88 92 104 140 248 ?

Solution:

	-	1	2	3	4	5	6	7	8	9	0
	◻	◻	◻	◻	◻	◻	◻	◻	◻	◻	◻

2.11.

-170 -155 -138 -119 -98 -75 ?

Solution:

	-	1	2	3	4	5	6	7	8	9	0
	◻	◻	◻	◻	◻	◻	◻	◻	◻	◻	◻

2.12.

2 5 10 8 12 24 22 ?

Solution:

	-	1	2	3	4	5	6	7	8	9	0
	◻	◻	◻	◻	◻	◻	◻	◻	◻	◻	◻

2.13.

-14 -3 -30 9 -46 81 ?

Solution:

	-	1	2	3	4	5	6	7	8	9	0
	◻	◻	◻	◻	◻	◻	◻	◻	◻	◻	◻

2.14.

4 5 6 8 10 13 ?

Solution:

	-	1	2	3	4	5	6	7	8	9	0
	◻	◻	◻	◻	◻	◻	◻	◻	◻	◻	◻

2.15.

-8 -9 -7 -21 -25 -20 -120 ?

Solution:

	-	1	2	3	4	5	6	7	8	9	0
	◻	◻	◻	◻	◻	◻	◻	◻	◻	◻	◻

2.16.

-11 -12 -24 -8 -12 -60 -10 ?

Solution:

	-	1	2	3	4	5	6	7	8	9	0
	◻	◻	◻	◻	◻	◻	◻	◻	◻	◻	◻

2.17.

-89 -91 -88 -92 -87 -93 ?

Solution:

	-	1	2	3	4	5	6	7	8	9	0
	◻	◻	◻	◻	◻	◻	◻	◻	◻	◻	◻

2.18.

-78 -77 -75 -78 -74 -69 ?

Solution:

	-	1	2	3	4	5	6	7	8	9	0
	◻	◻	◻	◻	◻	◻	◻	◻	◻	◻	◻

2.19.

77 86 78 85 79 84 ?

Solution:

	-	1	2	3	4	5	6	7	8	9	0
	◻	◻	◻	◻	◻	◻	◻	◻	◻	◻	◻

2.20.

-30 -28 -31 -124 -119 -125 ?

Solution:

	-	1	2	3	4	5	6	7	8	9	0
	◻	◻	◻	◻	◻	◻	◻	◻	◻	◻	◻

2.21.

18 18 36 39 35 7 42 ?

Solution:

	-	1	2	3	4	5	6	7	8	9	0
	◻	◻	◻	◻	◻	◻	◻	◻	◻	◻	◻

2.22.

-4 12 4 -16 -48 240 ?

Solution:

	-	1	2	3	4	5	6	7	8	9	0
	◻	◻	◻	◻	◻	◻	◻	◻	◻	◻	◻

6.5.3 EXAM3

3.1.

-10 -20 -40 -80 -160 -320 ?

Solution:

	-	1	2	3	4	5	6	7	8	9	0
	◻	◻	◻	◻	◻	◻	◻	◻	◻	◻	◻

3.2.

12 15 21 33 57 105 ?

Solution:

	-	1	2	3	4	5	6	7	8	9	0
	◻	◻	◻	◻	◻	◻	◻	◻	◻	◻	◻

3.3.

-22 -44 -47 -94 -97 -194 ?

Solution:

	-	1	2	3	4	5	6	7	8	9	0
	◻	◻	◻	◻	◻	◻	◻	◻	◻	◻	◻

3.4.

-146 -154 -150 -158 -154 -162 ?

Solution:

	-	1	2	3	4	5	6	7	8	9	0
	◻	◻	◻	◻	◻	◻	◻	◻	◻	◻	◻

3.5.

98 93 96 91 94 89 ?

Solution:

	-	1	2	3	4	5	6	7	8	9	0
	◻	◻	◻	◻	◻	◻	◻	◻	◻	◻	◻

3.6.

-1 -1 1 -3 15 -105 ?

Solution:

	-	1	2	3	4	5	6	7	8	9	0
	◻	◻	◻	◻	◻	◻	◻	◻	◻	◻	◻

3.7.

29 28 28 26 52 49 ?

Solution:

	-	1	2	3	4	5	6	7	8	9	0
	◻	◻	◻	◻	◻	◻	◻	◻	◻	◻	◻

3.8.

87 78 70 63 57 52 ?

Solution:

	-	1	2	3	4	5	6	7	8	9	0
	◻	◻	◻	◻	◻	◻	◻	◻	◻	◻	◻

3.9.

4 24 19 76 73 146 ?

Solution:

	-	1	2	3	4	5	6	7	8	9	0
	◻	◻	◻	◻	◻	◻	◻	◻	◻	◻	◻

3.10.

-9 -18 -14 -42 -37 -148 ?

Solution:

	-	1	2	3	4	5	6	7	8	9	0
	◻	◻	◻	◻	◻	◻	◻	◻	◻	◻	◻

3.11.

148 116 100 92 88 86 ?

Solution:

	-	1	2	3	4	5	6	7	8	9	0
	◻	◻	◻	◻	◻	◻	◻	◻	◻	◻	◻

3.12.

17 20 23 27 31 36 ?

Solution:

	-	1	2	3	4	5	6	7	8	9	0
	◻	◻	◻	◻	◻	◻	◻	◻	◻	◻	◻

3.13.

596 600 -300 -296 148 152 ?

Solution:

	-	1	2	3	4	5	6	7	8	9	0
	◻	◻	◻	◻	◻	◻	◻	◻	◻	◻	◻

3.14.

98 100 90 94 86 92 ?

Solution:

	-	1	2	3	4	5	6	7	8	9	0
	◻	◻	◻	◻	◻	◻	◻	◻	◻	◻	◻

3.15.

-14 -11 -19 -13 -19 -10 ?

Solution:

	-	1	2	3	4	5	6	7	8	9	0
	◻	◻	◻	◻	◻	◻	◻	◻	◻	◻	◻

3.16.

21 20 23 18 25 16 ?

Solution:

	-	1	2	3	4	5	6	7	8	9	0
	◻	◻	◻	◻	◻	◻	◻	◻	◻	◻	◻

3.17

0 0 0 8 24 72 80 ?

Solution:

	-	1	2	3	4	5	6	7	8	9	0
	◻	◻	◻	◻	◻	◻	◻	◻	◻	◻	◻

3.18.

6 22 23 9 -20 -64 ?

Solution:

	-	1	2	3	4	5	6	7	8	9	0
	◻	◻	◻	◻	◻	◻	◻	◻	◻	◻	◻

3.19.

30 40 20 50 10 60 ?

Solution:

	-	1	2	3	4	5	6	7	8	9	0
	◻	◻	◻	◻	◻	◻	◻	◻	◻	◻	◻

3.20.

-50 -43 -37 -38 -19 -33 ?

Solution:

	-	1	2	3	4	5	6	7	8	9	0
	◻	◻	◻	◻	◻	◻	◻	◻	◻	◻	◻

3.21.

-256 -128 -64 -32 -16 -8 24 ?

Solution:

	-	1	2	3	4	5	6	7	8	9	0
	◻	◻	◻	◻	◻	◻	◻	◻	◻	◻	◻

3.22.

12 13 21 48 112 237 ?

Solution:

	-	1	2	3	4	5	6	7	8	9	0
	◻	◻	◻	◻	◻	◻	◻	◻	◻	◻	◻

6.6 ANSWER KEY

Exam 1	
Question	Answer
1.1.	-3
1.2.	-81
1.3.	40
1.4.	97
1.5.	236
1.6.	10,782
1.7.	219
1.8.	-63
1.9.	54
1.10.	54
1.11.	41
1.12.	52
1.13.	1,962
1.14.	6
1.15.	60
1.16.	125
1.17.	8,715
1.18.	648
1.19.	296
1.20.	14
1.21.	1,536
1.22.	49

Exam 2	
Question	Answer
2.1.	4
2.2.	2
2.3.	-128
2.4.	-182
2.5.	1,590
2.6.	-3
2.7.	98
2.8.	12
2.9.	350
2.10.	572
2.11.	-50
2.12.	26
2.13.	-62
2.14.	16
2.15.	-127
2.16.	-17
2.17.	-86
2.18.	-75
2.19.	80
2.20.	-875
2.21.	49
2.22.	80

Exam 3	
Question	Answer
3.1.	-640
3.2.	201
3.3.	-197
3.4.	-158
3.5.	92
3.6.	945
3.7.	147
3.8.	48
3.9.	145
3.10.	-142
3.11.	85
3.12.	41
3.13.	-76
3.14.	86
3.15.	-14
3.16.	27
3.17.	240
3.18.	-123
3.19.	0
3.20.	4
3.21.	12
3.22.	453

ANSWER SHEET EXAM 1

	-	0	1	2	3	4	5	6	7	8	9
01	X				X						
02	X		X							X	
03		X				X					
04									X		X
05				X	X			X			
06		X	X	X					X	X	
07			X	X							X
08	X				X			X			
09						X	X				
10						X	X				
11			X			X					
12				X			X				
13			X	X				X			X
14								X			
15		X						X			
16			X	X			X				
17			X				X		X	X	
18						X		X		X	
19				X				X			X
20			X			X		X			
21			X		X		X				
22						X					X

ANSWER SHEET EXAM 2

	-	0	1	2	3	4	5	6	7	8	9
01	☐	☐	☐	☐	☐	X	☐	☐	☐	☐	☐
02	☐	☐	☐	X	☐	☐	☐	☐	☐	☐	☐
03	X	☐	X	X	☐	☐	☐	☐	☐	X	☐
04	X	☐	X	X	☐	☐	☐	☐	☐	X	☐
05	X	X	X	☐	☐	☐	X	☐	☐	☐	X
06	☐	☐	☐	☐	X	☐	☐	☐	☐	☐	☐
07	☐	☐	☐	☐	☐	☐	☐	☐	☐	X	X
08	☐	☐	X	X	☐	☐	☐	☐	☐	☐	☐
09	☐	X	☐	☐	X	☐	X	☐	☐	☐	☐
10	☐	☐	☐	X	☐	☐	X	☐	X	☐	☐
11	X	X	☐	☐	☐	☐	X	☐	☐	☐	☐
12	☐	☐	☐	X	☐	☐	☐	☐	X	☐	☐
13	X	☐	☐	X	☐	☐	☐	X	☐	☐	☐
14	☐	☐	X	X	☐	☐	☐	X	☐	☐	☐
15	X	☐	X	☐	☐	☐	☐	☐	X	☐	☐
16	X	☐	X	☐	☐	☐	☐	☐	X	☐	☐
17	X	☐	☐	☐	☐	☐	☐	X	X	X	☐
18	X	☐	☐	☐	☐	☐	X	☐	☐	☐	☐
19	X	X	☐	☐	☐	☐	☐	☐	X	X	☐
20	☐	☐	☐	☐	☐	☐	X	☐	☐	X	☐
21	☐	☐	☐	☐	☐	X	☐	☐	☐	☐	X
22	☐	X	☐	☐	☐	☐	☐	☐	☐	X	☐

ANSWER SHEET EXAM 3

	-	0	1	2	3	4	5	6	7	8	9
01	X	X				X		X			
02	X	X	X	X							
03	X		X						X		X
04			X				X			X	
05				X							X
06						X	X				X
07			X			X			X		
08						X				X	
09			X			X	X				
10	X		X	X		X					
11			X			X	X			X	
12											
13	X							X	X		
14								X		X	
15	X		X			X					
16				X					X		
17		X		X		X					
18	X		X	X	X						
19		X									
20						X					
21			X	X							
22					X	X	X				

6.7 DETAILED ANSWERS

6.7.1 EXAM 1

1.1

-9 -6 -7 -4 -5 -2 ?

Answer: -3

Explanation: First we look at the first two terms of the sequence, which are -9 and -6. -9 changes to -6. It seems that we add 3 to -9. The third term is -7, and one possible operation implemented to arrive at the value -7 is by subtracting 1 from -6. The fourth term is -4. One can get -4 from -7 by adding 3 to it. As we move far from the sequence, we can see that the pattern/rule is given below.

The rule for this numerical series: +3 -1 +3 -1 +3 -1

1.2.

-81 -98 -81 -97 -81 -96 ?

Answer: -81

The rule for this numerical series: +0 +1 +0 +1 +0 +1

The relationship is between the 1st, 3rd, 5th and 7th number and between 2nd, 4th and 6th number.

Explanation: If you try to look for pattern for the consecutive numbers, you will just end up being frustrated. The pattern can be established on the alternating numbers; between the 1st, 3rd, 5th and the 7th number and between 2nd, 4th and the 6th number. For the first set, you will notice that the terms are the same all throughout. It seems that the operation is +0. For the second set, the numbers seem to increase by one making the operation +1.

1.3.

31 32 34 35 37 38 ?

Answer: 40

Explanation: The first two terms are 31 and 32. The second term seems to increase by 1. If we look at the third term, it seems that the operation used to get 34 is +2 to second term. Then for the fifth term, it is +1 again. As we proceed on the sequence, we will see that it follows the pattern given below.

The rule for this numerical series: +1 +2 +1 +2 +1 +2

1.4.

76 77 79 82 86 91 ?

Answer: 97

Explanation: Notice that the sequence is increasing by relatively small values. The entire rule uses addition as the operation. Notice also that the increment is increasing. The second term increased by 1, the third by 2, the fourth by 3, and so on. Hence, we have the rule below.

The rule for this numerical series: +1 +2 +3 +4 +5 +6

1.5.

200 50 54 216 220 55 59 ?

Answer: 236

Explanation: Note that 200 is four times that of 50. That's why we can say that in order for us to get 50, we need to divide 200 by 4. The third is 54, which is obtained by adding 4 to the second term. The fourth term is four times 54. It is obvious that the operation is ×4. The fifth term is obtained by adding four to 216, and the sixth term is obtained by dividing 220 by 4. Notice that pattern involves the number 4 with varying operations used.

The rule for this numerical series: ÷4 +4 ×4 +4 ÷4 +4 ×4

1.6.

180 171 684 676 2,704 2,697 10,788 ?

Answer: 10782

Explanation: Clearly, the second term is obtained by subtracting 9 from the first term. Notice that 684 is four times 171, which implies that the operation is ×4. The next term is obtained by subtracting 8 from the second term. The fifth term is obtained by multiplying the previous term by four. The pattern seems to be the rule presented below. The rule for this numerical series: -9 ×4 -8 ×4 -7 ×4 -6

1.7.

101 108 106 106 112 109 218 223 ?

Answer: 219

Explanation: Looking at the first and second term, we can suspect that the first rule is +7. Then it is followed by the rule -2. For the fourth term, there are four possibilities (e.g. +0, -0, ×1 and ÷1). The fifth term is obtained by adding 6 to 106. For the sixth term the rule is -3. The seventh term is obtained by adding 5 to the previous. You can notice that the rule alternates with the operation used and follows a certain pattern. For addition, it is 7, 6 and 5, and for subtraction, 2, 3 and 4. Hence, the last number is obtained by subtracting 4.

The rule for this numerical series: +7 -2 ×1 +6 -3 ×2 +5 -4

1.8.

-11 -22 -19 -38 -34 -68 ?

Answer: -63

Explanation: The first and second terms are -11 and -22, respectively. It can be posited that the rule is either ×2 or -11. The third term is obtained by adding 3 to the previous term. The next term is obtained by multiplying by 2. With this, we can infer that the first rule is also ×2. The fifth term is obtained by adding 4 to -38. The rule is thus alternating multiplication (×2) and addition (+3, +4, +5 ...).

The rule for this numerical series: ×2 +3 ×2 +4 ×2 +5

1.9.

0 2 6 3 6 18 14 18 ?

Answer: 54

Explanation: Here, we can notice that first rule is +2 followed by ×3. The fourth term is obtained by either ÷2 or -3. The fifth term is obtained by +3 or ×2. We can now notice that the operation is alternating (+,×,-). For addition, the number being added increases by 1; for multiplication, it is consistently ×3; and for subtraction, the number being subtracted increases by 1.

The rule for this numerical series: + 2 ×3 -3 +3 ×3 -4 +4 ×3

1.10.

75 74 72 69 65 60 ?

Answer: 54

Explanation: As we can notice, the sequence is decreasing by a small magnitude. We can suspect that the entire rule involves subtraction. The decrease in the numbers follows an increasing trend. The second term decreased by 1, the third by 2, the fourth by 3, and so on. The rule is given below.

The rule for this numerical series: -1 -2 -3 -4 -5 -6

1.11.

44 48 42 46 41 45 ?

Answer: 41

Explanation: The second term is obviously obtained by adding 4 to 44. The next term is obtained by subtracting 6 from the second term. By adding 4, we can get 46. The fifth term is obtained by subtracting 4 from the previous term. It seems now that the operation employed for the rule is alternating (+ and -). For addition, the number being added is consistently 4. The value being subtracted decreases by 1.

The rule for this numerical series: +4 -6 +4 -5 +4 -4

1.12.

16 17 20 25 32 41 ?

Answer: 52

Explanation: Notice that the sequence of numbers is increasing by relatively small values. It seems that the operation employed for the entire rule is addition. The increment for the second term is 1, the third term is 3, the fourth term is 5, and so on. The values being added are odd numbers starting with 1.

The rule for this numerical series: +1 +3 +5 +7 +9 +11

1.13.

16 80 79 395 393 1,965 ?

Answer: 1962

Explanation: Note that 80 is obtained by multiplying 16 by 5. The third term is obtained by subtracting 1. Notice that the next rule is ×5 again. The next rule is -2. The operation is alternating (×,-). The value being multiplied is consistently 5, and the value being subtracted is increasing by 1.

The rule for this numerical series: ×5 -1 ×5 -2 ×5 -3

1.14.

16 48 42 14 8 24 18 ?

Answer: 6

Explanation: The first rule seems to be ×3 or +32. To obtain the third term, we need to subtract 6 from 48. We still have no idea about the first rule. Note that 14 can be obtained by ÷3 or -26. The fifth term is obtained by subtracting 6. This rule repeats. The sixth term is 24, which can be obtained by multiplying 3 or adding 16. It seems that the first rule is ×3, which is also used to get the sixth term. The rule is given below.

The rule for this numerical series: ×3 -6 ÷3 -6 ×3 -6 ÷3

1.15.

-10 0 0 10 20 30 ?

Answer: 60

Explanation: The second term in the sequence is zero. It can be obtained by adding 10 to the first number. For the third term, we have 0 again. There are many possibilities (e.g. +0, ×1, ×2, ×3 etc.) for the operation used. We proceed to the next term 10. It seems the operation employed is +10, which is similar to the first operation used. The fifth term is twice the value of the previous term; hence the operation is ×2. We might notice here that there is the alternating pattern described below.

The rule for this numerical series: +10 ×2 +10 ×2 +10 ×2

1.16.

110 55 115 60 120 65 ?

Answer: 125

Explanation: Here the rule/relationship is alternating. The relationship is between the 1st, 3rd, 5th and 7th numbers and between the 2nd, 4th and 6th numbers. For all terms the rule is +5.

The rule for this numerical series: +5 +5 +5 +5 +5 +5

1.17.

150 147 441 437 1,748 1,743 ?

Answer: 8715

Explanation: The second term is obtained by subtracting 3 from the first term. On the other hand, the third term is obtained by multiplying 3. It is followed by the rule -4 and ×4. Notice that the values being subtracted and multiplied increase by 1. Hence, we have the following rule.

The rule for this numerical series: -3 ×3 -4 ×4 -5 ×5

1.18.

24 36 72 108 216 324 ?

Answer: 648

Explanation: Note that 36 can be obtained by multiplying 24 with 1.5. The next term is determined by multiplying 2. The third and fourth term is ×1.5 and ×2, respectively. The rule continues as the sequence progresses.

The rule for this numerical series: ×1.5 ×2 ×1.5 ×2 ×1.5 ×2

1.19.

45 41 82 77 154 148 ?

Answer: 296

Explanation: The second term is obtained by subtracting 4 from 45. Then it is followed by the rule ×2 to get 82. The fourth term is obtained by subtracting 5 and then again followed by ×2. Notice now that the rule involves alternating operations (-,×). Moreover, the value being multiplied is consistently 2. The value being subtracted increases by 1.

The rule for this numerical series: -4 ×2 -5 ×2 -6 ×2

1.20.

24 8 55 27 11 58 30 ?

Answer: 14

Explanation: Here, the rule/relationship is alternating. Notice that for the 1st, 4th and 7th, the rule is +3. This is also the rule for the 2nd, 5th and 8th and 3rd, 6th and 9th.

The rule for this numerical series: +3 +3 +3 +3 +3

1.21.

14 84 78 390 385 1,540 ?

Answer: 1536

Explanation: The second term is obtained by multiplying the first term by 6. On the other hand, the third term is obtained by subtracting 6. It is followed by the rule ×5 and -5. Notice that the values being subtracted and multiplied increase by 1. Hence, we have the following rule.

The rule for this numerical series: ×6 -6 ×5 -5 ×4 -4

1.22.

16 18 27 19 38 20 ?

Answer: 49

Explanation: Here, the rule/relationship is alternating. Notice that for the 1st, 3rd, 5th and 7th the rule is +11. The rule for the 2nd, 4th, 6th and 8th is + 1.

The rule for this numerical series: +11 +1 +11 +1 +11 +1 +11

6.7.2 EXAM2

2.1.

-8 -6 -4 -2 0 2 ?

Answer: 4

The rule for this numerical series: +2 +2 +2 +2 +2 +2

2.2.

-29 -25 -22 -11 -7 -4 -2 ?

Answer: 2

The rule for this numerical series: +4 +3 ÷2 +4 +3 ÷2 +4

2.3.

-2 -4 -8 -16 -32 -64 ?

Answer: -128

The rule for this numerical series: ×2 ×2 ×2 ×2 ×2 ×2

2.4.

-110 -121 -134 -145 -158 -169 ?

Answer: -182

The rule for this numerical series: -11 -13 -11 -13

2.5.

412 402 404 808 798 800 1,600 ?

Answer: 1590

The rule for this numerical series: -10 +2 ×2 -10 +2 ×2 -10

2.6.

-13 -12 -10 -13 -9 -4 -10 ?

Answer: -3

The rule for this numerical series: +1 +2 -3 +4 +5 -6 +7

2.7.

1 2 6 18 23 92 ?

Answer: 98

The rule for this numerical series: ×2 +4 ×3 +5 ×4 +6

2.8.

201 152 110 75 47 26 ?

Answer: 12

The rule for this numerical series: -49 -42 -35 -28 -21 -14

2.9.

615 564 512 459 405 ?

Answer: 350

The rule for this numerical series: -51 -52 -53 -54 -55

2.10.

88 92 104 140 248 ?

Answer: 572

The rule for this numerical series: +4 +12 +36 +108 +324

The numbers added are 3 times as big as the number added before (4×3=12; 12×3=36, etc.)

2.11.

-170 -155 -138 -119 -98 -75 ?

Answer: -50

The rule for this numerical series: +15 +17 +19 +21 +23 +25

2.12.

2 5 10 8 12 24 21 ?

Answer: 26

The rule for this numerical series: +3 ×2 -2 +4 ×2 -3 +5

2.13.

-14 -3 -30 9 -46 81 ?

Answer: -62

The rule for this numerical series: -16 X^2 -16 X^2 -16

The relationship is between the 1st, 3rd, 5th and 7th numbers and between 2nd, 4th and the 6th numbers.

2.14.

4 5 6 8 10 13 ?

Answer: 16

The rule for this numerical series: +1 +1 +2 +2 +3 +3

2.15.

-8 -9 -7 -21 -25 -20 -120 ?

Answer: -127

The rule for this numerical series: -1 +2 ×3 -4 +5 ×6 -7

2.16.

-11 -12 -24 -8 -12 -60 -10 ?

Answer: -17

The rule for this numerical series: -1 ×2 ÷3 -4 ×5 ÷6 -7

2.17.

-89 -91 -88 -92 -87 -93 ?

Answer: -86

The rule for this numerical series: -2 +3 -4 +5 -6 +7

2.18.

-78 -77 -75 -78 -74 -69 ?

Answer: -75

The rule for this numerical series: +1 +2 -3 +4 +5 -6

2.19.

77 86 78 85 79 84 ?

Answer: 80

The rule for this numerical series: +9 -8 +7 -6 +5 -4

2.20.

-30 -28 -31 -124 -119 -125 ?

Answer: -875

The rule for this numerical series: +2 -3 ×4 +5 -6 ×7

2.21.

18 18 36 39 35 7 42 ?

Answer: 49

The rule for this numerical series: ÷1 ×2 +3 -4 ÷5 ×6 +7

2.22.

-4 12 4 -16 -48 240 ?

Answer: 80

The rule for this numerical series: ×(-3) ÷3 ×(-4) ×3 ×(-5) ÷3

The second number is obtained by multiplying -4 with -3. Thereafter follows the rule divide by 3 to obtain 4. The fourth number is achieved by multiplying by -4. This is followed by multiplication by 3, followed by multiplication by -5. Note that there are two alternate rules, of which the second is also alternating:

Each 1st, 3rd, 5th, 7th, ... number is multiplied with -4, -5, -6, i.e., the multiplier is reduced by 1 starting with -3.

Every 2nd, 4th, 6th ... number is divided or multiplied alternating by the fixed value of 3. In other words, every 2nd, 6th, 10th ... number is divided by 3, and every 4th, 8th, 12th ... number is multiplied by 3.

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CORE TEST

6.7.3 EXAM3

3.1.

-10 -20 -40 -80 -160 -320 ?

Answer: -640

The rule for this numerical series: ×2 ×2 ×2 ×2 ×2 ×2

3.2.

12 15 21 33 57 105 ?

Answer: 201

The rule for this numerical series: +3 +6 +12 +24 +48 +96

3.3.

-22 -44 -47 -94 -97 -194 ?

Answer: -197

The rule for this numerical series: ×2 -3 ×2 -3 ×2 -3

3.4.

-146 -154 -150 -158 -154 -162 ?

Answer: -158

The rule for this numerical series: -8 +4 -8 +4 -8 +4

3.5.

98 93 96 91 94 89 ?

Answer: 92

The rule for this numerical series: -5 +3 -5 +3 -5 +3

3.6.

-1 -1 1 -3 15 -105 ?

Answer: 945

The rule for this numerical series: ×1 ×(-1) ×(-3) ×(-5) ×(-7) ×(-9)

3.7.

29 28 28 26 52 49 ?

Answer: 147

The rule for this numerical series: -1 ×1 -2 ×2 -3 ×3

3.8.

87 78 70 63 57 52 ?

Answer: 48

The rule for this numerical series: -9 -8 -7 -6 -5 -4

3.9.

4 24 19 76 73 146 ?

Answer: 145

The rule for this numerical series: ×6 -5 ×4 -3 ×2 -1

3.10.

-9 -18 -14 -42 -37 -148 ?

Answer: -142

The rule for this numerical series: ×2 +4 ×3 +5 ×4 +6

3.11.

148 116 100 92 88 86 ?

Answer: 85

The rule for this numerical series: -32 -16 -8 -4 -2 -1

3.12.

17 20 23 27 31 36 ?

Answer: 41

The rule for this numerical series: +3 +3 +4 +4 +5 +5

3.13.

596 600 -300 -296 148 152 ?

Answer: -76

The rule for this numerical series: +4 ÷-2 +4 ÷-2 +4 ÷-2

3.14.

98 100 90 94 86 92 ?

Answer: 86

The rule for this numerical series: +2 -10 +4 -8 +6 -6

3.15.

-14 -11 -19 -13 -19 -10 ?

Answer: -14

The rule for this numerical series: +3 -8 +6 -6 +9 -4

The 1st rule is to add 3, starting with 3 (3, 6, 9). The 2nd rule is to subtract 2, counting down from 8 (8, 6, 4).

3.16.

21 20 23 18 25 16 ?

Answer: 27

The rule for this numerical series: -1 +3 -5 +7 -9 +11

3.17

0 0 0 8 24 72 80 ?

Answer: 240

The rule for this numerical series: ×3 ×3 +8 ×3 ×3 +8 ×3

3.18.

6 22 23 9 -20 -64 ?

Answer: -123

The rule for this numerical series: +16 +1 -14 -29 -44 -59

The series starts with +16. In each step deduct an additional 15: 16-15=1, 1-15=-14, and so on.

3.19.

30 40 20 50 10 60 ?

Answer: 0

The rule for this numerical series: +10 -20 +30 -40 +50 -60

3.20.

-50 -43 -37 -38 -19 -33 ?

Answer: 4

The rule for this numerical series: +13 +5 +18 +5 +23

The relationship is between the 1st, 3rd, 5th and 7th numbers and between 2nd, 4th, 6th and the 8th numbers.

3.21.

-256 -128 -64 -32 -16 -8 24 ?

Answer: 12

The rule for this numerical series: ÷2 ÷2 +32 ÷2 ÷2 +32 ÷2

3.22.

12 13 21 48 112 237 ?

Answer: 453

The rule for this numerical series:

+(1×1×1) +(2×2×2) +(3×3×3) +(4×4×4) +(5×5×5) +(6×6×6)

+1 +8 +27 +64 +125 +216

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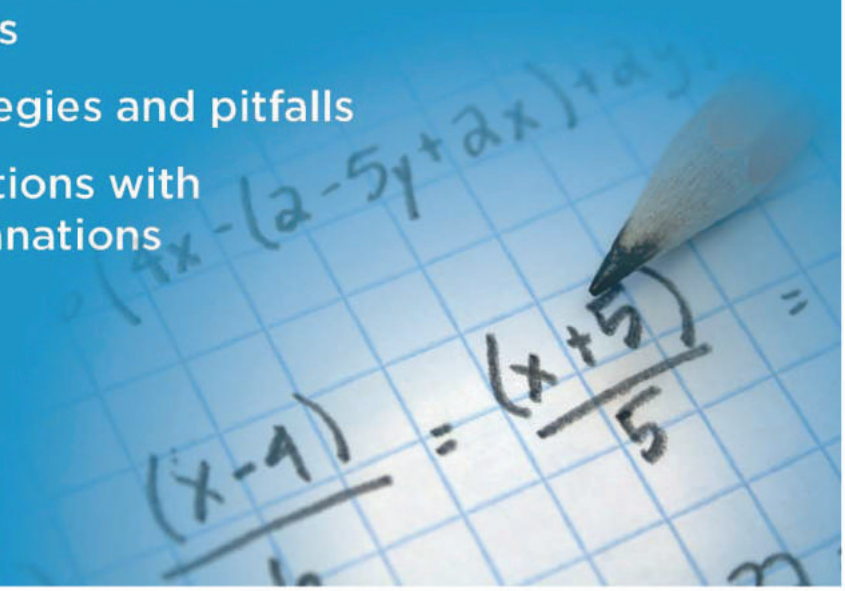

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2 Required Basic Knowledge

In this section we list a series of topics which are covered during the first years of high school in Maths courses. If you already have a high level of proficiency with Maths, you may consider skipping this section and move on directly to Section 3 – Question Types. Section 3 reviews the types of questions you will most likely encounter in the exam.

The background review in the following section has been created for students who did not study Maths in English and/or students who have not practiced Maths in some time.

2.1 Calculating without a calculator

Below we present a few exercises for you to test your calculation skills. Calculators cannot be used in the test, which is why we strongly recommend that you practice calculating without a calculator.

The equations that you will be required to solve in the exam are generally much easier than the ones you will find below. However, during the test, you will have to solve them under exam and time pressure. Therefore, for best results, we recommend that you prepare for the core and specialist modules of the test (except Humanities) by doing the calculations by hand, and not relying solely on the use of mental arithmetic. It is also smart to become familiar with the question types (Section 3). Past participants have reported that, while they were given enough time to solve the problems in the test, they sometimes still made mistakes because they were not familiar with the types of questions that would be asked.

In addition to understanding the math behind the questions, part of getting the answer right also simply comes down to how well you have read and understood the questions, figures and solutions you are given. Learn to work efficiently, through practice, and pay careful attention to the problems.

EXERCISE SET 1

a) 35 × 6 = ____

b) 74.53 + 734.84 + 1,439.32 + 4,050.06 = _____

c) 163 – ____ = 89

ANSWERS – EXERCISE SET 9

a) $\frac{200}{100} \times 20 =$ *40 Euro*

b) $\frac{15{,}000}{100} \times 15 =$ *2,250 Euro*

c) *Percentage of adults = 100% – 20% = 80%*

$\frac{850}{100} \times 80 = 680$ *adults*

d) $\frac{32}{40} = 0{,}8 = 80$ *percent*

e) *Percentage of girls = 100% – 45% = 55%*

$\frac{3{,}800}{100} \times 55 =$ *2.090*

f) *Percentage to be paid = 100% – 30% = 70%*

$\frac{80}{100} \times 70 =$ *56*

ANSWERS – EXERCISE SET 10

a) *(300 grams ÷ 20) × 100 = 1500 grams = 1.5 kilo*

b) $\frac{6}{24} = 0.25 =$ *25 percent*

c) $\frac{12}{100} \times 105 =$ *12.60 Euro*

d) $\frac{180}{90} \times 100 =$ *200 loaves of bread*

e) *2 × (2 m × 0.5 m) × 25 Euro/m = 50 Euro*

f) $\frac{38}{90} \times 5 \approx 2$

38 + 2 = 40 seats.

3.3.3 Interest Calculations

Questions with interest rates often ask how certain amounts of money change through interest. This means that you must master the basic rules of percentage calculations and be able to apply these correctly to the data.

Since the calculation of interest is a special form of percentage calculation, there are some specific terms that correspond to those of the percentage calculation:

EXAMPLE 21

Jon knows two sacks of flour weigh 13 kg. There are 5 sacks of flour in the storeroom that he has to move into the kitchen. How many total kg of flour will he have to move?

(A) 30
(B) 32.5
(C) 35
(D) 37.5

Answer: B

Determine how much 1 sack of flour weighs: 13 kg/2 = 6.5 kg per sack

If there are 5 sacks, then he will have to move: 5 x 6.5 kg = 32.5 kg

3.4.1 Currency Units

Questions about currency units test your ability to use various monetary currencies in relation to each other and to convert amounts of money from an initial currency to the target currency.

A general formula for calculating is:

Domestic currency (Euro) = $\frac{\text{Amount in foreign currency} \cdot 100}{\text{Exchange rate}}$

For simplicity, one usually does not use 100 but 1, especially when it comes to Dollars or British Pounds. The two examples below illustrate currency unit calculations.

EXAMPLE 22

The exchange rate for the Danish Krone is 750 DKK. That means € 100 = 750 DKK. By this rate, how much is 30 DKK in Euros?

(A) 4
(B) 5
(C) 6
(D) 7

$\frac{5}{6}l^2 = 135$

$l^2 = 162$

$l = \sqrt{162}$

$l = \sqrt{81 * 2}$

$l = 9\sqrt{2}$

Q17

Armen grows lettuce. He donates 1/3 of his lettuce to the soup kitchen and sells 7/8 of the rest to the supermarket. What percentage of lettuce does Armen have left to sell to the local restaurant?

(A) 8.33

(B) 29.17

(C) 70.08

(D) 91.67

Answer: A

Step 1: Determine how much he sells to the supermarket:

7/8 of 2/3 = *7/8 x 2/3*

= *7/12*

Step 2: Determine what fraction of lettuce is left:

= *1 – (1/3 + 7/12)*

= *1 – (4 + 7)/12*

= *1 – 11/12*

= *1/12*

Step 3: Convert the fraction to a percentage:

= 1/12 x 100

= 8.33%

Q18

A swimming pool can be emptied with two pipes in 300 minutes. If the larger pipe can empty the pool alone in 420 minutes, how long would it take the smaller pipe to empty the pool?

(A) 40/3h

(B) 44/3h

(C) 46/3h

(D) 50/3h

Answer: A

Let x be the numbers of hours that the smaller pipe can empty the pool. We have

1/8+1/x=1/5 *(x+8)/8x=1/5* *5x+40=8x*

40=3x *x=40/3*

Q19

Sports	Number of Students
Basketball	40
Volleyball	30
Table Tennis	25