

Sample questions

Humanities, Cultural Studies and Social Sciences Module

The Humanities, Cultural Studies and Social Sciences Module is divided in three different subtests. You have a total of 150 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
Understanding and Interpreting Texts	22	45 minutes
Using Representation Systems Flexibly	22	55 minutes
Recognising Linguistic Structures	22	50 minutes
Total working time		150 minutes



Understanding and Interpreting Texts

In the subtest “Understanding and Interpreting Texts”, short texts are presented on which questions have to be answered. This test measures the ability to read, understand, and correctly interpret different kinds of short texts with different content as well as to establish links between text elements and synthesise information from the text.

22 questions in the test, working time 45 minutes

Instructions

Please read the instructions before you start with the examples.

The following exercises are intended to test your ability to understand, interpret, and draw the right conclusions from the content of short texts. You will be asked to process several texts with different topics. Each text is followed by two or three questions relating to the preceding text. In each case please mark one of the four answering options on your answer sheet.

Text for sample questions 1 and 2

An Experiment

40 years ago, those who were friends with students of the sociology professor H. Garfinkel had to be prepared for surprises: His students would sometimes, without the least warning, behave very unusually. And so it was that one of his students, for example, involved her husband in the following dialogue while he sat watching TV in the evening, after he had casually remarked that he was tired:

“How do you mean you’re tired? Physically, mentally, or are you merely bored?”

“I don’t know, I think mostly physically.”

“Do you mean your muscles and bones hurt?”

“I guess so, yes! Don’t be so pedantic!” After a brief pause, he commented:

“In all these old films, the people are always well-dressed even when they’re at home!”

“What are you saying? Do you mean all old films, or only some of them, or only those you’ve seen?”

“What’s the matter with you? You know exactly what I mean!”

Sample question 1: degree of difficulty low

How did the husband probably feel at the end of this dialogue?

- (A) He was curious.
- (B) He was content.
- (C) He was irritated.
- (D) He was bored.

Sample question 2: degree of difficulty medium

What can be seen from the above-mentioned experiment?

- I. If people choose their words exactly this helps towards a clear understanding.
 - II. The husband believes he has expressed himself clearly.
- (A) Only I can be seen.
 - (B) Only II can be seen.
 - (C) I and II can be seen.
 - (D) Neither I nor II can be seen.

Text for sample questions 3 and 4

A Communication Model

A simple model of communication between two people consists of a “broadcaster”, a “message”, and a “receiver”. The broadcaster sends the message to the receiver. A message may have spoken parts and/or non-spoken parts (e.g. intonation, facial expressions, gestures). Parts of the message may be “explicit” (expressly formulated) or “implicit” (indirectly communicated in the form of hints). Implicit messages are often communicated as non-spoken statements.

If the spoken parts and the non-spoken parts of a message match, one calls this a “congruent message”. If the spoken parts and the non-spoken parts contradict each other, the message is “incongruent”.

Sample question 3: degree of difficulty low

Which of the two following statements is or are correct according to the above text?

- I. Messages sent by the broadcaster to the receiver may be communicated both implicitly and explicitly.
- II. Messages about the relationship between the broadcaster and the receiver are mostly communicated implicitly.

- (A) Only statement I is correct.
- (B) Only statement II is correct.
- (C) Both statements are correct.
- (D) Neither of the two statements is correct.

Sample question 4: degree of difficulty medium

Which of the two following statements is or are correct according to the above text?

- I. Someone who is silent is not communicating a message.
- II. Someone who is speaking dialect is communicating an incongruent message.

- (A) Only statement I is correct.
- (B) Only statement II is correct.
- (C) Both statements are correct.
- (D) Neither of the two statements is correct.



Text for sample questions 5 and 6

Lunch in the Courtyard, freely adapted from a tale by Johann Peter Hebel

The servant had a master whom he sometimes could not please whatever he did. And so it was that the master came home one day and sat down to lunch. The soup was either too hot or too cold or neither of the two. So he took the bowl and, together with its contents, threw it through the open window into the courtyard. And how did the servant react? With great presence of mind he threw the meat he was about to set down on the table after the soup down into the courtyard, followed by the bread, the wine, and finally the tablecloth with all that was remaining on it. "What on earth are you doing?" asked the master, rising angrily from his chair. The servant, however, responded: "Forgive me, master, if I did not guess your true intention. I was convinced you wanted to dine in the courtyard today. The air is so delightful, the sky so blue, and see, master, how sweetly the apple tree blooms and how cheerfully the bees are buzzing!" – The soup had been thrown down for the last time! The master realised the error of his ways and, cheered by the sight of the beautiful spring sky, smiled to himself about the quick-wittedness of his servant, thanking him in his heart for the well-taught lesson.

Sample question 5: degree of difficulty medium

Which of the following statements is or are correct according to the above text?

- I. The master wanted to dine in the courtyard.
 - II. The servant threw the food out of the window because he thought his master wanted to dine in the courtyard.
- (A) Only statement I is correct.
 - (B) Only statement II is correct.
 - (C) Both statements are correct.
 - (D) Neither of the two statements is correct.

Sample question 6: degree of difficulty high

Which of the following statements is or are correct according to the above text?

- I. After this incident, the master never again threw soup out of the window.
 - II. The master thanked the servant for teaching him a lesson.
- (A) Only statement I is correct.
 - (B) Only statement II is correct.
 - (C) Both statements are correct.
 - (D) Neither of the two statements is correct.



Using Representation Systems Flexibly

The subtest “Using Representation Systems Flexibly”, shows the content of a text diagrammatically or, in the reverse case, a diagrammatic illustration has to be put into words.

This test measures inductive reasoning (the ability to draw generalised conclusions on the basis of individual instances) in the linguistic field as well as the ability to derive what is concrete from the abstract and vice versa. In addition, it measures the ability to capture the meaning of diagrammatic illustrations and to put their content into words.

22 questions in the test, working time 55 minutes



Instructions

Please read the instructions before you start with the examples.

To help understand a text, a diagram is helpful to visualise the essential content.

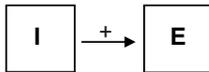
When it comes to **effects**, one notes down the key variables from the text and uses arrows to show the effects occurring between the variables. “+” and “-” are used to indicate whether the effect is positive or negative.

Here is an example of a positive effect:

Text: The bigger the income (**I**) of a family, the bigger is also its expenditure (**E**).

OR: The lesser the income (**I**) of a family, the lesser is also its expenditure (**E**).

Diagram:



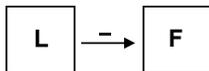
I.e. an increase in variable **I** leads to an increase in the target variable (in this case **E**) or, alternatively, a decrease in variable **I** leads to a decrease in the target variable **E**. Thus, both variables follow the same trend.

Here is an **example** of a negative effect between two variables:

Text: The more a student studies (**L**), the lower is his fear (**F**) of the examination.

OR: The lesser a student studies (**L**), the greater is his fear (**F**) of the examination.

Diagram:



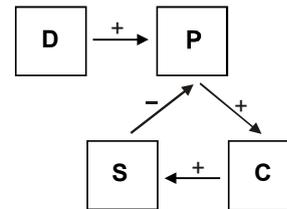
I.e. an increase in variable **L** leads to a decrease in the target variable **F** and vice versa. Thus, the two variables follow an opposite trend.

Since more than two variables are usually described in a text, diagrams generated from texts are frequently more complex.

Here is an **example** of various effects occurring between four variables:

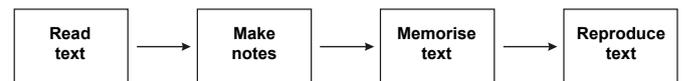
Text: Over the last few years, the demand (**D**) for PCs rose continuously. This led to an increase in prices (**P**). The general increase in prices led to more and more companies (**C**) coming into the PC market and the supply (**S**) of PCs increased. This in turn affected prices (**P**): they fell.

Diagram:



Chronological processes are shown using arrows (without the signs “+” and “-”). Here is an example:

Text: To help understand a text, it makes sense to first read the text and then make notes. One can then memorise the content of the text using the notes. Afterwards one tries to reproduce the essential content of the text from memory.



There are **relations** which are shown by other arrows or line connections. These are explained in the corresponding exercises.

The following exercises in each case comprise up to three questions on a particular topic. In finding solutions to the exercises you will possibly also have to take previously given information into account, for example solving Exercise 3 may require information given in Exercises 1 and 2. If exercises are linked this way, you will always be informed of this.

Solve the exercises using only the corresponding information given. Specialist knowledge is not required for correctly solving the exercises.

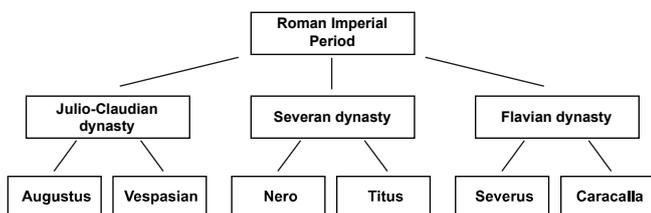


Sample question 1: degree of difficulty low

The Roman Imperial Period

The Roman Imperial Period can be divided into the Julio-Claudian dynasty, the Severan dynasty, and the Flavian dynasty. Vespasian and his son Titus reigned in the Flavian dynasty. Severus and his son Caracalla belonged to the Severan dynasty. Augustus and Nero were emperors of the Julio-Claudian dynasty.

The following diagram is intended to show the described affiliations. Affiliations are shown by connecting lines.



Which of the following statements is or are correct?

- I. The Julio-Claudian dynasty is shown correctly.
- II. The Flavian dynasty is shown correctly.

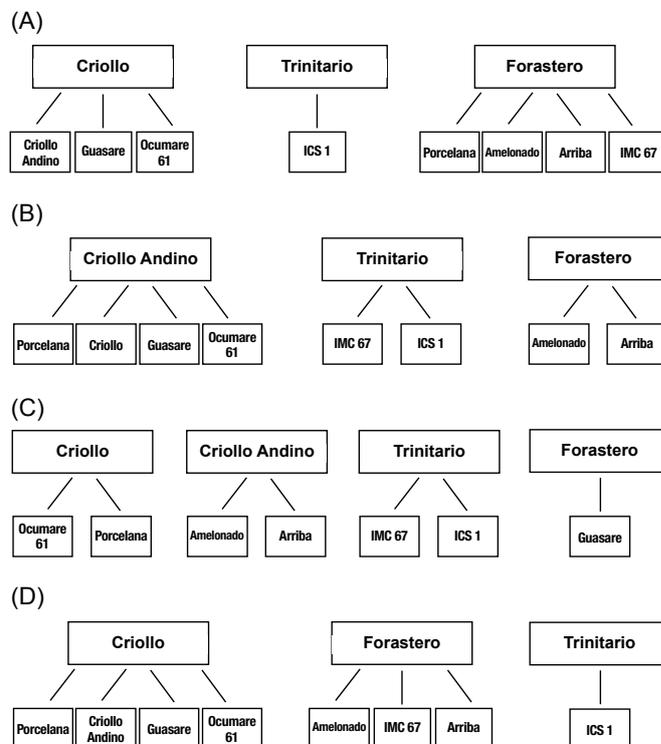
- (A) Only statement I is correct.
- (B) Only statement II is correct.
- (C) Both statements are correct.
- (D) Neither of the two statements is correct.

Sample question 2: degree of difficulty low

Types of Cocoa

A differentiation can be made between three groups of cocoa subspecies: Criollo, Trinitario, and Forastero. Forastero accounts for 80% of worldwide cocoa cultivation. Due to its resilience to various diseases, this group of cocoa subspecies tends to be preferred to the fine cocoas Criollo and Trinitario, although it is inferior in taste to the latter. Several types are known under the name of Criollo: Porcelana has smooth, green to red fruits. Criollo Andino is the name given to a Criollo subspecies from the Venezuelan Andes provinces of Merida and Tachira. Guasare grows very quickly for a Criollo subspecies and bears its first fruits after only three years. It has a much stronger flavour than Porcelana. Ocumare 61 is quite widespread in Venezuela, thanks to its superior flavour and robustness. There are also several subspecies of Forastero: Amelonado is the most widespread cocoa variety. This is the type most often used to make sellable cocoas. Type IMC 67 (Iquitos Mixed Calabacillo 67) is widespread throughout the world, from Africa to Hawaii, and requires little shade. Arriba is one of the finest tasting Forastero varieties. It has a flowery flavour. Imperial College Selection 1 (ICS 1) is a high-yield Trinitario variety, producing around 100 medium-sized fruits per year. It has a mild and distinctly fruity flavour.

Which of the following diagrams shows the correct allocation of superordinate terms and subordinate terms? Superordinate and subordinate terms are linked together by lines.

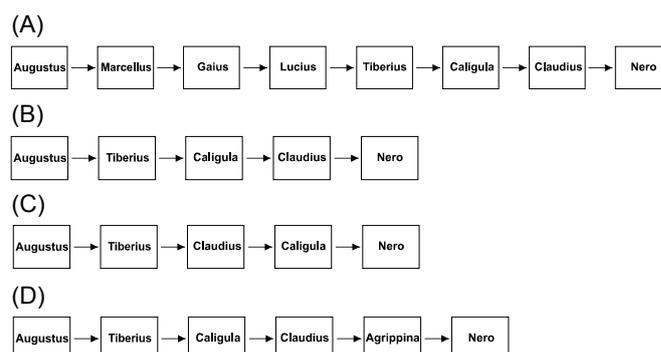


Sample question 3: degree of difficulty medium

The Roman Empire

Augustus ruled over the Roman Empire from 24 BC to 14 AD. Tiberius, Augustus' stepson, was initially excluded from succession to the throne by Augustus. Only after the death of Augustus' nephew Marcellus, and the deaths of the two grandsons Gaius and Lucius (neither of whom reigned), did Tiberius come to power in 14 AD. Claudius, initially passed over in Caligula's favour, was the only legitimate candidate after Caligula's murder and became emperor. Nero, who became Claudius' successor through the efforts of his ambitious mother Agrippina, is described by historians as a tyrant and passionate actor who, in fulfilling his role, killed his mother.

Which of the following diagrams correctly shows the imperial succession?





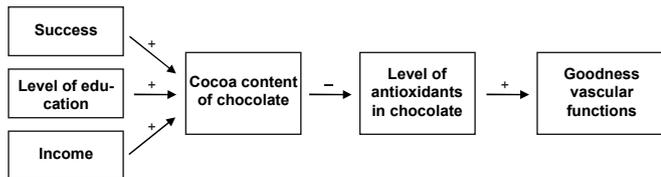
Sample question 4: degree of difficulty medium

Chocolate

A magazine makes the claim:

“Successful people eat dark chocolate to do something for their hearts. Dark chocolate contains more cocoa and hence more antioxidants than light-coloured chocolate. Antioxidants improve the body’s vascular functions for a few hours. The higher the level of education and income, the darker the chocolate.”

The following diagram is intended to show the described effects.



Which of the following two statements about this diagram is or are correct?

- I. The diagram correctly shows the effects of education and income on cocoa content in the preferred type of chocolate.
 - II. The diagram correctly shows the effects of cocoa content in chocolate on the level of antioxidants in chocolate.
- (A) Only statement I is correct.
 (B) Only statement II is correct.
 (C) Both statements are correct.
 (D) Neither of the two statements is correct.

Sample question 5: degree of difficulty medium to high

Chocolate and its Effects

Research has shown that eating cocoa-containing chocolate may contribute slightly towards reducing blood pressure. Cocoa-containing chocolate also contains a substance which supports the healing of wounds and reduces the risk of stomach diseases.

How can one show these effects in a diagram?

- I. Eating cocoa-containing chocolate is connected to a reduction of blood pressure using $\xrightarrow{+}$. $\xrightarrow{+}$ points to reduction of blood pressure.
 - II. Eating cocoa-containing chocolate is connected to the healing of wounds using $\xrightarrow{+}$ and is connected to the risk of stomach diseases using $\xrightarrow{-}$. $\xrightarrow{+}$ and $\xrightarrow{-}$ point to eating cocoa-containing chocolate.
- (A) Only statement I is correct.
 (B) Only statement II is correct.
 (C) Both statements are correct.
 (D) Neither of the two statements is correct.

Sample question 6: degree of difficulty high

Arable Farming in the Roman Empire

In the Roman Empire, there was not much fertiliser available in the form of dung for its fields since there were frequently no larger herds of cattle near the farms. The further away the cattle herds were from a farm, the less dung was available for the fields. The less dung there was for fertilising, the more frequently the farmers had to let the corn fields rest.

The following diagram shows the effects of the distance of the cattle herds from the farm, the availability of fertiliser in the form of dung, and the frequency of resting periods when growing corn crops.

Cattle = distance of the cattle herds from the farm
 Dung = availability of fertiliser in the form of dung
 Rest = frequency of resting periods when growing corn crops



If there was less fertiliser in the form of dung, nitrogen-rich plants were cultivated and used as fertiliser. However, due to the low rainfall frequency in the Roman Empire, this was not always possible: The fewer the rainfalls, the less nitrogen-rich plants could be grown. Nevertheless, intensive irrigation significantly increased the cultivation of nitrogen-rich plants and so shortened the resting periods for growing corn. What additions have to be made to the diagram to show these effects correctly?

Cul = cultivation of nitrogen-rich plants
 Dung = availability of fertiliser in the form of dung
 Irrig = intensity of irrigation
 Rain = rainfall frequency
 Rest = frequency of resting periods when growing corn crops

Which of the following statements is or are correct?

- I. Cul is positioned between Dung and Rest and is linked to both by $\xrightarrow{-}$. One $\xrightarrow{-}$ points from Dung to Cul, one $\xrightarrow{-}$ points from Cul to Rest.
 - II. Rain and Irrig are each linked to Cul with a $\xrightarrow{+}$. Both arrows point to Cul.
- (A) Only statement I is correct.
 (B) Only statement II is correct.
 (C) Both statements are correct.
 (D) Neither of the two statements is correct.



The subtest “Recognising Linguistic Structures” comprises sentences in a fictitious language and their English counterparts. The information provided is to be used to derive the meaning of individual words, semantic relations between the terms, and several grammar rules. Subsequently the newly acquired knowledge is to be used to formulate new sentences in the fictitious language.

This test measures the ability to recognise structures and inherent laws in language patterns and use these laws in new contexts. In addition, it is a matter of recognising semantic relations expressed by word order or other linguistic characteristics.

22 questions in the test, working time 50 minutes

Instructions

Please read the instructions before you start with the examples.

In the following exercises, you will be shown several expressions in invented foreign languages and their English translation. This will allow you to derive the meaning of individual words and some grammatical rules in the respective foreign language. This information will help you answer the subsequent questions. In each case two exercises relate to a certain language. Therefore please only use the provided expressions to answer the questions.

You may proceed on the assumption that

- there are no exceptions to the rules (e.g. irregular verbs) and
- only those rules apply which may be derived from the provided expressions.

Example:

koloa = I lie

kolue = he lay

satoe = he stands

Question: What is “I stood” in the foreign language?

- (A) satoa
- (B) kolua
- (C) satoe
- (D) satua

Answer (D) is correct since:

- I. The expressions for “I lie” and “he lay” differ only as regards the last two letters; hence “kol” must be the root of the verb “lie”.
- II. The final letter of the expressions “he lay” and “he stands” is in both cases “e”; hence an appended “e” means “he”.
- III. The two present tense forms (“I lie” and “he stands”) both have an “o” as the penultimate letter; hence “u” as the penultimate letter must indicate the past tense and “a” as the last letter must mean “I”.

Consequently: “I stood” in the foreign language must be “satua”.

Sample question 1: degree of difficulty low

palo ko = I sit

palo tu = she sits

karo tu = she stands

“I stand” is expressed in the foreign language by:

- (A) tu ko
- (B) ko karo
- (C) karo ko
- (D) karo palo

Sample question 2: degree of difficulty medium

tundo ramodopo novot = The pupil called his uncle.

namidu kavino suvavot = The saleswoman greeted the teacher.

tundu kavinopu tetavosir = The schoolgirl is asking her teacher.

hidamo tundo nosir = The caretaker is scolding the pupil.

“The uncle greeted his caretaker” is expressed in the foreign language by:

- (A) novot suvosir hidamo
- (B) namidu hidamopu suvavot
- (C) novot hidamopo suvasir
- (D) ramodo hidamopo suvavot

Sample question 3: degree of difficulty medium

rumpulöpp = The child is sleeping.

renguming tschik löppzi = The person is protecting his child.

rumpilemp gum = The goat is sleeping deeply.

yanitzorr lempzi = The lion is killing the goat.

“The child is protecting his goat” is expressed in the foreign language by:

- (A) rumpulemp tschik rengzi
- (B) rengilöpp tschik lempzi
- (C) rumpilemp tschik löppzi
- (D) rengulöpp tschik lempzi

Sample question 4: degree of difficulty medium to high

puna selveui = The child is coming from the hut.

puna tipveu = The cat is going to the hut.

lom fanveui = The farmer is coming from the field.

borro selveu = The child is walking to the meadow.

“The child is walking to the field” is expressed in the foreign language by:

- (A) lom selveui
- (B) lom selveu
- (C) lom fanveu
- (D) puna selveu



Sample question 5: degree of difficulty medium to high

po namal	=	He learns everything.
su ?mal	=	You will learn.
ki ?malna	=	I will learn nothing.
lemal rah malle su	=	Are you learning a lot or a little?
?nafor ak	=	Will we ask everything?

“Will he learn a little?” is expressed in the foreign language by:

- (A) po malle
- (B) ?lemal po
- (C) ?malle po
- (D) po ?lema

Sample question 6: degree of difficulty high

ao tane lom sok bani jo sharuli	=	He spoke on the radio yesterday.
ao hai lom yal bani ao lanta	=	He will learn to program tomorrow.
ao simi kiso jo fesomo ao hai	=	You are sitting at university and learning.
ao rumi lom shili jo fesomo	=	I am listening at university today.

“I speak and listen” is expressed in the foreign language by:

- (A) ao tane shili ao rumi
- (B) shili tane ao rumi
- (C) ao tane lom jo rumi
- (D) tane ao rumi lom

Sample questions

Engineering Module

The Engineering Module is divided in three different subtests. You have a total of 150 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
Formalising Technical Interrelationships	22	60 minutes
Visualising Solids		
- Question type 1	13	30 minutes
- Question type 2	13	
Analysing Technical Interrelationships	22	60 minutes
Total working time		150 minutes



Formalising Technical Interrelationships

In the subtest “Formalising Technical Interrelationships”, you are to transfer technical or scientific facts described verbally into a formulaic presentation and to interrelate the arising parameters to each other.

This test measures your ability to formalise, your deductive and combinatory powers and your ability to use basic mathematical tools of the trade. Deeper knowledge of mathematics and physics is not required to solve the problems – formulae and laws are given but must be used and interrelated correctly.

22 questions in the test, working time 60 minutes

Instructions

Please read the instructions before you start with the examples.

In the following items, the relationships between various technical quantities will be described in a text or a sketch. Your task is to determine the formal relationship between the given quantities.

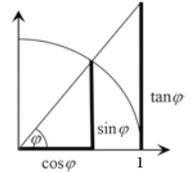
Aids:

- Circumference of a circle: $U = 2\pi r = \pi D$
- Area of a circle: $A = \pi r^2 = \pi \frac{D^2}{4}$
- Circle: degrees: 360° or radians: 2π
- Sphere: the volume of a sphere is $\frac{4}{3} \pi r^3$.
- Average speed: distance divided by time
- Rotational frequency: number of revolutions per time unit (e.g. 10 revolutions per second or $n = 10 \text{ s}^{-1}$)
- Pressure: force divided by surface area
- Torque: force multiplied by lever arm (only applies to right angles)
- A lever is balanced when the magnitudes of the clockwise and counter-clockwise torques are equal.
- Proportionality:
 - The quantities x and y (e.g. weight and volume) of a body are **proportional** to one another ($x \sim y$), when their ratio is a constant.
 - The quantities u and w (e.g. volume and pressure of an ideal gas at a constant temperature) are **inversely proportional** ($u \sim \frac{1}{w}$) to one another, when their product is a constant.

Trigonometry

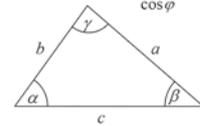
$$\sin^2 \varphi + \cos^2 \varphi = 1, \quad \tan \varphi = \frac{\sin \varphi}{\cos \varphi}, \quad \cot \varphi = \frac{1}{\tan \varphi}$$

φ	0°	30°	45°	60°	90°	120°	150°	180°
$\sin \varphi$ $= \cos(90^\circ - \varphi)$	0	$\frac{1}{2}$	$\frac{\sqrt{2}}{2}$	$\frac{\sqrt{3}}{2}$	1	$\frac{\sqrt{3}}{2}$	$\frac{1}{2}$	0



$$\frac{a}{\sin \alpha} = \frac{b}{\sin \beta} = \frac{c}{\sin \gamma} \quad (\text{Law of sines})$$

$$c^2 = a^2 + b^2 - 2ab \cos \gamma \quad (\text{Law of cosines})$$



The illustrations are merely included as a visualisation aid and are not true to scale.

Sample question 1: degree of difficulty low

A gear mechanism consists of the gears A and B. Gear A has Z_A cogs; Gear B has Z_B cogs. In the time it takes Gear A to complete n_A number of rotations, Gear B completes n_B number of rotations.

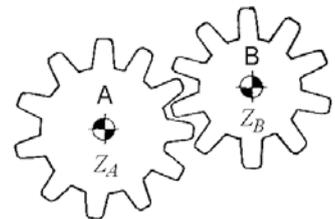
Which of the following equations is correct?

(A) $n_B = \frac{Z_B}{Z_A n_A}$

(B) $n_B = \frac{Z_A n_A}{Z_B}$

(C) $n_B = \frac{Z_A Z_B}{n_A}$

(D) $n_B = \frac{Z_B n_A}{Z_A}$

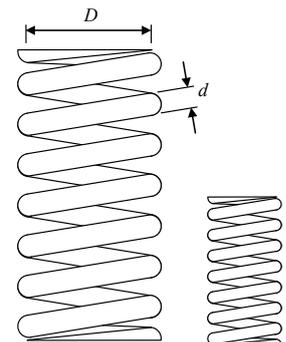


Sample question 2: degree of difficulty low

The stiffness c of a spring depends on the core diameter D , on the wire diameter d , on the number of turns n and the material parameter G – the insertion module. The following applies:

$$c = \frac{G d^4}{8 n D^3}$$

In the case of a second spring made from the same material and with the same number of turns, both the core diameter and the wire diameter are halved.





Which statement is correct?

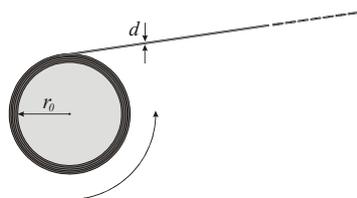
- (A) The stiffness halves.
- (B) The stiffness remains unchanged.
- (C) The stiffness doubles.
- (D) The stiffness quadruples.

Sample question 3: degree of difficulty medium

In a steel mill, sheet steel is rolled onto cylinders at the end of the production process. When empty, the radius of one of these cylinders is r_0 and the cylinder turns at a constant rotation speed n during the rolling process. The thickness of the sheet steel is expressed as d .

Which equation expresses the change in a cylinder's radius r in relation to the time t (in seconds)?

- (A) $r = r_0 + dt$
- (B) $r = (r_0 + nd) t$
- (C) $r = r_0 + ndt$
- (D) $r = r_0 + \frac{nd}{t}$



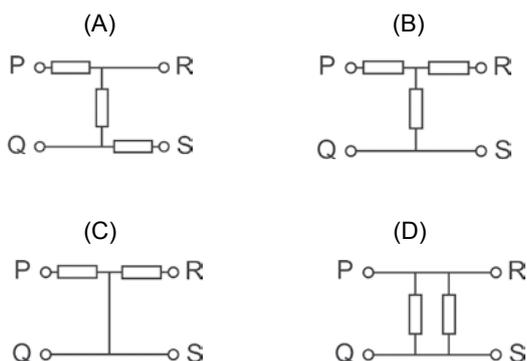
Sample question 4: degree of difficulty medium

A black box with the four terminals P, Q, R and S contains ohmic resistors in an unknown arrangement. It is known that their resistance values are equal. Resistance measurements on the terminals lead to the following results:



- (1) Between Q and S, there is no measurable resistance.
- (2) Between P and Q, 5 Ohms are measured.
- (3) The resistance between P and R is twice as high as that between P and Q.

Which circuit does the black box contain?



Sample question 5: degree of difficulty high

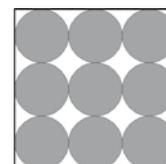
The initial weight of a rocket is W_1 . After the engines are started ($t = 0$), fuel is expelled; the amount of fuel is proportional to time. When the fuel has been burned up, at the point in time T , the engines are turned off. The weight of the rocket has decreased to W_T .

Which of the following equations applies for the rocket weight W at the point in time t in the time interval $0 \leq t \leq T$?

- (A) $W = W_1 - W_T \frac{t}{T}$
- (B) $W = W_1 - W_T t$
- (C) $W = (W_1 - W_T) \frac{t}{T}$
- (D) $W = W_1 - \frac{(W_1 - W_T)}{T} t$

Sample question 6: degree of difficulty high

Inside a square with the surface area $A = 1m^2$, n^2 circles ($n = 1, 2, 3, \dots$) are drawn (see diagram for $n = 3$). The surface area of all the circles drawn is A_n .



Which statement is correct?

- (A) $A_1 < A_2 < A_4 < A_8$
- (B) $A_1 > A_2 > A_4 > A_8$
- (C) $A_1 > A_2 = A_4 > A_8$
- (D) $A_1 = A_2 = A_4 = A_8$



Visualising Solids

In the subtest “Visualising Solids”, you have to infer perspectives of a solid from one given view of the solid. The test measures your spatial sense.

26 questions in the test, 2 question types with 13 questions each, working time 30 minutes



Instructions

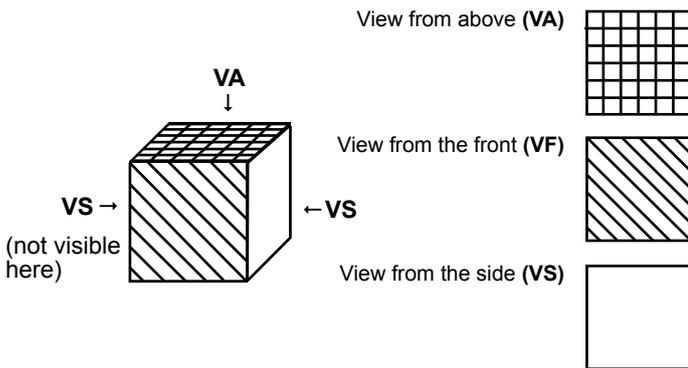
Please read the instructions before you start with the examples.

Question type 1

To solve the following items, you are to visualise the bodies three-dimensionally. In each exercise, the body is shown from two perspectives. You are to identify the view of the same body from a third perspective. Please select the correct solution (A, B, C or D).

The views/perspectives are referred to as follows:

Parallel projection of a cube:



Further pointers:

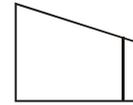
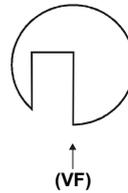
- In the illustrations, all visible edges are depicted as continuous (uninterrupted) lines.
- If the illustration of a view from the side is not accompanied by an arrow → indicating which of the two side views is intended, part of the task is to find that out.
- If, for example, a side view is illustrated to the right of the view from the front or the view from above, it does not necessarily mean that it is a view from the right side.

Sample question 1: degree of difficulty low

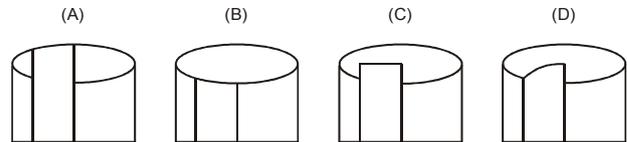
Given: The view of a solid from above and one side view of the same solid

View from above (VA)

View from the side (VS)



Wanted: View from the front (VF) of the solid

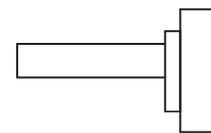
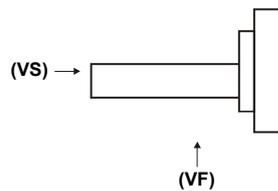


Sample question 2: degree of difficulty low

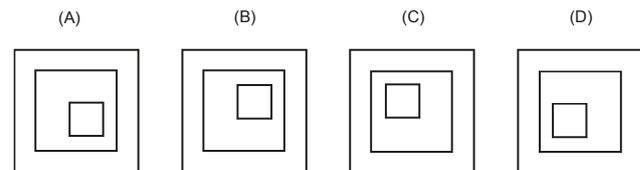
Given: View from above and view from the front of a solid

View from above (VA)

View from the front (VF)



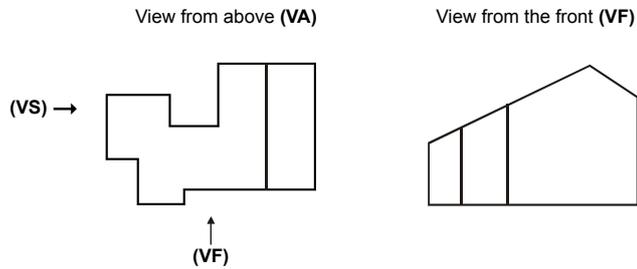
Wanted: View of the same solid from the side (VS) indicated by the arrow



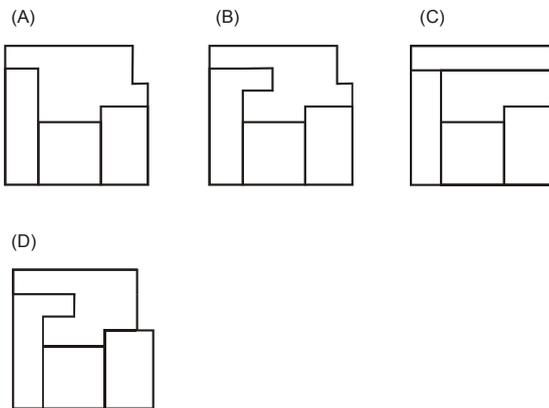


Sample question 3: degree of difficulty medium

Given: The view of a solid from above and the view from the front of the same solid

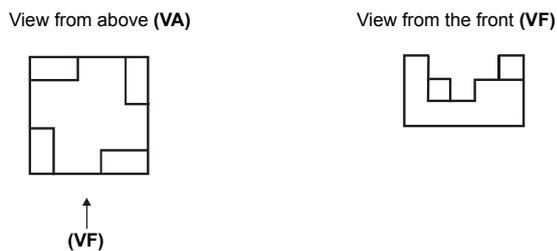


Wanted: View from the side (VS) of the solid indicated by the arrow

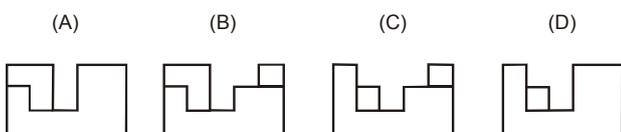


Sample question 4: degree of difficulty medium

Given: View from above and view from the front of a solid

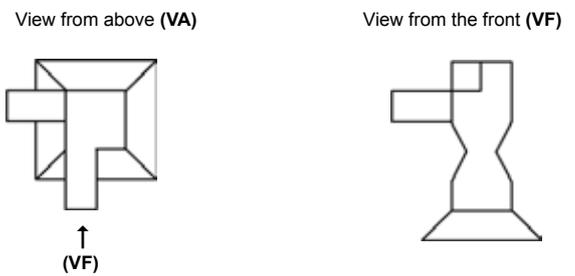


Wanted: View of the same solid from the side (VS)

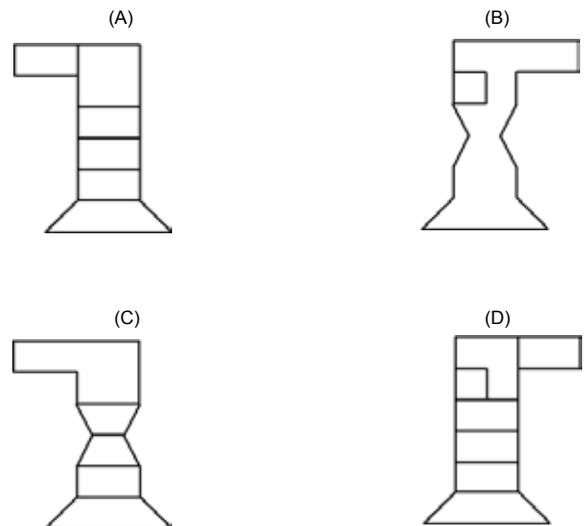


Sample question 5: degree of difficulty high

Given: The view of a solid from above and the view from the front of the same solid

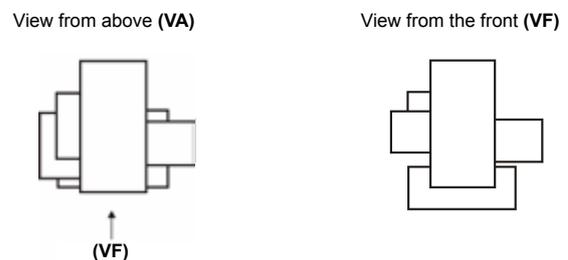


Wanted: View from the side (VS) of the solid

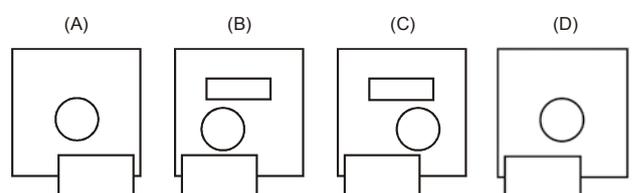


Sample question 6: degree of difficulty high

Given: View from above and view from the front of a solid



Wanted: View of the same solid from the side (VS)

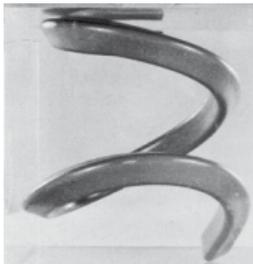




Question type 2

The following items also test your ability to visualise three-dimensional figures. Each item consists of two illustrations showing a transparent cube with one or two cables in its interior. The first illustration (left) always shows the view from the front. In the picture on the right, the same cube is illustrated again. Your task is to determine whether the picture on the right shows that cube from the right (r), left (l), from below (w), above (a) or behind (d).

Example:



Here you see the cube from the front!

- (A) : r
- (B) : l
- (C) : w
- (D) : a
- (E) : d



Here you see the cube from ____?

In the picture on the right, you see the cube from above. On your answer sheet, you would mark the D.

These items can be solved in one of the following two ways:

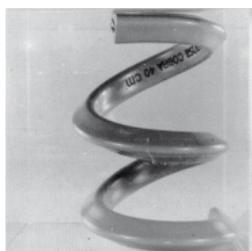
- Imagine that the cube had been placed on a glass table and that you could walk all the way around it. Standing to the right or left of the table, you look at the cube from the right or from the left. If you go behind the table, you look at the cube from behind. If you come back to the front of the table and bend over it, to look at the cube from above, and if you imagine yourself lying down underneath the table, feet first, you see the view from below.
- Or you imagine that you could pick up the cube and turn it around in your hands. If you looked at the cube from the front, i.e. from the position shown in the left-hand illustration, and then tipped it towards you by 90 degrees, not changing your own position at all, then you would see the view from above. If you looked at the cube from the front and then turned it 90 degrees to the right you would see the view from the left. If you turned it from the starting position 90 degrees to the left, you would see it from the right. And if you turned it 180 degrees to the right or left from the starting position you would see it from behind. Finally, if you tipped it backward, you would see it from below.

Sample question 1: degree of difficulty low



Here you see the cube from the front!

- (A) : r
- (B) : l
- (C) : w
- (D) : a
- (E) : d



Here you see the cube from ____?

Sample question 2: degree of difficulty low



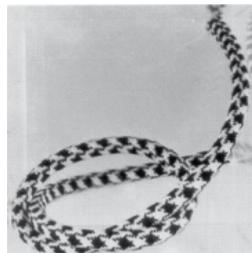
Here you see the cube from the front!

- (A) : r
- (B) : l
- (C) : w
- (D) : a
- (E) : d



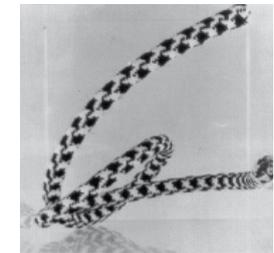
Here you see the cube from ____?

Sample question 3: degree of difficulty medium



Here you see the cube from the front!

- (A) : r
- (B) : l
- (C) : w
- (D) : a
- (E) : d



Here you see the cube from ____?

Sample question 4: degree of difficulty medium



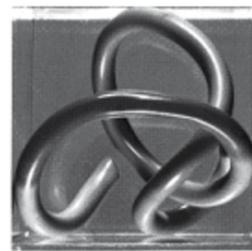
Here you see the cube from the front!

- (A) : r
- (B) : l
- (C) : w
- (D) : a
- (E) : d



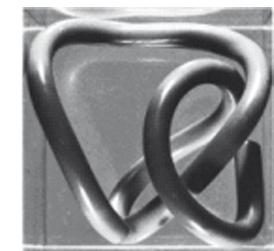
Here you see the cube from ____?

Sample question 5: degree of difficulty high



Here you see the cube from the front!

- (A) : r
- (B) : l
- (C) : w
- (D) : a
- (E) : d



Here you see the cube from ____?

Sample question 6: degree of difficulty high



Here you see the cube from the front!

- (A) : r
- (B) : l
- (C) : w
- (D) : a
- (E) : d



Here you see the cube from ____?



Analysing Technical Interrelationships

In the subtest “Analysing Technical Interrelationships”, you have to analyse and interpret diagrams, charts or tables depicting technical laws or formulae.

The test measures the ability to abstract from scientific and technical facts and to put abstract facts in concrete terms. Knowledge of mathematics, physics or technology is not needed, background information will be provided if necessary.

22 questions in the test, working time 60 minutes



Instructions

Please read the instructions before you start with the examples.

These items contain questions from various technical areas. Your task is to visualize simple technical procedures and recognise technical interrelationships.

Unless otherwise indicated, the axes (scales) of all diagrams are linearly subdivided.

In some of the items, you must identify the “qualitatively” correct diagram. In other words, your task is to decide which graph best represents the relationship between the variables shown. Even the correct diagram will not necessarily be drawn to scale.

Sample question 1: degree of difficulty low

A tank lorry is half full. The pictures show it in three different situations: travelling at a constant speed, braking and accelerating (gaining speed).

Picture 1

Picture 2

Picture 3

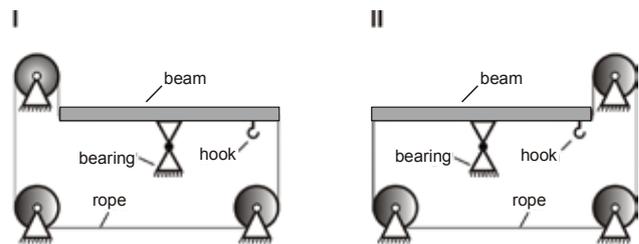


Which assignment of pictures to situations is correct?

	constant speed	braking	accelerating
(A)	Picture 3	Picture 2	Picture 1
(B)	Picture 2	Picture 1	Picture 3
(C)	Picture 1	Picture 2	Picture 3
(D)	Picture 3	Picture 1	Picture 2

Sample question 2: degree of difficulty low to medium

Arrangements I and II each include a beam which is pivot-mounted (like a swing or see-saw). A hook has been mounted on the right end of the beam. The ends of the beam are connected by a rope which is threaded through rolls.



A weight is hung on the hook.

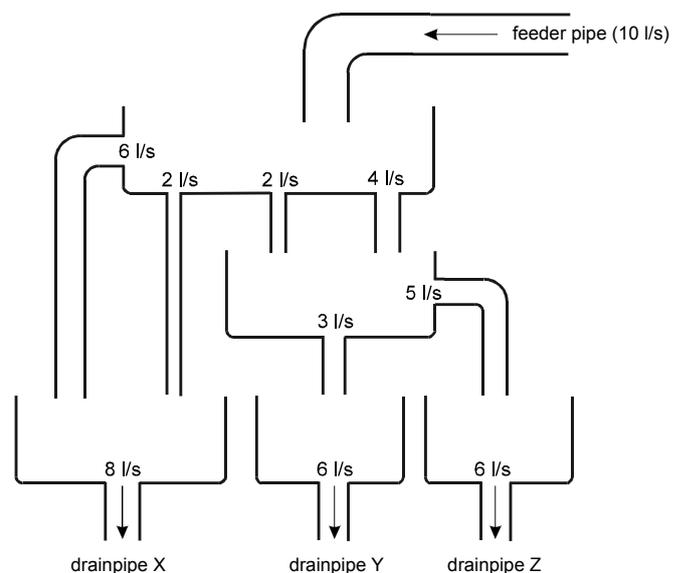
Which of the following statements is or are then correct? (The masses of the beam, rope and hook can be neglected.)

- In the case of arrangement I, the right end of the beam moves downward.
- In the case of arrangement II, the right end of the beam moves downward.

- (A) Only statement I is correct.
 (B) Only statement II is correct.
 (C) Both statements are correct.
 (D) Neither of the two statements is correct.

Sample question 3: degree of difficulty medium

In the system illustrated below, 10 litres of water per second (10 l/s) flow into the system by way of a feeder pipe. The water then flows through surge tanks and drainpipes of differing diameters into the final drainpipes X, Y and Z. For each drainpipe, the illustration shows the maximum amount of water that can flow through it per second.



After one minute, how much water flows out through the three final drainpipes per second?

	Litres of water per second (l/s)		
	Drainpipe X	Drainpipe Y	Drainpipe Z
(A)	8	6	6
(B)	2	3	5
(C)	3	4	3
(D)	4	3	3



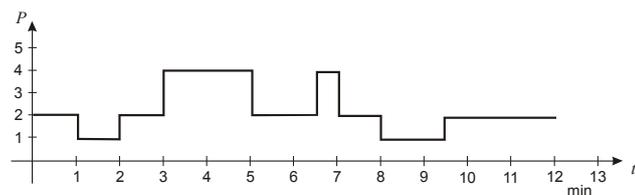
Sample question 4: degree of difficulty medium to high

This diagram shows the power P required by a lift motor in a period of 12 minutes (min).

When the lift travels upward, four times as much power (per minute) is required as when the lift travels downward.

When the lift stops at a floor, twice as much power is required as when the lift travels downward.

The travelling time between two consecutive floors is 30 seconds. At the point in time $t = 0$, the lift is on the third floor.



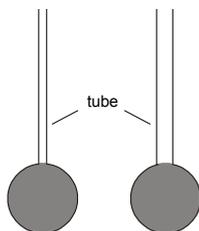
Which of the following statements is or are correct?

- I. Within the 12 minutes shown, the lift travels up to the sixth floor.
- II. At the point in time $t = 10$ min, the lift is on the third floor.

- (A) Only statement I is correct.
- (B) Only statement II is correct.
- (C) Both statements are correct.
- (D) Neither of the two statements is correct.

Sample question 5: degree of difficulty high

The diagram shows two thermometers on which no temperature scales have yet been indicated. They are both filled with the same liquid, and the amount of liquid is also the same. Their tubes are of the same length. However, the tube of the left-hand thermometer has a smaller diameter than that of the right-hand thermometer.



We will assume that the markings for the two temperature scales are added correctly. They begin at the same height on each tube and end at the same height. Both thermometers are used only at temperatures for which they are suitable.

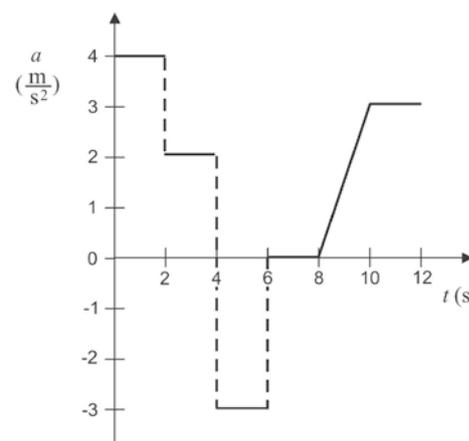
Which of the two statements is or are therefore correct?

- I. Rises in temperature can be measured less accurately with the left-hand thermometer than with the right-hand one.
- II. The right-hand thermometer covers a greater temperature range than the left-hand one.

- (A) Only statement I is correct.
- (B) Only statement II is correct.
- (C) Both statements are correct.
- (D) Neither of the two statements is correct.

Sample question 6: degree of difficulty high

In this diagram, the acceleration a (in m/s^2) of an object is shown as a function of the time t (in s). At $t = 1$, the speed of the object is positive.



Which of the following statements is or are correct?

- I. At $t = 3$, the object is moving faster than at $t = 1$.
- II. At $t = 7$, the object is not moving.

- (A) Only statement I is correct.
- (B) Only statement II is correct.
- (C) Both statements are correct.
- (D) Neither of the two statements is correct.

Sample questions

Mathematics, Computer Science and Natural Sciences Module

The Mathematics, Computer Science and Natural Sciences Module is divided in two different subtests. You have a total of 145 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
Analysing Scientific Interrelationships	22	60 minutes
Understanding Formal Depictions	22	85 minutes
Total working time		145 minutes



Analysing Scientific Interrelationships

The subtest “Analysing Scientific Interrelationships” presents texts and illustrations with natural sciences content on which questions are then posed.

This test measures how well people can grasp and analyse simple natural sciences topics. It is also a matter of recognising interrelationships, separating important data from unimportant data and drawing the right conclusions from the presented information. Relevant background information is provided.

22 questions in the test, working time 60 minutes



Instructions

Please read the instructions before you start with the examples.

These items contain questions from various fields of science. You are to picture various scientific processes and recognise scientific interrelationships.

Unless otherwise specified, the axes (scales) in the diagrams are linearly subdivided.

In several items, you are asked to identify the “qualitatively” correct diagram. In these cases, decide which diagram shows the curve that best expresses the circumstances described. Even the correct diagram may not be drawn in numerically precise manner.

Sample question 1: degree of difficulty low

An experiment is conducted on three plants of the same species:

- Plant 1 is not treated.
- The tip of the main shoot of plant 2 is cut off.
- The tip of the main shoot of plant 3 is cut off. Afterwards a phytohormone is applied to the cut surface on the plant.

The plants are now placed under observation:

- The main shoot and the side shoots on plant 1 grow.
- The main shoot on plant 2 does not grow. The side shoots grow.
- The main shoot on plant 3 grows. The side shoots do not grow.



These results are generally applicable to this species of plant.

Which of the following statements is or are correct?

- The phytohormone promotes the growth of the main shoot of this plant species.
 - The phytohormone hinders the growth of the side shoots of this plant species.
- (A) Only statement I is correct.
 (B) Only statement II is correct.
 (C) Both statements are correct.
 (D) Neither of the two statements is correct.

Sample question 2: degree of difficulty low to medium

The peptide X consists of a chain of 10 amino acids. Each amino acid is designated by three letters (for example: “Trp”). The sequence of the amino acids is shown from left to right. One end of the peptide is formed by the amino acid Gly, the other end by the amino acid Leu.

With the enzyme Ch, the peptide X is split behind the amino acids Tyr and Trp. The following four parts come about as a result:

- Lys – Gly
- Leu – Ala – Tyr
- Lys – Gly – Trp
- Arg – Tyr

With the enzyme Tr, the peptide X is split behind the amino acids Arg and Lys. The following four parts come about as a result:

- Gly – Trp – Arg
- Tyr – Lys
- Gly
- Leu – Ala – Tyr – Lys

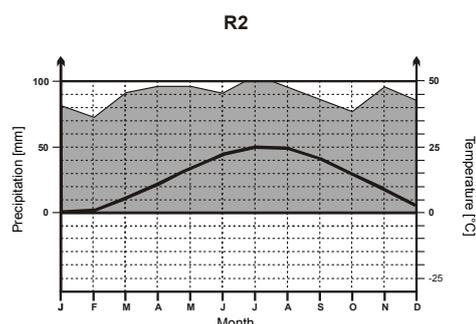
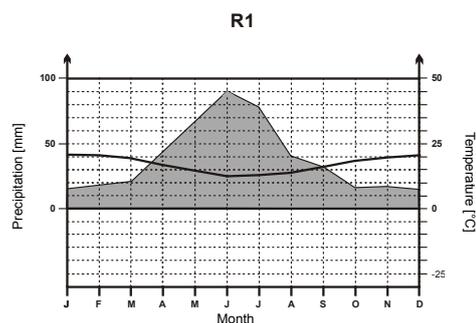
What is the structure of peptide X?

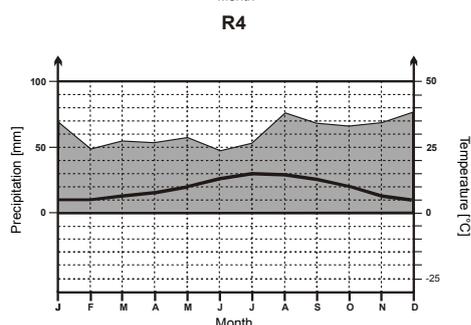
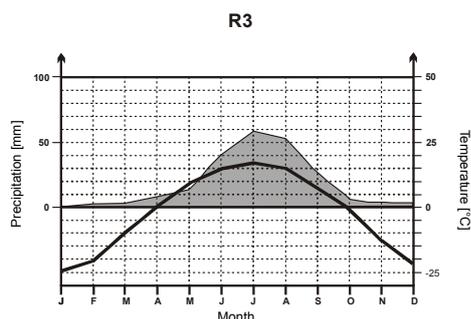
- (A) Leu – Ala – Tyr – Arg – Tyr – Lys – Gly – Trp – Lys – Gly
 (B) Gly – Trp – Arg – Leu – Ala – Tyr – Lys – Tyr – Lys – Gly
 (C) Leu – Ala – Tyr – Lys – Arg – Tyr – Lys – Gly – Trp – Gly
 (D) Leu – Ala – Tyr – Lys – Gly – Trp – Arg – Tyr – Lys – Gly

Sample question 3: degree of difficulty medium

The climate of a certain region is described in terms of the average monthly temperatures (in °C) and the average monthly amount of precipitation (rain in mm).

The illustrations below show climate charts of four different regions (R1 to R4).



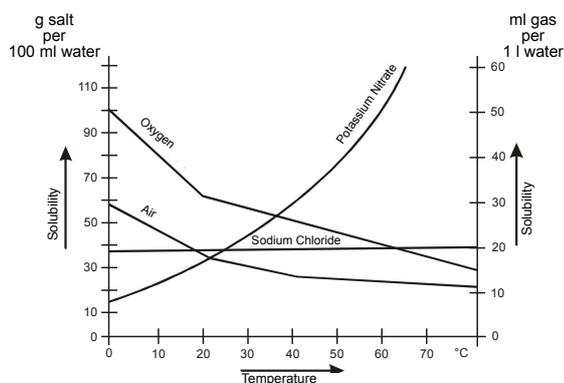


Which of the two statements is or are correct?

- I. The annual precipitation is greater in region R1 than in region R4.
 - II. At least one of the four regions is located south of the equator.
- (A) Only statement I is correct.
 (B) Only statement II is correct.
 (C) Both statements are correct.
 (D) Neither of the two statements is correct.

Sample question 4: degree of difficulty medium

The diagram shows how the solubility of substances in water is dependent on temperature. Potassium nitrate and sodium chloride are salts (shown as grams of salt per 100 millilitres of water). Oxygen and air are gases (shown as millilitres of gas per 1 litre of water).



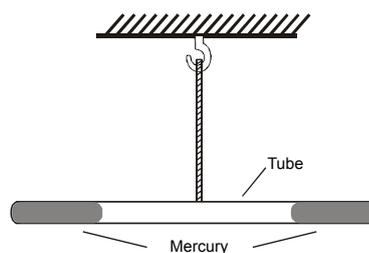
Which of the following two statements is or are correct?

- I. 60 g of potassium nitrate does not fully dissolve in 100 ml of water at 50°C.
- II. Within a temperature range of 0°C to 20°C, the solubility of oxygen is more dependent on temperature than in the temperature range from 20°C to 80°C.

- (A) Only statement I is correct.
 (B) Only statement II is correct.
 (C) Both statements are correct.
 (D) Neither of the two statements is correct.

Sample question 5: degree of difficulty high

A closed tube is hung up so that it is in a balanced state. Both ends are filled with mercury; the space between is filled with air.



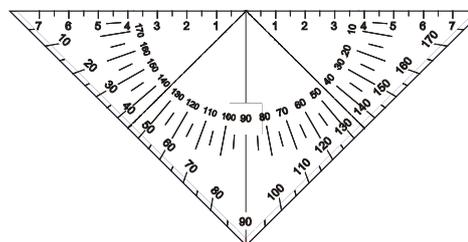
The mercury on the right side of the tube is now heated.

Which of the two statements on the impact of this heating action is or are correct? (Please note: the weight of the air in the tube is to be ignored.)

- I. The left side will go down.
 - II. The right side will become lighter.
- (A) Only statement I is correct.
 (B) Only statement II is correct.
 (C) Both statements are correct.
 (D) Neither of the two statements is correct.

Sample question 6: degree of difficulty high

A set square comprises a ruler and an angle gauge (a scale for measuring angles). This particular set square consists of a material which has expanded homogeneously by 1 percent in all lengths since it (the set square) was manufactured.



Which of the two statements is or are correct?

- I. When measuring length, the values shown by the ruler are too small.
 - II. The circumference of the set square has increased by 3 percent.
- (A) Only statement I is correct.
 (B) Only statement II is correct.
 (C) Both statements are correct.
 (D) Neither of the two statements is correct.



Understanding Formal Depictions

The subtest “Understanding Formal Depictions” involves transposing information from a text into a diagrammatic illustration (“flow chart”) and vice versa.

This test, in one respect, measures the ability to transpose concrete natural sciences content into models and the ability to think in terms of formalised systems. In another respect, it measures critical thinking skills in the sense that the information provided has to be checked for correctness. What is more, this subtest seeks to verify the existence of a basic understanding of natural sciences.

22 questions in the test, working time 85 minutes



Instructions

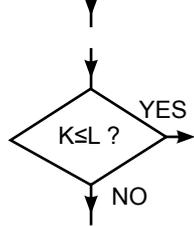
Please read the instructions before you start with the examples.

In this group of items, a process or a model has to be transferred to a flow chart or a given flow chart has to be analysed.

The flow charts can contain the following elements:



Beginning of the process

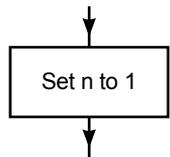


Decision point: The further process depends on the answer given to the question set here.

Example: If the question “ $K \leq L$?” is answered with “YES”, then the “path” marked “YES” has to be followed.

If the question “ $K \leq L$?” is answered with “NO”, then the “path” marked “NO” has to be followed.

(The answer to the question “ $K \leq L$?” is “YES” if quantity K is smaller than quantity L, or if both quantities are of equal size. The answer is “NO” if K is larger than L.)



Operation that is carried out, or an alternative that is selected. In the example, “n” is set to 1.

Examples of notation:

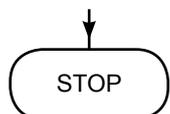
$M := 2$ M is allocated a value of 2.

$M := M + 1$ The value of M is increased by 1.

$M := M - N$ The value of M is decreased by the value of N.



Joining together: Two “paths” are joined together to form a joint “path”.

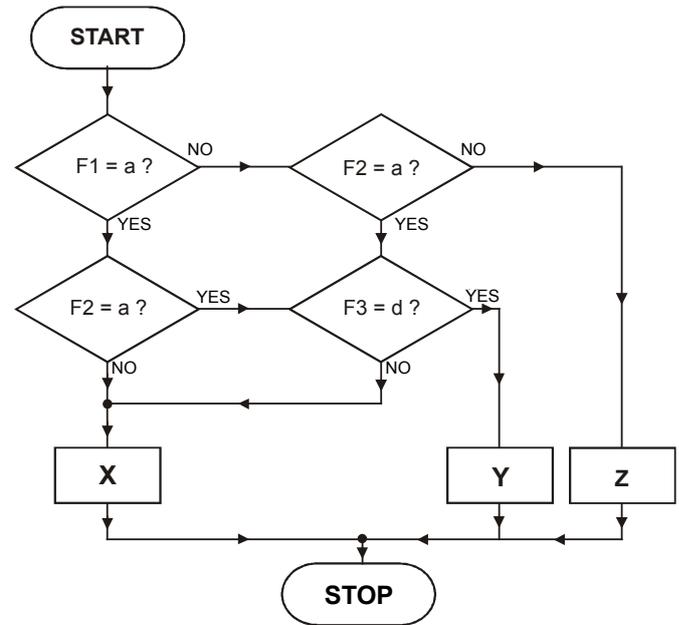


End of the process

Text and flow chart for sample questions 1 and 2

A decision between X, Y, and Z depends on the factors F1, F2, and F3.

F1 may take the value a or b, F2 may take the value a or b, and F3 may take the value c or d. The flow chart shows how the decision is taken.



Sample question 1: degree of difficulty low

Which of the following statements is or are correct?

- I. If $F1 = a$, then X is always selected.
 - II. If $F2 = b$, then X is always selected.
- (A) Only statement I is correct.
 (B) Only statement II is correct.
 (C) Both statements are correct.
 (D) Neither of the two statements is correct.

Sample question 2: degree of difficulty medium

Which of the following statements is or are correct?

- I. If $F3 = c$, then X is always selected.
 - II. If $F2 = a$, then Z is never selected.
- (A) Only statement I is correct.
 (B) Only statement II is correct.
 (C) Both statements are correct.
 (D) Neither of the two statements is correct.

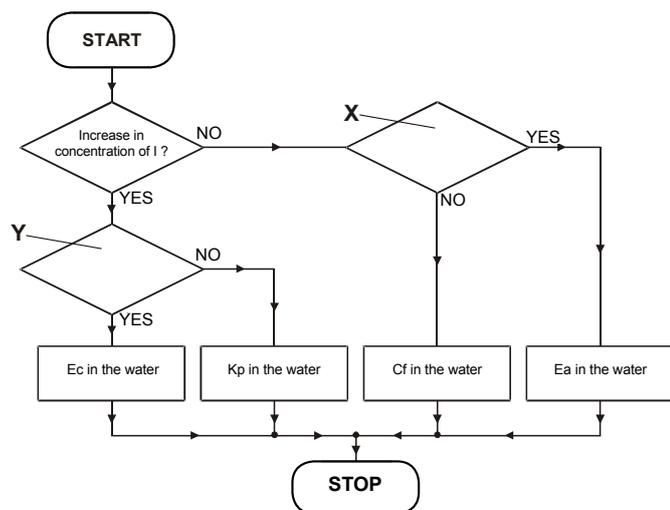


Text and flow chart for sample questions 3 and 4

Water may contain bacteria. Bacteria produce substances which can be traced in water. If the concentration of these substances is increased, one can draw the conclusion that the water contains bacteria.

The bacteria Ec and Kp produce indol (I). The bacteria Cf and Ec produce acid (S). The bacteria Ea and Kp produce acetoin (A).

If one has a water sample which contains exactly one type of bacteria, this bacteria type can be detected by conducting a test. The flow chart shows how the test is conducted.



Sample question 3: degree of difficulty low

Which of the following statements is or are correct?

- I. If decision point Y is labelled "Increase in concentration of S?", the flow chart may be correct.
 - II. If decision point X is labelled "Concentration of A normal?", the flow chart may be correct.
- (A) Only statement I is correct.
 (B) Only statement II is correct.
 (C) Both statements are correct.
 (D) Neither of the two statements is correct.

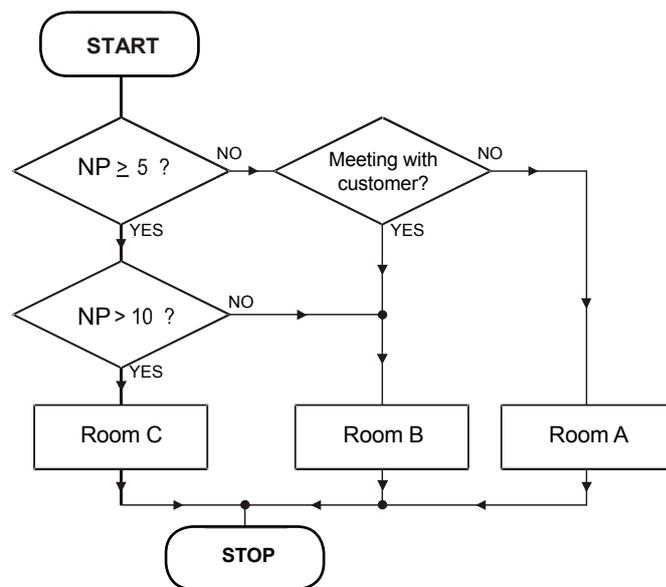
Sample question 4: degree of difficulty medium to high

Which of the following statements is or are correct?

- I. If decision point Y is labelled "Increase in concentration of A?", the flow chart may be correct.
 - II. If decision point X is labelled "Concentration of S normal?", the flow chart may be correct.
- (A) Only statement I is correct.
 (B) Only statement II is correct.
 (C) Both statements are correct.
 (D) Neither of the two statements is correct.

Text and flow chart for sample questions 5 and 6

A business consulting company has three rooms, A, B, and C, available for meetings. Room A is the smallest and seats a maximum of 4 people. Room B seats 10 people. Room C is the largest and seats 30 people. The flow chart shows how a choice is made between the three rooms. "NP" = number of people.



Sample question 5: degree of difficulty medium to high

Which of the following two statements is or are correct?

- I. If customers are taking part in the meeting, then Room B is always chosen.
 - II. If no customers are taking part in the meeting, then the smallest room with enough space for the participants is always chosen.
- (A) Only statement I is correct.
 (B) Only statement II is correct.
 (C) Both statements are correct.
 (D) Neither of the two statements is correct.

Sample question 6: degree of difficulty high

Which of the following two statements is or are correct?

- I. If there are 10 participants, Room B is always chosen.
 - II. Room B is only chosen if the number of people is between 5 and 10.
- (A) Only statement I is correct.
 (B) Only statement II is correct.
 (C) Both statements are correct.
 (D) Neither of the two statements is correct.

Sample questions

Economics Module

The Economics Module is divided in two different subtests. You have a total of 150 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
Analysing Economic Interrelationships	22	65 minutes
Analysing Processes	22	85 minutes
Total working time		150 minutes



Analysing Economic Interrelationships

In the subtest “Analysing Economic Interrelationships”, you are to analyse and interpret economic diagrams, charts and tables. This test measures mainly your ability to differentiate between relevant and unimportant data and to draw the correct conclusion from the information given. Background information will be provided if necessary.

22 questions in the test, working time 65 minutes



Instructions

Please read the instructions before you start with the examples.

In the following items, economic interrelationships are depicted in a graph or table. Your task is to analyse these interrelationships and interpret them correctly.

For each item, choose the correct answer (A, B, C or D).

General recommendations on taking the “Analysing Economic Interrelationships” subtest:

In this test you will encounter various types of illustrations: curve graphs (cf. sample question 4), column or bar graphs (cf. sample question 5), pie graphs (cf. sample question 1) and tables.

In curve and column graphs, pay special attention to the units with which the axes are marked. In the simplest case, you will find absolute numbers (e.g. the number of residents or the price in Euros). But sometimes the axis will represent percentages (e.g. the percentage of the population of a country). In the latter case, it is difficult to keep track of the overall number to which the percentage refers. Ten percent of the U.S. population is naturally a greater number of persons than ten percent of the population of Germany.

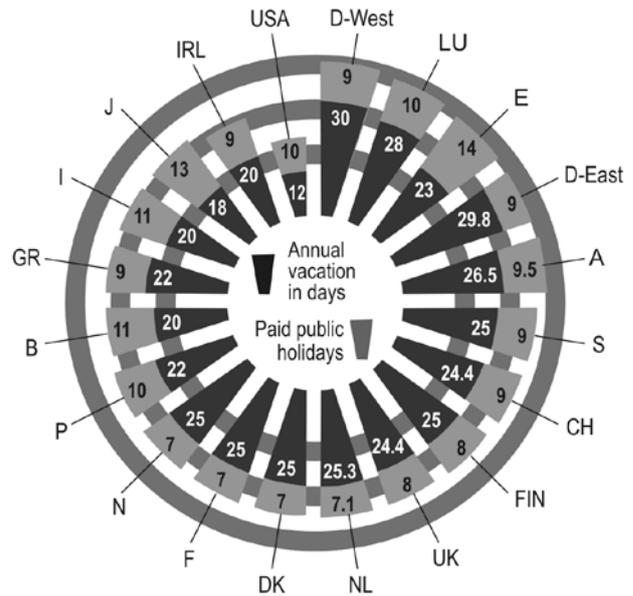
Experience has shown that graphs depicting percentage changes (cf. Item 5) are particularly difficult.

As a little exercise, check Statements III and IV against the graph in sample question 5:

- Statement III: In the first quarter of 2001, the earnings were greater than in the second quarter of 2001.
The statement may appear correct at first sight. But be careful: The statement cannot be evaluated on the basis of the graph, since it would be wrong to compare the bars with one another (cf. above). It is entirely possible that the earnings in 2/2001 were greater than in 1/2001; but it is also possible that they were smaller. Since we do not know the answer, the statement is incorrect.
- Statement IV: In the fourth quarter of 2003, the earnings were smaller than in the fourth quarter of 2000.
This statement is incorrect. In 4/2001, the earnings were one percent greater than in 4/2000. In 4/2002, they were about 0.5 percent greater than in 4/2001, and in 4/2003, they were slightly lower than in 4/2002. Altogether, the earnings in 4/2003 were therefore more than one percent greater than in 4/2000.

Sample question 1: degree of difficulty low

Annual vacation (in days) and paid holidays of employees in various countries



Which of the following statements is or are correct?

- There is no country with fewer annual vacation days than the USA.
 - Of all countries, Spain (E) has the greatest number of paid holidays.
- (A) Only statement I is correct.
 (B) Only statement II is correct.
 (C) Both statements are correct.
 (D) Neither of the two statements is correct.

Sample question 2: degree of difficulty medium

The diagram shows the number of employees and the turnover of big German companies in 1997.

Company	Employees		Turnover	
	worldwide	thereof abroad	worldwide (in million DM)	thereof abroad
Siemens	379,000	46 %	94,180	61 %
Volkswagen	260,811	47 %	100,123	64 %
Bosch	176,481	47 %	41,146	61 %
Hoechst	147,862	63 %	50,927	82 %
Bayer	142,200	60 %	48,608	82 %
BMW	116,112	45 %	52,265	72 %
BASF	103,406	41 %	48,776	73 %
VIAG	88,014	47 %	42,452	50 %



Which of the following statements is or are correct?

- I. In 1997, VIAG in Germany had a higher turnover than BASF.
 - II. In 1997, Siemens had a higher worldwide turnover per employee than BMW.
- (A) Only statement I is correct.
 - (B) Only statement II is correct.
 - (C) Both statements are correct.
 - (D) Neither of the two statements is correct.

Sample question 3: degree of difficulty medium

The illustration shows the development of the US Dollar/Euro exchange rate from the beginning of April 2004 to the beginning of April 2005. It shows how many US Dollars one Euro was worth. The value of the dollar in Euros can easily be calculated.

Development of the US Dollar/Euro Exchange Rate



Which of the following statements is or are correct?

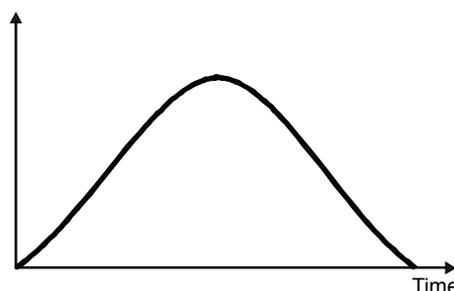
- I. The value of the Euro (in US Dollars) increased by ten percent from April to the end of October 2004.
 - II. Anyone who exchanged 1,000 Euros for dollars at the end of November 2004 received more than 1,000 Euros when re-exchanging the money at the end of March 2005.
- (A) Only statement I is correct.
 - (B) Only statement II is correct.
 - (C) Both statements are correct.
 - (D) Neither of the two statements is correct.

Sample question 4: degree of difficulty high

The first diagram on the right shows the development in the number of people testing a new product for the first time.

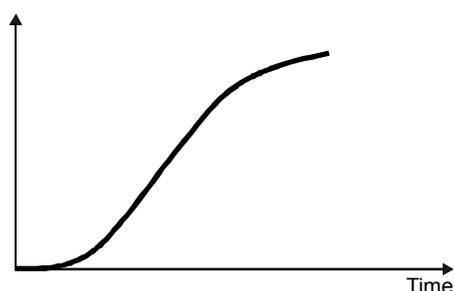
Which diagram shows the development in the number of people who have already tested the product at least once?

Number of people



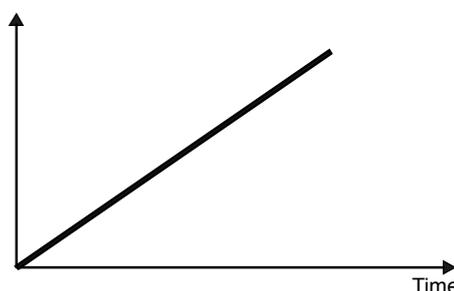
(A)

Number of people



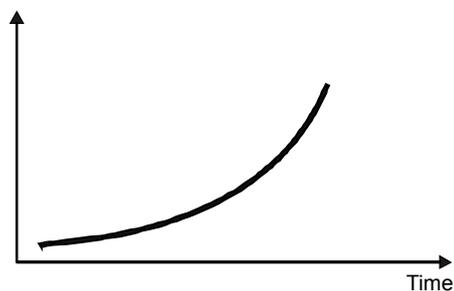
(B)

Number of people



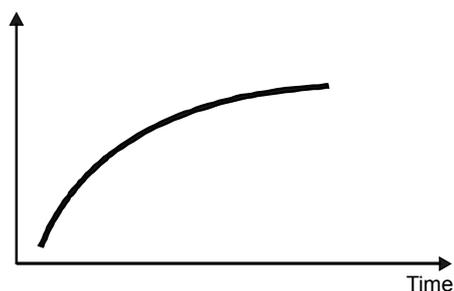
(C)

Number of people



(D)

Number of people

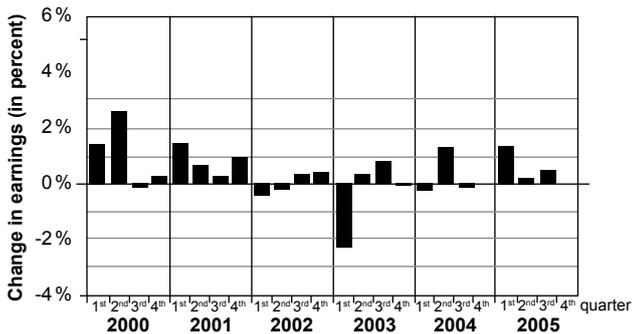




Sample question 5: degree of difficulty high

The illustration shows the change in earnings in commerce from the beginning of 2000 to the end of 2005. For each year, the chart shows the percentage by which the earnings changed in the first, second, third and fourth quarters of the year in comparison to the same quarter of the previous year.

Change in Earnings in commerce (in each case: the change with regard to the same quarter of the previous year)



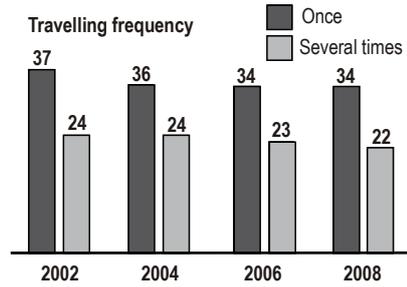
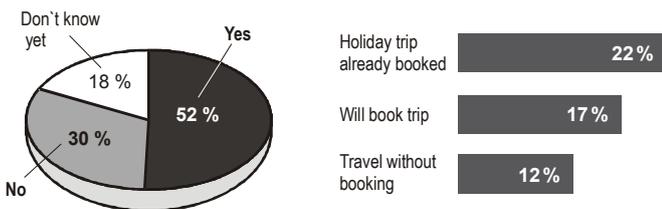
Which of the following statements is or are correct?

- I. In the first quarter of 2003, the earnings were more than two percent lower than the earnings in the first quarter of 2002.
 - II. In the fourth quarter of 2004, the earnings were exactly as high as in the fourth quarter of 2003.
- (A) Only statement I is correct.
 - (B) Only statement II is correct.
 - (C) Both statements are correct.
 - (D) Neither of the two statements is correct.

Sample question 6: degree of difficulty high

The diagrams show the results of a survey conducted in Germany at the start of 2009. People were asked whether they had planned a holiday trip for 2009. The third diagram shows the percentage of Germans who took a holiday trip once or several times in the last few years.

Are you planning a holiday trip for 2009?



Which of the following statements is or are correct?

- I. On average, more Germans took a holiday trip in 2002 than in 2008.
 - II. Of those Germans who had planned a trip for 2009, over 40% had already booked a holiday trip at the time the survey was conducted.
- (A) Only statement I is correct.
 - (B) Only statement II is correct.
 - (C) Both statements are correct.
 - (D) Neither of the two statements is correct.



In the subtest “Analysing Processes”, you are to formalise sequences of events and analyse flow charts.

This test measures mainly the ability to convert concrete economic facts into models and to think within the context of formalised systems. It also measures critical thought in the sense that given facts are tested for correctness and not accepted as true a priori.

22 questions in the test, working time 85 minutes

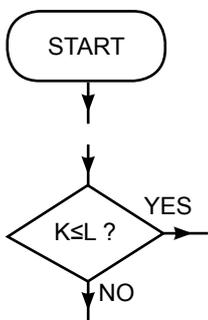


Instructions

Please read the instructions before you start with the examples.

In this group of items, a process or a model has to be transferred to a flow chart or a given flow chart has to be analysed.

The flow charts can contain the following **elements**:



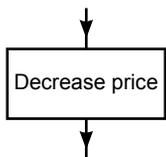
Beginning of the process

Decision point: The further process depends on the answer given to the question set here.

Example: If the question “ $K \leq L$?” is answered with “YES”, then the “path” marked “YES” has to be followed.

If the question “ $K \leq L$?” is answered with “NO”, then the “path” marked “NO” has to be followed.

(The answer to the question “ $K \leq L$?” is “YES” if quantity K is smaller than quantity L , or if both quantities are of equal size. The answer is “NO” if K is larger than L .)



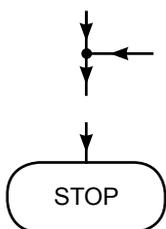
Operation that is carried out, or an alternative that is selected. In the example, the price is decreased.

Examples of notation:

$M = 2$ M is allocated a value of 2.

$M = M + 1$ The value of M is increased by 1.

$M = M - N$ The value of M is decreased by the value of N .



Joining together: Two “paths” are joined together to form a joint “path”.

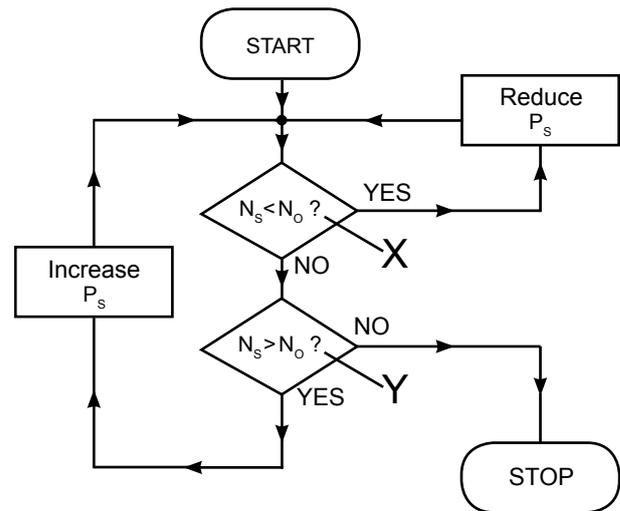
End of the process

Text and flow chart for sample questions 1 and 2

In the case of a certain product, the number sold per day, N_s , increases, the lower the sales price P_s . Conversely, the higher the P_s , the lower the N_s .

A company employee has determined that it is optimal for the company when the number of pieces sold per day is N_o .

The flow chart shows a strategy which is to lead to the number sold per day amounting to N_o at the end (“STOP”).



Sample question 1: degree of difficulty low

Which of the two statements about the strategy is or are correct?

- I. If not enough pieces are sold, the sales price is – correctly – reduced.
- II. It can happen that a sales price which is already too low is further reduced.

- (A) Only statement I is correct.
- (B) Only statement II is correct.
- (C) Both statements are correct.
- (D) Neither of the two statements is correct.

Sample question 2: degree of difficulty medium

Which of the two statements is or are correct, when the contents of decision points X and Y are exchanged?

- I. A correct price is reduced.
- II. A price which is too high is further increased.

- (A) Only statement I is correct.
- (B) Only statement II is correct.
- (C) Both statements are correct.
- (D) Neither of the two statements is correct.

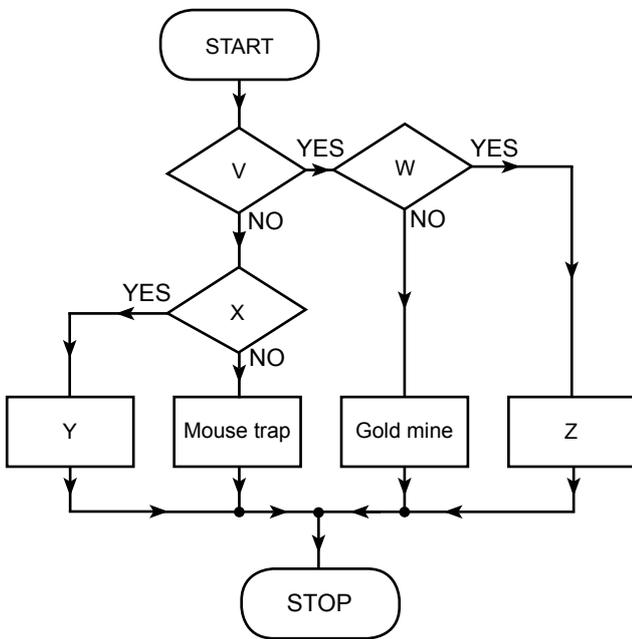


Text and flow chart for sample questions 3 and 4

Markets (for example the automobile market in Germany) have an entry barrier and an exit barrier. The entry barrier supplies information as to how difficult it is for a new provider to enter the market – for example to sell cars in Germany. The exit barrier supplies information as to how difficult it is to exit (leave) the market again.

- “flea market”: low entry barrier, low exit barrier
- “mouse trap”: low entry barrier, high exit barrier
- “gold mine”: high entry barrier, low exit barrier
- “gilded cage”: high entry barrier, high exit barrier

Complete the flow chart in such a way that it assigns each market to the correct position.



Sample question 3: degree of difficulty medium

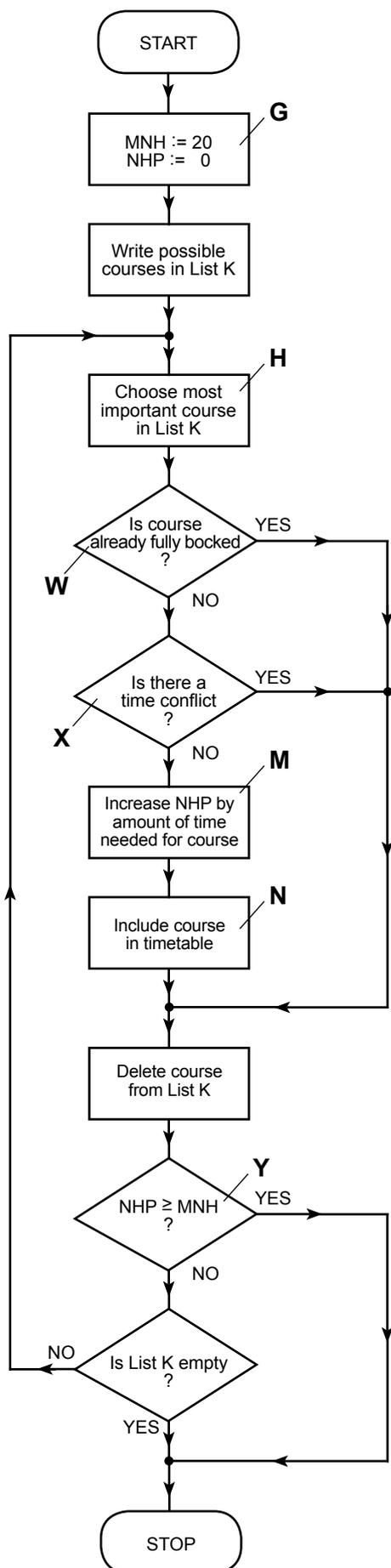
Which of the two statements is or are correct?

- I. Decision point V could read: “Exit barrier high?”
 - II. Element Y could read: “Gilded cage”
- (A) Only statement I is correct.
 - (B) Only statement II is correct.
 - (C) Both statements are correct.
 - (D) Neither of the two statements is correct.

Sample question 4: degree of difficulty medium to high

Which of the two statements is or are correct?

- I. Decision point V could read: “Entry barrier low?”
 - II. Decision point X could read the same as decision point W.
- (A) Only statement I is correct.
 - (B) Only statement II is correct.
 - (C) Both statements are correct.
 - (D) Neither of the two statements is correct.



Text and flow chart for sample questions 5 and 6

University entrant Schmidt is writing his timetable for his first semester.

The flow chart shows how he proceeds.

MNH: Maximum number of hours that Schmidt has time for courses each week.

NHP: Number of hours that Schmidt has already planned in for courses each week.

“fully booked”: a course is fully booked when no more places are free.

“time conflict”: The course Schmidt has to decide about takes place at the same time as a course already in the timetable.

Sample question 5: degree of difficulty high

Which of the following statements is or are correct?

- I. It is possible that Schmidt includes a course in the timetable for which he does not have enough time.
- II. It is possible that Schmidt includes a course in the timetable that is less important than a course that has not been included.

- (A) Only statement I is correct.
- (B) Only statement II is correct.
- (C) Both statements are correct.
- (D) Neither of the two statements is correct.

Sample question 6: degree of difficulty high

Which of the following statements is or are correct?

- I. If there is a time conflict between two courses which both still have free places, then Schmidt always chooses the more important course.
- II. If decision point Y is eliminated, then Schmidt always plans in more than twenty hours per week.

- (A) Only statement I is correct.
- (B) Only statement II is correct.
- (C) Both statements are correct.
- (D) Neither of the two statements is correct.