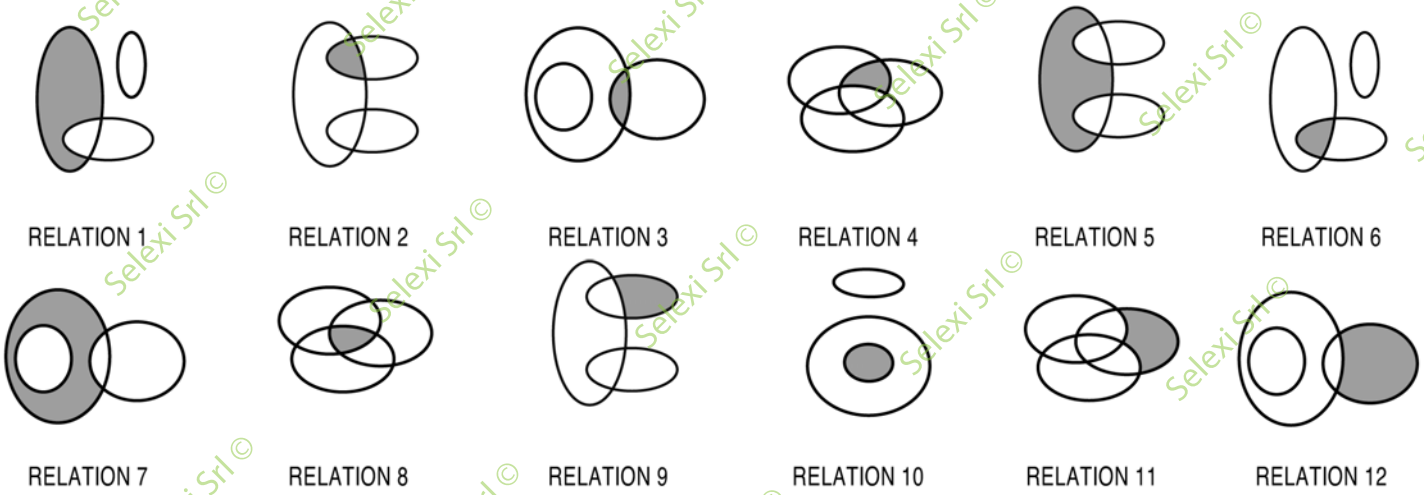
This is a Guide to the logic items appearing in the Database published by the Università Cattolica del Sacro Cuore for the preparation for the Admission Test to the Medicine and Surgery Degree Course.
The Guide contains some exercises about the main subjects, provided with the operating methods to solve them both quickly and correctly.
The given explanations are a useful aid to improve your logical skills in preparation for the official test to be held on 28 January 2016.

DIAGRAM RY 02



1 Answer the following question concerning DIAGRAM RY 02

The three terms "Numbers between 1 and 22, Numbers between 5 and 11, Even numbers divisible by 7" are connected by a specific set relation. Within this relation, "4" can be found in the black part of:

A) relation 7
B) relation 3
C) relation 8
D) relation 1
E) relation 6

The exercise is aimed at finding the set relation existing between given terms and at indicating the diagram which correctly represents the considered relation.
In order to find the solution it is necessary to consider the three elements from the set theory point of view: the set of numbers included between 1 and 22 contains the whole set of numbers between 5 and 11. Therefore the latter will be completely inscribed in the first one. It follows that the solution must be found among Diagrams 3, 7, 10 and 12. All the other diagrams can be already excluded. Next we can examine the third set to determine its relation with the first two sets: the first one includes even numbers divisible by 7, such as 14; the second one doesn't include even numbers divisible by 7. It follows that the first and the third set have an intersection area, while the second and the third don't. The solution is provided by a diagram in which there is a set (numbers between 1 and 22) that contains the whole of another set (numbers between 5 and 11) and at the same time intersects with the third set (even numbers divisible by 7). The latter must be, however, disjoint from the second set.
The Diagram which correctly represents the three relations could be diagram 3, 7 or 12 (which is, however, not in the answer list).
Number 4 is contained in the set of even numbers between 1 and 22 but it does not belong either to the second one or to the third one. The only darkened part in which number 4 could be placed is therefore the one in Diagram 7, which is the correct answer.

2 **Which, among the terms given, correctly complete the following verbal proportion? Tie : neck = X : Y**

A) X = watch; Y = wrist
B) X = shoes; Y = shoe polish
C) X = bag; Y = shoes
D) X = bag; Y = backpack
E) X = trousers; Y = belt

Verbal proportions can be solved in the same way as numerical proportions, having the same symbology. The logical ratio linking the two terms of the first member position has to be identically replicated between the two terms of the second member position. The option indicated as correct is the only one that links two elements with the same logical rule of the first member of the given proportion: the tie is put around the neck as the clock is put on the wrist.

3 **Which, among the terms given, correctly completes the following verbal proportion? Swallow : bird = dolphin : X**

A) X = mammal
B) X = shellfish
C) X = fish
D) X = whale
E) X = sparrow

Verbal proportions can be solved in the same way as numerical proportions, having the same symbology. The logical ratio linking the two terms of the first member position has to be identically replicated between the two terms of the second member position. The option indicated as correct is the only one that links two elements with the same logical rule of the first member of the given proportion: the swallow is a bird just as the dolphin is a mammal.

4 **“All postmen are cheerful. Patrick is a motorcyclist. All motorcyclists are cheerful”. On the basis of these statements, which o the following is NOT necessarily true?**

A) Patrick is a postman
B) Patrick is cheerful
C) Those who are not cheerful are not postmen
D) There are no sad motorcyclists
E) Some postmen may be motorcyclists

The given condition is that both postmen and motorcyclists are cheerful. So there cannot be either postmen or motorcyclists that are not cheerful. Patrick is a motorcyclist, so he is cheerful, but it isn't necessarily true that he is also a postman. It isn't excluded (so it is possible, but not sure) that some postmen are also motorcyclists.

5 **“If you practice on the computer diligently, then you will pass the final test for the European Computer Driving Licence. Only if you pass the final test for the European Computer Driving Licence can you obtain the European Computer Driving Licence”. If these statements are true, which of the following is certainly NOT true?**

A) If you obtained the European Computer Driving Licence, then you practiced on the computer diligently
B) If you do not pass the last test for the European Computer Driving Licence, then you did not practiced on the computer diligently
C) Practicing on the computer is the sufficient condition to pass the last test for the European Computer Driving Licence
D) If you obtained the European Computer Driving Licence, then you passed the last test for the European Computer Driving Licence
E) Passing the last test for the European Computer Driving Licence is the necessary condition for obtaining the European Computer Driving Licence

Diligently practicing on the computer is a sufficient but not necessary condition to pass the final examination of the European Computer Driving Licence: the final exam of the European Computer Driving Licence can be passed even if you do not practice on the computer diligently. Passing the final examination is necessary condition to obtain the relative certification. In other words, if you fail the final exam, you won't be able to obtain the European Computer Driving Licence. If you obtain it, it means that the final exam has been passed, but not necessarily by practicing on the computer diligently. So the statement which is NOT certainly true is the following: "If you obtained the European Computer Driving Licence, then you practiced on the computer diligently".

6 **"If O then H and if H then M and only if M then N". If this statement is true, then it is certainly true that:**

A) if not M then not O
B) if N then O
C) if M then O
D) if N then H
E) if not N then not M

The sequence of true logical implications is: "O implicates H", "H implicates M" and "N implicates M" (because the text states that "If O then H", "If H then M" and "Only if M then N"). It follows, by transitivity, that "O implicates M". The negative implication of the latter, "if not M then not O", is certainly true.
The following statements are not necessarily true:
1) "if N then H" because "if M then H" is not valid;
2) "if N then O" because N is a sufficient condition only for M;
3) "if M then O" because M is not a sufficient condition for H.

7 **Identify the alternative that does not fit with the others.**

A) Milan
B) Stockholm
C) London
D) Vienna
E) Oslo

This kind of exercise has to be solved by identifying a nonrandom logic that links 4 of the 5 options. A "random" logic could be: Oslo is the only city that begins with a vowel. But in this case, the other options might contain random words beginning with a consonant, while all options indicate cities, and "Milan" is the only given city which is not also a capital city.

8 **“Medical research has not helped to demonstrate the impossibility that gastric ulcer is a hereditary disease”. Which of the following is the correct meaning of this statement?**

A) Medical research has not demonstrated that gastric ulcer is not a hereditary disease
B) Medical research has demonstrated that gastric ulcer is a hereditary disease
C) Medical research does not always have all the answers
D) It is impossible that gastric ulcer is a hereditary disease
E) Medical research has demonstrated that gastric ulcer cannot be a hereditary disease

The given statement contains a double negation. Therefore, according to logic rules, it follows that nothing certain can be stated about gastric ulcer. In particular it has not been demonstrated that it is a hereditary disease.

9 **"The legal provision that exempted Italian politicians from incompatibility between their office as members of the Italian Parliament and that of member of the European Parliament has been revoked”. Which of the following is the correct meaning of this statement?**

A) Italian politicians may either hold the office of members of the Italian Parliament or that of members of the European Parliament
B) Italian politicians cannot hold the office of members of the Italian Parliament
C) Italian politicians cannot hold the office of members of the European Parliament
D) Italian politicians may hold both the office of members of the Italian Parliament and that of members of the European Parliament
E) There was a legal provision that prevented Italian politicians from holding the office of members of the Italian Parliament and at the same time that of members of the European Parliament

The correct meaning of the sentence: ""The legal provision that exempted Italian politicians from incompatibility between their office as members of the Italian Parliament and that of member of the European Parliament has been revoked” is "The legal provision that let the Italian politicians the compatibility between their office as members of the Italian Parliament and that of member of the European Parliament has been revoked". Therefore Italian politicians may now either hold the office of members of the Italian Parliament or that of members of the European Parliament; the two offices are now incompatible.

10 **Which, among the terms given, correctly complete the following verbal proportion? Tenacious : stubborn = X : Y**

A) X = unfit; Y = incapable
B) X = strong; Y = weak
C) X = reckless; Y = shy
D) X = fragile; Y = sturdy
E) X = powerful; Y = faint

Verbal proportions can be solved in the same way as numerical proportions, having the same symbology. The logical ratio linking the two terms of the first member position has to be identically replicated between the two terms of the second member position. The terms of every member position are synonymous with each other; only the correct option follows this condition.

DIAGRAM RY 00

EXAMPLE

Find the diagram that satisfies the set relationship existing among the given terms:
Skilled workers, Factories, Workers

All skilled workers are workers, but not vice versa; the solution to the exercise therefore must depict a set (*Skilled workers*) contained inside another set (*Workers*). The Factory set instead, compared to the other two, stands alone (even though a worker often works in a factory, as far as the set theory is concerned, he does not belong to the *Factory* set): the *Worker* and *Factory* sets are therefore separate.
The correct alternative is therefore the one shown in Diagram 2.

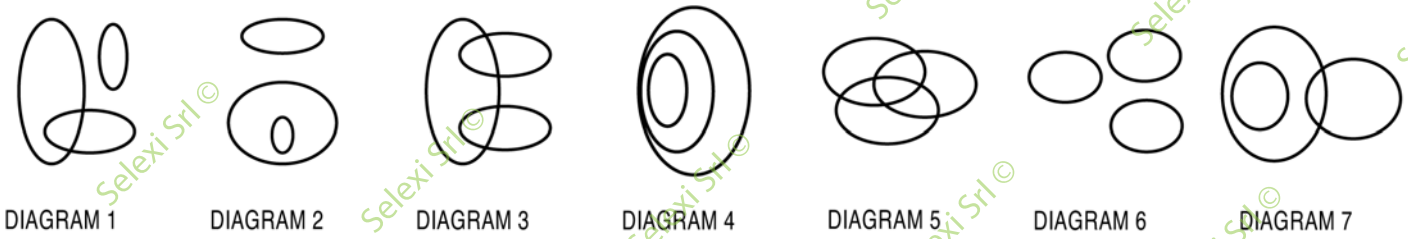


DIAGRAM 1 DIAGRAM 2 DIAGRAM 3 DIAGRAM 4 DIAGRAM 5 DIAGRAM 6 DIAGRAM 7

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11 Answer the following question concerning DIAGRAM RY 00

Which of the following series of terms is connected by the set relation graphically represented by Diagram 3?

A) Singers, People in their twenties, People in their sixties
B) iPhones, Smartphones, QWERTY Keyboards
C) Arenas, Gladiators, Short people
D) US citizens, Singers, People with a high school degree
E) Italian lakes, Lakes greater than 100 km^2, European lakes

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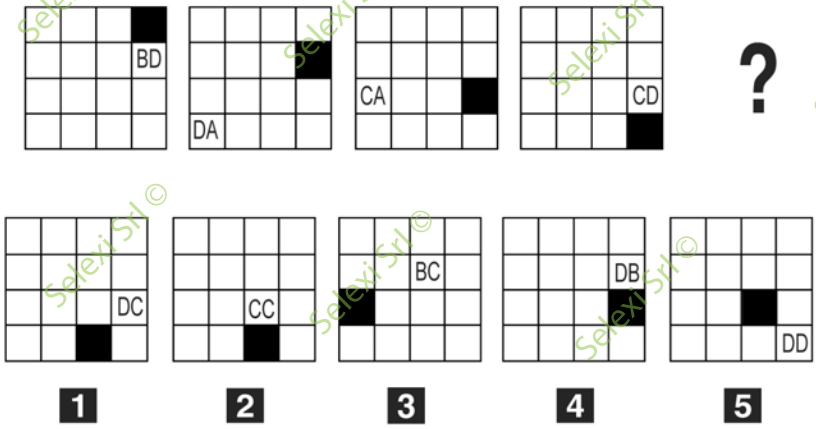
"People in their twenties and People in their sixties are represented, by definition, by two different sets. Singers might be both in their twenties and in their sixties or belong to other age groups. On the other hand, not all people in their twenties or in their sixties are singers. These logical and set relations are perfectly and faithfully represented by diagram 3.
iPhones, Smartphones, QWERTY Keyboards: iPhones are contained in the Smartphone group, while, logically, QWERTY Keyboards do not have any connection with it, even if a Smartphone might have a QWERTY Keyboard. This case is represented by diagram 2.
Arenas, Gladiators, Short people: Gladiators might or might not be short people. Arenas have historic connection with Gladiators, but the two items have no connection with each other in terms of set theory. This case is represented by diagram 1.
US citizens, Singers, People with a high school degree: US citizens might be neither singers nor people with a high school degree. On the other hand, there are US citizens who are singers and do not have a high school degree, or US citizens who have a high school degree but are not singers. Finally, there might be US citizens who have a high school degree and are singers. This set relation is represented by diagram 5.
Italian lakes, Lakes greater than 100 km^2, European lakes: Italian lakes are also European lakes, so this is a group that is completely contained in another group. If Lakes greater than 100 km^2 are considered, some are Italian (but not all of them), some are European (but not all of them), and some are neither Italian nor European. This case it is represented by diagram 7."

IMAGE SV 83



12 Answer the following question concerning IMAGE SV 83

Find the figure that completes the series.

A) Figure 2
B) Figure 3
C) Figure 1
D) Figure 4
E) Figure 5

The figural series proposed in the text is based on two different logics:
a. the darkened square "proceeds" clockwise along the external perimeter by one position for each figure;
b. the letters identify the coordinates of the very square that contains them, referring respectively to the row (first letter) and the column (second letter), where the square is placed.
So, by observing the darkened square position, options "Figure 3", "Figure 4" and "Figure 5" can be excluded, and it is clear that the only correct options can be "Figure 1" and "Figure 2". By observing the square containing the letters, it can be noticed that "Figure 1" cannot be the right solution, because it should read "CD" instead of "DC".
In "Figure 2", "CC" are the right coordinates and it is, therefore, the only possible solution.

13 **What is the probability of drawing a three or a sword card from a deck of 40 playing cards?**

A) 13/40
B) 3/10
C) 7/20
D) 1/4
E) 14/40

A deck of 40 cards contains 10 cards for each of the 4 different suits and the cards of one suit are equivalent to those of the other three. So, in the considered deck there are certainly ten sword cards, four cards whose value is 3, and one 3 for each suit. As one of the four cards numbered 3 is certainly also a sword card and counting each card only once, the probability is: (10 + 4 – 1)/40, which is equal to 13/40.

14 **At a time of economic growth the Beta company profit (X) increases by 20%. Once the period of euphoria is over, the Beta company records a 20% drop in profit. We can conclude that the final profit is:**

A) less than X
B) equal to X
C) greater than X
D) in any case equal to zero
E) 20% greater in any case

The problem can be solved intuitively by considering that 20% of a X value is certainly lower than 20% of another value higher than X. In the given example, in the beginning the X profit increases by 20%, then it shows an identical percentage decrease. However, since this decrease is calculated on the basis of a value that is higher than X, in absolute value it is higher than the starting increase and thus it is not enough to bring the profit to the initial level. The correct answer is the one that says that the final profit, Y, is lower than X.

15 **Two cyclists race one against the other on a 500 m circular track, leaving together from the starting line and each one doing 10 laps. Knowing that the first cyclist travels at a speed of 55 km/h and the second travels at a speed of 20 km/h, when will the first cyclist overtake the second by four laps?**

A) During his seventh lap
B) During his fifth lap
C) During his sixth lap
D) During his eighth lap
E) During his fourth lap

If the first cyclist overtakes the second cyclist for the fourth time, it means that the former has travelled 500 m * 4 = 2,000 m = 2 km more than the latter, using the same time. Considering an uniform motion, since time is equal to the ratio between distance and velocity, if d indicates the distance covered by the second cyclist, the following equivalence is true: d/20 = (d + 2)/55. The result is: d = 1.14 km. When the first cyclist overtakes the second for the fourth time, he has travelled 1.14 km (like the second) + 2 km = 3.14 km = 3,140 m. Dividing this distance by the circuit's length, you have: 3,140 : 500 = 6.28; thus, the first cyclist overtakes the other cyclist for the fourth time during his seventh lap.

16 **In a primary school attended by 250 children there are two afterschool courses. 200 children attend the Spanish course, 199 the swimming course and 47 children do not attend either course. How many children attend both courses?**

A) 196
B) It cannot be determined because the given data are insufficient
C) 3
D) 4
E) 203

According to the given information, if 47 students do not take part in any course, it means that there is a total of 399 partecipations (200 + 199) by 203 students (250 - 47). It follows that 196 students (399 - 203) necessarily attend both afternoon courses.

17 **A bakery sold 500 kg of bread in March and 625 in April. What was the percentage increase?**

A) 25%
B) 30%
C) 20%
D) 11.25%
E) 18%

The increase is 125 kg, which is a quarter of the initial 500 kg, corresponding to 25%.

18 **A blindfolded person extracts one ball from a box containing 15 balls numbered from 1 to 15. Knowing that all balls have the same probabilities of being extracted, what is the probability of obtaining a number that can be divided by 2?**

A) 7/15
B) 1/3
C) 8/15
D) 1/4
E) 1/15

The definition of probability is: number of favourable events / number of possible events. Since between 1 and 15 there are 8 odd numbers, the probability is equal to 8/15.

19 **Three painters, working at the same speed, paint a wall in 9 days. How long would it take each of them to do the work alone?**

A) 27 days
B) 3 days
C) 81 days
D) The given data are insufficient for an answer
E) 36 days

It is necessary to use numerical proportions. 3 workers : 9 days = 1 worker : 27 days.

20 **If:**
∂ + @ – $ = 25
2∂ – $ = 25
5@ = 25
then ∂ equals:

A) 5
B) 25
C) 0
D) 10
E) 1

The exercise contains a system of equations. Starting from the third equation, it can be deduced that @ = 5. This value is replaced in the first equation: ∂ + 5 – $ = 25, ∂ = 20 + $. By replacing ∂ with this result in the second equation, you will obtain: 2(20 + $) – $ = 25. Therefore, $ = –15.
Now you can go back to the first equation and insert the obtained values:
∂ + 5 –(–15) = 25 ∂ = 5. So the correct answer is "5".

21 **Correctly complete the following number sequence: 16; 36; 76; 156; 316; 636; ?**

A) 1.276
B) 1.275
C) 1.278
D) 1.280
E) 1.274

In order to correctly solve the problem it is necessary to find the relation which connects every element with the one that precedes and the one that follows it, according to a logic that is both univocal and coherent with the whole number series. It can be observed that the difference between the first two elements is 40, the one between the second and the third is 80, and the difference between the third and the fourth element is 160. As the series goes on, it becomes clear that each number is equal to the previous number plus the double of the difference of the two elements that precede it. Since 636 - 316 = 320, the number that follows 636 will be: 636 + (320 * 2) = 636 + 640 = 1,276.

22 **Correctly complete the following number sequence: 101; 76; 43; ?; ?; 9; 33; 8**

A) 67; 42
B) 70; 44
C) 76; 68
D) 10; 34
E) 63; 40

Analyze the numerical sequence three numbers by three numbers: 76 corresponds to 101 minus 25, and 43 to 76 minus 33. The difference between the second unknown element and 9 is equal to 33; so the element before 9 is 9 + 33 = 42. The difference between the first unknown element and 42 is equal to 25; so the element before 42 is 42 + 25 = 67, which is equal to 43 + 24. Consequently, the missing couple is 67, 42. So the development rule of the sequence, satisfied also by the following terms, is: –25, –33, +24.

23 **A number of streetlights must be placed along the sides of a rectangular courtyard whose sides are 42 and 77 meters, all at the same and greatest distance, so that each corner of the courtyard has a streetlight. At what distance should streetlights be placed from each other?**

A) 7 meters
B) 14 meters
C) 3.5 meters
D) 12 meters
E) 4 meters

The question describes, figuratively, the necessity to find the Greatest Common Divisor between 42 and 77, which is 7.

24 **The tiler Ario paves a room with X rectangular tiles sized 4 x 7 cm; each tile costs 3 euros. The tiler Eddie paves a room with the same area, but his tiles are 6.5 x 7.5 cm; each tile costs 3.1 euros. Which covering is cheaper?**

A) The covering used by Eddie
B) The covering used by Ario
C) The covering used by Eddie, which costs less than half as much as Ario's covering
D) The covering used by Ario, which costs less than half as much as Eddie's covering
E) This cannot be determined unless we know the area of the two rooms

In order to answer the question, not knowing the real and total area of the two rooms, it is enough to find the smallest area covered by the two different kinds of tiles. It is necessary to find the least common multiple between the tiles' lengths (respectively 4 and 6.5) and the tiles' widths (respectively 7 and 7.5).
Considering the length, the least common multiple is 52, so Ario will use 13 tiles to cover this side, while Eddie will use 8 tiles.
Considering the width, the least common multiple is 10, so Ario will use 15 tiles to cover this side, while Eddie will use 14 tiles.
Therefore, Ario will use 195 tiles, for a total amount of 585 euros, while Eddie will use 112 tiles, for a total amount of about 347 euros.
Alternatively, it is more intuitive to observe that the cost of Eddie's tiles is 3% higher than that of Ario's tiles, but Eddie's tiles are 70% larger than Ario's tiles. So, the number of tiles used by Eddie is much lower, making the price increase negligible.

25 **700 seats in the Parliament are divided among 10 political parties. There aren't two parties with the same number of seats and each party has at least 20 seats. Which is the highest number of seats that the fifth bigger party can have?**

A) 116
B) 120
C) 24
D) 118
E) 121

Considering the given information, to answer the question it is necessary to "assign" the lowest number of seats possible to the 5 smallest parties, as follows:
- tenth party: 20; - ninth party: 21; - eighth party: 22; - seventh party: 23; - sixth party: 24; The sum of assigned seats is 110. The 590 seats left have to be divided among the 5 largest parties so that the fifth has the highest number possible. This is the resulting distribution:
- fifht party: 116; - fourth party: 117; - third party: 118; - second party: 119; - first party: 120.
116 is the right answer.

26 **A block of shares, whose starting value was 70,000 euros, has yielded the value of 20% during the first year, of 50% during the second year, of 10% during the third year. Which is the final value of the block?**

A) 138,600 euros
B) 126,000 euros
C) 132,300 euros
D) 151,200 euros
E) 68,600 euros

The exercise can be solved by calculating the given percents on the basis of the values that can be obtained year after year: a 20% increase in the starting value means that the block of shares is worth 84,000 at the end of the first year. This is the starting value against which the second-year increase (50%) must be calculated, with the following operation: 84,000 + 84,000/2 = 84,000 + 42,000 = 126,000. During the third year, the value of the block of shares increases by 10%: 126,000 * 0.1 = 12,600. Therefore, at the end of the third year the final value is the result of the operation: 126,000 + 12,600 = 138,600.

27 **The price of a product is reduced by 25% during a promotion. To sell the same product at the starting price, it is necessary to increase the promotional price by:**

A) about 33%
B) it cannot be determined without knowing the price of the product
C) 25%
D) 50%
E) 24%

In order to solve the problem, you can formulate the hypothesis that the starting price is 100 and that the promotional price is hence equal to 75. The difference between 75 and 100, equal to 25, corresponds exactly to one third of 75; it implicates that, to go back to the starting price, the value of 75 must be increased by one third, in other words, by about 33%. The correct solution doesn't take into account the value considered as an hypothesis.

28 **Grace has got three sisters – Sophia, Mary and Nadia – and two brothers – Darren and Vince. It is known that: 1) Darren is the eldest child; 2) Vince is older than Mary and Nadia (not necessarily in this order), but younger than Grace and Sophia (not necessarily in this order). Based on these statements, which of the following statements is FALSE?**

A) Grace is older than Nadia but younger than Vince
B) Mary is younger than Sophia
C) Sophia is older than Mary
D) Sophia is older than Nadia
E) Grace is older than Mary

Darren is the eldest child, followed by Grace and Sophia (not necessarily in this order), then by Vince and, finally, by Mary and Nadia (not necessarily in this order). It is therefore false that "Grace is younger than Vince", even if she is older than Nadia. But it is true that Grace is older than Mary, Mary is younger than Sophia and Sophia is older than Nadia.

29 **In the final run of a cross-country skiing competition, the ranking from first to seventh place is as follows: Aldous, Frank, Isabel, Beatrice, Claude, Henry, Gail. Five of these seven athletes use the classic technique, and it is known that three of the skiers who use the classic technique are among those who ranked first to fourth, and three are among those who ranked fourth to seventh. It can be stated with certainty that one skier who uses the classic technique is:**

A) Beatrice
B) Henry
C) Frank
D) Claude
E) Isabel

Since the participants who use the classic technique are 5 out of 7 and since this technique is used by both three of the top four athletes and three of the last four athletes, it must be inferred that one of the skiers must belong to both groups. The given conditions are fulfilled only by the person who came fourth: Beatrice.

30 **A is more attractive than B. B is more attractive than C and more unattractive than D. If all these statements are correct, and if F is more attractive than B, it is necessarily true that:**

A) F is more attractive than C
B) F is more unattractive than A
C) F is more attractive than D
D) F is more unattractive than D
E) F is more unattractive than C

In order to solve the problem you have to connect the given elements according to the rules of the transitive property: since B is more attractive than C, it follows that whoever is more attractive than B is necessarily more attractive than C. None of the other statements is necessarily true.

31 **Andrew arrives at Rome airport and notices the following information: I) the flight to Prague arriving from Milan lands in Rome at 12:00 (noon) and departs at 12:30; II) the flight to Stockholm departs 90 minutes after the one to Berlin, which departs at 12:00; III) the flight to Madrid departs 40 minutes before the one to Stockholm, and the flight to Lisbon departs 10 minutes after the one to Madrid. Based on this information, the flight to Lisbon departs:**

A) 30 minutes before the flight to Stockholm
B) one hour after the flight to Prague
C) 30 minutes after the flight to Berlin
D) 50 minutes before the flight to Prague
E) 10 minutes before the flight to Madrid

According to the information provided in the text, the flight to Berlin leaves at 12:00 (noon), the flight to Prague departs at 12:30 p.m., the flight to Stockholm departs at 1:30 p.m. (90 minutes after noon), the flight to Madrid leaves at 12:50 p.m. (40 minutes before 1:30 p.m.) and the flight to Lisbon departs at 1 p.m. (10 minutes after 12:50 p.m.).
Therefore, the flight to Lisbon departs one hour after the one to Berlin, half an hour before the one to Stockholm (correct answer), half an hour after that to Prague and 10 minutes after the flight to Madrid.

32 **You have a scale with two platforms. The right arm of the scale is twice the length of the left arm. If 6 identical weights are placed on the right platform, how many weights of the same kind must be placed on the left platform to balance the scale?**

A) 12
B) 14
C) 36
D) 24
E) 3

Since the right arm of the scale is twice the length of the left arm and since a weight of 6 units is put on the former, we can say that a force equal to 12 acts on the right platform (6 weights x 2 distance units from the centre). The exercise requires to calculate the equilibrium condition, so the force acting on the left arm (which is 1 unit long, being half the right arm's length) must be equal to 12.

33 **You have a scale with two platforms. The left arm of the scale is three times the length of the right arm. If 24 identical weights are placed on the right platform, how many weights of the same kind must be placed on the left platform to balance the scale?**

A) 8
B) 7
C) 18
D) 12
E) 15

The left arm of the scale is three times the length of the right arm, which means that, to balance the two platforms, the weight that must be placed on the right platform need to be one third of the one placed on the left platform. So: 24/3 = 8.

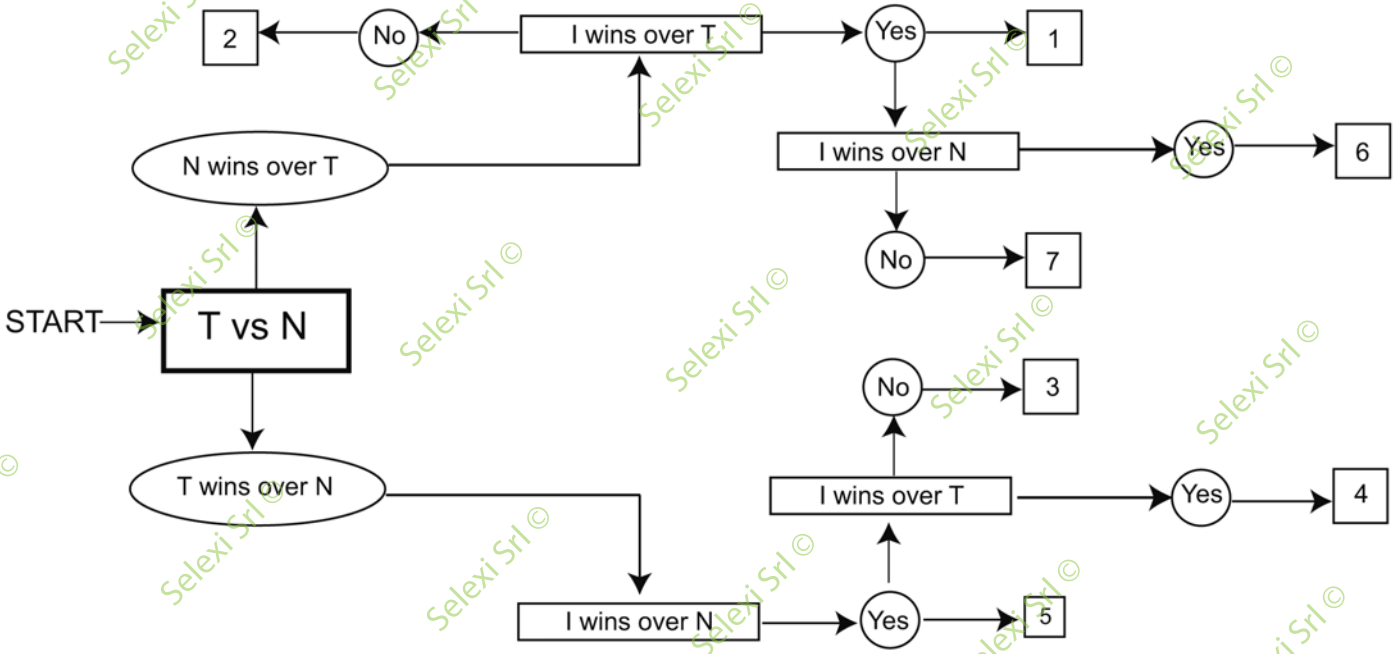
34 **Marcus has got 5 identical tokens. One of them, however, is heavier than the others. If he has a scale with two platforms, how many weighings will he need to find the heaviest token?**

A) 2
B) 5
C) 4
D) 3
E) 1

Since the number of tokens is an odd number, it is necessary to take out a token from the total and divide the left tokens between the two platforms of the scale (first weighing). If the scale is balanced, it means that the heaviest token is the one that has been left out; if this doesn't occur, it means that the scale is not balanced because of the heaviest token. Therefore, the two tokens placed on the considered platform must be collected and a second and last weighing must be carried out to determine which of them is the heaviest token. Then, the lowest number of weighings Marcus will need to find the heaviest token is 2.

DIAGRAM SZ 14

The personnel of a company are asked to take a test about their habits. One of the questions is about the medium they prefer to get news from. Results are obtained by comparing three different media two by two, and always asking which is the favourite between the two. The research thus aims at establishing an order of preference among staff.
T = television, N = newspaper, I = internet
By following the chart shown in the figure, find the order of preference corresponding to each square.



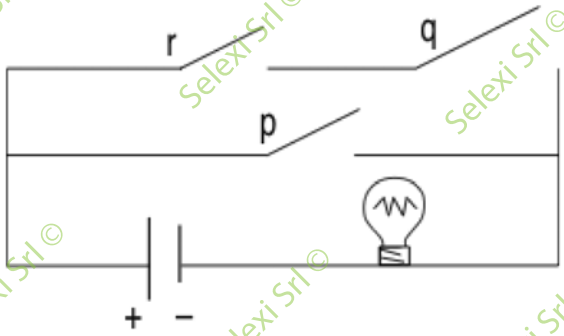
35 **Answer the following question concerning DIAGRAM SZ 14**
Find the order of preference between I, N and T resulting at box "1" of the diagram.

A) More than one order of preference is possible
B) No order of preference can be determined
C) ITN
D) INT
E) NTI

The problem can be solved by considering the order of preference among the given elements, taking them two by two and being careful not to jump to wrong conclusions. To each numbered box corresponds a specific order, but there are also boxes, such as number 1, which have more than one possible order. Beginning from START, before reaching box 1, a comparison is made between N and T, resulting in establishing that N prevails on T. Next the comparison between I and T is also made, from which it can be inferred that I also prevails on T. Therefore, when you reach box 1, you can be sure that T is the option with the smallest number of preferences, but nothing can be said about the preference order between N and I. It follows that at box 1 both NIT order and INT order are possible, i.e. more than one order of preferences is possible, as stated in the correct option.

IMAGE SP 87

The figure shows a circuit with several switches (p, q and r) placed either in series or in parallel. The switches represent the following statements:
p = "x is a divisor of 63";
q = "x is a multiple of 3";
r = "x is even".
The circuit needs to be closed so as to turn the lamp on.



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36 Answer the following question concerning IMAGE SP 87

The bulb will be lit when x has the following value:

A) 24
B) 189
C) 33
D) 14
E) 124

In order to close the circuit and turn the light bulb on, it is necessary to turn off either p switch or both r and q switches.
24 is a multiple of 3 and it is an even number, and therefore it makes r and q switches turn off, unlike the other proposed options:
- 189 is a multiple and not a divisor of 63. Moreover, it is a multiple of 3 but it isn't even
- 33 is a multiple of 3 but not an even number. Moreover, it isn't a divisor of 63
- 124 is even but not a multiple of 3. Moreover, it isn't a divisor of 63
- 14 is even but not a multiple of 3. Moreover, it isn't a divisor of 63.

IMAGE SP 90

The midpoint of a graduated wooden ruler rests on a fulcrum, and several coins of equal weight are placed on the ruler.

---

37 Answer the following question concerning IMAGE SP 90

In order to balance the system shown in the figure, it is necessary to move a token:

A) from position 3 to position 5
B) from position 12 to position 10
C) from position 12 to position 11
D) from position 3 to position 6
E) none of the other answers is correct; the system is already balanced

---

To make counts easier, suppose that the weights used on the ruler all weigh 1 unit: a force of 1 (token) x 6 (notches) = 6 is exerted on the right side; on the other hand, a force of 2 (tokens) x 4 (notches) = 8 is exerted on the left side. Thus, the ruler leans on the left, which is the heaviest side, and this condition excludes the option "none of the other answer is correct; the system is already balanced".
The option "from position 12 to position 11" would bring the value of the right side to 5, which is different from the value of the left side. The option "from position 3 to position 6" would bring the value of the left side to 5, which is different from the value of the right side. The option "from position 3 to position 5" would bring the value of the left side to a number provided by the following operation: 1 (token) x 4 (notches) + 1 (token) x 2 (notches) = 6. This value balances the system and is, therefore, the correct answer.

IMAGE SU 13

A wooden graduated beam is balanced in its middle point and several tokens, all of equal weight, are placed on it.

---

38 Answer the following question concerning IMAGE SU 13

In order to rebalance the system shown in the figure, one must move a token:

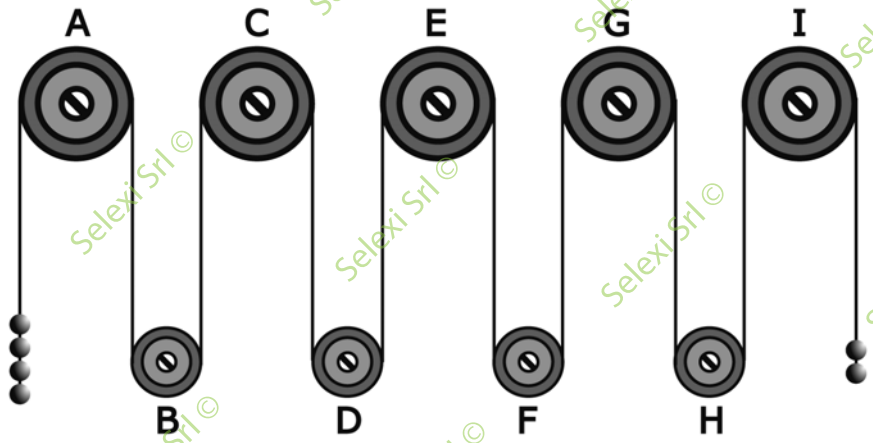
A) from position 9 to position 10
B) from position 5 to position 7
C) from position 9 to position 11
D) from position 5 to position 4
E) none of the other answers is correct; the system is already balanced

---

A graduated beam balanced in its middle point is an example of first-class lever. In order to balance the beam, the product of the first weight (2 tokens), placed on the left side, and its arm (distance between force and fulcrum equal to 2 length units = 2 u) has to be equal to the product of the second weight (1 token), placed on the right side, and its arm (3 u). Since the product 2 * 2 = 4 is greater than 1 * 3 = 3, the lever is not in equilibrium. Indeed, it is imbalanced on the left side. If a token is moved from position 9 to position 10, the length of the second force arm increases by 1 u and the product of force and arm becomes in 1 * 4 = 4. The levere will be, therefore, in equilibrium, and this option is the correct answer. The other options don't satisfy the equilibrium principle of a lever: 1) moving a token from position 9 to position 11 causes a product 1 * 5 = 5 ≠ 4, which results in an imbalance of the lever on the right side; 2) moving a token from position 5 to position 7 causes a further imbalance on the left side of the lever.

IMAGE SU 15

The system shown in the figure is in its starting phase. All the metal balls have the same mass, and the mass of the cables is negligible.



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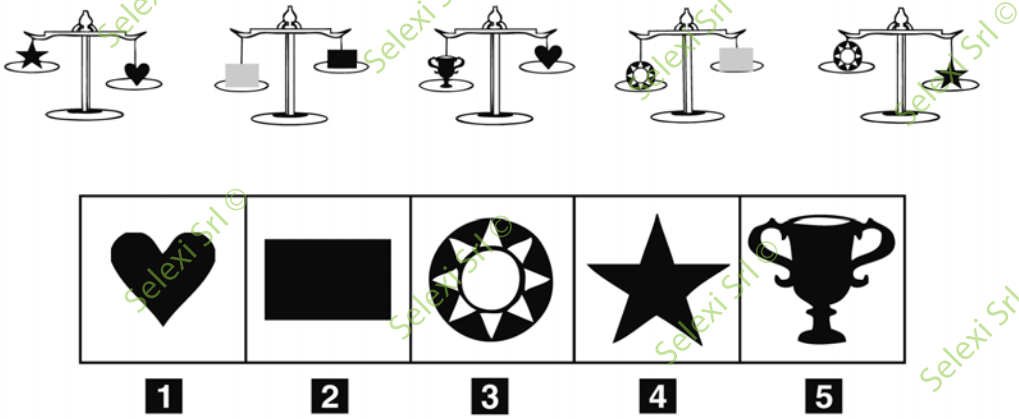
39 **Answer the following question concerning IMAGE SU 15**

If the system is only subject to the gravitational field in the absence of friction, then it may be concluded that:

A) pulley C turns counter-clockwise
B) pulley C turns clockwise
C) pulley D turns counter-clockwise
D) the system remains still because it is in equilibrium
E) pulley A turns clockwise

Given that in the system there are 4 spheres hung on the left side and 2 spheres hung on the right side, the rope weighs more on the left side and it will make pulleys A, C, E, G and I turn counter-clockwise, and the others clockwise.

IMAGE SV 21



40 **Answer the following question concerning IMAGE SV 21**

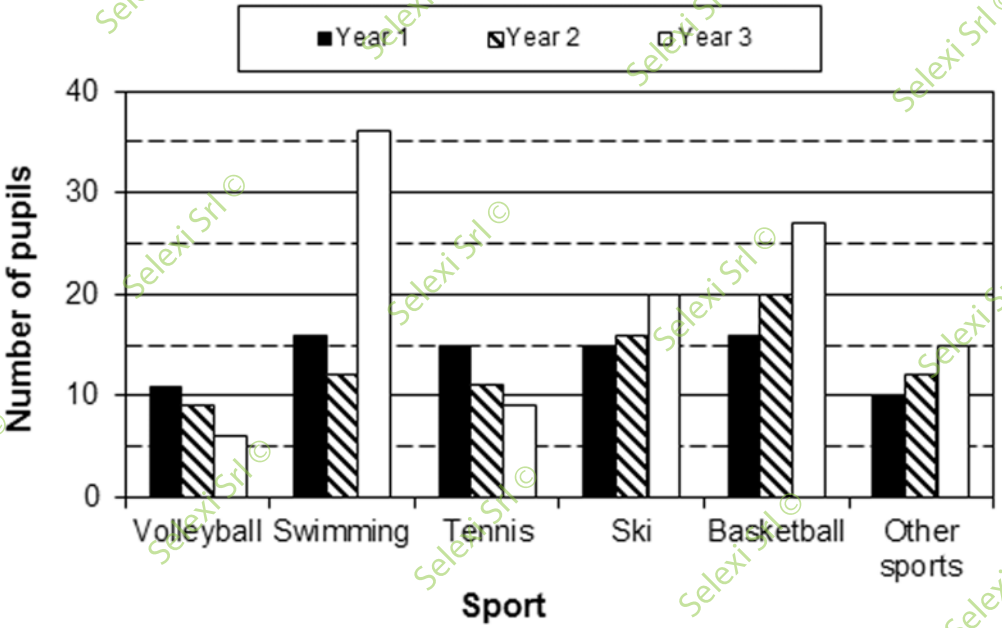
Of all the objects shown on the platforms of the scales, which object weighs the least?

A) The one in figure 2
B) The one in figure 4
C) The one in figure 3
D) It cannot be determined
E) The one in figure 5

The exercise is aimed at finding the lightest object, so you should focus on the objects which weigh the least in terms of individual comparisons.
By observing the 5 figures above, it can be inferred that the cup is heavier than the heart (third figure), which in turn is heavier than the star (first figure). The latter (fifth figure) is heavier than the spherical object, which in turn is heavier than the white rectangle (fourth figure). Finally, the second figure shows that the white rectangle is heavier than the black one, which is therefore the lightest object and the correct answer to the question (Figure 2).

CHART SZ 57

The graph shows some data on the number of pupils of a middle school who play sport.



41 Answer the following question concerning CHART SZ 57

Referring to the graph from Year 2 to Year 3, who showed a greater percentage increase, pupils practising skiing or those practising other sports?

A) They both increased by about 25%
B) Those who practised skiing
C) Those who practised other sports
D) They both increased by about 50%
E) They both decreased

From Year 1 to Year 2 the number of pupils practising ski increased from 15 to 16, while that of pupils practising Other Sports increased from 10 to 12. The percentage increase of pupils practising ski equals 1/15 ≈ 7 % and that of pupils practising Other Sports equals 2/10 = 1/5 = 20%. Thus the percentage of pupils who practice Other Sports has registered the largest increase.

42 Answer the following question concerning CHART SZ 57

From the graph you can draw all the following conclusions except one. Which one?

A) If the number of young people who practise skiing is a good indicator for the amount of snow that falls in winter, less snow fell in Year 3 than in Year 2
B) From Year 1 to Year 2 the number of young people practising volleyball decreased
C) From Year 2 to Year 3 the highest percentage increase in people practising sports was recorded among those who practised swimming
D) In the three-year period considered, about 65 young people altogether practised swimming
E) The number of sports-devoted people who practised tennis decreased from Year 1 to Year 2

From Year 1 to Year 2, the number of pupils who play volleyball decreased from 12 to 9. From Year 2 to Year 3, the largest percentage increase involved pupils who swim, because they increased approximately from 12 to 36, in other words they tripled, with a percentage increase of 200%. None of the other sports had such an increase from Year 2 to Year 3. Over the three years considered, about 65 pupils chose to swim, because by summing the values indicated by the three differently-coloured bars indicating this sport, the following can be obtained: 16 + 12 + 36 = 64. If the number of pupils who ski is linked to the quantity of snow that fell in winter, it can be inferred that it snowed less in Year 2 than in Year 3, because about 16 pupils skied in Year 2, and about 20 of them did it in Year 3.

PASSAGE ED 75

Read the passage and answer the related questions.

Five Blue Chips – Alpha, Beta, Gamma, Delta and Omega – are analysed. Their sectors are: Insurance, Banking, Chemistry, Energy and Technology (not necessarily in this order). Quotations of the five Blue Chips recorded the following trends throughout the analysed period: +1%, –1%, +2%, –2% e +0%, not necessarily in this order.

We also know that:

1) Omega is in the Energy sector
2) Alpha is in the Banking sector
3) The Blue Chip of the Chemical sector reported no changes in its quotation
4) Delta is in the Technology sector and had a positive trend
5) Gamma recorded a 1% increase

---

43 **Answer the following question concerning PASSAGE ED 75**

Which of the following CANNOT be inferred with certainty from the passage?

A) Alpha registered a decrease equal to 2%
B) The Banking sector Blue Chip registered a decrease
C) Delta registered a 2% increase
D) Omega registered a decrease
E) Beta did not register a decrease

Look at the tables on the last page of this guide. Table 2 allows us to learn that Alpha registered a decrease, but it isn't possible to determine whether it equals 1% or 2%. The answer concerning Alpha cannot be inferred and is, therefore, the correct option.

---

44 **Answer the following question concerning PASSAGE ED 75**

Which quotation variation may the Energy sector Blue Chip have recorded?

A) A 2% decrease
B) A 2% increase
C) Either a 2% increase or a 2% decrease
D) A 1% increase
E) Either a 1% increase or a 1% decrease

Look at the tables on the last page of this guide. According to this, it can be deduced that the Energy sector Blue Chip registered a decrease, even if its value cannot be determined.
The Energy sector Blue Chip might have recorded "a 2% decrease".

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45 **Answer the following question concerning PASSAGE ED 75**

Which of the following can be inferred with certainty from the passage?

A) Beta did not register either a decrease or an increase
B) Beta registered a 2% increase
C) The Blue Chip in the Energy sector registered a 2% decrease
D) Omega registered a 1% decrease
E) The Blue Chip in the Insurance sector did not register any changes

Look at the tables on the last page of this guide. Table 2, in particular, allows you to infer that Beta registered a 0% quotation variation. So the statement "Beta did not registered either a decrease or an increase" is the correct answer.

46 **Answer the following question concerning PASSAGE ED 75**

Which Blue Chip had a 1% increase?

A) Gamma
B) Delta
C) It cannot be inferred with the given data
D) Apha
E) Beta

Look at the tables on the last page of this guide. It can be deduced that Blue Chip "Gamma" registered a 1% increase.

47 **Answer the following question concerning PASSAGE ED 75**

Based only on items 1, 2, 3 and 4, which of the following can be inferred with certainty from the text?

A) It is not possible to determine the result registered by Beta
B) The Blue Chip in the Energy sector registered a positive or negative change equal to 1% of its quotation
C) Omega registered a decrease
D) Alpha registered a negative change
E) Gamma is in the Insurance sector

Look at the tables on the last page of this guide. From Table 3 it can be deduced that "It is not possible to determine the result registered by Beta" is the correct option.

In order to solve the problem, the items of information must be inserted into a table like the one below:

	BLUE CHIP	SECTORS	TRENDS
	A	B	C
1			
2			
3			
4			
5			

Item no. 1 allows you to fill in boxes A1 and B1.

Item no. 2 allows you to fill in boxes A2 and B2.

Item no. 3 allows you to fill in boxes B3 and C3.

Item no. 4 allows you to fill in boxes A4 and B4. It also provides information about C4, which registers a trend greater than 0.

Item no. 5 allows you to fill in boxes A5 and C5.

Table 1

	BLUE CHIP	SECTORS	TRENDS
	A	B	C
1	Omega	Energy	
2	Alpha	Banking	
3		Chemistry	0%
4	Delta	Technology	+1% or +2%
5	Gamma		+1%

By observing the table once it has been completed, it can be also deduced that:

1. the 2% increase must be placed into box C4;
2. “Beta” must be placed into box A3;
3. the “Insurance” sector must be placed into box B5.

Table 2

	BLUE CHIP	SECTORS	TRENDS
	A	B	C
1	Omega	Energy	
2	Alpha	Banking	
3	Beta	Chemistry	0%
4	Delta	Technology	+2%
5	Gamma	Insurance	+1%

Omega and Alpha trends are not univocally determinable: both of them could match both values –1% and –2%, and it is therefore impossible to complete the table by filling in boxes C1 and C2.

All the exercises can be solved by observing Table 2. The only exception is the question that reads “Based only on items 1, 2, 3 and 4, which of the following can be inferred with certainty from the text?” because, when omitting item no. 5, it is necessary to create and complete a new table, in which, obviously, you will have fewer items you know for sure and more empty boxes.

Table 3

	BLUE CHIP	SECTORS	TRENDS
	A	B	C
1	Omega	Energy	
2	Alpha	Banking	
3		Chemistry	0%
4	Delta	Technology	+1% or +2%
5		Insurance	