HUMANITAS UNIVERSITY

Trial Test Paper 1 (A) -June 2019

Instructions

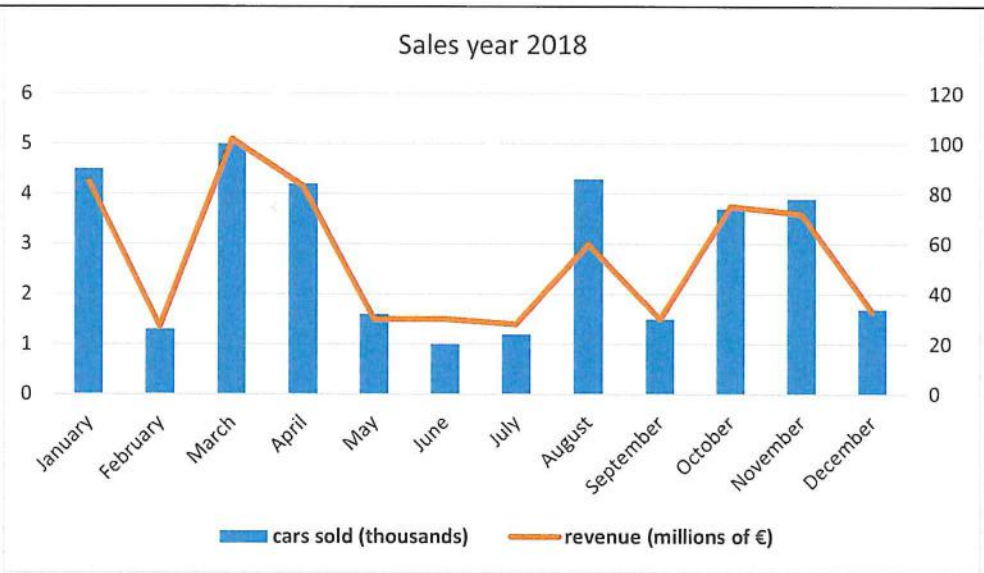
Do not open this test booklet until you are told to do so. There is one correct answer far each question.

You must answer each question by putting a circle around the correct letter, A, B, C, D or E on the ANSWER SHEET.

There are 30 questions. You have 60 minutes to complete the test.

Please be aware that the February 14th test will be a computer based test.

1. Look at this graph



It shows the number of cars sold and the revenue per month for a car manufacturer in 2018. The number of cars sold is expressed in thousands on the y-axis on the left. The revenue is expressed in millions of euros on the y-axis on the right. For example, in January 2018 about 4,500 cars were sold and the revenue was slightly more than 80 million euros. Select the statement that is correct according to the graph:

A) The revenue in February 2018 was slightly more than 1 million euros.
B) The number of cars sold in August 2018 was about 3,000.
C) The revenue in May 2018 was about 30 million euros.
D) The number of cars sold in November 2018 was about 80 thousand.
E) The revenue in September 2018 was the same as the number of cars sold.

2. Look at this formula

$$R = \frac{TP^4}{S^2K^3}$$

We can affirm that R is directly proportional to T and the fourth power of P, and is inversely proportional to the second power of S and the third power of K.
For certain positive values of T, P, S, and K, R=1.
If P and S become half their value while T and K do not change, how will R change?

A) The answer depends on the value of the variables.
B) R will decrease.
C) R will increase.
D) R will not change.
E) None of the above

3. The following equations hold

$\Delta V = \Delta I \times R \qquad \Delta V = V_2 - V_1 \qquad \Delta I = I_2 - I_1 \qquad g = \frac{1}{R}$

Given that $V_1 = 2, V_2 = 14, I_2 = 8,$ and $I_1 = 5$, which of these is the value of g?

A) 4
B) 0.25
C) -4
D) 0.333
E) The formulae are ambiguous.

4. You find this mysterious writing in an ancient book

$%&/!*?

If **%** and **!** mean plus, and two adjacent ciphers represent a two-digit number, what is the correct match between the values of the remaining symbols and the value of the corresponding numerical expression?

A) $=1, &=3, /=4, *=5, ?=1, value of expression=86
B) $=3, &=1, /=4, *=5, ?=1, value of expression=78
C) $=4, &=3, /=5, *=5, ?=1, value of expression=80
D) $=1, &=1, /=3, *=5, ?=4, value of expression=58
E) $=5, &=1, /=4, *=3, ?=1, value of expression=60

5. Arrange these numbers in decreasing order

5 1/5 -0.51 -0.05 0.02 -1/2

Choose the correct answer.

A) 5 1/5 0.02 -0.05 -1/2 -0.51
B) 5 0.02 1/5 -0.05 -0.51 -1/2
C) 5 1/5 -0.51 -1/2 -0.05 0.02
D) -0.51 -1/2 -0.05 0.02 1/5 5
E) -1/2 -0.51 -0.05 0.02 1/5 5

6. **Calculate the value of this expression by using the usual rules that define the priority of operations**

$$2 + 3 \times 2^2$$

Choose the correct answer.

A) 20
B) 38
C) 100
D) 14
E) the formula is ambiguous

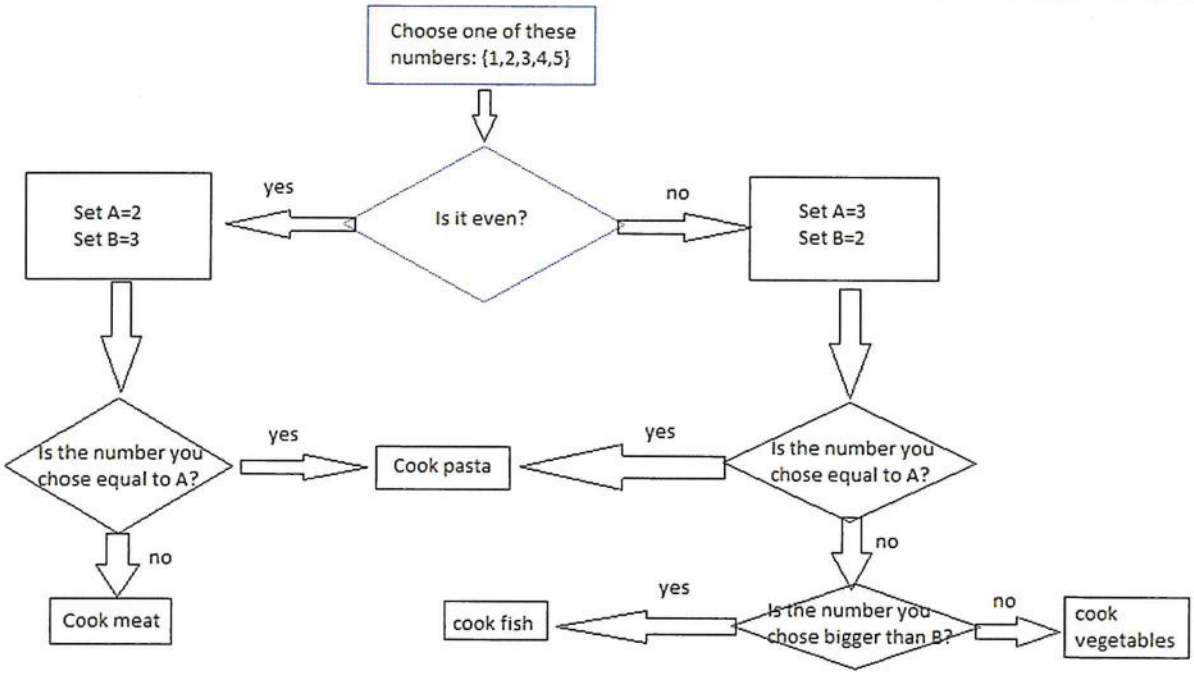
7. **You are given three numbers**

x = 0.3 million **y = 30 thousand** **z = 300,000**

Which statement is correct?

A) x is less than z
B) z is the same as y
C) x is the same as z
D) x is the same as y
E) y is greater than x

8. Sheila has set up a flow chart to help her decide what to cook for dinner



Every evening, Sheila throws a 6-sided die and uses the number on the die as her starting number. If she gets a 6, she throws the die again until she gets a number between 1 and 5.

Which statement is correct?

A) Sheila gets 4 and cooks pasta
B) Sheila gets 2 and cooks meat
C) Sheila gets 3 and cooks pasta
D) Sheila gets 1 and cooks pasta
E) Sheila gets 5 and cooks meat

9. Four integer variables J, K, L, M are such that

- if J increases by 1, then after a few seconds K increases by 1
- if L decreases by 1, then after a few seconds M increases by 1
- if J decreases by 1, then after a few seconds L decreases by 1
- if M increases by 1, then after a few seconds J decreases by 1

At the beginning of an experiment, the four variables are stable with these values:

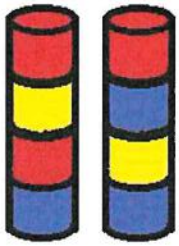
J=K=0, L=M=1

What will happen if J is set to -1?

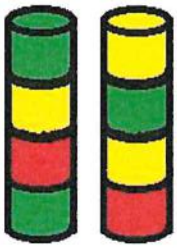
A) The variables will be stable as well, with the values J=-1, K=0, L=M=1.
B) L will increase without ever stopping.
C) A new equilibrium point will be achieved in a few seconds.
D) M will increase without ever stopping.
E) After a while, the variables will go back to their initial values.

10. In a new game you have to build towers made of different coloured pieces, all with the shape of a cylinder with the same dimensions

Luca has built these two towers:



And John has built these two towers:



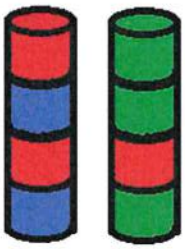
Claudia must combine Luca and John's towers to create a new pair of towers. The rules are:

Claudia must choose one of Luca's towers and one of John's towers, but before doing that, she can switch one piece in a tower with the corresponding piece (i.e. the piece situated at the same height) in the other tower built by the same person.

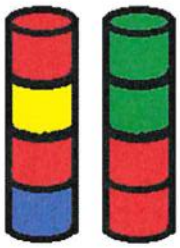
She can do this once per person but she does not have to.

Which of these pairs of towers is Claudia able to create?

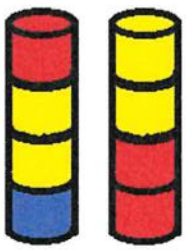
A)



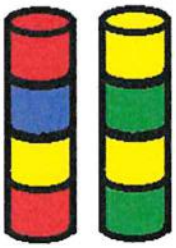
B)



C)



D)



E) none of the above.

11. A group of explorers has discovered a new species of plant and called it Rosàlia

The group has studied how Rosàlia reacts when exposed to pathogens such as bacteria, fungi and viruses.

The group has observed that, when exposed to Bacterium A, Rosàlia's leaves become bigger but fragile, and its roots grow deeper in the soil. When exposed to Fungus X, Rosàlia's leaves also become bigger and fragile, but its roots cease to grow. If Fungus Y is used to infect Rosàlia, then its roots grow deeper in the soil and its leaves become bigger and stronger. When Rosàlia is infected with Virus T, its roots cease to grow and its leaves become fragile. When Virus U is used, instead, its roots grow deeper in the soil and its leaves become smaller but stronger. When exposed to Bacterium B, Rosàlia's leaves become smaller and more fragile, and its roots cease to grow. Finally, when two or more pathogens are used to infect Rosàlia, red dots appear on all leaves.

Compared to healthy examples of Rosàlia, one infected specimen presents fragile but red-dot-free leaves, and under-developed roots. There is no information about the size of the leaves.

The group wants to identify the pathogen(s) responsible for this infection. Which do they need to investigate further?

A) Bacterium A and Bacterium B
B) Fungus X, Virus T and Bacterium B
C) Virus T only
D) Fungus X only
E) None of the above

12. In order to qualify for a bonus, company employees must fulfil these criteria

£1,000 bonus:	Absences less than 5%
	Production targets exceeded by at least 10%
	Rejects are less than 5% of output
£500 bonus:	Absences less than 10%
	Production targets met
	Rejects are less than 8% of output

Workers performed as follows:

	Smith	Jones	Patel	Owololu	McKay
attendance (%)	95	90	100	96	97
over production target (%)	+5	+6	+12	0	-4
product accepted (%)	98	96	95	93	96

Who qualifies for a bonus?

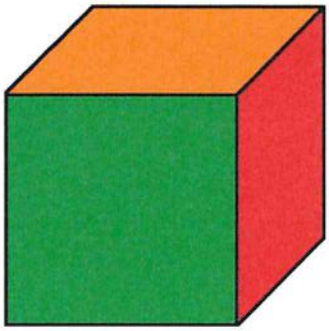
A) Nobody
B) Smith
C) Patel and Smith
D) Owololu, Patel and Smith
E) Jones, Owololu, Patel and Smith

13. The faces of a cube have been painted red, green, yellow, blue, orange, and white

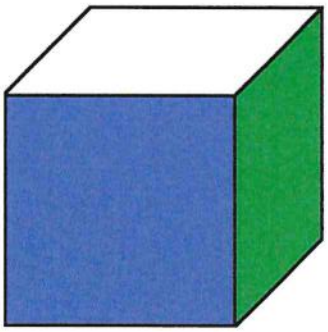
Each face has been painted with one colour and no colour has been used twice.
Red and white faces are opposite, as well as yellow and green faces. Also, if you look at the vertex shared by the blue face, the red face, and the green face, you will see Red, Blue, and Green arranged in a clockwise rotation.

Which of these is an **impossible** view of the cube?

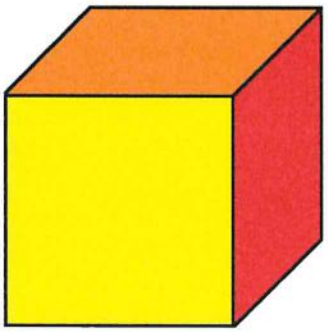
A)



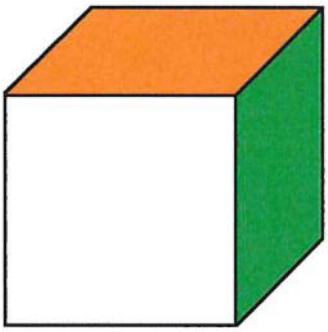
B)



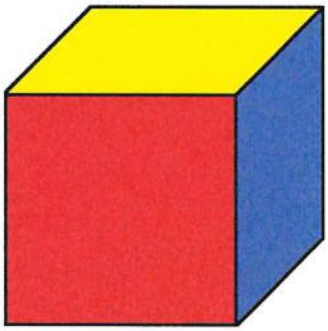
C)



D)

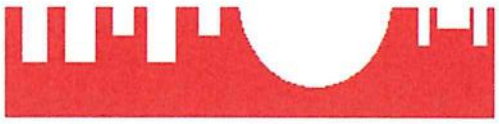


E)



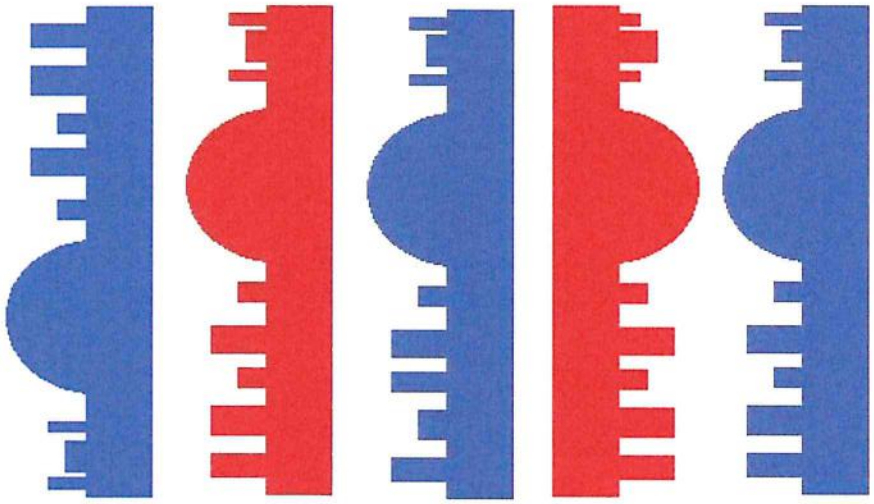
14. A rectangular sheet of paper is painted red on one side and blue on the other side. It is then cut into two pieces

One of the shapes is this one:

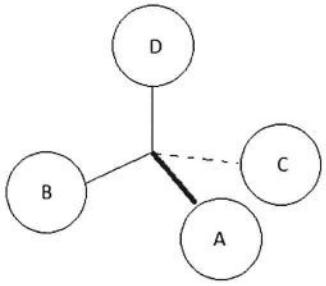


Which of these is the other piece?

A) B) C) D) E)



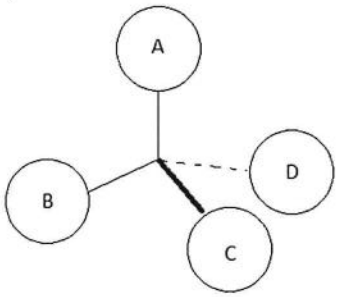
15. Look at this representation of a three-dimensional object



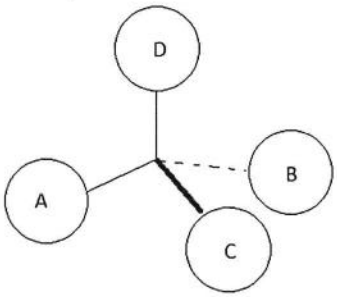
The object is made of four equal-sized spheres, labelled A, B, C, and D, connected to the same point by four equal rods. The four spheres create a regular tetrahedron, occupying the position of the vertexes, while the common point to which they are connected by the rods occupies the centre. Spheres B and D can be thought of as lying in the plane of this paper. Sphere A can be thought of as being placed in front of the paper (i.e. between the observer and the paper), while sphere C can be thought of as being behind the paper, with respect to the observer. The bold and dashed traits are drawn accordingly.

Which of these is a possible view of the mirror image of the tetrahedron represented above?

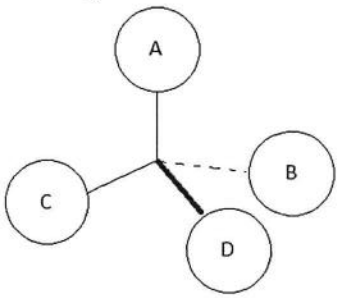
A)



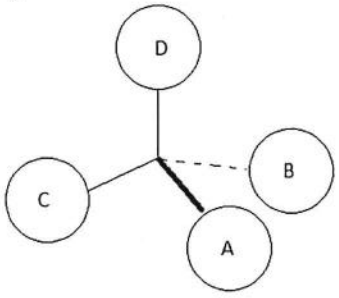
B)



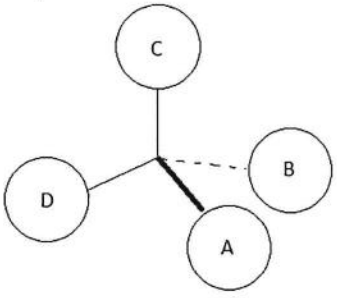
C)



D)



E)



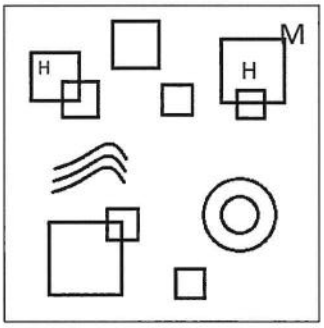
16. You work in a fashion house and your boss has asked you to create a new pattern

The pattern must have these characteristics

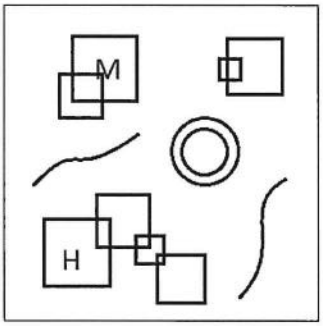
- the letters of the brand, H and M, must appear (they can appear multiple times);
- there must be squares intersecting each other, but no chains made of three or more intersecting squares;
- there must be concentric circles but these must not touch other shapes;
- there can be other shapes or lines;
- each letter M must touch at least one shape or line.

Which of these patterns matches your boss's requirements?

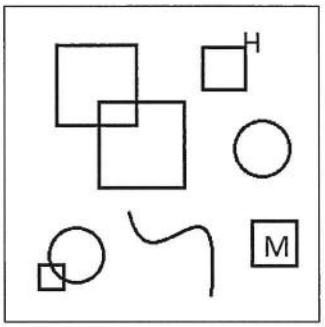
A)



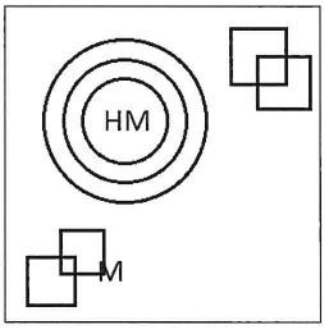
B)



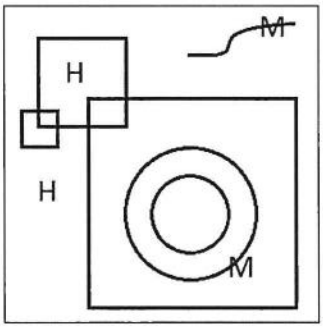
C)



D)

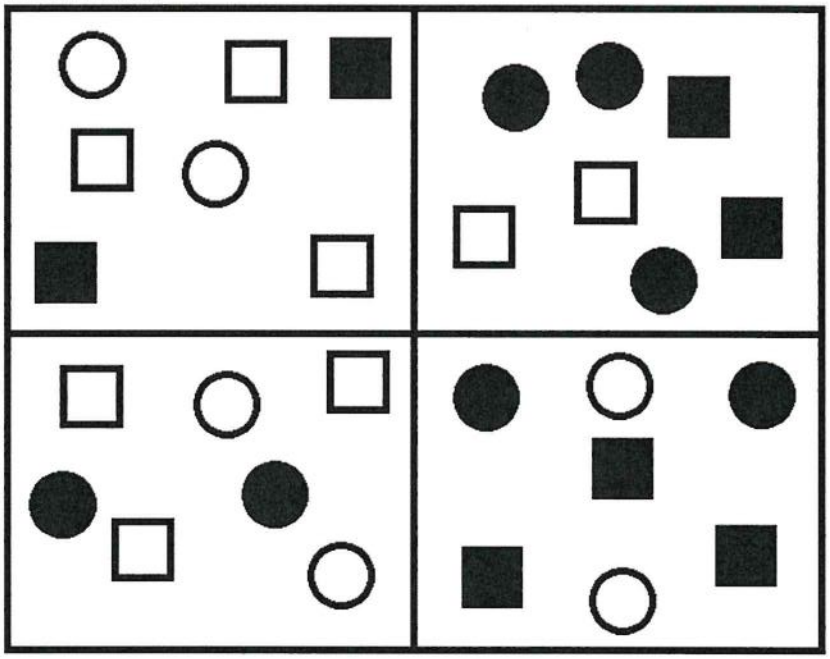


E)



17. Alice is looking at the closed window in her kitchen from the inside, while her friend Bob is looking at the same window from the outside

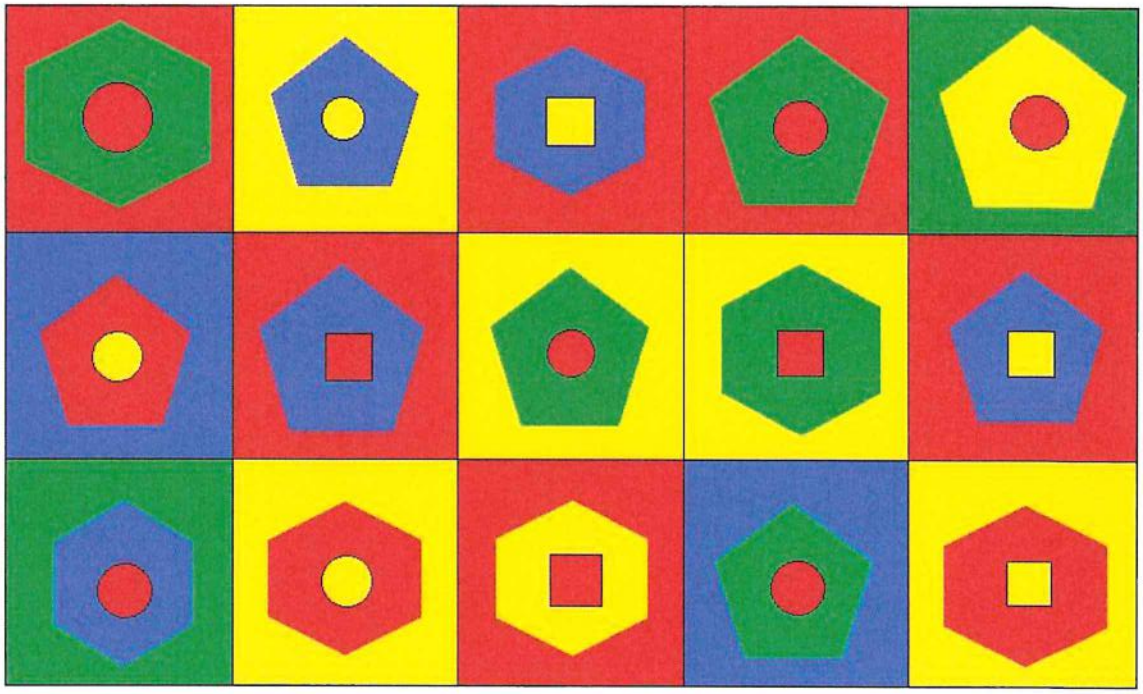
Alice's children have put a few stickers on the window. This is a view of what Bob sees from outside:



From Alice's point of view, which statement is correct?

A) All the circles in the top-right quarter of the window are filled.
B) All the squares in the bottom-right quarter of the window are filled.
C) All the full shapes in the top-left quarter of the window are circles.
D) All the empty shapes in the top-right quarter of the window are squares.
E) All the empty shapes in the bottom-left quarter of the window are circles.

18. In a modern art gallery you see this painting, inspired by a famous work by the artist Kandinsky



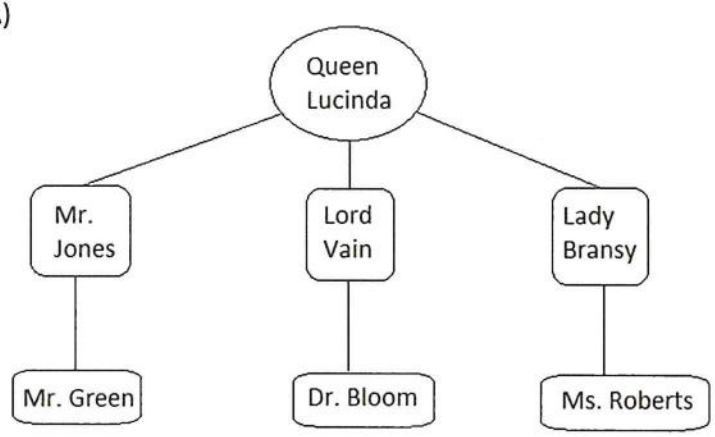
Which of these is true?

A) If a pentagon contains a circle, then that circle is red.
B) If a pentagon is red or blue, then it contains a yellow square.
C) If a hexagon is green or yellow, then it contains a red shape.
D) Each small yellow square is contained in a blue shape.
E) If a hexagon has a pentagon on its left and another one on its right, then it contains a red square.

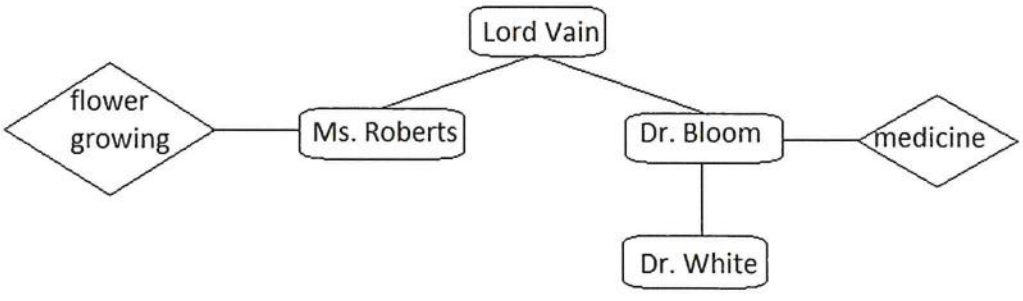
19. Read this text and choose the diagram that most effectively summarises it.

In a far-off kingdom there is a Queen, called Queen Lucinda, who reigns with the help of a number of servants and advisors. Lord Vain, Lady Bransy, and Mr. Jones report directly to the Queen. Lord Vain is helped in his work by Mr. Green, Dr. Bloom, and Ms. Roberts. The three of them are expert in agriculture, medicine, and gardening respectively. Queen Lucinda adores red roses, which is why Ms. Roberts has recently hired four new gardeners: Matt, John, Claire, and Robert. Together with the other gardeners, they will take care of the thousands of red roses in the Queen's gardens. Dr. Bloom also likes red roses and is studying their curative properties together with his assistants, Dr. Brown and Dr. White. Lady Bransy is secretly in love with Dr. White, but she is too busy organising royal parties at Queen Lucinda's palace to find time to declare her love. The parties take place every week and require music, food, pastries, and last but not least, red roses. Once, Ms. Roberts had an argument with Lady Bransy because the latter wanted an exorbitant quantity of rose petals to use as decorations at the Moon ceremony but the former could not provide any petals at such short notice. Anyway, as well as parties and red roses, Queen Lucinda is also interested in finance and commerce, which is why Mr. Jones's presence at the court is so important. His ability to buy and sell gold, silver, and other metals has been crucial in improving Queen Lucinda's finances over the last two years. He is likely to be nominated a Lord next year, during the great Sun ceremony.

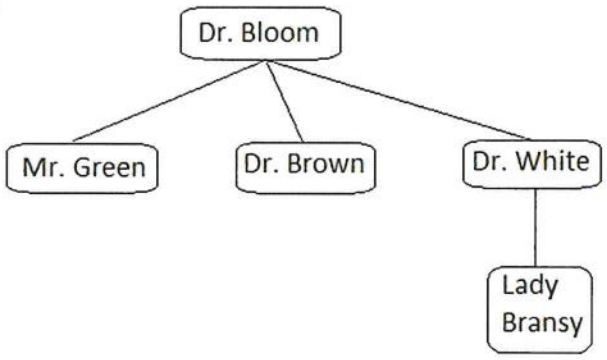
A)



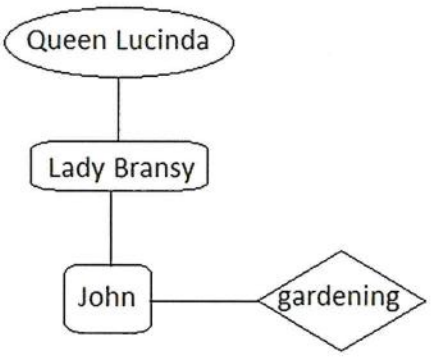
B)



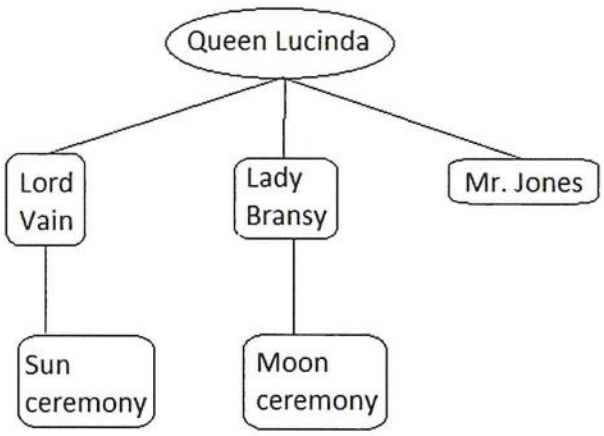
C)


Dr. Bloom
Mr. Green
Dr. Brown
Dr. White
Lady Bransy

D)


Queen Lucinda
Lady Bransy
John
gardening

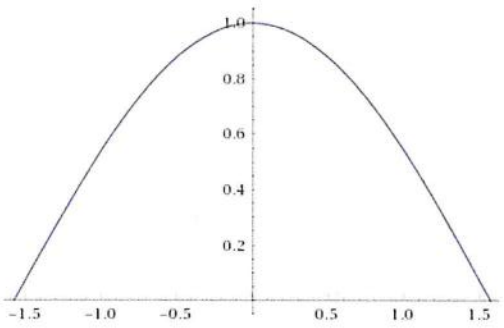
E)


Queen Lucinda
Lord Vain
Lady Bransy
Mr. Jones
Sun ceremony
Moon ceremony

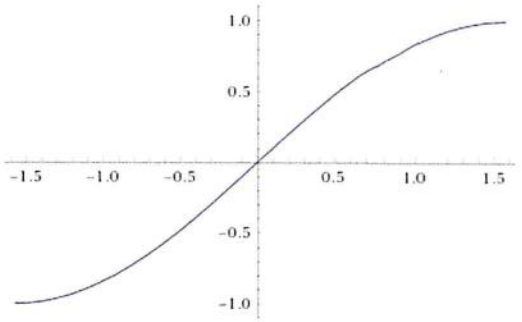
20. In the cartesian plane, a curve can undergo many different geometric transformations. Two of these are the reflection around the x-axis (any point P(x,y) becomes P'(x,-y)) and the reflection around the y-axis (any point P(x,y) becomes P'(-x,y))

Which of these curves looks the same when reflected twice in a row (once around the x-axis and then once around the y-axis)?

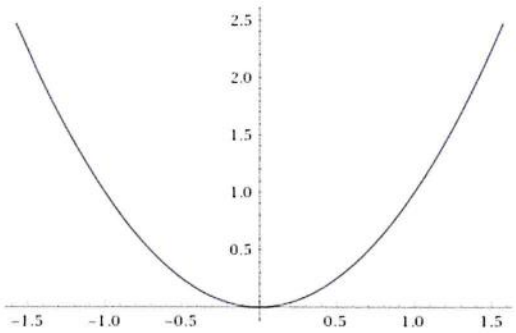
A)



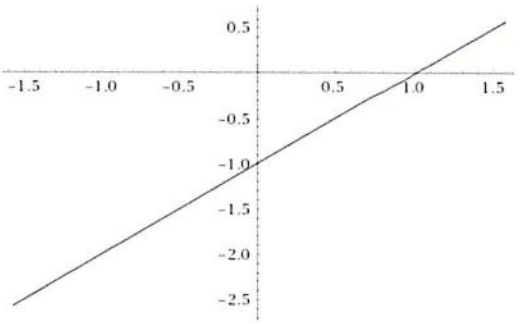
B)



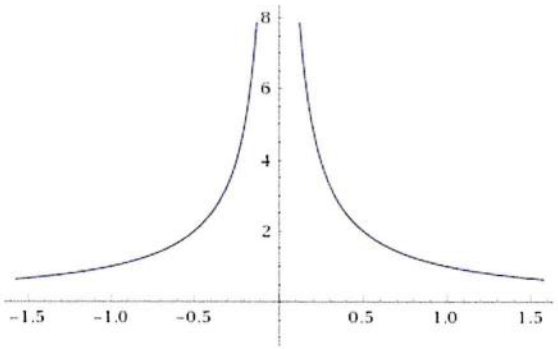
C)



D)



E)



21. Consider this formula

$$R = \frac{\sqrt{S}}{S}$$

where S is positive. If S increases, then:

A) R will decrease
B) R will increase
C) R will not change
D) The answer depends on the values of S
E) None of the preceding

22. Consider this law

$$V = \frac{T}{S}$$

where all variables are positive.

Which of these is an equivalent way to state that law?

A) $S = VT$

B) $S = \frac{V}{T}$

C) $S = \frac{T}{V}$

D) $T = \frac{S}{V}$

E) $T = \frac{V}{S}$

23. Assuming that $x = 10, y = 100, z = 10^{-2}$, and $t = \frac{1}{1000}$

how many of these inequalities are correct?

$$x > \frac{1}{z}$$

$$\frac{1}{x} < t$$

$$xyz > t^{-1}$$

$$\frac{1}{ty} > \frac{1}{z}$$

A) 0
B) 1
C) 2
D) 3
E) 4

24. This set of equations is given, where symbols $, £, & represent numbers

$ + & = 11 - £
& + $ = 1 + £ + $
£ - $ = $

What is the correct value of $+&-£ ?

A) 1
B) 2
C) 3
D) 5
E) 7

25. Five friends are playing a tactical war game where they can make deals with any other player

In this game players can attack and defend at the same time, but they can only attack one player at a time.

Anthony and Cathy agree that if Anthony is attacked by Brian, then Cathy will attack Dylan. However, Brian and Anthony agree that if Cathy is attacked by Brian, then Anthony will attack him. Emilia agrees with Dylan to not attack each other and that, if Dylan attacks anybody, then Emilia will immediately join him in the attack. Dylan agrees with Brian that they will attack Anthony together immediately, if anybody attacks Brian.

Which of these happens if Brian attacks Cathy?

A) Dylan attacks Cathy
B) Cathy attacks Brian
C) Emilia attacks Anthony
D) Cathy attacks Anthony
E) Anthony attacks Dylan

26. At a science museum there is a room dedicated to lamps and switches

Marc, Claudia, Robert, and Sophia find an interesting installation containing six lamps, numbered 1 to 6. The even-numbered lamps are on, while the odd-numbered ones are off. There are four switches that operate specific sets of lamps:
Switch S1 operates lamps 1, 2, and 3.
Switch S2 operates lamps 4, 5, and 6.
Switch S3 operates lamps 3 and 4,
Switch S4 operates lamps 1 and 6.

Robert takes control of switch S2, Claudia chooses switch S3, Marc opts for switch S4, and Sophia takes switch S1.

In which order should Marc, Claudia, Robert, and Sophia press their switches in order to turn on all lamps?

A) Sophia, Marc, Claudia
B) Robert, Sophia, Marc
C) Marc, Robert, Sophia
D) Claudia, Robert, Marc
E) Sophia, Claudia, Robert

27. Tomorrow is Jonathan's 10th birthday

Jonathan's family have put all his presents into four different bags, numbered 1 to 4. Jonathan can choose one present from each bag. Each bag contains these presents:

Bag 1: Present A, Present B, Present D, Present E

Bag 2: Present B, Present C, Present Y, Present A

Bag 3: Present F, Present H, Present D, Present G

Bag 4: Present T, Present F, Present E, Present Y

Which combination of presents is it **impossible** for Jonathan to choose?
[Presents are listed in random order]

A) Presents C, G, T, E
B) Presents F, H, B, A
C) Presents E, F, Y, A
D) Presents E, D, B, A
E) Presents F, H, C, Y

28. You are organising a party for 55 children

You have arranged everything, except the drinks. You calculate that you will need at least one litre of liquid per child, apart from water, which is free at the party venue. You decide to provide Cola, Juice, Soda, and Lemonade, in equal amounts.

Here are the prices of goods at the local supermarket:

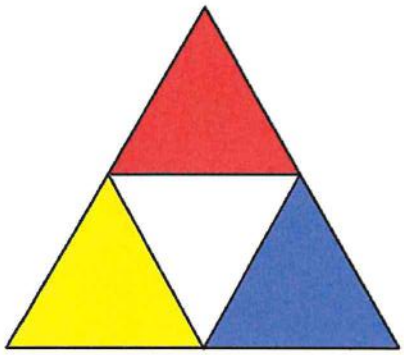
Beverage	500 ml	1500 ml
Cola – Company Alfa	1.50 €	1.90 €
Cola – Company Beta	1.20 €	2.20 €
Apple Juice	1.20 €	Not available
Apricot Juice	1.20 €	Not available
Peach Juice	1.50 €	4.00 €
Soda – Company Alfa	0.80 €	2.00 €
Soda – Company Beta	0.80 €	1.80 €
Lemonade	1.30 €	3.00 €

You want to keep your budget as low as possible.

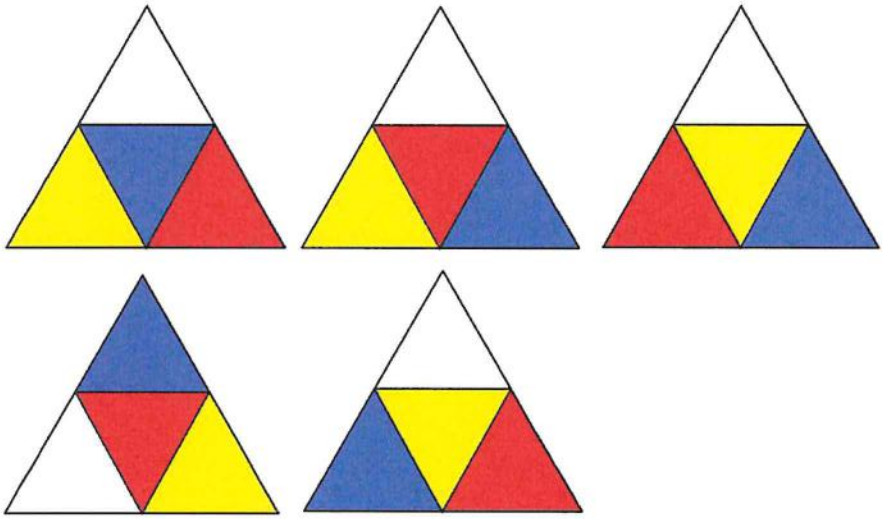
What is the minimum you need to spend on the beverages?

A) 102.70€
B) 100.80 €
C) 98.70 €
D) 97.20 €
E) 92.70 €

29. Here is a net that, when folded up, becomes a regular tetrahedron, with the coloured faces outwards (the back of the net is completely white)



How many of these nets give the same tetrahedron, when folded up with the coloured faces outwards?



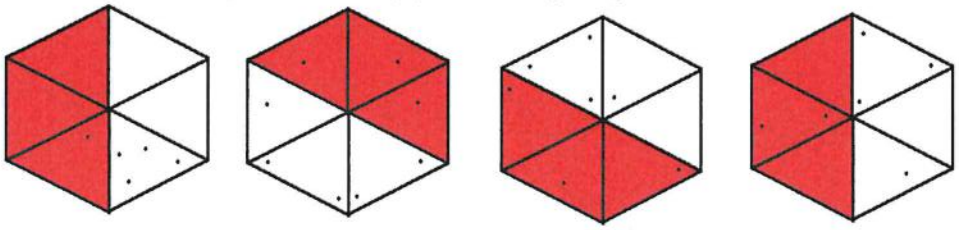
A) 1
B) 2
C) 3
D) 4
E) 5

30. You work as a quality controller in a factory

Each product consists of six triangular shapes glued together to form of a planar hexagon. Your job is to check that each product complies with these quality standards:

- Maximum number of dots per triangular shape: 3
- Maximum number of dots per product: 7
- If a triangular shape is painted red, then the maximum number of dots admitted for that shape is 1

How many of these products comply with the quality standards?



A) 0
B) 1
C) 2
D) 3
E) 4

That is the end of the test.