

Year 11 to 13 (ENGLISH VERSION)

Thursday, 20th March 2025

Time allowed: 75 minutes

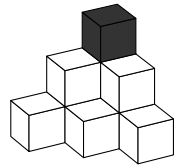
- For each question exactly one of the 5 options is correct.
- Each participant is given 30 points at the beginning. For each correct answer 3, 4 or 5 points are added. No answer means 0 points are added. If a wrong answer is given, one quarter of the points is subtracted, i.e. 0.75 points, 1 point or 1.25 points, respectively. At the end, the maximum number of points is 150, the minimum is 0.
- Calculators and other electronic devices are not allowed.

3 point problems

A1 Which of the following fractions has the largest value?

- (A) $\frac{20}{25}$ (B) $\frac{20}{2+5}$ (C) $\frac{20}{-2+5}$ (D) $\frac{20}{2-5}$ (E) $\frac{20}{2 \times 5}$

A2 The pyramid shown is built using black and grey cubes. Cubes that touch with a face must be of different colours. On the top is a black cube. What does the pyramid look like from above?

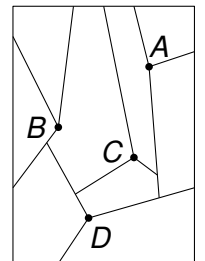


- (A) (B) (C) (D) (E)

A3 In which range does the value of 88×888 lie?

- (A) between 888 and 4 444 (B) between 4 444 and 8 888 (C) between 8 888 and 44 444
(D) between 44 444 and 88 888 (E) between 88 888 and 444 444

A4 Viola marked 4 points on a piece of paper. She chooses each point one after another and draws three lines from each point. Each line ends at the edge of the paper or at an already drawn line. In which order did Viola choose the points?



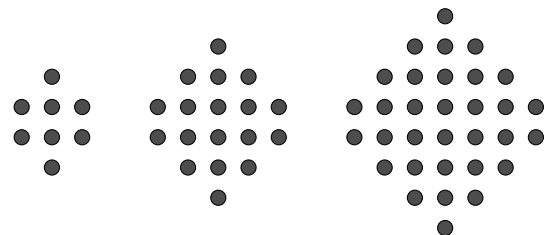
- (A) $DACB$ (B) $ADBC$ (C) $BDAC$ (D) $BCDA$ (E) $DABC$

A5 Dimitry has 20 coloured balls. Each ball is either red or black or yellow or blue. Exactly 17 of the balls are not red, 15 balls are not black and 12 balls are not yellow. How many of the balls are blue?

- (A) 8 (B) 7 (C) 6 (D) 4 (E) 3

A6 Here are the first three shapes in a sequence. How many dots are needed to make the 4th shape in the sequence?

- (A) 46 (B) 50 (C) 52 (D) 56 (E) 58



A7 Which of the following powers is equal to $\sqrt{16^{25}}$?

- (A) 4^5 (B) 16^5 (C) 8^{25} (D) 32^5 (E) 4^{25}

A8 The area of my room is 15 m^2 . I've drawn the floor plan of my room using a scale 1 : 100. What is the area of my room in the drawing?

- (A) 1.5 cm^2 (B) 15 cm^2 (C) 150 cm^2 (D) $1\,500 \text{ cm}^2$ (E) $15\,000 \text{ cm}^2$

- A9** Two normal 6-sided dice are rolled at the same time and their scores are multiplied together. What is the probability of obtaining a result that is a prime number?

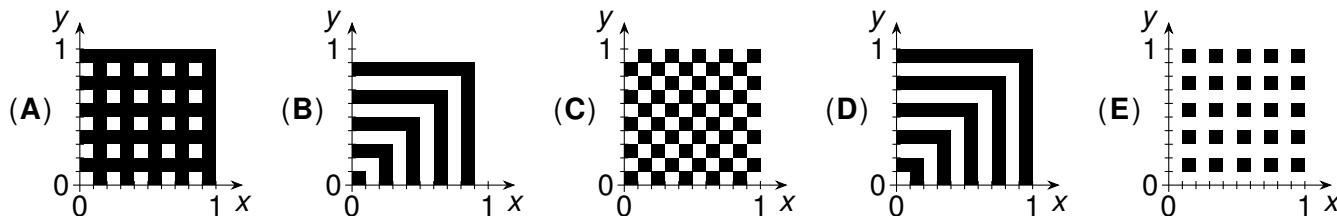
(A) $\frac{1}{3}$ (B) $\frac{1}{4}$ (C) $\frac{1}{5}$ (D) $\frac{1}{6}$ (E) $\frac{1}{7}$

- A10** Johanna's favourite cereal bars come in packets. Each packet used to contain 5 bars. Now each packet only contains 4 bars, but the packet still costs the same. By what percentage has the price per bar increased?

(A) by 10 % (B) by 15 % (C) by 25 % (D) by 30 % (E) by 40 %

4 point problems

- B1** On a coordinate grid, some points in the region where $0 \leq x \leq 1$ and $0 \leq y \leq 1$ are painted black. The point (x, y) is painted black if for both x and y the first digit after the decimal point is odd. What does the result look like?

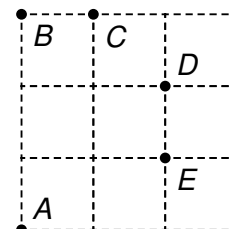


- B2** Let M be the largest of 10 different positive integers of which exactly 5 are divisible by 5 and exactly 7 are divisible by 7. What is the smallest possible value of M ?

(A) 105 (B) 77 (C) 75 (D) 70 (E) 63

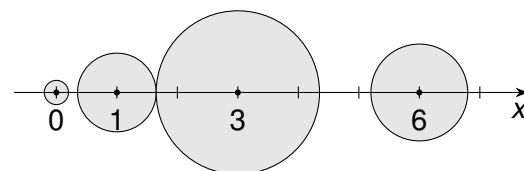
- B3** Robert removes one of the five marked points A, B, C, D, E from the grid. The 6 distances between any 2 of the 4 remaining points are all different lengths. Which point did Robert remove?

(A) A (B) B (C) C (D) D (E) E

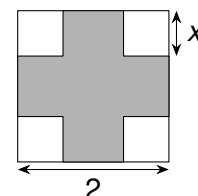
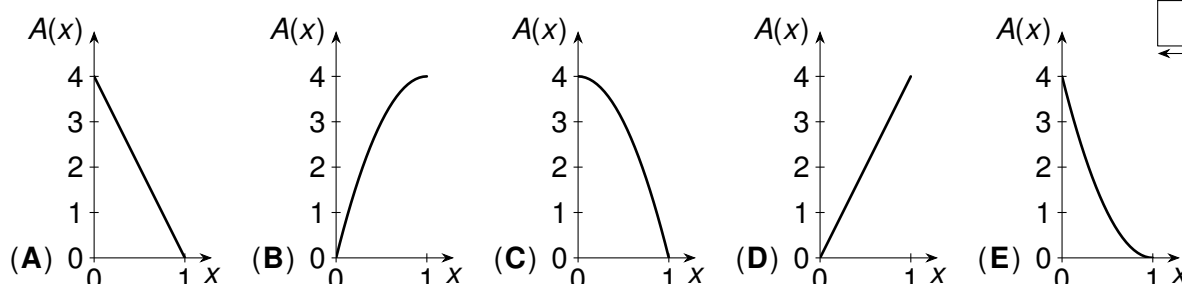


- B4** Four circular discs with radii r_1, r_2, r_3 and r_4 are centred at 0, 1, 3 and 6, respectively. The discs may touch but not overlap. What is the largest possible value of $r_1 + r_2 + r_3 + r_4$?

(A) 3 (B) 4 (C) 5 (D) 7 (E) 9



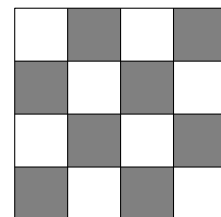
- B5** A square piece of card has side length 2. A square of side length x is cut from each corner of the card, leaving a cross as shown. The area of the cross is given by the function $A(x)$. What does the graph of A look like?



B6 How many 5-digit numbers of the form $\overline{A18AA}$ are divisible by 18?

- (A) one (B) two (C) three (D) four (E) five

B7 On a 4×4 chessboard there are 16 kangaroos, one in each square. On each turn, all of the kangaroos jump to a neighbouring square: up, down, left or right. All kangaroos stay on the board. There can be several kangaroos on any square. After 10 turns, what is the largest possible number of empty squares?



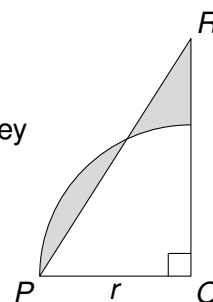
- (A) 15 (B) 14 (C) 13 (D) 12 (E) 11

B8 What is the smallest positive integer N such that $\sqrt{2 \times \sqrt{3 \times \sqrt{N}}}$ is an integer?

- (A) $2^6 \times 3^6$ (B) $2^2 \times 3^8$ (C) $2^4 \times 3^{10}$ (D) $2^6 \times 3^8$ (E) $2^4 \times 3^6$

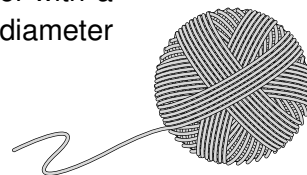
B9 The diagram shows a quarter-circle with radius r and a right-angled triangle. The two grey regions have the same area. What is the length of OR ?

- (A) $\frac{\pi r}{2}$ (B) $\frac{3r}{2}$ (C) πr (D) $\frac{\pi^2 r}{6}$ (E) $\sqrt{3}r$



B10 When grandma started knitting woollen baby socks, she had a huge ball of wool with a diameter of 20 cm. After finishing 14 socks, she still has a ball of wool with a diameter of 10 cm. How many more socks can grandma knit with the wool that is left?

- (A) 8 (B) 6 (C) 4 (D) 3 (E) 2

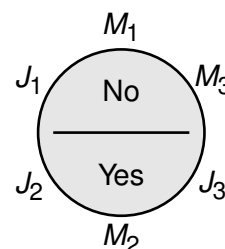


5 point problems

C1 Jasper wrote a small computer program, which returns the sum and the positive difference of two numbers and repeats the program for the results. He wants to find out how the numbers develop. He starts the program with the numbers 5 and 3. After the first iteration, the results are 8 and 2. Which two numbers does he get after the 50th iteration?

- (A) 5×2^{25} and 3×2^{25} (B) 5^{25} and 3^{25} (C) 2^{28} and 2^{26}
(D) 5^{26} and 3^{26} (E) 2×5^{25} and 2×3^{25}

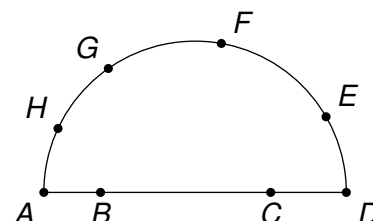
C2 Three aliens from Mars, M_1 , M_2 and M_3 , and three aliens from Jupiter, J_1 , J_2 and J_3 , sit around a table as shown. All the aliens from one planet only tell the truth and all the aliens from the other planet only tell lies. One of the six aliens has the key to their shared spaceship. To the question: "Does one of the aliens sitting next to you have the key?" J_1 , M_1 and M_3 answer "No" and the rest of the aliens answer "Yes". Who has the key?



- (A) J_1 (B) J_2 (C) J_3 (D) M_1 (E) M_2

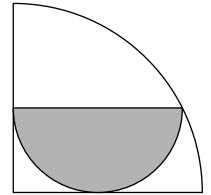
C3 On a semicircle with diameter AD , points B and C lie on the diameter and points E , F , G and H lie on the arc of the semicircle. How many different triangles can be formed with their vertices at 3 of these 8 points?

- (A) 48 (B) 49 (C) 50 (D) 52 (E) 54



- C4** The area of the grey semicircle is 12 cm^2 . What is the area of the big quarter circle?

(A) 42 cm^2 (B) 36 cm^2 (C) 32 cm^2 (D) 30 cm^2 (E) 25 cm^2



- C5** Three boxes contain five balls each. The lids are rearranged so that each of them shows the content of one of the other two boxes. Aleya and Luis play a game.



Aleya should determine the contents of each box in as few turns as possible. In each turn, Aleya chooses a box and Luis gives her a ball out of that box. Luis chooses the balls in such a way that Aleya needs as many turns as possible. How many turns does Aleya need?

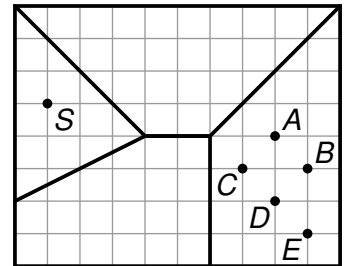
(A) 1 (B) 2 (C) 3 (D) 4 (E) 5

- C6** Lorena and her little brother Dani both start riding their bikes from home at the same time. They both ride the same route with constant speed. Lorena rides at 18 km/h and Dani at 12 km/h . After 20 minutes, Lorena gets tired and returns home the way she came. When she meets Dani, he also turns around and rides home. How long does Lorena need to wait at home till her little brother arrives?

(A) 4 minutes (B) 6 minutes (C) 8 minutes
(D) 10 minutes (E) 15 minutes

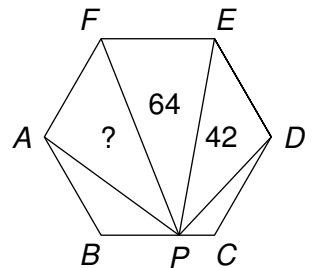
- C7** On the right is a simplified map of a town. There are four secondary schools, and the map shows their catchment areas. The catchment area of each school is the set of all points that are closer to that school than any of the other three schools. The school in the leftmost area is located at the point S . At which point is the school in the right most area located?

(A) at A (B) at B (C) at C (D) at D (E) at E



- C8** The diagram shows a regular hexagon $ABCDEF$. Point P lies on BC so that the area of the triangle PEF is 64 cm^2 and the area of the triangle PDE is 42 cm^2 . What is the area of the triangle PFA ?

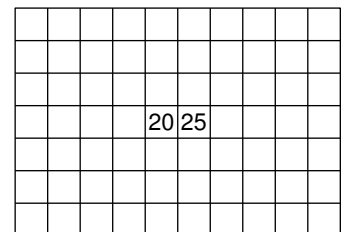
(A) 53 cm^2 (B) 54 cm^2 (C) 56 cm^2 (D) 60 cm^2 (E) 64 cm^2



- C9** A number is written in each cell of this 7×10 rectangle. The sum of all the numbers in any 3×4 or 4×3 rectangle is 0. The numbers 20 and 25 are written into the two cells in the middle.

What is the sum of all numbers in the 7×10 rectangle?

(A) -45 (B) -25 (C) -20 (D) -5 (E) 5



- C10** The figure shows a regular octagon of side 1 cm. An arc of radius 1 cm has been drawn centred at each vertex, as shown. What is the perimeter of the grey region?

(A) $\pi \text{ cm}$ (B) $\frac{2\pi}{3} \text{ cm}$ (C) $\frac{8\pi}{9} \text{ cm}$ (D) $\frac{4\pi}{5} \text{ cm}$ (E) $\frac{3\pi}{4} \text{ cm}$

