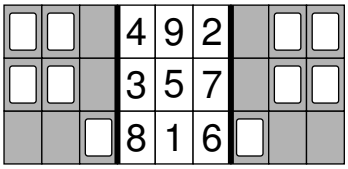
Year 9 and 10 (ENGLISH VERSION)

Thursday, 20th March 2025 Time allowed: 75 minutes

1. For each question exactly one of the 5 options is correct.
2. 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.
3. Calculators and other electronic devices are not allowed.

3 point problems

A1 A piece of card with holes is folded along the thick black lines. When both flaps are folded over, what is the sum of the numbers that can be seen through the holes?

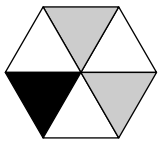
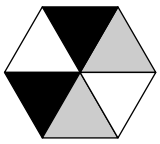
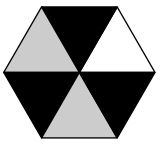
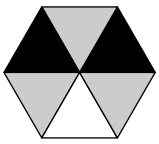
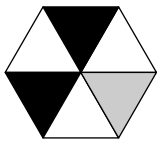


(**A**) 7 (**B**) 9 (**C**) 12 (**D**) 14 (**E**) 15

A2 The yearly chess tournament at my school always takes place on the 3rd Friday in May.
Which date is the earliest possible date for the tournament?

(**A**) 14th May (**B**) 15th May (**C**) 16th May (**D**) 17th May (**E**) 18th May

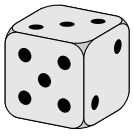
A3 In which of the following hexagons is exactly one third of the area black and exactly half of the area white?

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

A4 On a packet of rice it says that 1 cup of rice has to be cooked with $1\frac{1}{2}$ cups of water. Niklas wants to cook $1\frac{1}{2}$ cups of rice. How many cups of water does he need?

(**A**) $1\frac{1}{4}$ (**B**) $1\frac{3}{4}$ (**C**) $2\frac{1}{4}$ (**D**) $2\frac{1}{2}$ (**E**) $2\frac{3}{4}$

A5 On a normal dice, the total number of spots on two opposite faces is always 7. Only one of the dice below can be a normal one. Which one?

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

A6 The number of the year 2025 is a perfect square because $2025 = 45^2$.
In how many years is the number of the year a perfect square for the next time?

(**A**) 35 (**B**) 91 (**C**) 123 (**D**) 171 (**E**) 236

A7 Last week, a supermarket manager increased the price of bananas by 50 %. This week, she decreased the price of bananas by one third. Complete the statement: The price of bananas now is _____ the price of bananas two weeks ago.

(**A**) half of (**B**) one fifth less than (**C**) the same as
(**D**) one quarter more than (**E**) twice as much as

A8 On my fridge there are four magnets with digits **2 0 2 5**.
How many different 4-digit numbers can be made with these magnets?

(**A**) 4 (**B**) 5 (**C**) 7 (**D**) 9 (**E**) 11

A9 At 8 am, Elisa, Gabriel, Julika, Levi and Yasin each had a fully-charged mobile phone. Below are the battery displays of the phones at 6 pm. Gabriel used as much battery power as Elisa and Julika combined. Gabriel's battery is empty. Levi didn't use his phone at all. Which battery display belongs to Yasin's phone?

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

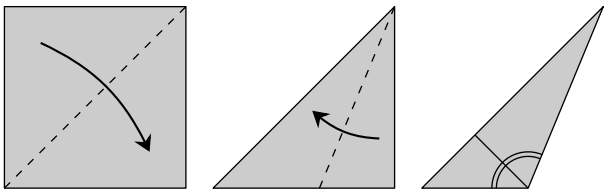
A10 Given that $x > 5$, which of the following numbers is the smallest?

(**A**) $\frac{5}{x+1}$ (**B**) $\frac{5}{x}$ (**C**) $\frac{5}{x-1}$ (**D**) $\frac{x}{5}$ (**E**) $\frac{x+1}{5}$

4 point problems

B1 Alex folds a square paper along the dashed lines as shown. What is the size of the obtuse angle in the created triangle?

(**A**) 105° (**B**) 112.5° (**C**) 115° (**D**) 120° (**E**) 127.5°



B2 Since Ellen's neighbour Fritz can no longer walk well, Ellen does a lot of shopping for him. Today she bought sesame rolls, poppy seed rolls and caraway rolls. Fritz counts in a cumbersome way what she brought: "8 rolls are without sesame, and 5 rolls are without poppy seeds." "And 7 rolls are without caraway," says Ellen. How many rolls has Ellen bought?

(**A**) 9 (**B**) 10 (**C**) 11 (**D**) 12 (**E**) 13

B3 A bag contains 11 balls which are numbered from 3 to 13. Without looking, I take one ball after the other from the bag. I do not put the balls back in the bag after taking them. What is the minimum number of balls that must be drawn to guarantee three balls with prime numbers?

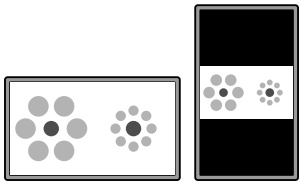
(**A**) 5 (**B**) 6 (**C**) 7 (**D**) 8 (**E**) 9

B4 Kati and Tom both think of a positive whole number. The sum of their numbers is between 40 and 100. Tom notices that $\frac{1}{19}$ of Kati's number is equal to $\frac{1}{17}$ of his number. What number did Kati think of?

(**A**) 19 (**B**) 32 (**C**) 38 (**D**) 57 (**E**) 76

B5 Romy looks at a photo on her mobile phone. The format is 16 : 9 and fills the whole display. When she turns the phone, the picture gets smaller.
What fraction of the display area is taken up by the smaller picture?

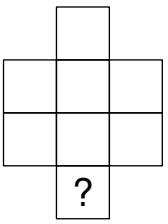
(**A**) $\frac{3}{4}$ (**B**) $\frac{4}{9}$ (**C**) $\frac{27}{64}$ (**D**) $\frac{32}{81}$ (**E**) $\frac{81}{256}$



B6 The number N is the largest 6-digit integer whose digits have a product of 180.
What is the sum of the digits of N?

(**A**) 21 (**B**) 20 (**C**) 19 (**D**) 17 (**E**) 16

B7 Vasily wants to write the numbers 1 to 8 in the eight cells of the diagram, with one number in each cell. He wants the cells that contain two consecutive numbers not to share a side or a vertex. Which numbers can Vasily put in the cell marked with a question mark?

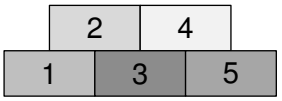


(**A**) 1 or 8 (**B**) 2 or 7 (**C**) 3 or 6 (**D**) 4 or 5 (**E**) 7 or 8

B8 The 4-digit number 80▮▮ is missing its last two digits. The number is divisible by 8 and 9. What is the product of these two missing digits?

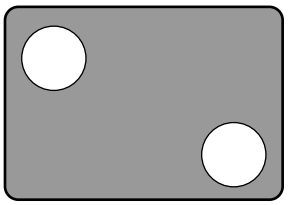
(**A**) 6 (**B**) 16 (**C**) 20 (**D**) 24 (**E**) 48

B9 Five packages are stacked on the table. Mara wants to clear them away, but she can only remove a package if there are no packages on top of it. Mara randomly chooses a free package and removes it, until all the packages are removed. What is the probability that the package numbered 3 is the third package to be removed?



(**A**) $\frac{1}{2}$ (**B**) $\frac{1}{3}$ (**C**) $\frac{1}{5}$ (**D**) $\frac{1}{6}$ (**E**) $\frac{1}{8}$

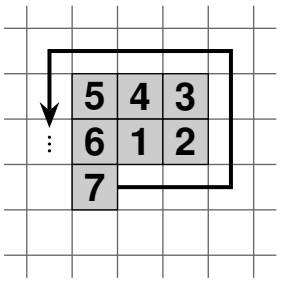
B10 Paul shoots a total of 27 times at two targets. He hits 50 % of the shots he aims at the top left target and 80 % of the shots he aims at the bottom right target. He misses a total of 9 shots.
How many times did Paul aim for and hit the top left target?



(**A**) 4 (**B**) 5 (**C**) 6 (**D**) 7 (**E**) 8

5 point problems

C1 Lucie is writing on grid paper. Each square has a side length of 0.5 cm. She starts with one square and numbers it with the number 1. Then she continues to number the squares in a spiral as shown. After numbering the 2025th square, she colours all numbered squares grey.
What is the perimeter of the grey shape?



(**A**) 75 cm (**B**) 78 cm (**C**) 85 cm (**D**) 90 cm (**E**) 96 cm

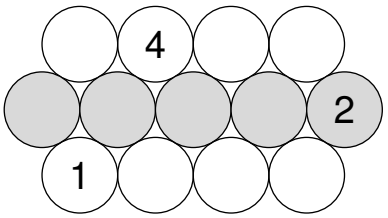
C2 The girls' 3×3 basketball team of my school has 5 regular and 2 new players. In one match, the players had the shirt numbers 3, 14, 15, 9, 26, 5, 35. At times during this match, always one player was substituted for another. There were always 2 regular players and 1 new player in play. The shirt numbers of the players on the field were:

3, 14, 15 $\rightarrow$ 14, 15, 9 $\rightarrow$ 15, 9, 26 $\rightarrow$ 9, 26, 5 $\rightarrow$ 26, 5, 35 $\rightarrow$ 5, 35, 3.

What is the sum of the shirt numbers of the 2 new players?

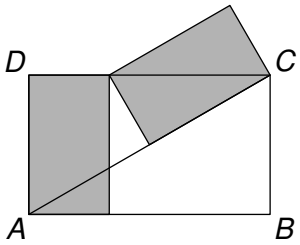
(**A**) 12 (**B**) 20 (**C**) 29 (**D**) 40 (**E**) 44

C3 In the diagram on the right, a number is written in each circle so that any group of 3 circles that are touching each other have the same sum. Three of the circles already have numbers in them.
What is the sum of the five numbers in the circles in the middle row?



(**A**) 3 (**B**) 8 (**C**) 13 (**D**) 18 (**E**) 23

C4 The two grey rectangles in the diagram are congruent. Both have an area of $3\,\text{cm}^2$. What is the area of the large rectangle $ABCD$?

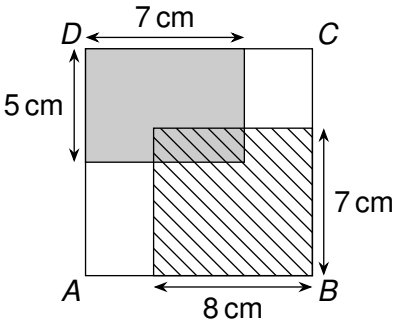


(**A**) $8\,\text{cm}^2$ (**B**) $9\,\text{cm}^2$ (**C**) $10\,\text{cm}^2$ (**D**) $11\,\text{cm}^2$ (**E**) $12\,\text{cm}^2$

C5 The six-digit number $\overline{ABCDEF}$ is made up of the digits 1, 2, 3, 4, 5, and 6, with no repeated digits. The number $\overline{AB}$ made from its first two digits is a multiple of 2, the number $\overline{ABC}$ made from its first three digits is a multiple of 3, the number $\overline{ABCD}$ made from its first four digits is a multiple of 4, the number $\overline{ABCDE}$ made from its first five digits is a multiple of 5, and the full integer $\overline{ABCDEF}$ is a multiple of 6.
What is the sixth digit, F?

(**A**) 4 (**B**) 6 (**C**) 2 and 4 are possible
(**D**) 4 and 6 are possible (**E**) 2, 4 and 6 are possible

C6 The square $ABCD$ contains two rectangles. One is grey and the other striped, with dimensions as shown in the diagram. The area of the overlapping part of the two rectangles is $18\,\text{cm}^2$. (*diagram not to scale*)
What is the perimeter of the square $ABCD$?

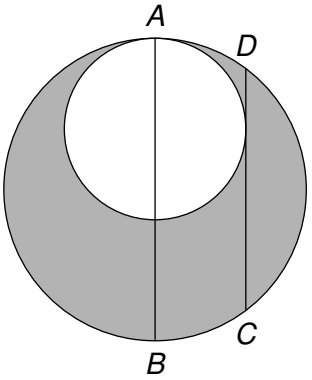


(**A**) 28 cm (**B**) 34 cm (**C**) 36 cm (**D**) 38 cm (**E**) 40 cm

C7 Jacob thinks of the sequence of numbers $a_1, a_2, a_3, a_4, \ldots$. From the third term onwards, each term is equal to the average (i. e. the arithmetic mean) of <u>all</u> the previous terms. That is, a_3 is the average of a_1 and a_2, then a_4 is the average of a_1, a_2, and a_3, and so on. In Jacob's sequence $a_1 = 8$ and $a_{10} = 26$.
What is the value of a_2?

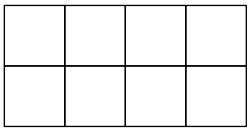
(**A**) 20 (**B**) 28 (**C**) 32 (**D**) 38 (**E**) 44

C8 The diagram shows two circles touching each other at point A. The line segment AB is a diameter of the larger circle. The line segment CD is 16 cm long, parallel to AB and tangent to the smaller circle.
What is the area of the shaded region in cm^2?



(**A**) 45π (**B**) 56π (**C**) 64π (**D**) 72π (**E**) 85π

C9 Isabella wants to write the numbers 1 to 8 into the squares of a 2×4 grid. The number in each square must be smaller than the number in the square to its right and smaller than the number in the square below it.
In how many different ways can Isabella fill the grid?



(**A**) 6 (**B**) 8 (**C**) 9 (**D**) 12 (**E**) 14

C10 In a youth hostel canoeing tours are offered. Today 12 children take part, including 3 pairs of siblings. The 12 children are divided into two groups: the first group canoes to the bird island and the second one to the long lake. In each group should be 6 children.
In how many ways can the 12 children be put in two group so that pairs of siblings are kept together?

(**A**) 74 (**B**) 92 (**C**) 118 (**D**) 136 (**E**) 150