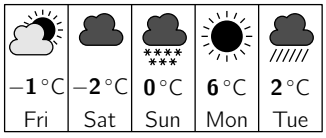
Year 9 and 10 (ENGLISH VERSION)

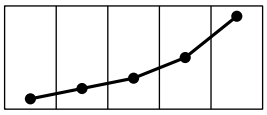
Thursday, 18th March 2021 Time allowed: 75 minutes

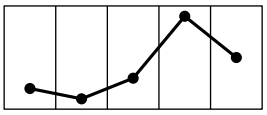
1. For each question exactly one of the 5 options is correct.
2. Each participant is given 30 points at the beginning. For each correct answer 3, 4 or 5 points are added. No answer means 0 points are added. If a wrong answer is given, one quarter of the points is subtracted, i. e. 0.75 points, 1 point 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.

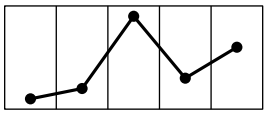
3 point problems

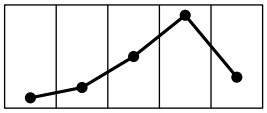
A1 The weather app on Jenny's mobile phone shows the expected maximum temperatures for the next 5 days. What does the corresponding graph look like?

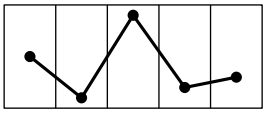


(**A**) 

(**B**) 

(**C**) 

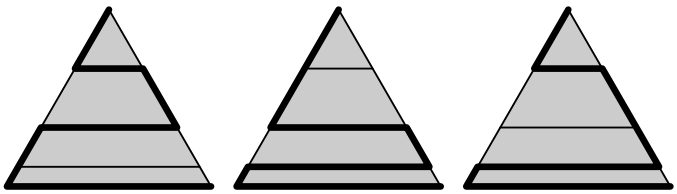
(**D**) 

(**E**) 

A2 Which of the following calculations has the largest result?

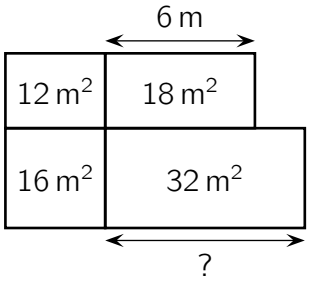
(**A**) 202×1 (**B**) 202^1 (**C**) $2 \times 0 \times 2 \times 1$ (**D**) 20×21 (**E**) $20 \times 2 \times 1$

A3 From above, our city park looks like an equilateral triangle. The four horizontal paths in the park are parallel to each other. In the travel guide, 3 routes through the park are recommended and marked with thick lines. They have the lengths P, Q and R. Which statement is true?



(**A**) $P < R < Q$ (**B**) $P < Q < R$ (**C**) $P < Q = R$ (**D**) $P = R < Q$ (**E**) $P = Q = R$

A4 Jurek's grandfather is thinking about how many seeds he needs for his herb and vegetable beds. For this purpose, the grandfather wrote down the area of each of the rectangular beds. The bed at the top right is 6 m long. How long is the bed at the bottom right?

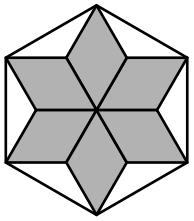


(**A**) 7 m (**B**) 7.5 m (**C**) 8 m (**D**) 8.5 m (**E**) 9 m

A5 In a handball match, the home team led 14 : 9 at half-time. In the 2nd half, the away team got better and scored twice as many goals as the home team. In the end, the away team won by one goal. What was the final score?

(**A**) 23 : 24 (**B**) 22 : 23 (**C**) 21 : 22 (**D**) 20 : 21 (**E**) 19 : 20

A6 Six identical rhombuses form a star. Each rhombus has an area of 5 cm^2. The tips of the star are joined to form a regular hexagon. What is the area of this hexagon?

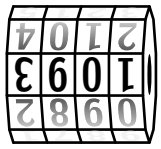


(**A**) 36 cm^2 (**B**) 40 cm^2 (**C**) 45 cm^2 (**D**) 48 cm^2 (**E**) 60 cm^2

A7 The triplets Samuel, Lukas and Gabriel from my class play in our six-member school jazz band. The other three band members are 13, 14 and 15 years old. The average age of all six band members is 15. How old are the triplets Samuel, Lukas and Gabriel?

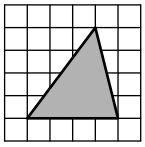
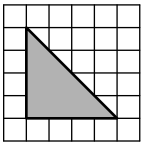
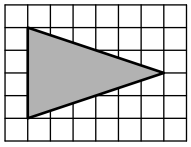
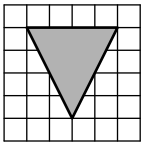
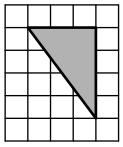
(**A**) 15 years (**B**) 16 years (**C**) 17 years (**D**) 18 years (**E**) 19 years

A8 When Mariam sets the correct code on her bicycle lock at the front, the lock looks from the back as shown. What is the correct code?



(**A**) 4836 (**B**) 3981 (**C**) 6548 (**D**) 6427 (**E**) 5358

A9 Which of the following triangles is isosceles, not right-angled, and has an area of 8 squares?

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

A10 Ada has thought of a number. The result she gets when she subtracts $\frac{1}{10}$ from her number is the same as the result she gets when she multiplies her number by $\frac{1}{10}$. What number did Ada think of?

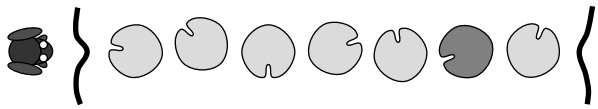
(**A**) $\frac{1}{100}$ (**B**) $\frac{1}{11}$ (**C**) $\frac{1}{10}$ (**D**) $\frac{11}{100}$ (**E**) $\frac{1}{9}$

4 point problems

B1 There are 10 children waiting at the water slide. A slide ride at constant speed lasts 1 minute. When a child reaches the last tenth of the slide, the light turns green and the next child starts sliding immediately. How long does it take for all 10 children to reach the bottom?

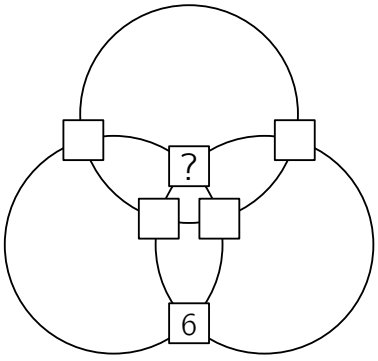
(**A**) 9 min 18 s (**B**) 9 min 6 s (**C**) 8 min 54 s (**D**) 8 min 30 s (**E**) 8 min 20 s

B2 A frog wants to cross a pond. He uses 7 lily pads in a row. He only jumps forward 1 or 2 lily pads at a time. He has to jump over the 6th lily pad because it is wilted. How many different possibilities are there for the frog to cross the pond in this way?



(**A**) 6 (**B**) 7 (**C**) 8 (**D**) 9 (**E**) 10

B3 The numbers from 1 to 6 are to be written in the six squares in the figure shown. On each of the three circles there are four of the squares. The 6 is already written. Which number must be written in the square with the question mark, so that the sum of the four numbers on each circle is the same?

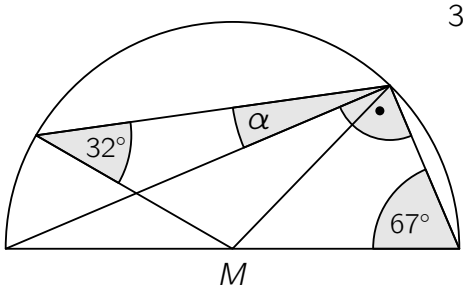


(**A**) 1 (**B**) 2 (**C**) 3 (**D**) 4 (**E**) 5

B4 If the year 2021 is divided by 6, by 7, by 8 or by 9, you get the remainder 5 each time. In how many years does the number of the year have this property again for the first time?

(**A**) 504 (**B**) 72 (**C**) 1512 (**D**) 126 (**E**) 336

B5 The picture shows a semicircle with centre M. What is α? (*figure not to scale*)

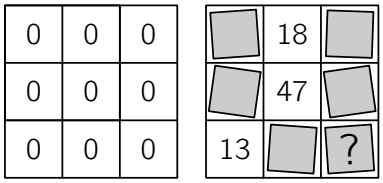


(**A**) 5° (**B**) 7° (**C**) 9° (**D**) 11° (**E**) 13°

B6 Five kangaroos with the starting numbers I, II, III, IV and V take part in the kangaroo jumping competition. Kangaroo V starts, followed by IV, III, II and I – in this order. Each time a kangaroo overtakes another, it receives a point. Kangaroo II reaches the finish first, followed by IV, I, V and III – in this order. How many points did the five kangaroos get in total at least?

(**A**) 10 (**B**) 9 (**C**) 8 (**D**) 7 (**E**) 6

B7 Anselm has a 3×3 field filled with zeros. In this 3×3 field, he selects in each step a 2×2 square and increases each of the four numbers in it by 1. After a few steps, he stops. Three of the numbers that are now in the 3×3 square can be seen, the others are covered. Which number is under the question mark?

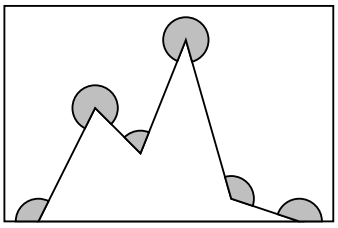


(**A**) 16 (**B**) 17 (**C**) 19 (**D**) 20 (**E**) 22

B8 After the Kangaroo competition, certificates and prizes are sent to all schools. Parcels are packed at two large tables. Each of the five packing helpers has a fixed place. At the breakfast break, each helper counts his or her finished parcels. There are 9, 15, 17, 19 and 21, respectively. One of them has already carried all his or her parcels to the parcel trolley. Now there are three times as many parcels on one table as on the other. How many parcels are already on the parcel trolley?

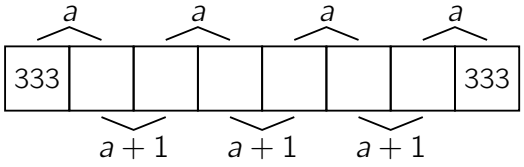
(**A**) 9 (**B**) 15 (**C**) 17 (**D**) 19 (**E**) 21

B9 What is the sum of the 6 angles marked in the figure?



(**A**) 960° (**B**) 1020° (**C**) 1080° (**D**) 1120° (**E**) 1140°

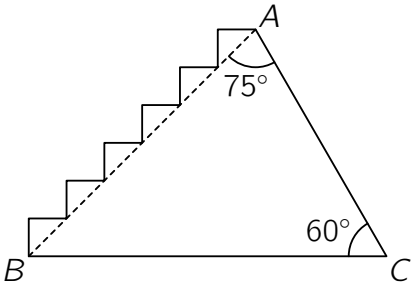
B10 Numbers are to be entered in the fields of the strip shown. The 1st box and the 8th box each contain 333. The sum of neighbouring numbers should be a and $a+1$ alternately, as shown. What is the value of a?



(**A**) 336 (**B**) 933 (**C**) 666 (**D**) 369 (**E**) 669

5 point problems

C1 In triangle ABC with angles $\measuredangle BAC = 75°$ and $\measuredangle ACB = 60°$ and side length $|\overline{AC}| = 1$, the side $\overline{AB}$ has been replaced by a "staircase" (see figure). What is the length of this stair-shaped line?



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

C2 The numbers a, b and c satisfy $a+b+c=0$ and $abc=78$. What is the value of $(a+b)(b+c)(c+a)$?

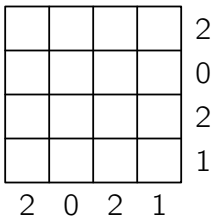
(**A**) -156 (**B**) -78 (**C**) -39 (**D**) 78 (**E**) 156

C3 If N is the smallest natural number with the sum of its digits equal to 2021, what is the sum of the digits of the number $N + 2021$?

(**A**) 10 (**B**) 12 (**C**) 19 (**D**) 28 (**E**) 2021

C4 In the 4×4 table, some cells must be painted black. The numbers next to or below the table show how many cells in the respective row or column must be painted black. In how many different ways can this table be painted in this manner?

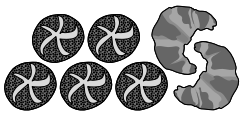
(**A**) 1 (**B**) 2 (**C**) 3 (**D**) 5 (**E**) more than 5

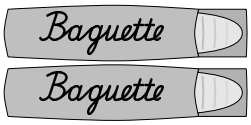


C5 Mila, Olivia and Elena write down as many capitals as possible for 2 minutes. Whoever writes down one capital that none of the other two have, gets 3 points. If a capital is chosen by exactly two, each of these two gets 1 point. If a capital was chosen by all of them, 0 points are awarded. Finally, each girl has written down 10 capitals. When they add up their points, each has a different total. Olivia is last with 19 points. Elena has the most points. How many points does Mila have?

(**A**) 20 (**B**) 21 (**C**) 23 (**D**) 24 (**E**) 25

C6 Lorenz has been doing some shopping for five senior citizens from the neighbourhood for almost a year. Today he did some shopping at the bakery. Four of the purchases had the same price. For one of the purchases, Lorenz had to pay a different amount. For which one?

(**A**) 

(**B**) 

(**C**) 

(**D**) 

(**E**) 

C7 How many 5-digit positive numbers have the product of their digits equal to 1000?

(**A**) 10 (**B**) 20 (**C**) 30 (**D**) 40 (**E**) 60

C8 For a beam balance there are 8 weighing pieces, all with different weights and each with an integer mass (in g). If any two weights are placed together on one pan and any two of the remaining weights are placed on the other pan, the side with the heaviest of the four weights is always the heavier one. What is the mass of the heaviest weighing piece at least?

(**A**) 12 g (**B**) 34 g (**C**) 55 g (**D**) 128 g (**E**) 256 g

C9 We imagine a long row in which there are 2021 single-coloured balls. Each of the balls is either blue, red, white or green. Among 5 adjacent balls, there is always exactly one blue ball, exactly one red ball and exactly one white ball. Every red ball is followed by a white ball. The 2nd ball, the 20th ball and the 202nd ball are green. What colour is the last ball in the row?

(**A**) blue (**B**) red (**C**) white (**D**) green (**E**) That is not determined.

C10 The smaller of the squares shown has an area of 16 cm^2, the grey triangle has an area of 1 cm^2. What is the area of the larger square?

(**A**) 17 cm^2 (**B**) 18 cm^2 (**C**) 19 cm^2 (**D**) 20 cm^2 (**E**) 21 cm^2