

Year 9 and 10 (ENGLISH VERSION)

Thursday, 19th March 2020

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.

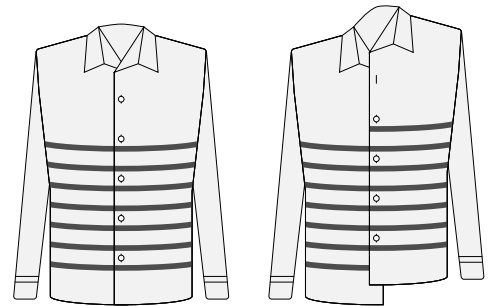
3 point problems

A1 Which of the following calculations gives the largest result?

- (A) $12345 + 6$ (B) $1234 + 56$ (C) $123 + 456$ (D) $12 + 3456$ (E) $1 + 23456$

A2 If Tom had buttoned his shirt properly, as shown in the left picture, the horizontal stripes would have formed 7 closed rings around his waist. This morning he buttoned his shirt in the wrong way, as shown in the right picture. How many closed rings do the stripes now form around Tom's body?

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

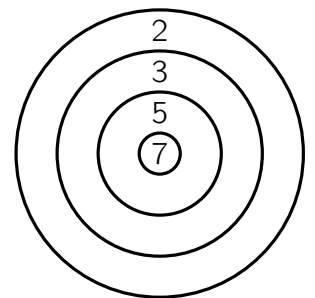


A3 The numbers of the years 2020 and 1717 both consist of two equal 2-digit numbers. In how many years from today will the number of the year have this property again for the first time?

- (A) in 20 years (B) in 101 years (C) in 120 years (D) in 121 years (E) in 202 years

A4 At Olivia's school there is a competition in archery. Each arrow that hits gives as many points as the number written on that field. At the end of the competition, all the points scored are multiplied. As a product Olivia receives 18 points. She scored with each arrow. How many hits did Olivia have?

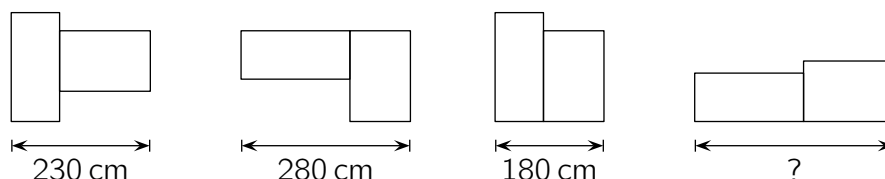
- (A) 9 (B) 6 (C) 5 (D) 3 (E) 2



A5 The sum of 4 consecutive integers is 2. Which is the smallest of these 4 numbers?

- (A) -3 (B) -2 (C) -1 (D) 0 (E) 1

A6 Two rectangular tables can be pushed together in four different ways:



What is the length of the segment denoted by the question mark?

- (A) 330 cm (B) 350 cm (C) 360 cm (D) 400 cm (E) 410 cm

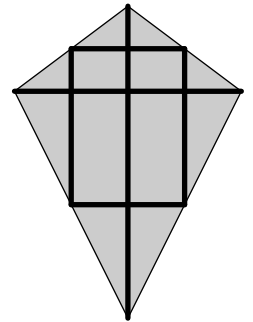
- A7** Each letter in the calculation
$$\begin{array}{r} \text{AB} \\ + \text{CD} \\ \hline 43 \end{array}$$
 stands for one digit. In the calculation on the right,
$$\begin{array}{r} \text{AD} \\ + \text{CD} \\ + \text{AB} \\ + \text{CB} \\ \hline ? \end{array}$$
 the letters stand for the same digits. What is the result of the calculation on the right?
- (A) 43 (B) 77 (C) 86 (D) 98 (E) 102

- A8** On the veranda there are 8 stools, three-legged ones and four-legged ones. Marius glues a felt floor protector to each stool leg from below, a total of 27 pieces. How many of the stools on the veranda are three-legged?

(A) 7 (B) 6 (C) 5 (D) 4 (E) 2

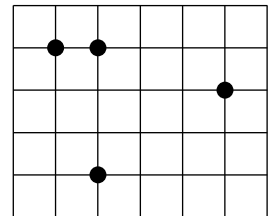
- A9** Judith sawed a wooden bar into 6 pieces and built a kite with it. For the diagonals she took a 60 cm long piece and a 40 cm long piece. With the other four parts of the bar she connected the centers of the edges of the kite. How long was the bar before it was cut?

(A) 150 cm (B) 180 cm (C) 200 cm (D) 210 cm (E) 225 cm



- A10** Four dots are marked on a squared paper. Each box is a square with a side length of 5 mm. Any three of these four points can be chosen as the vertices of a triangle. What is the smallest area of such a triangle?

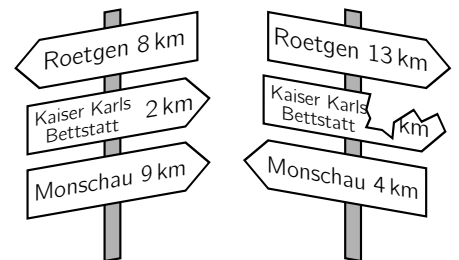
(A) 12.5 mm² (B) 25 mm² (C) 40 mm² (D) 50 mm² (E) 62.5 mm²



4 point problems

- B1** The Eifelsteig, a hiking trail at the German-Belgian border, leads on the section from Roetgen to Monschau past a granite block called "Kaiser Karls Bettstatt". There are two signposts along the way. One was recently damaged. What was the distance on the damaged signpost?

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



- B2** During the holidays Helen visits her grandmother for 18 days. Every day they go to the outdoor swimming pool. Every Tuesday, Saturday and Sunday the high divers have a training session there, Helen is eager to watch. The 18 days are arranged in such a way that Helen can watch the greatest possible number of training sessions. What day of the week is Helen's first day at her grandmother's?

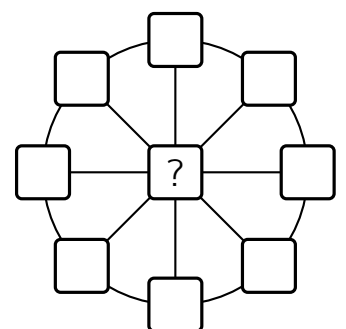
(A) Monday (B) Tuesday (C) Wednesday (D) Saturday (E) Sunday

- B3** If $11x + 33y = 121$, what is the value of $7x + 21y$?

(A) 77 (B) 64 (C) 49 (D) 44 (E) 28

- B4** Jeremias wants to write a number in each of the 9 boxes of the figure on the right. The sum of the 3 numbers on each line through the box in the center must be 13. The sum of the 8 numbers on the outer circle must be 40. What number must Jeremias write in the box in the center?

(A) 3 (B) 4 (C) 5 (D) 6 (E) 7



B5 Lucia starts her drive to her aunt's home 520 km away with 14 litres of fuel in her tank. Her old car needs 10 litres per 100 km. After 55 km the next petrol stations along the motorway are indicated. They are 35 km, 45 km, 55 km, 75 km and 95 km away. Lucia's car has a 40 litre tank. Lucia would like to stop for fuel only once. How far away is the petrol station she should choose?

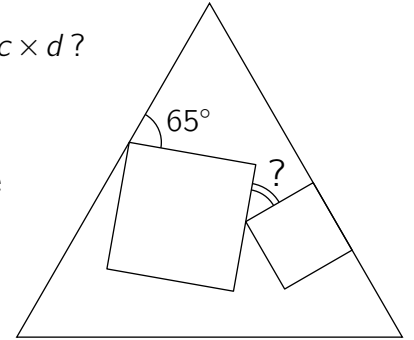
- (A) 35 km (B) 45 km (C) 55 km (D) 75 km (E) 95 km

B6 For the integers a , b , c and d the equation $a \times b = 2 \times c \times d$ applies. Which of the following numbers is then certainly not the product $a \times b \times c \times d$?

- (A) 32 (B) 200 (C) 50 (D) 72 (E) 100

B7 Two squares are drawn inside an equilateral triangle as shown in the diagram (*diagram not to scale*). What is the size of the angle marked with the question mark?

- (A) 35° (B) 40° (C) 45° (D) 50° (E) 55°



B8 One of the sides of an isosceles triangle is 20 cm long. Of the other two sides, the length of one side is $\frac{2}{5}$ of the length of the other. How long is the perimeter of this triangle?

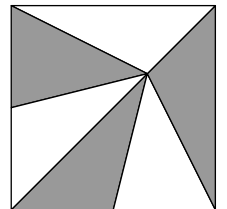
- (A) 36 cm (B) 48 cm (C) 60 cm (D) 95 cm (E) 120 cm

B9 Sascha writes a multiplication sign between the second and third digit of the year 2020. The product 20×20 is a square number. For how many of the years from 2021 to 2099 is the corresponding product also a square number?

- (A) 2 (B) 3 (C) 4 (D) 5 (E) 6

B10 A square ornamental window consists of 6 glass triangles, which all have the same area. The side length of the square is 15 cm. How far from the bottom of the square is the point where the 6 triangles meet?

- (A) 8.5 cm (B) 9 cm (C) 9.5 cm (D) 10 cm (E) 10.5 cm



5 point problems

C1 A rectangle and a square have the same area. One of the side lengths of the rectangle is by 25% longer than the side length of the square. By what percentage is the perimeter of the rectangle larger than the perimeter of the square?

- (A) by 1% (B) by 2% (C) by 2.5% (D) by 3.5% (E) by 5%

C2 Ertem writes down the numbers from 1 to 9 in random order. What is the probability that this 9-digit number is divisible by 18?

- (A) $\frac{1}{2}$ (B) $\frac{4}{9}$ (C) $\frac{1}{3}$ (D) $\frac{5}{9}$ (E) $\frac{1}{18}$

C3 Kaisa wants to fill a 4×4 square with numbers so that the sum of the four numbers in each row and column is equal. She has already filled in some numbers. Which number belongs in the grey box?

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

1		6	3
	2	2	8
	7		4
		7	

C4 A hare and a hedgehog have a 5 km race along a straight track. The hare is five times as fast as the hedgehog. Hectically, the hare runs off in the wrong direction at the start, perpendicular to the track. When he notices the mistake, he stops and runs on a direct path to the finish line, which he reaches at the same time as the hedgehog. After how many kilometers did the hare realize his mistake?

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

C5 At the school festival the teachers Mr Richter, Mr Dorn and Mr Nicol compete in thumb wrestling. In each round, two teachers wrestle and the third one rests. After each round the winner competes against the teacher that just had a rest. In total Mr. Richter competed 10 times, Mr. Dorn 17 times and Mr. Nicol 15 times. Who lost the second round?

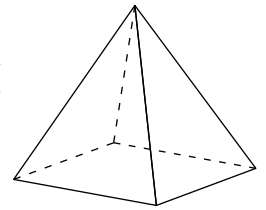
- (A) Mr Richter (B) Mr Dorn (C) Mr Nicol
(D) Both Mr Richter and Mr Dorn may have lost the second round.
(E) Both Mr Dorn and Mr Nicol may have lost the second round.

C6 Connor builds a large cube from 64 identical small cubes and then paints three of its sides completely red. What is the largest possible number of small cubes that have exactly one red side?

- (A) 27 (B) 28 (C) 32 (D) 34 (E) 40

C7 Valeska writes the numbers 1, 2, 3, 4 and 5 at the corners of a square pyramid. Then she writes on each of the five faces of the pyramid the sum of the numbers at the corresponding corners. Four of these sums are 7, 8, 9 and 10. Which number is on the fifth face?

- (A) 10 (B) 11 (C) 12 (D) 13 (E) 14



C8 Ida wants to buy a protective cover for her smartphone on the market. Some of the covers are black, all the others are light. Some of the covers are patterned, all the others are plain. The covers are either made of leather or silicone. Ida notices:

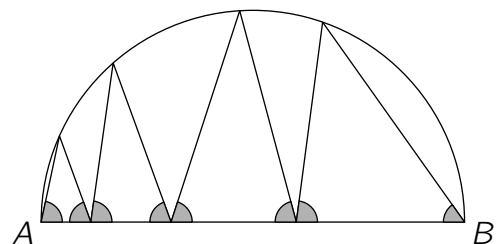
- 1) If a cover is made of leather, then it is black.
- 2) If a cover is patterned, then it is light.

Which of the following statements is definitely true?

- (A) All plain covers are black. (B) All black covers are made of leather.
(C) All silicone covers are patterned. (D) All light covers are patterned.
(E) All patterned covers are made of silicone.

C9 Starting at the end point A of the diameter AB of a semi-circle, a zig-zag line runs to the arc of the semicircle and back again to the diameter. After four peaks the zigzag line ends exactly at the point B . If all grey angles had the same size, how large would they be?

- (A) 60° (B) 72° (C) 75° (D) 80° (E) 82.5°



C10 Leopold wrote down eight consecutive three-digit numbers. Each of these numbers is divisible by its last digit. What is the sum of the digits of the smallest number that Leopold wrote down?

- (A) 10 (B) 11 (C) 12 (D) 13 (E) 14