

Year 7 and 8 (ENGLISH VERSION)

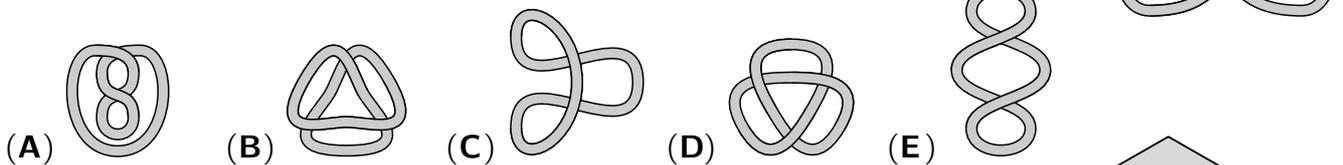
Thursday, 18th April 2024

Time allowed: 75 minutes

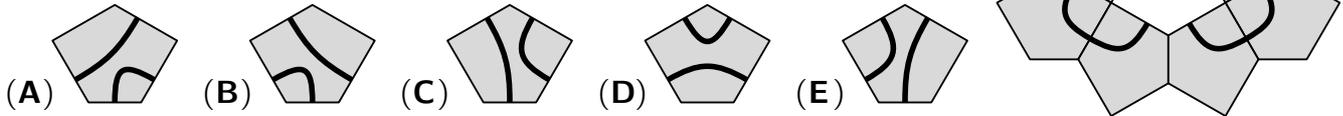
- For each question exactly one of the 5 options is correct.
- Each participant is given 30 points at the beginning. For each correct answer 3, 4 or 5 points are added. No answer means 0 points are added. If a wrong answer is given, one quarter of the points is subtracted, i. e. 0.75 points, 1 point 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 strings cannot be laid down like the string on the right without cutting?



A2 Which of the following pieces fits into the middle of the puzzle to obtain two closed curves?

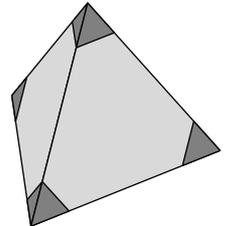


A3 $(20 \times 24) \div (2 \times 0 + 2 \times 4) =$

- (A) 12 (B) 30 (C) 48 (D) 60 (E) 120

A4 Julio cuts off the four corners of a tetrahedron, as shown. How many vertices does the solid that remains have?

- (A) 8 (B) 9 (C) 12 (D) 16 (E) 18



A5 Margarethe would like to lay four-digit numbers with the three cards shown. How many different four-digit numbers are possible?

- (A) 3 (B) 4 (C) 6 (D) 8 (E) 9



A6 The maximum weight that the elevator in the youth hostel can carry is 12 adults or 20 children. How many children can use the elevator together with 9 adults?

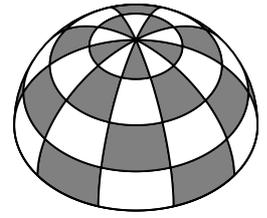
- (A) at most 3 (B) at most 4 (C) at most 5 (D) at most 6 (E) at most 7

A7 The Cheek family has made five appointments with the dentist for next Thursday. They have marked in a table who has time for which appointments. In fact, the five appointments can be divided up to suit everyone. When will it be Nils' turn?

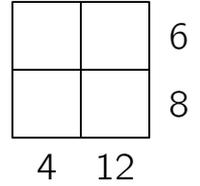
- (A) 13:00 (B) 14:00 (C) 15:00 (D) 16:00 (E) 17:00

	13:00	14:00	15:00	16:00	17:00
Anne		×			
Nils	×	×	×	×	
Caro	×		×	×	×
Mama		×	×	×	
Papa		×	×		

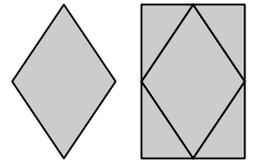
- A8** Eliza’s round tent is evenly patterned all around. The individual areas alternate between white and gray. How many gray areas does Eliza’s tent have?
 (A) 18 (B) 20 (C) 22 (D) 25 (E) 27



- A9** Enter four different natural numbers in the boxes of the figure on the right. Next to each row and under each column, the product of the two numbers in the respective row or column is indicated. What is the sum of the four numbers to be entered?
 (A) 16 (B) 15 (C) 14 (D) 13 (E) 12



- A10** Four congruent right-angled triangles were attached to a rhombus. The result is a rectangle. By what percentage is the area of the rectangle larger than the area of the rhombus?
 (A) by 40 % (B) by 60 % (C) by 75 % (D) by 80 % (E) by 100 %



4 point problems

- B1** The three pieces

2	1	3	1
			1

	2	
3	1	2

2	2
1	
2	

 together with one more piece can be used to create a 4 × 4 square in which the sum of the numbers in each of the four rows and in each of the four columns is the same. What does the fourth piece look like?
 (A)

1	1	3
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 (B)

2	1	0
---	---	---

 (C)

1	2	1
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 (D)

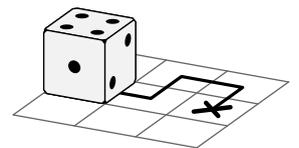
0	3	2
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 (E)

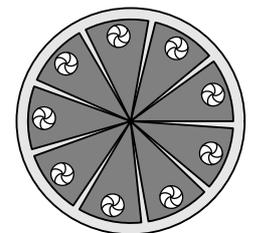
2	2	3
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- B2** Maria, Yegor and Leela imagine how they will fly in self-flying air cabs in the future. Suppose there was one red and one blue flying cab, each of which could seat two people. How many ways would there be for the three of them to split up into the two air cabs?
 (A) 1 (B) 2 (C) 4 (D) 6 (E) 9

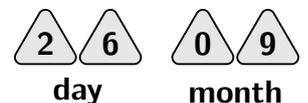
- B3** On a die, the number of dots on two opposite sides always adds up to 7. Jamie moves the die along the path drawn by tilting it over its edges. At the beginning, the 4 is on top. Which number is on top when the die reaches the end of the path?
 (A) 1 (B) 2 (C) 3 (D) 4 (E) 5



- B4** Denise baked a cake and cut it into 10 equal pieces. She ate one piece straight away. She arranged the other pieces so that the gaps between neighbouring pieces are all the same size. What is the size of the angle between any two pieces?
 (A) 5° (B) 4° (C) 3° (D) 2° (E) 1°

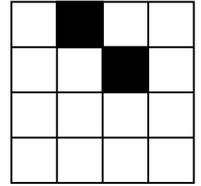


- B5** Marta would like to be able to show the date on every day of the year on the fridge with triangular numbered magnets. She would like to use four number magnets with one digit each. The magnets should point upwards and the digits should be readable upright. What is the smallest number of magnets she needs to achieve this?



- (A) 20 (B) 21 (C) 22 (D) 23 (E) 24

B6 In the square shown on the right, Aila would like to colour two more boxes black so that the square then has an axis of symmetry. How many different options does Aila have for this?

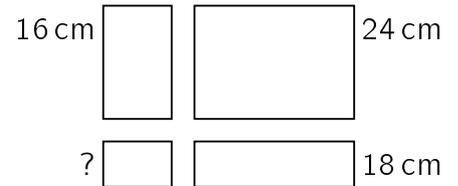


- (A) 2 (B) 3 (C) 5 (D) 6 (E) 8

B7 Nico's grandpa made ravioli. Nico divided them onto 6 plates so that there is the same amount of ravioli on each plate. "Everyone should get a smaller portion first", says Nico's grandma and takes 3 ravioli from each plate. Nico realises: "You have taken as many ravioli in total as there were previously on 2 plates together." How many ravioli are now on each plate?

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

B8 Per cut a large rectangle into four smaller rectangles. The perimeter of three of the small rectangles is shown in the picture. What is the perimeter of the fourth small rectangle?

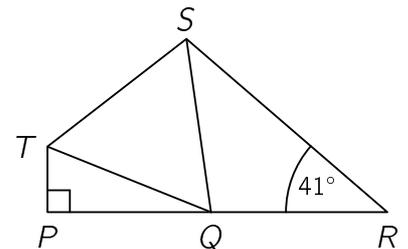


- (A) 6 cm (B) 8 cm (C) 10 cm (D) 12 cm (E) 14 cm

B9 A kangaroo jumps up a mountain and then back to the starting point along the same path. Uphill, it jumps 1 m with each jump. Downhill, it covers 3 m with each jump. The kangaroo makes a total of 2024 jumps. What distance does the kangaroo cover in total?

- (A) 2530 m (B) 3036 m (C) 3542 m (D) 4284 m (E) 5060 m

B10 In the figure on the right, the points P , Q and R lie on a straight line. The triangle PQT is right-angled. The triangle QST is equilateral. The triangle QRS is isosceles with equal sides \overline{QR} and \overline{QS} . The angle SRQ measures 41° . What is the size of the angle PTS ?



- (A) 125° (B) 126° (C) 127° (D) 128° (E) 129°

5 point problems

C1 By candlelight, four pirates have counted how many gold, silver and bronze coins they have captured. When Captain Flint wants to check late at night, four curious geckos quickly scurry away from the notes. Only one of the pirates has counted everything correctly. The others have counted each type incorrectly. There are 30 coins in total. How many gold coins have the pirates captured?

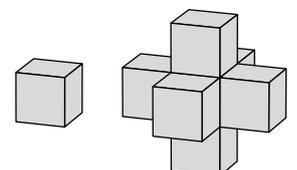
- (A) 7 (B) 8 (C) 9 (D) 10 (E) 11

	gold	silver	bronze
Ed	9	11	
Tom	7	12	
Pit	10	10	
Jack	9	10	

C2 All the guests can be seen in a photo of Milena's 9th birthday. Each child has their arms up and shows 9 fingers. With their left hands they show a total of 26 fingers. How many fingers do they show in total with their right hands?

- (A) 19 (B) 25 (C) 28 (D) 32 (E) 37

C3 Amir has lots of cubes of the same size. He takes a cube and glues 6 cubes to it so that all of its faces are completely covered. Now he wants to glue additional cubes to the new solid so that all of its faces are completely covered. What is the smallest number of additional cubes Amir needs?

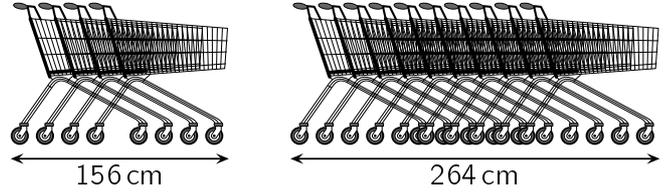


- (A) 18 (B) 16 (C) 14 (D) 12 (E) 10

C4 Ilona sells red and yellow apples at the market. She has 6 baskets with 6, 8, 11, 12, 14 and 16 apples. The first customer buys a whole basket straight away. Now there are twice as many red apples as yellow apples left. How many apples has this customer bought?

- (A) 6 (B) 8 (C) 12 (D) 14 (E) 16

C5 The length of a set of four well-parked supermarket trolleys is 156 cm. The length of a set of ten well-parked supermarket trolleys is 264 cm. What is the length of a single supermarket trolley?



- (A) 94 cm (B) 96 cm (C) 98 cm
(D) 100 cm (E) 102 cm

C6 Seven cards with the numbers 1 to 7 are placed face down on the table. David, Anastasia and Lennox each take two of the cards.

David states: "One of my two numbers is 5 greater than the other."

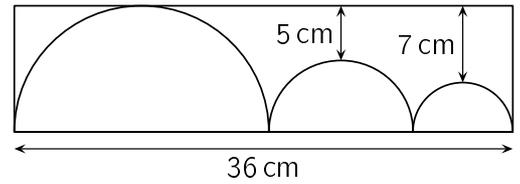
Anastasia states: "The sum of my two numbers is 6."

Lennox states: "One of my two numbers is twice the other one."

Which number is on the card that is still on the table?

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

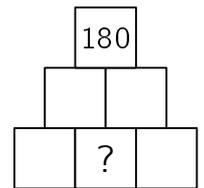
C7 Three semicircles touch each other and the rectangle, whose longer side is 36 cm long. The distances of the medium-sized semicircle and the small semicircle to the upper longer side of the rectangle are 5 cm and 7 cm, respectively.



What is the perimeter of the rectangle? (*diagram not to scale*)

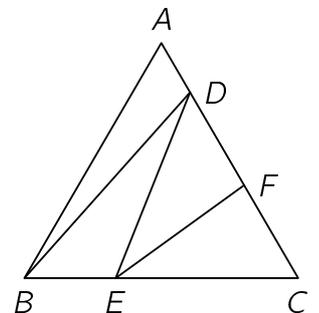
- (A) 98 cm (B) 96 cm (C) 94 cm (D) 92 cm (E) 90 cm

C8 Donggyu wants to write a natural number in each box of the figure. The product of two horizontally neighbouring numbers should always be in the box directly above. The number 180 is at the top. How many different numbers greater than 1 can be in the box with the question mark?



- (A) 2 (B) 3 (C) 5 (D) 6 (E) 8

C9 The equilateral triangle ABC has a side length of 120 cm. The points D , E and F lie on the sides \overline{AC} and \overline{BC} in such a way that the segments \overline{BD} , \overline{DE} and \overline{EF} divide the triangle into 4 smaller triangles with equal area. What is the length of the segment \overline{CF} ? (*diagram not to scale*)



- (A) 45 cm (B) 46 cm (C) 47 cm (D) 48 cm (E) 49 cm

C10 Lene rides her scooter from her house to Mattea's house and straight back again. Mattea rides her bike from her house to Lene's house and immediately back again. Lene and Mattea follow the same route, start at the same time and ride at a constant speed each. Mattea is four times as fast on her bike as Lene is on her scooter. Lene and Mattea meet for the first time 18 min after the start. How long after the start do they meet for the second time?

- (A) 24 min (B) 25 min (C) 27 min (D) 28 min (E) 30 min