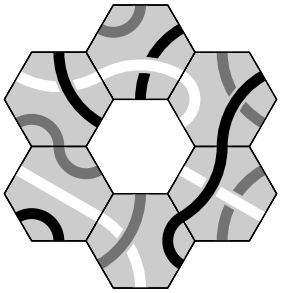
Year 9 and 10 (ENGLISH VERSION)

Thursday, 17th March 2016 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 are not allowed.

3 point problems

A1 Which of the following tiles fits in the middle of the puzzle such that black lines meet black lines, grey lines meet grey lines and white lines meet white lines?



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

A2 Michelle has a die whose faces are labelled with the numbers -5, -3, -1, 2, 4, 6. She rolls the die twice and adds the two numbers she rolled. Which sum can Michelle *not* obtain?

(**A**) 3 (**B**) 4 (**C**) 5 (**D**) 7 (**E**) 8

A3 In last year's Math Kangaroo Competition Moritz answered all 30 questions. Each answer was either right or wrong. Moritz had 6 more right answers than he had wrong answers. How many right answers did Moritz have?

(**A**) 16 (**B**) 18 (**C**) 20 (**D**) 21 (**E**) 24

A4 How many weeks are 2016 hours?

(**A**) 6 (**B**) 8 (**C**) 10 (**D**) 12 (**E**) 16

A5 The average of four numbers is 9. What is the fourth number if three of the numbers are 5, 9 and 12?

(**A**) 8 (**B**) 9 (**C**) 10 (**D**) 11 (**E**) 12

A6 Which of the following numbers is the closest to the value of $\dfrac{17 \times 0.3 \times 20.16}{999}$?

(**A**) 0.01 (**B**) 0.1 (**C**) 1 (**D**) 10 (**E**) 100

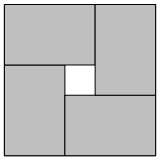
A7 In a coordinate system four of the following points are the four vertices of a square. Which point is *not* a vertex of this square?

(**A**) $P(-1|3)$ (**B**) $Q(0|-4)$ (**C**) $R(-2|-1)$ (**D**) $S(1|1)$ (**E**) $T(3|-2)$

A8 16 % of 25 is equal to

(**A**) 25 % of 16. (**B**) 18 % of 20. (**C**) 15 % of 26. (**D**) 10 % of 30. (**E**) 36 % of 12.

A9 The diagram on the right shows four identical grey rectangles placed inside a square. The area of the small square in the middle is 4 cm^2, the area of the outer square is 64 cm^2. What is the perimeter of each grey rectangle?



(**A**) 8 cm (**B**) 11 cm (**C**) 14 cm (**D**) 16 cm (**E**) 19 cm

A10 Four numbers a, b, c, d are such that $a+5=b-1=c+3=d-4$. Which one of them is the largest?

(**A**) a (**B**) b (**C**) c (**D**) d (**E**) This is not uniquely determined.

4 point problems

B1 Football fans were travelling to a match in 18 minibuses. There was an equal number of people in each of them. On the way 6 minibuses broke down and the fans from these buses got on the remaining ones. After that there were 5 more fans in each of these minibuses. How many fans were travelling to the match?

(**A**) 120 (**B**) 140 (**C**) 150 (**D**) 160 (**E**) 180

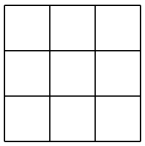
B2 Sven chose five of the numbers 1, 2, 3, 4, 5, 6, 7, 8, 9 and wrote them on a blackboard. He discovered that none of the sums of two different numbers he wrote is equal to 10. Which number did Sven *definitely* write on the blackboard?

(**A**) 4 (**B**) 7 (**C**) 2 (**D**) 8 (**E**) 5

B3 Jil, Candice and Laura are riding bicycles. Jil starts behind Candice and Candice starts behind Laura. During the ride, each of the girls passes exactly once exactly one of the other girls. In how many different orders can they finish the ride?

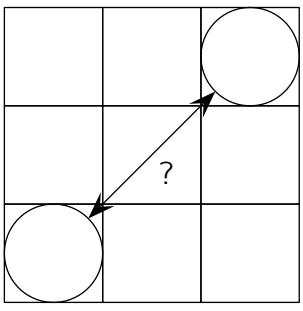
(**A**) only one (**B**) two (**C**) three (**D**) four (**E**) five

B4 Peter wants to colour the cells of the 3×3 square shown in such a way that each of the rows, the columns and both diagonals have three cells of three different colours. What is the least number of colours Peter must use?



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

B5 Each of the 9 squares in the 3×3 table shown has sides of length 1 cm. Two circles are inscribed in two of these squares, as shown. What is the distance (in cm) between these two circles?



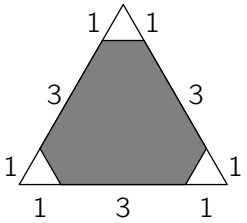
(**A**) $2\sqrt{2}-1$ (**B**) $\sqrt{2}+1$ (**C**) $\sqrt{2}+\frac{1}{4}$

(**D**) $\frac{\sqrt{2}}{2}+1$ (**E**) $3\sqrt{2}-3$

B6 When the positive integer A is divided by 6, the remainder is 3. What is the remainder when $3\times A$ is divided by 6?

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

B7 What percentage of the area of the triangle in the figure is shaded?

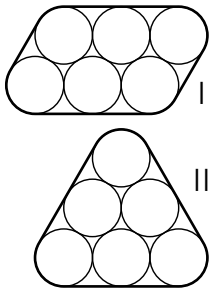


(**A**) 80 % (**B**) 84 % (**C**) 85 % (**D**) 88 % (**E**) 90 %

B8 In a tennis tournament on a knock-out basis, six of the results of the quarter-finals, the semi-finals and the final were (not necessarily in this order): Bella beat Ann, Celine beat Donna, Gina beat Holly, Gina beat Celine, Celine beat Bella and Emma beat Farah. Which result is missing?

(**A**) Gina beat Bella. (**B**) Celine beat Ann. (**C**) Emma beat Celine.
(**D**) Bella beat Holly. (**E**) Gina beat Emma.

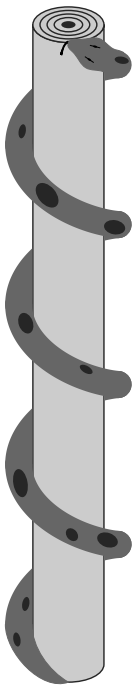
B9 Six equal round pencils can be grouped in the two different ways shown. In both options the pencils are fixed with sticky tape, as shown. Which of the following is true about the perimeters U_{I} and U_{II}?



(**A**) U_{I} is 5 cm shorter than U_{II}. (**B**) U_{I} is 5 cm longer than U_{II}.
(**C**) U_{I} is 10 cm shorter than U_{II}. (**D**) U_{I} is 10 cm longer than U_{II}.
(**E**) U_{I} is as long as U_{II}.

B10 I have 2016 cards. Each of them is either red or yellow, and has a fraction written on it. On each yellow card the numerater of this fraction is equal to the total number of red cards and the denominator is equal to the total number of yellow cards. On each red card the numerater of this fraction is equal to the total number of yellow cards and the denominator is equal to the total number of red cards. What is the sum of the 2016 fractions on these cards?

(**A**) 2016 (**B**) $\frac{1}{2}\times 2016$
(**C**) $\frac{2}{3}\times 2016$ (**D**) 2×2016
(**E**) It depends on the number of red cards and the number of yellow cards.



5 point problems

C1 Kaa, the python, is wound around a straight tree trunk, uniformly and exactly 4 times, as shown. The tree trunk is exactly 18 feet high and has a circumference of 6 feet. How long ist Kaa, the python?

(**A**) 24 feet (**B**) 25 feet (**C**) 27 feet (**D**) 28 feet (**E**) 30 feet

C2 It takes 4 hours for a motorboat to travel downstream from Sourceton to Mouthville. To return upstream from Mouthville to Sourceton it takes the motorboat 6 hours. How many hours would it take a wooden log to be carried from Sourceton to Mouthville by the current, assuming it is unhindered by any obstacles?

(**A**) 10 (**B**) 12 (**C**) 16 (**D**) 22 (**E**) 24

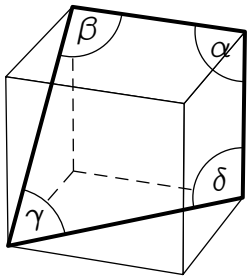
C3 Four craftsmen are having breakfast at a round table: a floor tiler, a plumber, a painter and an electrician. The plumber sits at Andrew's left hand. The floor tiler sits opposite David. Marc and Paul sit next to each other. At the painter's left hand sits Andrew or Marc. Which craft does Marc do?

(**A**) floor tiler (**B**) plumber (**C**) painter
(**D**) electrician (**E**) This is not uniquely determined.

C4 What is the largest possible remainder that is obtained when a two-digit number is divided by the sum of its digits?

(**A**) 11 (**B**) 13 (**C**) 14 (**D**) 15 (**E**) 17

C5 The picture shows a cube with four line segments drawn on its surface. What is the sum $\alpha+\beta+\gamma+\delta$ of the marked angles?

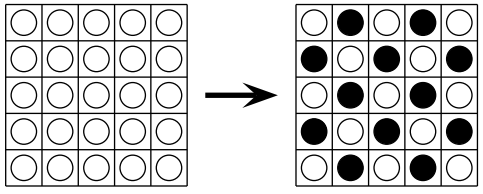


(**A**) 315° (**B**) 330° (**C**) 345° (**D**) 360° (**E**) 375°

C6 François wrote down four consecutive positive integers. He then calculated all possible totals made by taking three of these integers at a time. None of these totals was a prime number. What is the smallest integer François could have written?

(**A**) 12 (**B**) 10 (**C**) 7 (**D**) 6 (**E**) 3

C7 In each cell of a 5×5 square there is a token that is black on one side and white on the other. Initially all tokens are placed with the white side facing up. On each move two neighbouring tokens in a row or a column are flipped over. What is the smallest number of moves needed in order to obtain the chessboard colouring shown on the right?



(**A**) 16 (**B**) 15 (**C**) 14 (**D**) 12 (**E**) 10

C8 Nelly is making a magic multiplication square using the numbers 1, 2, 4, 5, 10, 20, 25, 50 and 100. The products of the numbers in each row, in each column and in the two diagonals must all be the same. In the figure you can see how Nelly has started. Which number must she place in the cell with the question mark?

20	1	
		?

(**A**) 2 (**B**) 4 (**C**) 5 (**D**) 10 (**E**) 25

C9 On a circle 100 points P_1, P_2, ..., P_{100} are marked. Each of these points is connected with some other of these points by a line segment, each of the points from P_1 to P_{99} with exactly the same number of points as their number indicates. How many of these points are connected with P_{100}?

(**A**) 25 (**B**) 33 (**C**) 49 (**D**) 50 (**E**) 99

C10 The lengths of two of the altitudes of a triangle are 10 cm and 11 cm. Which of the following *cannot* be the length of the third altitude in this triangle?

(**A**) 5 cm (**B**) 10 cm (**C**) 21 cm (**D**) 67 cm (**E**) 68 cm