
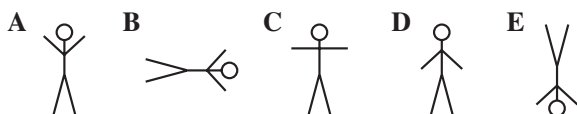


Questions of Kangaroo 2006

MINOR (grades 3 and 4)

3-POINT QUESTIONS

M1. Betty keeps drawing three different figures in the same order. Which figure should be the next?

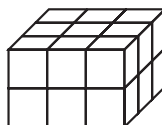



M2. What is the value of $2 \cdot 0 \cdot 0 \cdot 6 + 2006$?

- A** 0 **B** 2006 **C** 2014 **D** 2018 **E** 4012

M3. How many cubes have been taken from the block?

- A** 4 **B** 5 **C** 6 **D** 7 **E** 9



M4. Kate’s birthday was yesterday. Tomorrow is Thursday. What day was Kate’s birthday?

- A** Tuesday **B** Wednesday **C** Thursday **D** Saturday **E** Monday

M5. Ivo was playing “Darts”. He had 10 arrows. For each throw at the centre he gained two additional arrows. Ivo made 20 throws. How many times did he hit the centre?

- A** 6 **B** 8 **C** 10 **D** 5 **E** 4

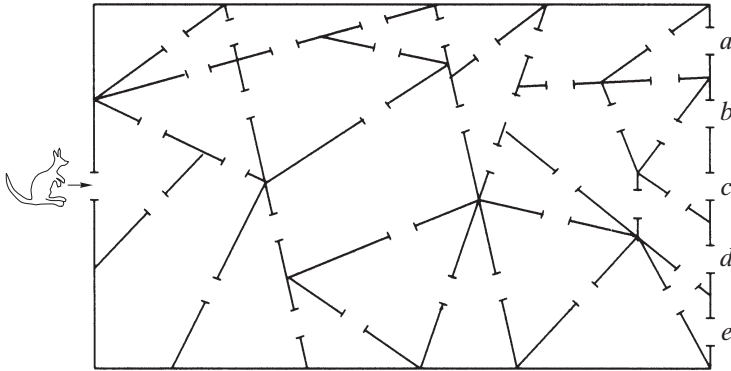
M6. Four people can sit at a square table. For the school party the students put together 7 square tables in order to make one long rectangular table. How many people could sit at this long table?

- A** 14 **B** 16 **C** 21 **D** 24 **E** 28

M7. In his purse Stan has a note of 5 euros, a coin of 1 euro and one coin of 2 euros. Which of the following amounts Stan can not pay without change?

- A** 3 euros **B** 4 euros **C** 6 euros **D** 7 euros **E** 8 euros

M8. A kangaroo enters a building. He only passes through triangular rooms. Where does he leave the building?



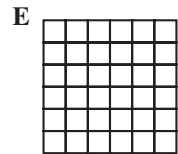
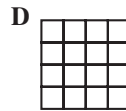
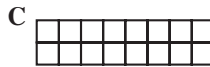
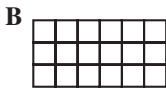
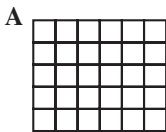
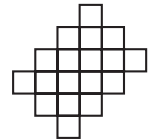
A a B b C c D d E e

4-POINT QUESTIONS

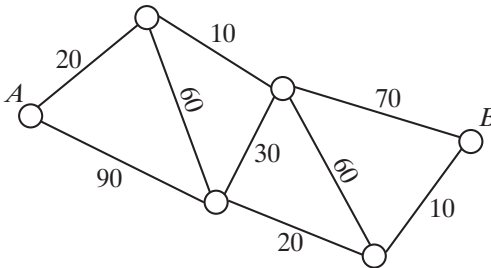
M9. On the left side of Main Street one will find the house numbers 1, 3, 5,..., 19. On the right side the house numbers are 2, 4, 6,...., 14. How many houses are there on Main Street?

A 8 B 16 C 17 D 18 E 33

M10. From which rectangular can you cut the figure shown on the right side out?

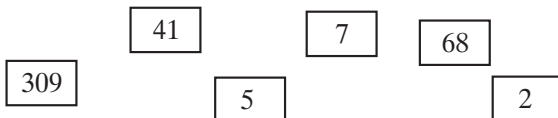


M11. Numbers in the picture are ticket prices between neighbouring towns. Peter wants to go from A to B as cheaply as possible. What is the lowest price he has to pay?



A 90 B 100 C 110 D 180 E 200

M12. Six numbers are written on the following cards, as shown.



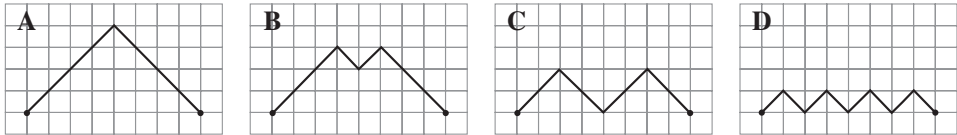
What is the smallest number you can form with the given cards?

A 1234567890 B 1023456789 C 3097568241 D 2309415687
E 2309415678

M13. Six weights – 1g, 2g, 3g, 4g, 5g and 6g – were sorted into three boxes, two weights in every box. The weights in the first box weigh 9 grams together and those in the second box weigh 8 grams. What weights are in the third box?

- A** 5g and 2g **B** 6g and 1g **C** 3g and 1g **D** 4g and 2g **E** 4g and 3g

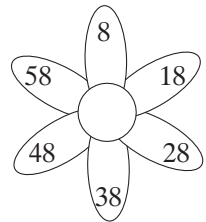
M14. Between two points four routes are drawn. Which route is the shortest?



- E** All routes are equal

M15. In the picture you can see a number flower. Mary pulled out all the leaves with numbers which give remainder 2 when divided by 6. What is the sum of the numbers on the leaves that Mary pulled out?

- A** 46 **B** 66 **C** 84 **D** 86 **E** 114

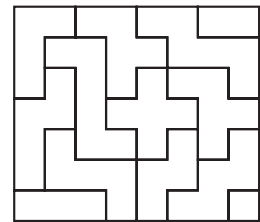
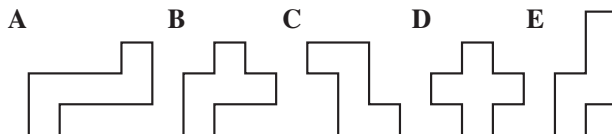


M16. Four crows sit on the fence. Their names are Dana, Hana, Lena and Zdena. Dana sits exactly in the middle between Hana and Lena. The distance between Hana and Dana is the same as the distance between Lena and Zdena. Dana sits 4 metres from Zdena. How far does Hana sit from Zdena?

- A** 5 m **B** 6 m **C** 7 m **D** 8 m **E** 9 m

5-POINT QUESTIONS

M17. You can move or rotate each shape as you like, but you are not allowed to flip them over. What shape is not used in the puzzle?



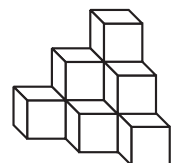
M18. John is building houses of cards. On the picture there are houses of one, two, and three layers that John built. How many cards does he need to build a 4-layer house?

- A** 23 **B** 24 **C** 25 **D** 26 **E** 27



M19. The structure shown in the picture is glued together from 10 cubes. Roman painted the entire structure, including the bottom. How many faces of the cubes are painted?

- A** 18 **B** 24 **C** 30 **D** 36 **E** 42



M20. Irena, Ann, Kate, Olga and Elena live in the same house: two of the girls live on the first floor, three of them on the second floor. Olga lives on a different floor from Kate and Elena. Ann lives on a different floor from Irena and Kate. Who is living on the first floor?

- A** Kate and Elena **B** Irena and Elena **C** Irena and Olga
D Irena and Kate **E** Ann and Olga

M21. In the expression $2006 * 2005 * 2004 * 2003 * 2002$ instead of each asterisk $+$ or $-$ can be written. Which result is impossible?

- A** 2004 **B** 2005 **C** 2006 **D** 2008 **E** 2010

M22. During some month, 5 Mondays occurred. Then this month could not have

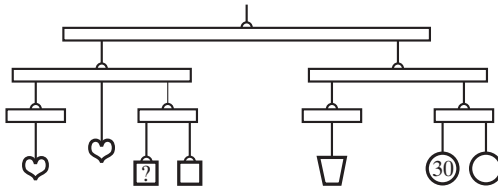
- A** 5 Saturdays **B** 5 Sundays **C** 5 Tuesdays **D** 5 Wednesdays
E 5 Thursdays

M23. In each of the nine cells of the square we will write down one of the digits 1, 2 or 3. We will do this in such a way that in each horizontal row and vertical column each of the digits 1, 2 and 3 will be written. In the upper left cell we will start with 1. How many different squares can we then make?

- A** 2 **B** 3 **C** 4 **D** 5 **E** 8

1		

M24. A child's toy hangs from the ceiling and it is in balance at all places. The same shapes have the same weight. The weight of a circle is 30 grams. What is the weight of a square?



- A** 10 **B** 20 **C** 30 **D** 40 **E** 50

BENJAMIN (grades 5 and 6)

3-POINT QUESTIONS

B1. $3 \cdot 2006 = 2005 + 2007 + x$. Find x .

- A** 2005 **B** 2006 **C** 2007 **D** 2008 **E** 2009

B2. Six numbers are written on the following cards, as shown:



What is the largest number you can form with the given cards?

- A** 9876543210 **B** 4130975682 **C** 3097568241 **D** 7903684152 **E** 7685413092

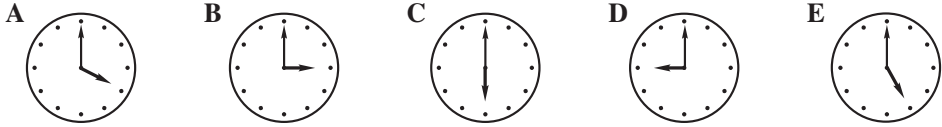
B3. Four people can sit at a square table. For the school party the students put together 10 square tables in order to make one long table. How many people could sit at this long table?

- A** 40 **B** 32 **C** 30 **D** 22 **E** 20

B4. A ball and a dumb-bell cost 90Lt, and 3 balls and 2 dumb-bells cost 240Lt. How much does one ball cost?

- A** 130Lt **B** 60Lt **C** 50Lt **D** 40Lt **E** 30Lt

B5. Choose the picture where the angle between the hands of a watch is 150° .

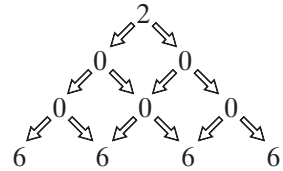


B6. On the left side of Main Street one will find all odd house numbers from 1 to 39. On the right side the house numbers are all the even numbers from 2 to 34. How many houses are there on Main Street?

- A 37 B 38 C 28 D 36 E 73

B7. With how many ways one can get a number 2006 while following the arrows on the figure?

- A 12 B 11 C 10 D 8 E 6

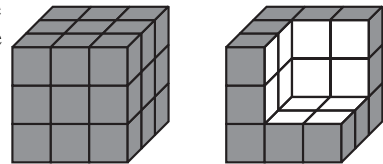


B8. One half of one hundredth is

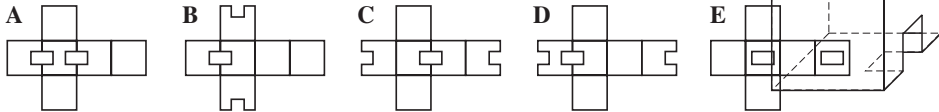
- A 0.005 B 0.002 C 0.05 D 0.02 E 0.5

B9. We need 9 kg of ink (in kilograms) to paint the whole cube. How much ink do you need to paint the white surface?

- A 2 B 3 C 4.5 D 6 E 7



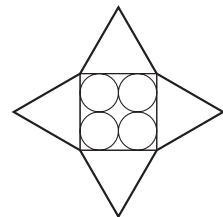
B10. Which of the following nets has a cube in the right picture?



4-POINT QUESTIONS

B11. What is the perimeter of the star (in centimetres) if you know that the star on the picture is formed by four equal circles with radius 5 cm, one square and four equilateral triangles?

- A 40 B 80 C 120 D 160 E 240

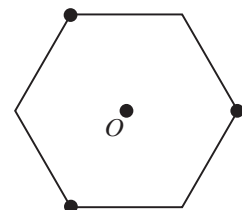


B12. What is the difference between the sum of the first 1000 strictly positive even numbers and the sum of the first 1000 positive odd numbers?

- A 1 B 1002 C 500 D 1000 E 2000

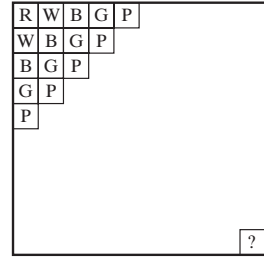
B13. A paper in the shape of a regular hexagon, as the one shown, is folded in such a way that the three marked corners touch each other at the centre of the hexagon. What is the obtained figure?

- A Six corner star B Dodecagon C Hexagon D Square E Triangle

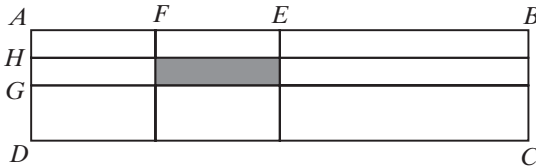


B14. A square consists of 10 by 10 little squares. Those little squares are coloured in diagonals: red, white, blue, green, purple, red, white, blue,...What will be the colour of the square in the right corner below?

- A Red B White C Blue D Green E Purple



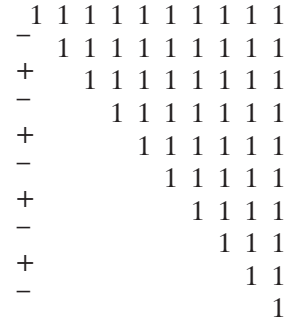
B15. $|AB| = 4$ m, $|BC| = 1$ m. E is a midpoint of AB , F is a midpoint of AE , G is a midpoint of AD and H is a midpoint of AG . The area of the black rectangle is equal to:



- A $\frac{1}{4}$ m² B 1 m² C $\frac{1}{8}$ m²
 D $\frac{1}{2}$ m² E $\frac{1}{16}$ m²

B16. Which will be the result?

- A 111 111 111
 B 1 010 101 010
 C 100 000 000
 D 999 999 999
 E 1 000 000 000

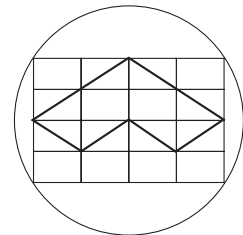


B17. How many different cubes exists if 3 sides are blue and 3 sides are red?

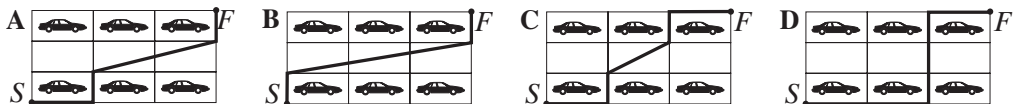
- A 1 B 2 C 3 D 4 E 5

B18. The diameter of the circle from the picture is 10 cm. What is the perimeter of the figure which is marked with double line, if the rectangles in the picture are coincident?

- A 8 cm B 16 cm C 20 cm D 25 cm E 30 cm



B19. Six cars are parked on a parking. Someone wants to move from S to F . His route must be as short as possible. Which of the following routes is the shortest?



- E All routes are equal

B20. In a segment OE with $OE = 2006$, we put points A, B, C such that $OA = BE = 1111$ and $OC = 70\%$ of OE . Which is the order in which we will see the points, from O until E ?

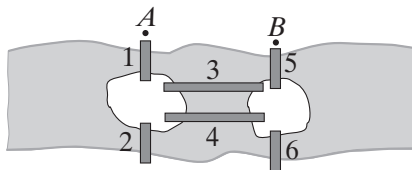
- A A, B, C B A, C, B C C, B, A D B, C, A E B, A, C

5-POINT QUESTIONS

B21. A rod of length 15 dm was divided into the greatest possible number of pieces of different integer lengths in dm. The number of cuts is:

- A 3 B 4 C 5 D 6 E 15

B22. A river goes through a city and there are two islands. There are also six bridges how it is shown in the attached image. How many paths there are going out of a shore of the river (point A) and come back (to point B) after having spent one and only one time for each bridge?



- A 0 B 2 C 4 D 6 E More than 6

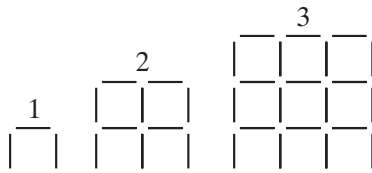
B23. Which set of three numbers represents three dots with the same space in between, if you plot them on a number line?

- A $\frac{1}{3}; \frac{1}{4}; \frac{1}{5}$ B 12; 21; 32 C 0.3; 0.7; 1.3 D $\frac{1}{10}; \frac{9}{80}; \frac{1}{8}$ E 24; 48; 64

B24. Ann calculated the sum of the greatest and the least two-digit multiples of three. Bob calculated the sum of the greatest and the least two-digit numbers that are not multiples of three. The number of Ann is greater than the number of Bob by how much?

- A 2 B 3 C 4 D 5 E 6

B25. Belinda is building squares with matches adding small squares that it already has built according to the schema of the figure. How many matches does she have to add to the 30th square to build the 31st?



- A 148 B 61 C 254 D 120 E 124

B26. The natural numbers from 1 to 2006 are written down on the blackboard. Peter underlined all numbers divisible by 2, then all numbers divisible by 3, and then all numbers divisible by 4. How many numbers are underlined precisely twice?

- A 1003 B 668 C 501 D 334 E 167

B27. What is the smallest number of dots that need to be removed from the pattern shown, so that no three of the remaining dots are at the vertices of an equilateral triangle?

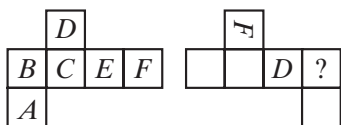


- A 2 B 3 C 4 D 5 E 6

B28. Three friends, Alex, Ben and Charlie, were together 15 times in the swimming pool. Alex bought the tickets for all of them 8 times, and Ben — 7 times. Charlie pays his share by using 30 coins, all of the same value. The right way to distribute the coins is

- A 22 to Alex and 8 to Ben B 20 to Alex and 10 to Ben
C 15 to Alex and 15 to Ben D 16 to Alex and 14 to Ben
E 18 to Alex and 12 to Ben

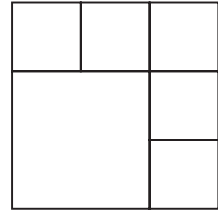
B29. On the faces of a cube are written letters. First figure represents one possibility of its net. What letter should be written instead of the question mark in the other version of its net?



- A A B B C C D E E Impossible to determine

- B30.** In how many ways can all the numbers 1, 2, 3, 4, 5, 6 be written on the squares of the picture (one on each square) so that there are no adjacent squares in which the difference of the numbers written is 3? (Squares that share only a corner are not considered adjacent.)

A $3 \cdot 2^5$ B 3^6 C 6^3 D $2 \cdot 3^5$ E $3 \cdot 5^2$



CADET (grades 7 and 8)

3-POINT QUESTIONS

- C1.** The contest Kangaroo in Europe has taken place every year since 1991. So, the contest Kangaroo in 2006 is the

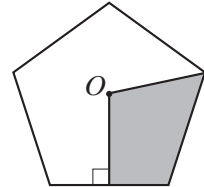
A 15th B 16th C 17th D 13th E 14th

- C2.** $20 \cdot (0 + 6) - (20 \cdot 0) + 6 =$

A 0 B 106 C 114 D 126 E 12

- C3.** The point O is the centre of a regular pentagon. How much of the pentagon is shaded?

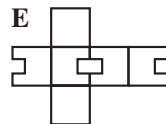
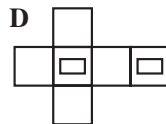
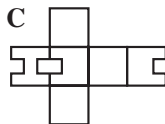
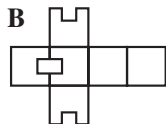
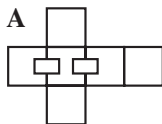
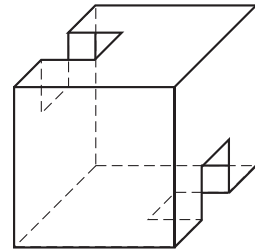
A 10% B 20% C 25% D 30% E 40%



- C4.** Granny told her grandchildren: "If I bake 2 pies for each of you, I'll have enough pastry left for 3 more pies. But I won't be able to bake 3 pies for each of you, as I'll have no pastry left for the last 2 pies." How many grandchildren does Granny have?

A 2 B 3 C 4 D 5 E 6

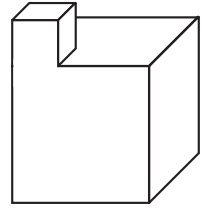
- C5.** Which of the following nets has a cube in the right picture?



- C6.** An interview of 2006 schoolchildren revealed that 1500 of them participated in the *Kangaroo* contest, 1200 – in the *Beaver* contest. How many from the interviewed children participated in both competitions, if 6 of them did not participate in either of the competitions?

A 300 B 500 C 600 D 700 E 1000

- C7. The solid in the picture is created from two cubes. The small cube with edges 1 cm long is placed on the top of a bigger cube with edges 3 cm long. What is the surface area of this solid?
A 56 cm^2 B 58 cm^2 C 59 cm^2 D 60 cm^2 E 64 cm^2



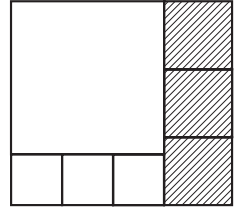
- C8. A bottle that can hold $\frac{1}{3}$ litre is $\frac{3}{4}$ full. How much will it contain after $\frac{1}{5}$ l has been poured out of it?
A $\frac{1}{20}$ l B $\frac{3}{40}$ l C 0.13 l D $\frac{1}{8}$ l E It will be empty
- C9. Two sides of a triangle are each 7 cm long. The length of the third side is an integer number of centimeters. At most how many centimeters does the perimeter of the triangle measure?
A 14 cm B 15 cm C 21 cm D 27 cm E 28 cm
- C10. A rod of length 21 dm was divided into the greatest possible number of pieces of different integer lengths in dm. The number of cuts is:
A 3 B 4 C 5 D 6 E 20

4-POINT QUESTIONS

- C11. If it's blue, it's round.
If it's square, it's red.
It's either blue or yellow.
If it's yellow, it's square.
It's either square or round.
That means:
A It's red B It's red and round C It's a blue and square
D It's blue and round E It's yellow and round
- C12. Three Tuesdays of a month fall on even dates. What day of a week was the 21st day of this month?
A Wednesday B Thursday C Friday D Saturday E Sunday
- C13. Alex, Hans and Stan saved money to buy a tent for a camping trip. Stan saved 60 % of the price. Alex saved 40 % of what was left of the price. This way Hans' share of the price was 30 euros. What was the price of the tent in euros?
A 50 B 60 C 125 D 150 E 200
- C14. Several aliens are travelling through the space in their rocket STAR 1. They are of three colours: green, orange or blue. Green aliens have two tentacles, orange aliens have three tentacles and blue aliens have five tentacles. In the spaceship there are as many green aliens as orange ones and 10 more blue ones than green ones. Altogether they have 250 tentacles. How many blue aliens are travelling in the rocket?
A 15 B 20 C 25 D 30 E 40
- C15. If kangaroo Jumpy pushes himself with his left leg, he will jump on 2 m, if he pushes with the right leg, he will jump on 4 m, and if he pushes with both legs, he will jump on 7 m. What the least number of jumps should Jumpy make to cover a distance of exactly 1000 m?
A 140 B 144 C 175 D 176 E 150

- C16.** A rectangle on the right is divided into 7 squares. The sides of the grey squares are all 8. What is the side of the great white square?

A 16 B 18 C 20 D 24 E 30



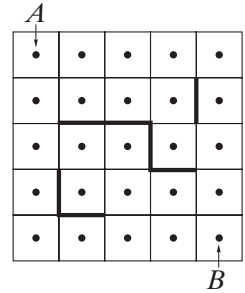
- C17.** Which number when squared is increased by 500%?
C18. How many isosceles triangles with area 1 have a side of length 2?

A 5 B 6 C 7 D 8 E 10

A 0 B 1 C 2 D 3 E 4

- C19.** Max and Moritz have drawn a square 5×5 and marked the centres of the small squares. Afterwards, they draw obstacles and then find out in how many ways it is possible to go from A to B using the shortest way avoiding the obstacles and going from centre to centre only vertically and horizontally. How many shortest paths are there from A to B under these conditions?

A 6 B 8 C 9 D 11 E 12



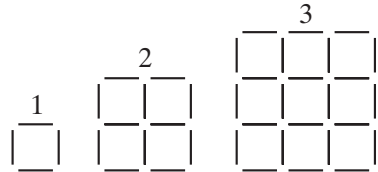
- C20.** The last digit of a three-digit number is 2. If we move the last digit to the front, the number is reduced by 36. What is the sum of digits of the original number?

A 4 B 10 C 7 D 9 E 5

5-POINT QUESTIONS

- C21.** Belinda is making patterns with toothpicks according to the schema of the figure. How many toothpicks does Belinda add to the 30th pattern to make the 31st?

A 124 B 148 C 61 D 254 E 120



- C22.** A train is composed of five wagons, I, II, III, IV and V, pulled by a locomotive. In how many ways can the train be composed so that the wagon I is nearer the locomotive than the wagon II?

A 120 B 60 C 48 D 30 E 10

- C23.** What is the first digit of the smallest positive integer that has the sum of its digits equal to 2006?

A 1 B 3 C 5 D 6 E 8

- C24.** Mother asks her son little John to make pairs from his socks after washing, but he didn't do that. He put his socks – 5 pairs of black, 10 pairs of brown and 15 pairs of grey socks – mixed in a box. John want to go to a 7-day trip. What is the smallest number of socks has he to take out to guarantee that he will have at least 7 pairs of socks, all of the same colour?

A 21 B 41 C 40 D 37 E 31

- C25.** The three positive numbers x, y, z satisfy the conditions $x \geq y \geq z, x + y + z = 20.1$. Which of the answers is true?

A Always $x \cdot y < 99$ B Always $x \cdot y > 1$ C Always $x \cdot y \neq 75$ D Always $x \cdot y \neq 25$
 E None of the above

- C26.** Peter rides a bicycle from point P to point Q with a constant speed. If he increases his speed by 3 m/s, he will arrive to Q 3 times faster. How many times faster will Peter arrive to Q , if he increases his speed by 6 m/s?
A 4 **B** 5 **C** 6 **D** 4.5 **E** 8

- C27.** If the product of two integers equals

$$2^5 \cdot 3 \cdot 5^2 \cdot 7^3,$$

then their sum

- A** can be divisible by 8 **B** can be divisible by 3 **C** can be divisible by 5
D can be divisible by 49 **E** cannot be divisible by 8, 3, 5, 49
- C28.** What is the smallest number of dots that need be removed from the pattern shown, so that no three of the remaining dots are at the vertices of an equilateral triangle?
A 2 **B** 3 **C** 4 **D** 5 **E** 6



- C29.** The first row shows 11 cards, each with two letters. The second row shows rearrangement of the cards.

M	I	S	S	I	S	S	I	P	P	I
K	I	L	I	M	A	N	J	A	R	O
P	S	I	S	I	M	I	S	S	P	I

Which of the following could appear on the bottom line of the second row?

- A** ANJAMKILIOR **B** RLIIMKOJNAA **C** JANAMKILIRO
D RAONJMILIKA **E** ANMAIKOLIRJ
- C30.** Find the value $x - y$, if $x = 1^2 + 2^2 + 3^2 + \dots + 2005^2$ and $y = 1 \cdot 3 + 2 \cdot 4 + 3 \cdot 5 + \dots + 2004 \cdot 2006$.
A 2000 **B** 2004 **C** 2005 **D** 2006 **E** 0

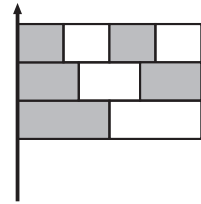
JUNIOR (grades 9 and 10)

3-POINT QUESTIONS

- J1.** What is halfway between 2006 and 6002?
A 3998 **B** 4000 **C** 4002 **D** 4004 **E** 4006
- J2.** How many four-digit numbers whose four digits are distinct are divisible by 2006?
A 1 **B** 2 **C** 3 **D** 4 **E** 5
- J3.** What is the least 10-digit number that can be obtained by putting together the following six numbers one after another: 309, 41, 5, 7, 68, and 2?
A 1 234 567 890 **B** 2 309 241 568 **C** 3 097 568 241 **D** 2 309 415 687 **E** 2 309 416 857
- J4.** How many times between 00:00 and 23:59 does an electronic watch show all the four digits 2, 0, 0 and 6 in any order?
A 2 **B** 4 **C** 5 **D** 6 **E** 12

- J5.** A flag consists of three stripes of equal width, which are divided into two, three and four equal parts, respectively. What fraction of the area of the flag is coloured grey?

A $\frac{1}{2}$ B $\frac{2}{3}$ C $\frac{3}{5}$ D $\frac{4}{7}$ E $\frac{5}{9}$



- J6.** My Grandma's watch gains one minute every hour. My Grandpa's watch loses one minute every hour. When I left their house I synchronised their watches and told them I would return when the difference between the times on their watches is exactly one hour. How long will it be before I return?

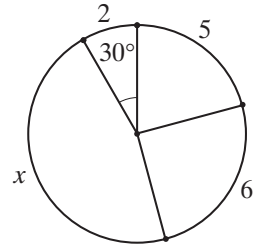
A 12h B 14h 30min C 30h D 60h E 90h

- J7.** Peter says that 25% of his books are novels, and $\frac{1}{9}$ of them are poetry. Given that he has between 50 and 100 books, how many books does he have?

A 50 B 56 C 64 D 72 E 93

- J8.** A circle is divided into four arcs of length 2, 5, 6, x . Find the value of x , if the arc of length 2 subtends an angle of 30° at the centre.

A 7 B 8 C 9 D 10 E 11



- J9.** One packet of Chocofruit candies costs 10 crowns. There is a coupon inside every packet. For three coupons you get another packet of Chocofruit candies. How many packets of Chocofruit candies can you get for 150 crowns?
- J10.** The numbers a, b, c, d and e are positive, such that $ab = 2, bc = 3, cd = 4, de = 5$. What is the value of $\frac{e}{a}$?

A $\frac{15}{8}$ B $\frac{5}{6}$ C $\frac{3}{2}$ D $\frac{4}{5}$ E Impossible to determine

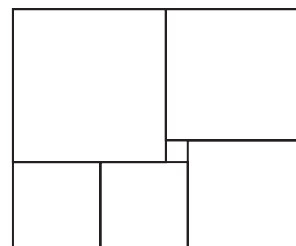
4-POINT QUESTIONS

- J11.** A tactless person asked Lady Agnes how old she is. Lady Agnes replied: "If I live to be one hundred, then my age is two thirds of my remaining time." How old is Lady Agnes?

A 20 B 40 C 50 D 60 E 80

- J12.** The rectangle in the picture is divided into six squares. The length of the sides of the smallest square is 1. What is the length of the sides of the largest square?

A 4 B 5 C 6 D 7 E 8



- J13.** Each letter represents a different digit, and each digit a different letter. What digit could G represent?

A 1 B 2 C 3 D 4 E 5

$$\begin{array}{r} \text{K A N} \\ + \text{K A G} \\ \hline \text{K N G} \\ \hline 2 0 0 6 \end{array}$$

- J14.** While Nick is solving one of the *Kangaroo* problems he makes the following correct conclusions:

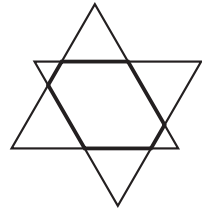
- 1) If answer A is true, then answer B is also true.
- 2) If answer C is not true, then answer B is also not true.
- 3) If answer B is not true, then neither D nor E is true.

Which of the answers to the problem is true? (Recall that for any *Kangaroo* problem exactly one answer is true.)

A A B B C C D D E E

- J15.** Two identical equilateral triangles with perimeters 18 are overlapped with their respective sides parallel. What is the perimeter of the resulting hexagon?

A 11 B 12 C 13 D 14 E 15



- J16.** What is the maximum number of digits that a number could have if every pair of consecutive digits is a perfect square?

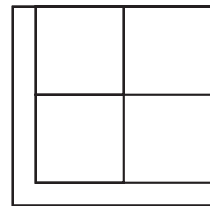
A 5 B 4 C 3 D 6 E 10

- J17.** A box contains 36 balls: 15 balls are coloured red-blue (half red, half blue), 12 balls are coloured blue-green and 9 balls are coloured green-red. What is the smallest number of balls that must be selected to guarantee that you have at least seven balls that share a colour?

A 7 B 8 C 9 D 10 E 11

- J18.** A square of area 125 cm^2 was divided into five parts of equal area – four squares and one L-shaped figure as shown in the picture. Find the length of the shortest side of the L-shaped figure.

A 1 B 1.2 C $2(\sqrt{5} - 2)$ D $3(\sqrt{5} - 1)$ E $5(\sqrt{5} - 2)$



- J19.** The three positive numbers x , y , z satisfy the conditions $x \geq y \geq z$, $x + y + z = 20$. Which of the answers is true?

A Always $x \cdot y < 99$ B Always $x \cdot y > 1$ C Always $x \cdot y \neq 25$ D Always $x \cdot y \neq 75$
E None of the above

- J20.** What is the smallest number of dots that need be removed from the pattern shown, so that no three of the remaining dots are at the vertices of an equilateral triangle?

A 2 B 3 C 4 D 5 E 6



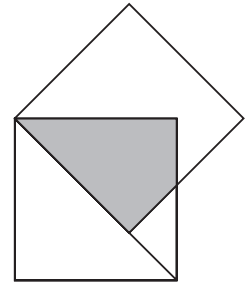
5-POINT QUESTIONS

- J21.** A train consists of five wagons: I, II, III, IV and V. How many ways can the wagons be arranged so that wagon I is nearer to the locomotive than wagon II is?

A 120 B 60 C 48 D 30 E 10

- J22.** Two squares have side 1. What is the area of the black quadrangle?

A $\sqrt{2} - 1$ B $\frac{\sqrt{2}}{2}$ C $\frac{\sqrt{2}+1}{2}$ D $\sqrt{2} + 1$ E $\sqrt{3} - \sqrt{2}$

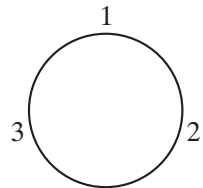


- J23.** The Dobson family consists of the father, the mother, and some children. The mean age of the Dobson family is 18 years. Without the 38-year-old father the mean age of the family decreases to only 14 years. How many children are there in the Dobson family?

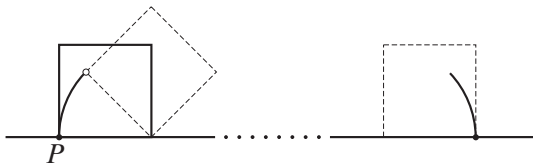
A 2 B 3 C 4 D 5 E 6

- J24.** The numbers 1, 2, 3 are written on the circumference of a circle. Then the sum of each pair of neighbouring numbers is written between them, so 6 numbers are obtained (1, 3, 2, 5, 3 and 4). This operation is repeated 4 more times, resulting in 96 numbers on the circle. What is the sum of these numbers?

A 162 B 1458 C 486 D 144 E 210



- J25.** A square with sides of length 10 is rolled without slipping along a line.



The rolling stops when P first returns to the line. What is the length of the curve that P has travelled?

A 10π B $5\pi + 5\pi\sqrt{2}$ C $10\pi + 5\pi\sqrt{2}$ D $5\pi + 10\pi\sqrt{2}$ E $10\pi + 10\pi\sqrt{2}$

- J26.** Each face of a cube is coloured with a different colour from a selection of six colours. How many different cubes can be made in this way?

A 24 B 30 C 36 D 42 E 48

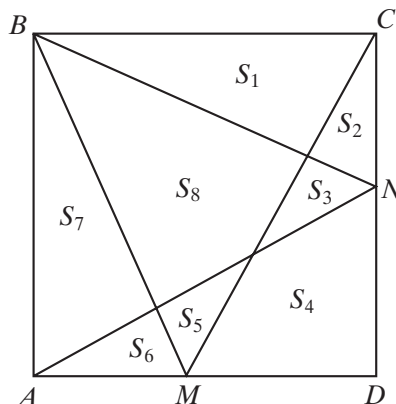
- J27.** Both the number 257 and number 338 each have 3 digits, which create a larger number when put in reverse order. How many 3-digit numbers have this property?

A 124 B 252 C 280 D 288 E 360

- J28.** y is defined to be the sum of the digits of x , and z is the sum of the digits of y . How many natural numbers x satisfy $x + y + z = 60$?

A 0 B 1 C 2 D 3 E More than 3

- J29.** Points M and N are arbitrarily chosen on the sides AD and DC , respectively, of a square $ABCD$. Then the square is divided into eight parts of areas S_1, S_2, \dots, S_8 as shown in the diagram. Which of the following expressions is always equal to S_8 ?
- A** $S_2 + S_4 + S_6$
B $S_1 + S_3 + S_5 + S_7$
C $S_1 + S_4 + S_7$
D $S_2 + S_5 + S_7$
E $S_3 + S_4 + S_5$

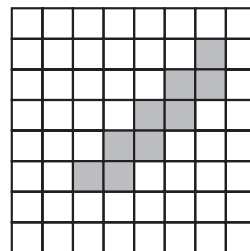


- J30.** Suppose the final result of a football match is 5:4 to the home team. If the home team scored first and kept the lead until the end, in how many different orders could the goals have been scored?
- A** 17 **B** 13 **C** 20 **D** 14 **E** 9

STUDENT (grades 11 and 12)

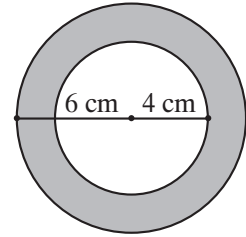
3-POINT QUESTIONS

- S1.** Which of the following numbers is greatest?
A $2006 \cdot 2006$ **B** $2005 \cdot 2007$ **C** $2004 \cdot 2008$ **D** $2003 \cdot 2009$ **E** $2002 \cdot 2010$
- S2.** How many zeroes does the product of the first 2006 prime numbers end with?
A 0 **B** 1 **C** 2 **D** 9 **E** 26
- S3.** We consider the perimeter and the area of the region corresponding to the grey squares. How many more squares can we colour grey for the grey area to increase without increasing its perimeter?
A 0 **B** 7 **C** 18 **D** 12 **E** 16



- S4.** There are four cards on the table as in the picture. Every card has a letter on one side and a number on the other side. Peter said: "For every card on the table it is true that if there is a vowel on one side, there is an even number on the other side." What is the smallest number of cards Alice must turn in order to check whether Peter said the truth?
- | |
|---|
| E |
| K |
| 4 |
- | |
|---|
| 6 |
| 7 |
- A** 1 **B** 2 **C** 3 **D** 4 **E** 5
- S5.** Two trains with the same length are travelling in opposite directions. The first is travelling at 100 km/h and the second at 120 km/h. A passenger on the second train observes that it takes the first train exactly 6 sec to pass completely in front of him. How long does it take for a passenger on the first train to see the second train pass completely?
A 5 s **B** 6 s **C** Between 6 s and 7 s **D** 7 s **E** Impossible to determine

- S6. Susan has two pendants made of the same material. They are equally thick and weigh the same. One of them has the shape of an annulus created from two concentric circles with the radii 6 cm and 4 cm (see the diagram). The second has the shape of a solid circle. What is the radius of the second pendant?



A 4 cm B $2\sqrt{6}$ cm C 5 cm D $2\sqrt{5}$ cm E $\sqrt{10}$ cm

- S7. The difference between any two consecutive numbers on the list a, b, c, d, e is the same. If $b = 5.5$ and $e = 10$, what is the value of a ?

A 0.5 B 3 C 4 D 4.5 E 5

- S8. If $4^x = 9$ and $9^y = 256$, then xy equals

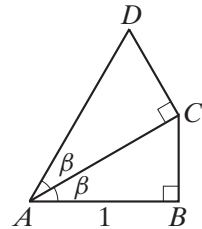
A 2006 B 48 C 36 D 10 E 4

- S9. Consider all 9-digit integers made by using all the digits 1, 2, ..., 9. Write each such number on a separate sheet and put all the resulting sheets in a box. What is the minimum number of sheets that you must extract from the box if you want to be certain that there are at least two numbers with the same digit in the first place among the chosen numbers?

A 9! B 8! C 72 D 10 E 9

- S10. In the diagram, AB has length 1; $\angle ABC = \angle ACD = 90^\circ$; $\angle CAB = \angle DAC = \theta$. What is the length of AD ?

A $\cos \beta + \text{tg } \beta$ B $\frac{1}{\cos(2\beta)}$ C $\cos^2 \beta$
 D $\cos(2\beta)$ E $\frac{1}{\cos^2 \beta}$



4-POINT QUESTIONS

- S11. Which of the following gives the formula of a function whose graph has the y -axis as an axis of symmetry?

A $y = x^2 + x$ B $y = x^2 \sin x$ C $y = x \cos x$ D $y = x \sin x$ E $y = x^3$

- S12. On a fair roulette wheel there are 37 numbers: 0 and the positive integers from 1 to 36. What is the probability that the ball lands on a prime number?

A $\frac{5}{18}$ B $\frac{11}{37}$ C $\frac{11}{36}$ D $\frac{12}{37}$ E $\frac{1}{3}$

- S13. The remainder of the division of the number 1001 by some one-digit number is equal to 5. What is the remainder of the division of the number 2006 by the same one-digit number?

A 2 B 3 C 4 D 5 E 6

- S14. The radius of the traffic sign is 20 cm. Each of the dark pieces is a quarter of a circle. The area of all 4 quarters equals that of the light part of the sign. What is the radius of this circle in centimetres?

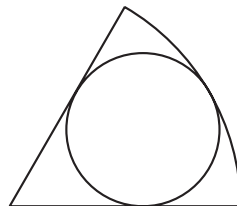
A $10\sqrt{2}$ B $4\sqrt{5}$ C $\frac{20}{3}$ D 12.5 E 10



- S15. You are given three prime numbers a, b, c with $a > b > c$. If $a + b + c = 78$ and $a - b - c = 40$ then $abc =$

A 438 B 590 C 1062 D 1239 E 2006

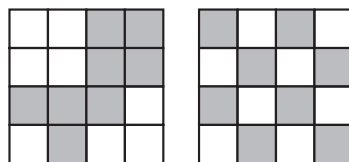
- S16.** The ratio of the radii of the sector and the incircle in the picture is 3 : 1. Then the ratio of their areas is:
A 3 : 2 **B** 4 : 3 **C** $\sqrt{3}$: 1 **D** 2 : 1 **E** 9 : 1



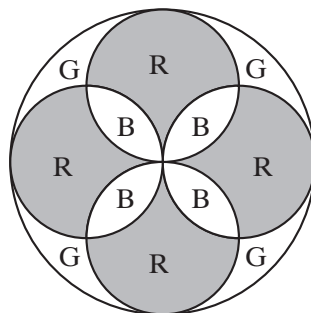
- S17.** Sixteen teams play in a volleyball league. Each team plays one game against each other team. For each game the winning team gets 1 point, and the losing team 0 points. There are no draws. After all games have been played the team scores form an arithmetic sequence. How many points has the team in last place received?
A 3 **B** 2 **C** 1 **D** The situation described is not possible
E The answer is some other number

- S18.** Last year there were 30 more boys than girls in the school choir. This year the number of choir-members has increased by 10%: the number of girls has increased by 20% and the number of boys by 5%. How many members has the choir this year?
A 88 **B** 99 **C** 110 **D** 121 **E** 132

- S19.** The cells of a 4×4 table are coloured black and white as shown in the left figure. One move allows us to exchange any two cells positioned in the same row or in the same column. What is the least number of moves necessary to obtain in the right figure?
A This is not possible **B** 2 **C** 3 **D** 4 **E** 5



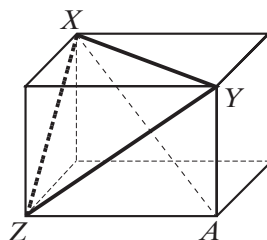
- S20.** In a church there is a rose window as in the figure, where the letters R, G and B represent glass of red colour, green colour and blue colour, respectively. Knowing that 400 cm² of green glass have been used, how many cm² of blue glass are necessary?
A 120π **B** 90√2π **C** 382 **D** 396 **E** 400



5-POINT QUESTIONS

- S21.** Given that numbers a and b are both greater than 1, which of the following fractions has the greatest value?
A $\frac{a}{b-1}$ **B** $\frac{a}{b+1}$ **C** $\frac{2a}{2b+1}$ **D** $\frac{2a}{2b-1}$ **E** $\frac{3a}{3b+1}$

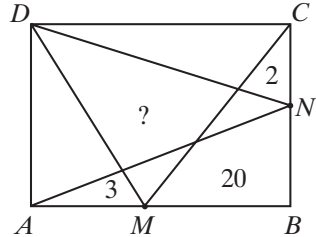
- S22.** The lengths of the sides of triangle XYZ are $XZ = \sqrt{55}$, $XY = 8$, $YZ = 9$. Find the length of the diagonal XA of the rectangular parallelepiped in the figure.
A $\sqrt{90}$ **B** 10 **C** $\sqrt{120}$ **D** 11 **E** $10\sqrt{2}$



- S23.** For how many values of the real number b does the equation $x^2 - bx + 80 = 0$ have two different positive even integer solutions?
A 0 **B** 1 **C** 2 **D** 3 **E** Infinitely many

- S24.** How many nonempty subsets of $\{1, 2, 3, \dots, 12\}$ exist in which the sum of the largest element and the smallest element is 13?
A 1024 **B** 1175 **C** 1365 **D** 1785 **E** 4095

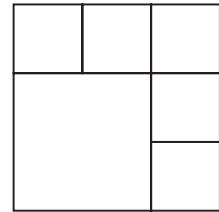
- S25.** Points M and N are given on the sides AB and BC of a rectangle $ABCD$. Then the rectangle is divided into several parts as shown in the picture. The areas of 3 parts are also given in the picture. Find the area of the quadrilateral marked with “?”.
A 20 **B** 21 **C** 25 **D** 26
E Not enough information is given



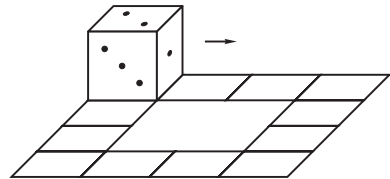
- S26.** John takes 10 cards, on 5 of them he writes letter A and on the other five – letter B. Then he turns them upside-down and aligns them on the table in random order. In view of the fact that there is an equal amount of letter A and B, an experienced participant of *Kangaroo* Ann claims that she can write either letter A or B on the face side of each card so that on both sides of at least 4 cards the same letter will be written. In how many ways can she do that?
A 5^5 **B** 255 **C** 2 **D** 10 **E** 22

- S27.** Paul removed one number from ten consecutive natural numbers. The sum of the remaining ones is 2006. The removed number is
A 218 **B** 219 **C** 220 **D** 225 **E** 227

- S28.** In how many ways can all the numbers 1, 2, 3, 4, 5, 6 be written in the squares of the figure (one in each square) so that there are no adjacent squares in which the difference of the numbers written is equal to 3? (Squares that share only a corner are not considered adjacent.)
A $3 \cdot 2^5$ **B** 3^6 **C** 6^3 **D** $2 \cdot 3^5$ **E** $3 \cdot 5^2$



- S29.** A die is in the position shown in the picture. It can be rolled along the path of 12 squares as shown. How many times must the die go around the path in order for it to return to its initial position with all faces in the initial positions?
A 1 **B** 2 **C** 3 **D** 4
E It is impossible to do so



- S30.** If each side of the regular hexagon has length $\sqrt{3}$ and $XABC$ and $XPQR$ are squares, what is the area of the shaded region?

- A** $\frac{5 - \sqrt{3}}{4}$ **B** $\frac{\sqrt{3} + 1}{2}$ **C** $\frac{\sqrt{3}}{4}$
D $\frac{2 - \sqrt{3}}{4}$ **E** $\frac{2 + \sqrt{3}}{4}$

