KANGAROO 2010

Nipper
1 and 2 grades
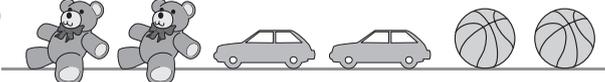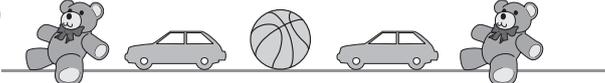
Time allowed: *50 min*
Calculators are not permitted

3-point questions

1. Which of the numbers indicated below is the smallest one?

    A) $2 - 0 + 1 - 0$
    B) $2 - 0 + 1 + 0$
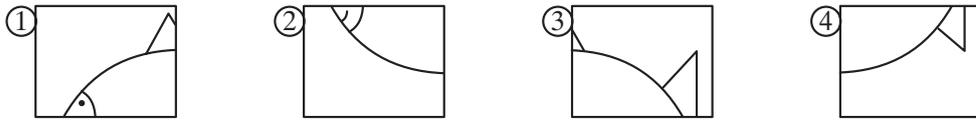   **C**) $2 + 0 + 1 + 0$
    D) $2 + 0 + 1 - 0$
    E) $2 + 0 - 1 + 0$

2. There are two bear cubs, a small car, and two balls on Dominick's shelf. Which of the pictures represents his shelf?

    A)

    B)

    C)

    D)

    E)

3. Fourteen children ranked in pairs. How many pairs were made?

A) 6   **B**) 14   **C**) 7   **D**) 24   **E**) 28

4. A fish can be composed of four square parts.

What rule should we follow in order to compose the fish of these parts?

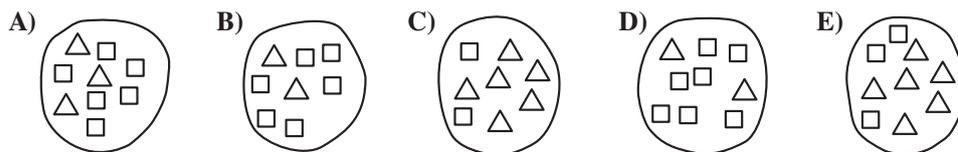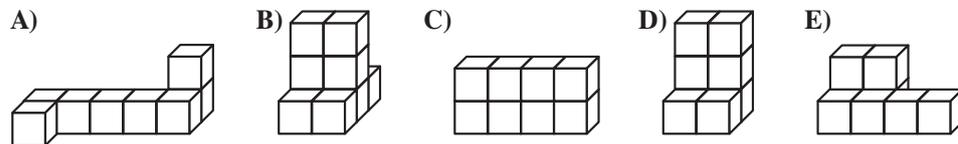**A)** ①④ ②③   **B)** ③① ④②   **C)** ①③ ④②   **D)** ①③ ②④   **E)** ④① ③②

5. In which picture there are three times more squares than triangles?

6. All the constructions built by Marius are comprised of 8 identical wooden cubes. Which of them is actually not by Marius?

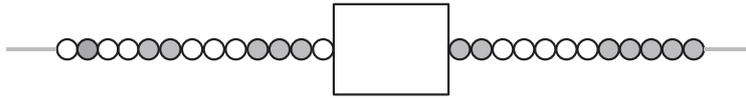**4-point questions**

7. Alla visited her grandmother on Thursday, January 21, and invited her to her birthday that will be celebrated on the 3rd of February. On which weekday she will celebrate her birthday?

A) On Sunday
B) On Monday
C) On Tuesday
D) On Wednesday
E) On Thursday

8. Birute has created beads by stringing small beads on the thread following a certain simple rule:

What does the covered part of those beads look like?

A)   B)   C)   D)   E)

9. Find the largest odd number among that written below.

A) $3 \cdot 1 + 2 \cdot 4$
B) $3 \cdot (1 + 2 \cdot 3)$
C) $3 \cdot (1 + 2) \cdot 4$
D) $(3 \cdot 1 + 2) \cdot 4$
E) $3 \cdot (1 + 2 \cdot 4)$

10. Vytautas celebrated his birthday in the hall with 9 four-seated tables. After Vytautas and all his guests have taken their seats, still there were 7 vacant seats. How many guests have come to Vytautas birthday?

A) 29   B) 28   C) 27   D) 25   E) 24

11. Mother gave Marta 20 euro. She bought a pack of milk, a kilogram of bananas, a loaf of bread, two packets of butter, and for the rest money she bought lollipops.

| 2 € | 5 € | 2 € | 2 € 50 ct | 1 € 50 ct |

How many sweets has Marta bought?

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

12. Twelve pairs of dancers take part in the contest of dances. Johny has counted that 18 dancers danced waltz. How many pairs have not danced waltz?

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

5-point questions

13. We can assemble a picture, representing a vase, out of small cardboard squares ☐, by cutting some of them in half. How many small squares will be needed to assemble the picture?
A) 19   **B)** 20   **C)** 21   **D)** 24   **E)** 25
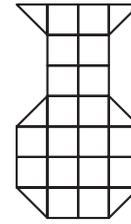
14. Helen has 3 sweets, Daiva has 2 sweets less than Birute, and Birute has 4 times more sweets than Helen. How many sweets have the girls got altogether?

A) 17   **B)** 19   **C)** 21   **D)** 23   **E)** 25

15. The preformance consists of two parts 45 minutes each with a break in between. It started at 10:50, and was over at 12:40. How many minutes did the break last?

A) 10   **B)** 15   **C)** 20   **D)** 25   **E)** 30

16. In the fairy-tale kingdom there live dragons with two or three heads. There are three times more two-headed than three-headed dragons. Altogether the dragons have 27 heads. How many dragons do there live in the kingdom?

A) 16   **B)** 15   **C)** 14   **D)** 13   **E)** 12

17. While gathering mushrooms, Adam found mushrooms every fourty steps. Adam's step is half a meter long, and he has gathered 20 mushrooms. How many meters has he covered from his first to the last mushroom?

A) 380   **B)** 360   **C)** 340   **D)** 400   **E)** 420

18. The street, on which Ele and Ule live, runs along the river, and the houses stand only on one side of the street. There are 47 houses to the left of Ele's house and 23 houses to the right. The same number of houses is both to the left and to the right of Ule's house. How many houses are there between Ele's and Ule's houses?

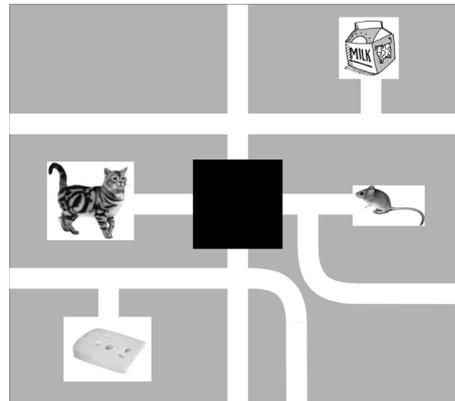**A)** 10   **B)** 11   **C)** 12   **D)** 13   **E)** 14

KANGAROO 2010

**Minor**
3 and 4 grades

Time allowed: *75 min*
Calculators are not permitted

3-point questions

1. There is a maze on the picture for a cat and a mouse. The cat can reach the bowl with milk, mouse can reach the cheese, but cat and mouse will never meet. How does the hidden part of the maze look like?

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

2. A 40 minutes lesson started at 11:50. Exactly at the middle of the lesson, a bird flew into the classroom suddenly. When did that happen?

A) 11:30   **B)** 12:00   **C)** 12:10   **D)** 12:20   **E)** 12:30

3. Which of the numbers indicated below is biggest one?

A) $2 + 0 - 1 + 0$ **B)** $2 - 0 - 1 + 0$ **C)** $2 + 0 - 1 - 0$ **D)** $2 - 0 + 1 + 0$
E) $2 - 0 - 1 - 0$

4. In this restaurant, first course costs 4 Lt, main course 9 Lt and dessert 5 Lt. The menu, which is first course + main course + dessert, costs 15 Lt. How much does someone save if he orders the menu instead of the three separate courses?

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

5. Six coins are lying in a triangle. You have to move some coins to place them in a circle as you can see in the second picture. How many coins must be moved at least?
A) 1   **B)** 2   **C)** 3   **D)** 4   **E)** 5
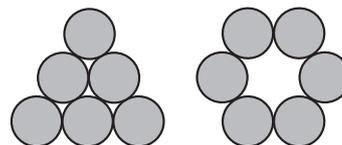
6. Four friends were eating ice-cream. Mišo ate more than Fero, Jaro ate more than Vilo, Jaro ate less than Fero. Which alternative lists the boys from the one who ate the most to the one who ate least?

A) Mišo, Jaro, Vilo, Fero   **B)** Vilo, Mišo, Fero, Jaro
C) Mišo, Fero, Jaro, Vilo   **D)** Jaro, Vilo, Mišo, Fero
E) Jaro, Mišo, Vilo, Fero

7. Using only tiles like this , which of the following mosaics would be impossible to construct if we want to cover the floor of a room?

A)   B)   C)   D)   E)
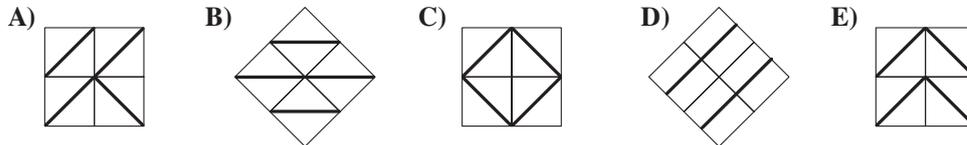
8. Centipede Eve has 100 feet. Yesterday, she bought and put on 16 pairs of new shoes. In spite of that, 14 of her feet are still bare. On how many feet did she have shoes before the shopping?

A) 27   **B)** 40   **C)** 54   **D)** 70   **E)** 77

4-point questions

9. By bending a square napkin twice, Mary obtained a square with a twice shorter side. Then she has cut all the four angles of the square obtained off. Which napkin is that of Mary?

A)   B)   C)   D)   E)
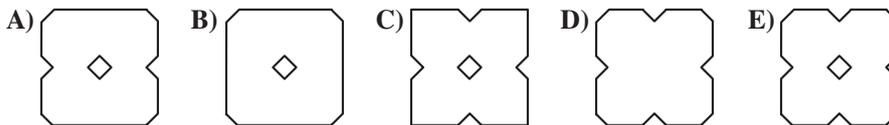
10. Mathew and Clara are living in a skyscraper. Clara is living 12 floors above Mathew. One day Mathew went by stairs to visit Clara. On the half of his way he was on the 8th floor. On which floor does Clara live?

A) 12   **B)** 14   **C)** 16   **D)** 20   **E)** 24

11. A larger cube is made out of 64 little white wooden equal-sized cubes. 5 sides of a larger cube are coloured green. How many cubes have 3 green sides?


A) 4   **B)** 8   **C)** 16   **D)** 20   **E)** 24
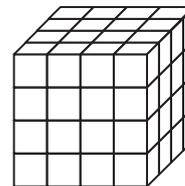
12. A ferry can take either 10 small cars or 6 lorries through the river at one time. On Wednesday, it crossed the river, every time it was full and transported some small cars and lorries — altogether 42 vehicles. How many trips did the ferry make?

A) 10   **B)** 7   **C)** 6   **D)** 8   **E)** 5

13. In the figure there are nine regions inside the circles. Put all the numbers from 1 to 9 exactly one in each region so that the sum of the numbers inside each a circle is 11. Which number must be written in the region with the question mark?
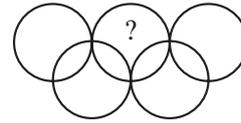
A) 5   **B**) 6   **C**) 7   **D**) 8   **E**) 9

14. John starts a chainletter. He sends a letter to his mate Peter. Peter has to send the letter to 2 other people. Everyone who receives this letter, has to send it also to 2 other people. After 2 rounds in total $1 + 2 + 4 = 7$ persons have received the letter. How many persons in total have received this letter after 4 rounds?

A) 15   **B**) 16   **C**) 31   **D**) 33   **E**) 63

15. Children were measuring length of the sand playground by steps. Ana made 15 equal steps, Betty 17, Denis 12 and Ivo 14. Whose steps were the longest ones?

A) Ana   **B**) Betty   **C**) Denis   **D**) Ivo   **E**) Impossible to determine

16. Both rows have the same sum.

1	2	3	4	5	6	7	8	9	10	199
11	12	13	14	15	16	17	18	19	20	x

What is the value of x?
A) 99   **B**) 100   **C**) 209   **D**) 289   **E**) 299

5-point questions

17. The product $60 \cdot 60 \cdot 24 \cdot 7$ equals

A) the number of minutes in seven weeks
B) the number of hours in sixty days
C) the number of seconds in seven hours
D) the number of seconds in one week
E) the number of minutes in twenty-four weeks

18. Every cell of the 4×4 table contains a playing card (their suits are shown in the picture). One lead allows switching the positions of any two cards. How many leads will be played at least so that each row and each column will contain all suits?
A) 1   **B**) 2   **C**) 3   **D**) 4   **E**) 5

19. Two years ago, the sum of the ages of two cats Tony and Tiny was 15 years. Now Tony is 13 years old. In how many years will Tiny reach the age of 9 years?

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

20. Camilla wrote all positive integers from 1 to 100 in sequence into a chart with 5 columns. There is a part of the chart on picture on the right. Her brother has cut a part of the table and then he has erased some numbers. Which picture represents part of the incomplete chart?

1	2	3	4	5
6	7	8	9	10
11	12	13	14	15
16	17	18	19	20

A)

	43			
		48		

B)

				60
	52			

C)

			69	
	72			

D)

| 81				
86				

E)

		87		
			94	

21. The library of the school that Ana, Bea and Carlos attend has a large number of books. "There are approximately 2000 books" says the teacher and invites the three students to guess the exact number. Ana guesses 2010, Bea guesses 1998 and Carlos guesses 2015. The teacher says that the difference between the numbers they guessed and the exact value are 12, 7 and 5 but not in this same order. How many books are there in the library?

A) 2003   **B)** 2005   **C)** 2008   **D)** 2020   **E)** 2022

22. Some segments are numbered $1, 2, \ldots, 8$ as shown in the picture. In order to bent the figure shown Anne cuts along four of them. Which four?
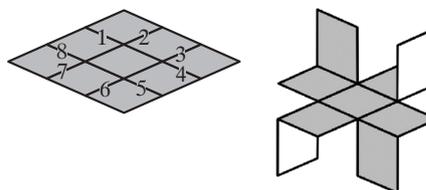
A) 1, 3, 5, 7   **B)** 2, 4, 6, 8

**C)** 2, 3, 5, 6   **D)** 3, 4, 6, 7   **E)** 1, 4, 5, 8

23. Andrew, Stefan, Robert and Marko met at a concert in Zagreb. They came from different cities: Paris, Dubrovnik, Rome and Berlin. Neither of Andrew and the boy from Berlin has ever been to Paris or Rome. Robert is not from Berlin, but he arrived in Zagreb at the same time as the boy from Paris. Marko and the boy from Paris liked the concert very much. Where did Marko come from?

A) Paris   **B)** Rome   **C)** Dubrovnik   **D)** Berlin   **E)** Zagreb

24. Each of Basil's friends added the number of the day and the number of the month of his birthday and obtained 35. Their birthdays are all different. What is the maximal possible number of Basil's friends?

A) 7   **B)** 8   **C)** 9   **D)** 10   **E)** 12

KANGAROO 2010
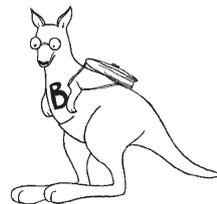
Time allowed: *75 min*
Calculators are not permitted

Benjamin
5 and 6 grades

3-point questions

1. Knowing that $\square + \square + 6 = \square + \square + \square + \square$, determine which digit is hidden by $\square$.
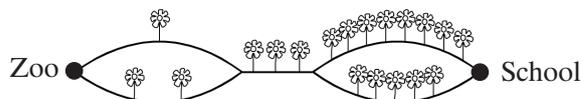
   A) 2   **B)** 3   **C)** 4   **D)** 5   **E)** 6

2. The number 4 is next to two mirrors so it reflects twice as shown. When the same thing happens to number 5, what do we get instead for the question mark?
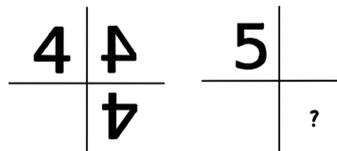
   A)   **B)**   **C)**   **D)**   **E)**

3. Kangu goes directly from Zoo to School. He counts each flower on the way. Which of the following number can not be his result?

   A) 9   **B)** 10   **C)** 11   **D)** 12   **E)** 13

4. A ladder has 21 stairs. Nick and Mike are counting stairs one – from bottom to top, another — from top to bottom. They met on a stair that was called the 10th by Nick. What number will Mike give to this stair?

   A) 13   **B)** 14   **C)** 11   **D)** 12   **E)** 10

5. Ann has connected all the upper points to all the lower points. How many lines Ann has drawn?
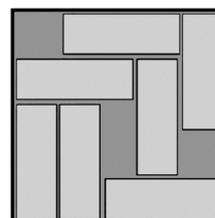   **A)** 20   **B)** 25   **C)** 30   **D)** 35   **E)** 40
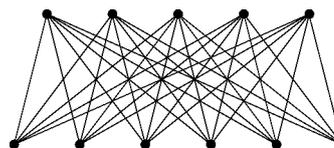
6. A fly has 6 legs, while a spider has 8 legs. Together, 2 flies and 3 spiders have as many legs as 10 birds and
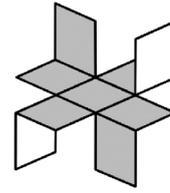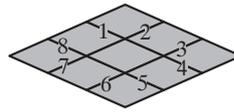
   A) 2 cats   **B)** 3 cats   **C)** 4 cats   **D)** 5 cats   **E)** 6 cats

7. There are seven bars in the box. It is possible to slide the bars in the box so there will be room for one more bar. At least how many bars have to be moved?
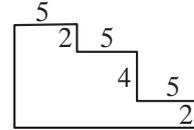   **A)** 1   **B)** 2   **C)** 3   **D)** 4   **E)** 5

8. Some segments are numbered 1, 2, . . . , 8 as shown in the picture. In order to bent the figure shown, Anne cuts along four of them. Which four?
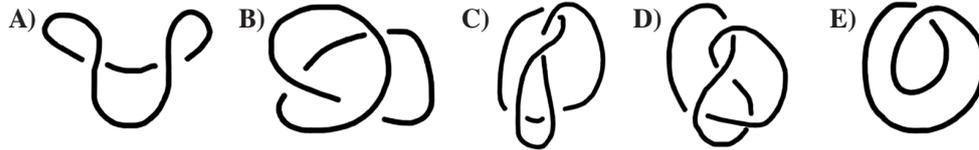**A)** 1, 3, 5 and 7   **B)** 2, 4, 6 and 8
C) 2, 3, 5 and 6   **D)** 3, 4, 6 and 7   **E)** 1, 4, 5 and 8

9. What is the perimeter of the figure below (whose angles are all right angles)?
A) $3 \cdot 5 + 4 \cdot 2$ **B)** $3 \cdot 5 + 8 \cdot 2$ **C)** $6 \cdot 5 + 4 \cdot 2$ **D)** $6 \cdot 5 + 6 \cdot 2$
E) $6 \cdot 5 + 8 \cdot 2$

10. The following figure shows five projections of knots. Actually only one of them is really a knot, all the others just seem to be one. Which one is the knot?
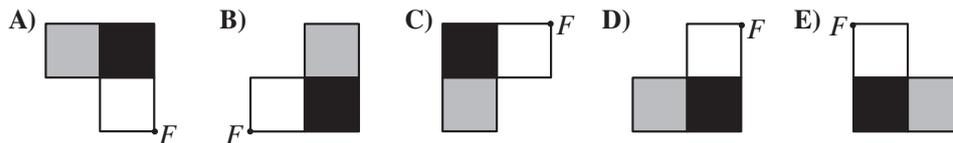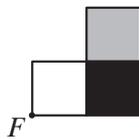
A)   **B)**   **C)**   **D)**   **E)**

4-point questions

11. Which of the following expressions has a different value?

A) $20 \cdot 10 + 20 \cdot 10$ **B)** $20 : 10 \cdot 20 \cdot 10$ **C)** $20 \cdot 10 \cdot 20 : 10$ **D)** $20 \cdot 10 + 10 \cdot 20$
E) $20 : 10 \cdot 20 + 10$

12. If the figure is rotated half term around F, the result is

**A)**   **B)**   **C)** F **D)** F **E)** F

13. Ben has selected a number, has divided it by 7, then added 7 and finally multiplied the sum by 7. That way he comes up with the number 777. Which number was it he selected?

A) 7   **B)** 111   **C)** 722   **D)** 567   **E)** 728

14. The numbers 1, 4, 7, 10 and 13 have to be written in the picture so that the sum of three numbers in a row is equal to the sum of three numbers in a column. What is the biggest possible sum?
**A)** 18   **B)** 20   **C)** 21   **D)** 22   **E)** 24
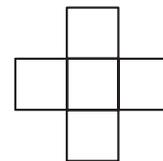
15. To make a newspaper with 60 pages you need 15 sheets of paper which are on top of each other. Then they are followed together. Page 7 is missing. Which other pages are missing in this newspaper?

A) 8, 9 and 10   **B)** 8, 42 and 43   **C)** 8, 48 and 49   **D)** 8, 52 and 53   **E)** 8, 53 and 54

16. An ant walks along the lines of a grid. She starts and finishes at the point *A*. There are no other points where the ant comes twice. She must walk along the indicated segments. What is the smallest possible number of square cells within the pass of the ant?
**A)** 8 **B)** 9 **C)** 10 **D)** 11 **E)** 13
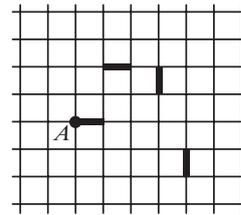
17. Using next picture we can observe that $1 + 3 + 5 + 7 = 4 \times 4$. What is the value of $1 + 3 + 5 + 7 + 9 + 11 + 13 + 15 + 17$?
A) 14×14 **B)** 9×9 **C)** $4 \times 4 \times 4$ **D)** 16×16 **E)** 4×9
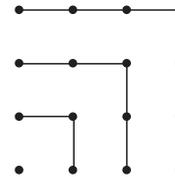
18. Ivona has drawn a flower with 5 petals. She wants to colour the flower, but she has only 2 different colours – red and yellow. How many different flowers can Ivona get if she has to colour each petal using one of these 2 colours?
A) 6 **B)** 7 **C)** 8 **D)** 9 **E)** 10
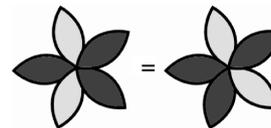
19. What fraction of the square is shaded?
**A)** $\frac{1}{3}$ **B)** $\frac{1}{4}$ **C)** $\frac{1}{5}$ **D)** $\frac{3}{8}$ **E)** $\frac{2}{9}$
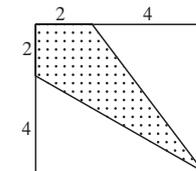
20. Three identical dice are glued together. See picture. The sum of dots on opposite sides of a dice is always 7. What is the sum of dots on the sides which are glued together?
**A)** 12 **B)** 13 **C)** 14 **D)** 15 **E)** 16
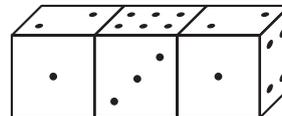
5-point questions

21. The picture shows a balanced mobile. We neglect weights of horizontal bars and vertical strings. The total weight is 112 grams. What is the weight of the star?
A) 6 **B)** 7 **C)** 12 **D)** 16 **E)** We can't know
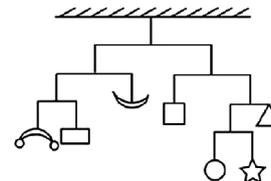
22. A pizza-shop offers a basic version of pizza with mozzarella and tomatoes. One or two toppings must be added: anchovies, artichokes, mushrooms, capers. Moreover, for each pizza three different sizes are available: small, medium, large. How many different types of pizza are available at all?

A) 30 **B)** 12 **C)** 18 **D)** 48 **E)** 72

23. To decide who will have the last piece of Leni's birthday cake Leni, Sarah, Hannes, Petra and Arno form a circle clockwise in this exact order. They count clockwise: KAN-GA-ROO-OUT-GOES-YOU – each syllable counts one child and the one who is caught by the YOU is out of the game. They repeat until there is only one child left. Leni can choose who starts. Who will she pick to secure the last piece of cake for her best friend Arno?
A) Leni **B)** Sarah **C)** Hannes **D)** Petra **E)** Arno

24. A jeweller makes chains by connecting identical grommets (picture 1). Proportions of grommets are shown on picture 2. What is the length of a chain which consists of 5 grommets?
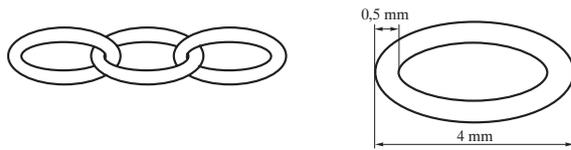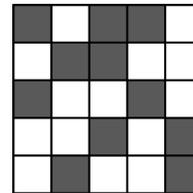

A) 20 mm   **B)** 19 mm   **C)** 17,5 mm   **D)** 16 mm   **E)** 15 mm

25. If in the multiplication $\overline{PPQ} \cdot Q = \overline{RQ5Q}$ the digits P, Q and R are different, then $P + Q + R =$
A) 13   **B)** 15   **C)** 16   **D)** 17   **E)** 20

26. What is the number of black cells in the figure that should be recolored white in order to any row and any column contains exactly one black cell?
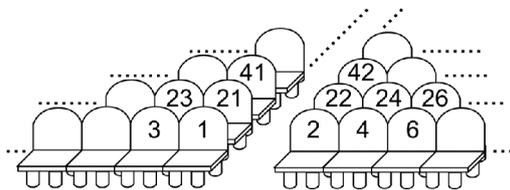**A)** 4   **B)** 5   **C)** 6   **D)** 7   **E)** This can't be done

27. Andrea has wound some rope around a piece of wood. She rotates the wood as shown with the arrow. What is the correct back side of the piece of wood?
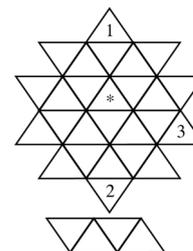

A)   **B)**   **C)**   **D)**   **E)**

28. Ana bought ticket 100. Bea wants to sit close to her. Only 5 tickets are available: 76, 94, 99, 104 and 118. Which of them will Bea buy?

A) 94
B) 76
C) 99
D) 104
E) 118

29. All triangles must be filled using the numbers 1, 2, 3, 4. Each time a piece of the form indicated on the right is placed on four triangles, it hides 4 different numbers. (The piece can turn around, and hence it can be placed in any position). Some numbers have already been written. What number should go instead of *?
**A)** Only 1   **B)** Only 2   **C)** Only 3   **D)** Only 4
E) Any of 1, 2 or 3

30. Six-, seven- and eight-legged octopuses serve the underwater king. Those who have got 7 legs always lie, but those with 6 or 8 legs, always tell the truth. One day four octopuses met. The blue one said: "Altogether we've got 28 legs", the green one said: "Altogether we've got 27 legs", the yellow one said: "Altogether we've got 26 legs", the red one said: "Altogether we've got 25 legs". Which octopus told the truth?

A) Red   **B)** Blue   **C)** Green   **D)** Yellow   **E)** None of them
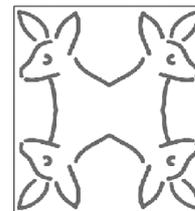
KANGAROO 2010
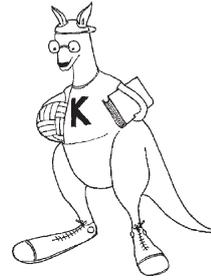
**Cadet**
7 and 8 grades

Time allowed: *75 min*
*Calculators are not permitted*

3-point questions

1. How much is $12 + 23 + 34 + 45 + 56 + 67 + 78 + 89$?

A) 389   **B**) 396   **C**) 404   **D**) 405   **E**) Other answer

2. How many axes of symmetry does the figure have?

**A**) 0   **B**) 1   **C**) 2   **D**) 4   **E**) Infinitely many

3. Toy kangaroos are packed for shipment. Each of them is packed in a box which is a cube. Exactly eight boxes are packed tightly in a bigger cubic cardboard box. How many kangaroo boxes are on the bottom floor of this big cube?

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

4. The perimeter of the figure is equal to

**A**) $3a + 4b$ **B**) $3a + 8b$ **C**) $6a + 4b$ **D**) $6a + 6b$ **E**) $6a + 8b$
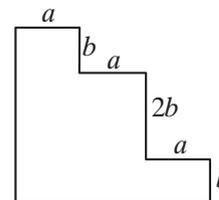
5. Eleanor draws the six vertices of a regular hexagon and then connects some of the 6 points with lines to obtain a geometric figure. Then this figure is surely not a
A) trapezium   **B**) right-angled triangle   **C**) square
D) equilateral triangle   **E**) obtuse-angled triangle

6. If we type seven consecutive integer numbers and the sum of the smallest three numbers is 33, which is the sum of the largest three numbers?

A) 39   **B**) 37   **C**) 42   **D**) 48   **E**) 45

7. After stocking up firewood, the worker summed up that from the certain number of logs he made 72 logs besides 53 cuts were made. He saws only one log at a time. How many logs were at the beginning?

A) 17   **B**) 18   **C**) 19   **D**) 20   **E**) 21
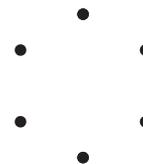
8. There are seven bars in the box. It is possible to slide the bars in the box so there will be room for one more bar. At least how many bars have to be moved?

A) 2   B) 3   C) 4   D) 5   E) It is imposible
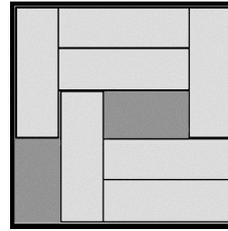
9. A square is divided into 4 smaller equal-sized squares. All the smaller squares are coloured either green or blue. How many different ways are there to colour the given square? (Two colourings are considered the same if one can be rotated to give the other.)

A) 5   B) 6   C) 7   D) 8   E) 9
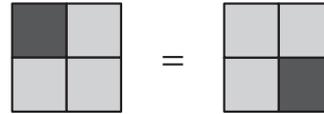
10. The sum of the first hundred positive odd integers subtracted from sum of the first hundred positive even integers is

A) 0   B) 50   C) 100   D) 10 100   E) 15 150

4-point questions

11. Grandma baked a cake for her grandchildren who will visit in the afternoon. Unfortunately she forgot whether only 3, 5 or all 6 of her grandchildren will come over. She wants to ensure that every child gets the same amount of cake. Into how many equal pieces should she cut the cake to be prepared for all three possibilities?

A) 12   B) 15   C) 18   D) 24   E) 30

12. Which of the following is the smallest two-digit number that is not the sum of three different one-digit numbers?

A) 24   B) 15   C) 23   D) 25   E) 10

13. Cathy needs 18 min to make a long chain by connecting three short chains with extra chain links. How long does it take her to make a really long chain by connecting six short chains in the same way?

A) 27 min   B) 30 min   C) 36 min   D) 45 min   E) 60 min

14. In quadrilateral $ABCD$ we have $AD = BC$, $\angle DAC = 50°$, $\angle DCA = 65°$, $\angle ACB = 70°$ (see the fig.). Find the value of $\angle ABC$.
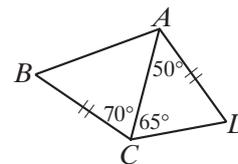
A) 50°   B) 55°   C) 60°   D) 65°   E) Impossible to determine

15. Andrea has wound some rope around a piece of wood. What is the correct back side of the piece of wood?

A)   B)   C)   D)   E)

16. There are 50 bricks of white, blue and red colour in the box. The number of white bricks is eleven times the number of blue ones. There are fewer red ones than white ones, but more red ones than blue ones. How many fewer red bricks are there than white ones?

A) 2   B) 11   C) 19   D) 22   E) 30

17. On the picture $ABCD$ is a rectangle, $PQRS$ is a square. The shaded area is half of the area of rectangle $ABCD$. What is the length of the PX?
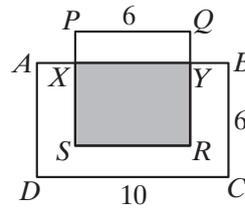
A) 1   B) 1,5   C) 2   D) 2,5   E) 4

18. What is the smallest number of straight lines needed to divide the plane into exactly 5 regions?

A) 3   B) 4   C) 5   D) 6   E) Another answer

19. If $a - 1 = b + 2 = c - 3 = d + 4 = e - 5$, then which of the numbers a, b, c, d and e is the largest?

A) a B) b C) c D) d E) e

20. The logo shown is made entirely from semicircular arcs of radius $2\,\text{cm}$, $4\,\text{cm}$ or $8\,\text{cm}$. What fraction of the logo is shaded?

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

5-point questions

21. In the figure there are nine regions inside the circles. Put all the numbers from 1 to 9 exactly one in each region so that the sum of the numbers inside each a circle is 11. Which number must be written in the region with the question mark?
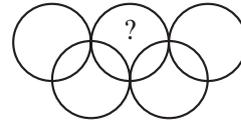
A) 5   B) 6   C) 7   D) 8   E) 9

22. At a barter market, the goods have to be exchanged according to the price list stated in the chart.

| How to exchange properly!		
1 turkey	⇔	5 cocks
1 goose + 2 hens	⇔	3 cocks
4 hens	⇔	1 goose

At least how many hens does Mr. Gaga have to bring to the market, to be able to take away one goose, one turkey and one cock?

A) 18   B) 17   C) 16   D) 15   E) 14

23. A paper strip was folded three times in half and then completely unfolded so that you can still see the 7 folds going up or down. Which of the following views from the side cannot be obtained in this way?

A)

B)

C)

D)

E)
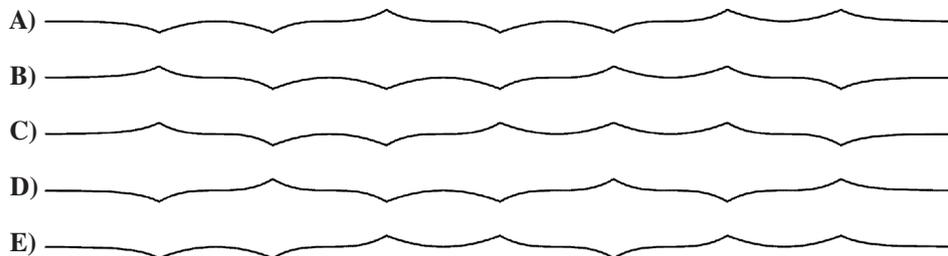
24. On each of 18 cards exactly one number is written, either 4 or 5. The sum of all numbers on the cards is divisible by 17. On how many cards is the number 4 written?

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

25. The natural numbers from 1 to 10 are written on the blackboard. The students in the class play the following game: a student deletes 2 of the numbers and instead of them writes on the blackboard their sum decreased by 1; after that another student deletes 2 of the numbers and instead of them writes on the blackboard their sum decreased by 1; and so on. The game continues until only one number remains on the blackboard. The last number is:

A) Less than 11   **B)** 11   **C)** 46   **D)** Greater than 46   **E)** Another answer

26. In a town there are only knights and liars. Every sentence spoken by a knight is true, every sentence spoken by a liar is false. One day some citizens were in a room and three of them spoke as follows.
1) The first one said: "There are no more than three of us in the room. All of us are liars".
2) The second said: "There are no more than four of us in the room. Not all of us are liars".
3) The third said: "There are five of us in the room. Three of us are liars."
How many people are in the room and how many liars are among them.

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

27. A Kangaroo has a large collection of small cubes $1 \times 1 \times 1$. Each cube is a single colour. Kangaroo wants to use 27 small cubes to make a $3 \times 3 \times 3$ cube so that any two cubes with at least one common vertex are of different colours. At least how many colours have to be used?

A) 6   **B)** 8   **C)** 9   **D)** 12   **E)** 27

28. The biggest equilateral triangle consists of 36 smaller equilateral triangles with area $1\,\text{cm}^2$ each. Find the area of $\triangle ABC$.

A) 11   **B)** 12   **C)** 13   **D)** 14   **E)** 15
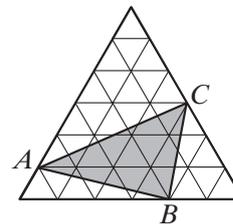
29. The least common multiple of 24 and x is less than that of 24 and y. Then $\frac{y}{x}$ cannot be equal to

A) $\frac{7}{8}$ **B)** $\frac{8}{7}$ **C)** $\frac{2}{3}$ **D)** $\frac{6}{7}$ **E)** $\frac{7}{6}$

30. In the figure, $\angle O = 7°$, and the segments $OA_1, A_1A_2, A_2A_3, \ldots$ are all equal. What is the greatest number of members in this sequence?

A) 11   **B)** 12   **C)** 13   **D)** 14   **E)** Infinitely many
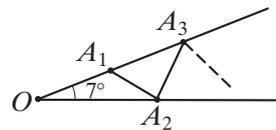
KANGAROO 2010

Time allowed: 75 min
Calculators are not permitted

Junior
9 and 10 grades

3-point questions

1. Which of these is the result when 20102010 is divided by 2010?

A) 11   **B**) 101   **C**) 1001   **D**) 10001   **E**) Not an integer number

2. Ivan gained 85% of all points in a test; Tibor gained 90% of all points in the same test. However, he gained only one point more than Ivan did. What was the maximum number of points in this test?

A) 5   **B**) 17   **C**) 18   **D**) 20   **E**) 25

3. Both rows have the same sum.

1	2	3	4	5	6	7	8	9	10	2010
11	12	13	14	15	16	17	18	19	20	x

What is the value of x?

A) 1010   **B**) 1020   **C**) 1910   **D**) 1990   **E**) 2020

4. The solid in the diagram picture is formed of four identical cubes. Surface of each of the cubes is $24\,cm^2$. What is the surface of the solid?
A) $80\,cm^2$ **B**) $64\,cm^2$ **C**) $40\,cm^2$ **D**) $32\,cm^2$ **E**) $24\,cm^2$

5. Every birthday, Roza receives as many flowers as her age in years. She dries and keeps the flowers and now has 120 flowers. How old is she?

A) 10   **B**) 12   **C**) 14   **D**) 15   **E**) 20

6. A paper strip was folded three times in half and then completely unfolded such that you can still see the 7 folds going up or down. Which of the following views from the side cannot come out this way?
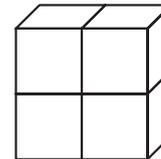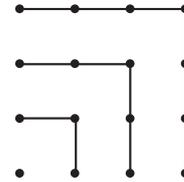
A)

B)

C)

D)

E)

7. 6 points are marked at nodes of a squared sheet of paper. Connecting these points by segments, we need to obtain these geometrical figures: a square, rhombus (not a square), parallelogram (not a rhombus, not a square), trapezium (not a parallelogram), aute-angled triangle. How many of these geometrical figures can we obtain?
A) 1 **B)** 5 **C)** 2 **D)** 4 **E)** 3
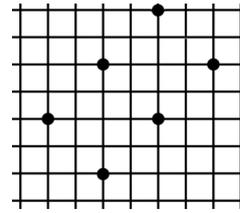
8. From the picture, we can see that $1 + 3 + 5 + 7 = 4 \times 4$. What is the value of $1 + 3 + 5 + 7 + 9 + 11 + 13 + 15 + 17$?
A) 14×14 **B)** 9×9 **C)** $4 \times 4 \times 4$ **D)** 16×16 **E)** 4×9

9. Brigitte goes to Verona on vacation, and plans to cross each of the five famous old bridges over the river Adige at least once. She starts walking from the train station, and when she returns there, she has crossed all of these bridges and no other. During her walk she crossed the river n times. Which is a possible value for n?

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

10. $ABCE$ is a square and BCF and CDE are equilateral triangles. If AB is of length 1, what is the length of FD?
A) $\sqrt{2}$ **B)** $\frac{\sqrt{3}}{2}$ **C)** $\sqrt{3}$ **D)** $\sqrt{5} - 1$ **E)** $\sqrt{6} - 1$
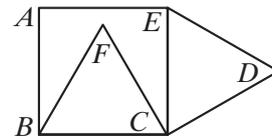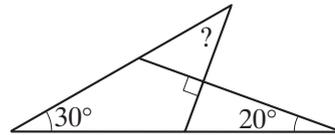
4-point questions

11. My teacher said that the product of his age and his father's age is 2010. In what year was my teacher born?

A) 1943 **B)** 1953 **C)** 1980 **D)** 1995 **E)** 2005

12. What is the value of angle marked with a question mark?
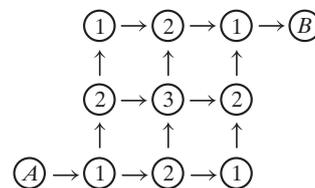**A)** $10°$ **B)** $20°$ **C)** $30°$ **D)** $40°$ **E)** $50°$

13. How many integers are there, such that the sum of their digits is 2010 and the product of their digits is 2?

A) 2010 **B)** 2009 **C)** 2008 **D)** 1005 **E)** 1004

14. In the figure we have to go from circle A to circle B following the arrows. On each walk we compute the sum of all numbers we passed through. How many different sums can we get?
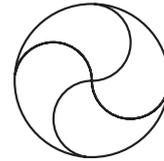**A)** 1 **B)** 2 **C)** 3 **D)** 4 **E)** 6

15. Three Tuesdays of a month coincided with even dates. What day of a week was the 21st day of this month?

**A)** Wednesday **B)** Thursday **C)** Friday **D)** Saturday **E)** Sunday

16. A circle of radius 4 cm is divided into four congruent parts by arcs of radius 2 cm as shown. What is the perimeter of one of the resulting parts?
A) 2π **B)** 4π **C)** 6π **D)** 8π **E)** 12π


17. The scatter graph shows the distance run and time taken from some time-trials run by 5 students. Who was the fastest?
**A)** Alicia   **B)** Bea   **C)** Carlos   **D)** Dani   **E)** Ernesto
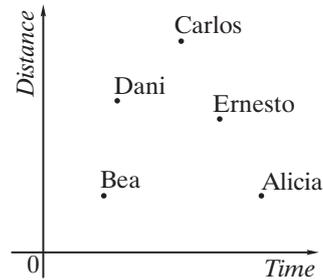
18. A triangle is folded along the dotted line to obtain a figure as shown in the picture. The area of the triangle is 1.5 times that of the resulting figure. Given that the total area of the three shaded regions is 1, find the area of the original triangle.
A) 2   **B)** 3   **C)** 4   **D)** 5
E) Impossible to determine
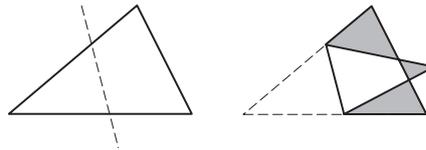
19. In a supermarket trolley park, there are two lines of tightly-packet trolleys. The first line has ten trolleys and is 2.9 m long. The second line has twenty trolleys and is 4.9 m long. What is the length of one trolley?
A) 0.8   **B)** 1   **C)** 1.1   **D)** 1.2   **E)** 1.4
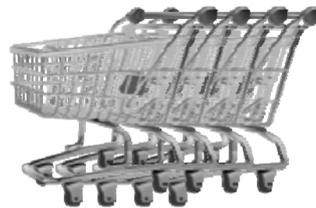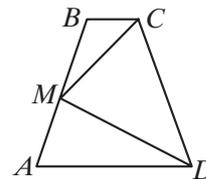

20. The biggest equilateral triangle consists of 36 smaller equilateral triangles with area $1\,\text{cm}^2$ each. Find the area of $\triangle ABC$.
**A)** 11   **B)** 12   **C)** 13   **D)** 14   **E)** 15
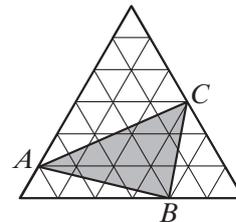
5-point questions

21. In a isosceles trapezium $ABCD$, M is the midpoint of the lateral side AB, $BM = 1$, and $\angle CMD = 90°$. Find the perimeter of the trapezium $ABCD$.
**A)** 5   **B)** 6   **C)** 7   **D)** 8   **E)** Impossible to determine

22. Lines parallel to the base divide each of the other two sides of the triangle shown into 10 equal segments. Which percentage of the area of triangle is grey?
A) 41,75%   **B)** 42,5%   **C)** 45%   **D)** 46%   **E)** 47,5%
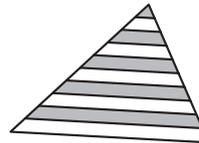
23. For how many integers n $(1 \leqslant n \leqslant 100)$ the number n^n is a perfect square?

A) 5   **B)** 50   **C)** 55   **D)** 54   **E)** 15

24. Six-, seven- and eight-legged octopuses serve the underwater king. Those who have got 7 legs always lie, but those with 6 or 8 legs – always tell the truth. One day four octopuses met. The blue one said: "Altogether we've got 28 legs", the green one said: "Altogether we've got 27 legs", the yellow one said: "Altogether we've got 26 legs", the red one said: "Altogether we've got 25 legs". How many legs has the red octopus got?

A) 6   **B)** 7   **C)** 8   **D)** 6 or 8   **E)** Impossible to determine.

25. In the figure, $\angle O = 7°$, and the segments $OA_1, A_1A_2, A_2A_3, \ldots$ are all equal. What is the greatest number of members in this sequence?
**A)** 11   **B)** 12   **C)** 13   **D)** 14   **E)** Infinitely many
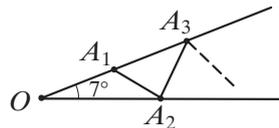
26. In a sequence the first 3 elements are 1, 2 and 3. From the 4th element on every element is calculated from the previous 3 elements, the third of them being subtracted form the sum of the 1st and the 2nd one: $1, 2, 3, 0, 5, -2, 7, \ldots$. What is the 2010th element of the sequence?

A) -2006 **B)** 2008   **C)** -2002 **D)** -2004 **E)** Other answer

27. On each side of a pentagon there is a natural number such that adjacent numbers never have a common divisor greater than 1 and non-adjacent numbers always have a common divisor greater than 1. There are several possibilities, but one of the following numbers will never occur on any of the sides of the pentagon. Which one is it?

A) 20   **B)** 18   **C)** 19   **D)** 21   **E)** 22

28. How many 3-digit integers have the property that their central digit is the average of the other two?

A) 9   **B)** 12   **C)** 16   **D)** 45   **E)** 36

29. An oval is built by four arcs of circles. The arcs on the left and right are the same and as well are the arcs above and below. The oval has vertical and horizontal lines of symmetry. The oval fits exactly in a rectangle of length 4×8. The radius of the little arcs is 1. What is the radius of the big arcs?
A) 6   **B)** 6,5   **C)** 7   **D)** 7,5   **E)** 8
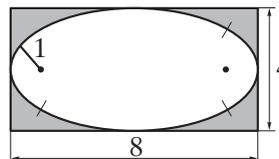
30. A bar-code of the type shown is composed of alternate strips of black and white, always beginning and ending with a black strip. Each strip (of either colour) has the width 1 or 2, and the total width of the bar code is 12. How many different codes are possible, always reading from left to right?

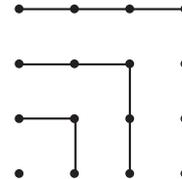**A)** 24   **B)** 132   **C)** 66   **D)** 12   **E)** 116

KANGAROO 2010

Student
11 and 12 grades

Time allowed: 75 min
*Calculators are not permitted*

3-point questions

1. Using next picture we can observe that $1 + 3 + 5 + 7 = 4 \times 4$. What is the value of $1 + 3 + 5 + 7 + 9 + 11 + 13 + 15 + 17$?
   A) 14×14 **B)** 9×9 **C)** $4 \times 4 \times 4$ **D)** 16×16 **E)** 4×9

2. Both rows have the same sum.

1	2	3	4	5	6	7	8	9	10	2010
11	12	13	14	15	16	17	18	19	20	x

   What is the value of x?

   A) 1010 **B)** 1020 **C)** 1910 **D)** 1990 **E)** 2020

3. Two empty cubes have base areas of $1\,\text{dm}^2$ and $4\,\text{dm}^2$ respectively. We want to fill the bigger cube with springwater which we fetch using the smaller cube. How many times do we have to go to the spring?

   A) 2 **B)** 4 **C)** 6 **D)** 8 **E)** 16

4. How many four-digit numbers formed of only odd digits are divisible by five?

   A) 900 **B)** 625 **C)** 250 **D)** 125 **E)** 100

5. The director of a company said: "Each of our employees is at least 25 years old." Later, it turned out, that he was not right. It means, that

   A) all employees in the company are exactly 25 years old
   B) all employees in the company are more than 26 years old
   C) none of the employees in the company is 25 years old yet
   D) some employee in the company is less than 25 years old
   E) some employee in the company is exactly 26 years old

6. There are seven bars in the box as shown in the figure. We wish to slide some bars in the box so there will be room for one more bar. At least how many bars must be moved in that case?
   **A)** 2 **B)** 3 **C)** 4 **D)** 5 **E)** It is impossible
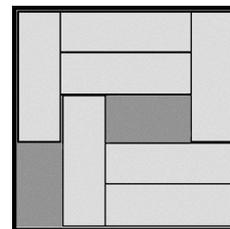
7. The triangle ABC is right-angled, M is the midpoint of the hypotenuse AB and $\angle A = 60°$. $\angle BMC =$
A) $105°$ B) $108°$ C) $110°$ D) $120°$ E) $125°$
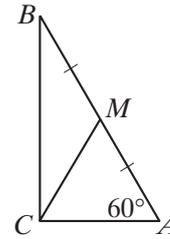
8. Choose a number which could be equal to a number of edges of some prism.

A) 100 B) 200 C) 2008 D) 2009 E) 2010

9. How many positive integer solutions does the equation $(x-3)^2 + (y-2)^2 = 1$ have?

A) 1 B) 2 C) 3 D) 4 E) Infinitely many

10. In the picture, the side of the square has length 2, the semicircles go through the center of the square and have centers on the vertices of the square. The shaded circles have centers on the sides of the squares and are tangent to the semicircles. What is the shaded area?

A) $4(3 - 2\sqrt{2})\pi$ B) $\sqrt{2}\pi$ C) $\frac{\sqrt{3}}{4}\pi$ D) π E) $\frac{1}{4}\pi$
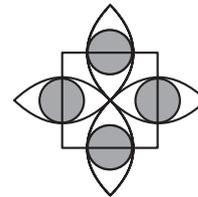
4-point questions

11. The three numbers $\sqrt{7}$, $\sqrt[3]{7}$, $\sqrt[6]{7}$ are consecutive terms of a geometric progression. The next term of the progression is

A) $\sqrt[9]{7}$ B) $\sqrt[12]{7}$ C) $\sqrt[5]{7}$ D) $\sqrt[10]{7}$ E) 1

12. The chord AB is tangent to the smaller of the concentric circle. If $AB = 16$, what is the area of the shaded region?
A) 32π B) 63π C) 64π D) $32\pi^2$
E) It depends on radii of the circles
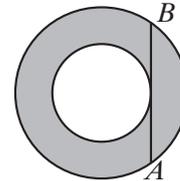
13. The integer numbers x and y satisfy $2x = 5y$. Only one of the following can be $x + y$. Which is it?

A) 2011 B) 2010 C) 2009 D) 2008 E) 2007

14. The biggest equilateral triangle consists of 36 smaller equilateral triangles with area $1\,\text{cm}^2$ each. Find the area of $\triangle ABC$ (in cm^2).
A) 11 B) 12 C) 13 D) 14 E) 15
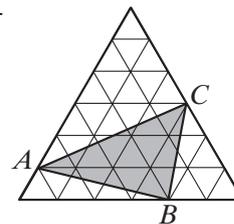
15. There are balls of three colours in a bag: blue, green and red (there is at least one of each colour). We know, that in case we are blindfolded and draw five balls randomly, there will definitely be at least two red ones and at least three will be the same colour. How many blue balls are there in the bag?

A) 1 B) 2 C) 3 D) 4 E) It is impossible to find out without more detailed information

16. Which of these graphs corresponds with the set of all solutions of the equation $(x - |x|)^2 + (y - |y|)^2 = 4$?

A) **B)** **C)** **D)** **E)**
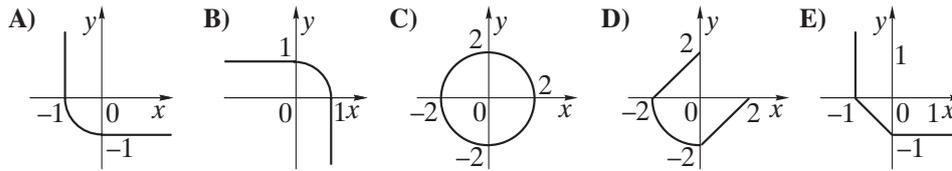
17. How many right-angled triangles can be formed by joining three vertices of a given regular 14-gon?

A) 42 **B)** 84 **C)** 88 **D)** 98 **E)** 168

18. Each star in the expression $1 * 2 * 3 * 4 * 5 * 6 * 7 * 8 * 9 * 10$ is replaced either by „+" or „·". Let N be the largest possible value of the expression that can be obtained this way. What is the smallest prime factor of N?

A) 2 **B)** 3 **C)** 5 **D)** 7 **E)** Some other number

19. The lengths of the sides of a triangle in centimeters are the natural numbers 13, x and y. Find the perimeter if $xy = 105$.

A) 35 **B)** 39 **C)** 51 **D)** 69 **E)** 119
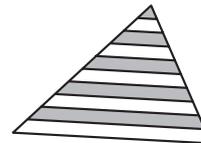
20. The paper ribbon is folded three times as shown.
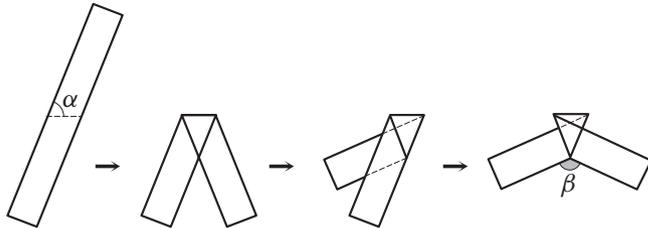
Find β, if $\alpha = 70°$.

A) 140° **B)** 130° **C)** 120° **D)** 110° **E)** 100°

5-point questions

21. Lines parallel to the base divide each of the other two sides of the triangle shown into 10 equal segment. Which percentage of the area of triangle is grey?
A) 42.5% **B)** 45% **C)** 46% **D)** 47.5% **E)** 50%

22. 100 people took part in a race, no two of which arrived at the same time. Each was asked, in which place they had finished and everybody answered with a number from 1 to 100. The sum of all answers equaled 4000. What is the smallest number of false answers the runners could have given?

A) 9 **B)** 10 **C)** 11 **D)** 12 **E)** 13

23. In the figure there are nine regions inside the circles. Put all the numbers from 1 to 9 exactly one in each region so that the sum of the numbers inside each a circle is 11. Which number will be written in the region with the question mark?
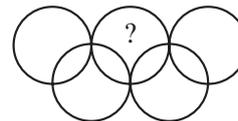
A) 5 **B)** 6 **C)** 7 **D)** 8 **E)** 9

24. A bar-code of the type shown is composed of alternate strips of black and white, always beginning and ending with a black strip. Each strip (of either colour) has the width 1 or 2, and the total width of the bar code is 12. How many different codes are possible, always reading from left to right?

A) 24 **B)** 132 **C)** 66 **D)** 12 **E)** 116

25. A wall is tiled with two sizes of square tile as shown. The larger tile has sides of length a, and the smaller of length b. The dashed lines (horizontal and slanted) form an angle of $30°$. Determine the ratio $a : b$.
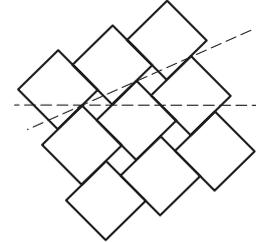
A) $2\sqrt{3}$ **B)** $2 + \sqrt{3}$ **C)** $3 + \sqrt{2}$ **D)** $3\sqrt{2}$ **E)** 2

26. The natural numbers from 1 to 10 are each written on the blackboard 10 times. The students in the class then play the following game: a student deletes 2 of the numbers and instead of them writes down on the blackboard their sum decreased by 1; after that another student deletes 2 of the numbers and instead of them writes down on the blackboard their sum decreased by 1; and so on. The game continues until only one number remains on the blackboard. The remaining number is:

A) less than 440 **B)** 451 **C)** 460 **D)** 488 **E)** more than 500

27. The value of the expression $\dfrac{(2+3)(2^2+3^2)\cdots(2^{1024}+3^{1024})(2^{2048}+3^{2048})+2^{4096}}{3^{2048}}$ equals:

A) 2^{2048} **B)** 2^{4096} **C)** 3^{2048} **D)** 3^{4096} **E)** $3^{2048} + 2^{2048}$

28. The square root $\sqrt{0.\underbrace{44...4}_{100 \text{ times}}}$ is written as an infinite decimal. What is the 100$^{\text{th}}$ digit after the decimal point?

A) 1 **B)** 2 **C)** 6 **D)** 7 **E)** 9

29. For any real number $x > 0$ function $f(x)$ is defined and meets the condition

$$2f(x) + 3f\left(\frac{2010}{x}\right) = 5x.$$

Find $f(6)$.

A) 993 **B)** 1 **C)** 2009 **D)** 1013 **E)** 923

30. Points P and Q are chosen, one on each leg of right-angled triangle. The length of the sides are a and b respectible. Let K and H be the feet of P and Q respectively on the hypotenuse. Find the least possible value of the sum $KP + PQ + QH$.

A) $a + b$ **B)** $\dfrac{2ab}{a+b}$ **C)** $\dfrac{2ab}{\sqrt{a^2+b^2}}$ **D)** $\dfrac{(a+b)^2}{\sqrt{a^2+b^2}}$ **E)** $\dfrac{(a+b)^2}{2ab}$