Lietuvos Respublikos švietimo ir mokslo ministerija
Kengūros konkurso organizavimo komitetas
Matematikos ir informatikos institutas
Leidykla TEV

KANGAROO 2011

Nipper
1 and 2 grades

Time allowed: *50 min*
Calculators are not permitted

3-point questions

1. What is the sum of the digits of the number 2011?

A) 202 **B**) 31 **C**) 4 **D**) 13

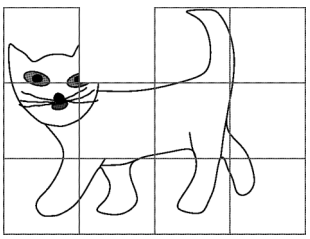
2. Kate's doll is wearing a gown, has two pigtails and holds one flower in her hand. Which picture portrays the doll?

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

3. As winter season has passed, 12 pairs of ski boots remain unsold at the sporting goods shop. How many ski boots remain in the shop?

A) 6 **B**) 12 **C**) 24 **D**) 4

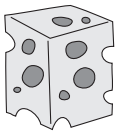
4. One piece is missing in the puzzle on the right. Which of the pieces below is the missing one?



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

5. Today's date is 17 03 2011. The goods are shown below together with their expiry dates. Which of the goods should not be consumed?

A)



15 09 2011

B)

4 03 2012

C)

11 04 2011

D)

25 02 2011

6. Martin's grandmother will celebrate her one hundred years birthday after 36 years. How old is Martin's grandmother now?

A) 74 **B**) 64 **C**) 66 **D**) 36

4-point questions

7. Ann keeps four cats, as well as some dogs. Her cats' ears count to the same number as her dogs' legs. How many dogs does Ann keep?

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

8. Simon has two aquaria. One of them is filled with 26 litres of water, while another one is filled with 42 litres. How many litres of water have to be poured from the second aquarium into the first one to have the same amount of water in both of them?

A) 6 **B**) 16 **C**) 10 **D**) 8

9. Below one line of the train schedule is shown. It is 8:45 AM at this moment.

DEPARTURE FROM DRUSKININKAI					
TO VILNIUS	6:55	8:30	9:35	11:15	12:50

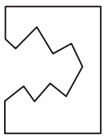
Tom is going to take the proximate train from Druskininkai to Vilnius. The trip lasts 2 hours 45 minutes. At which time will Tom arrive to Vilnius?

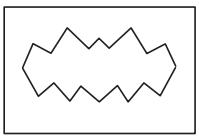
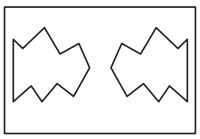
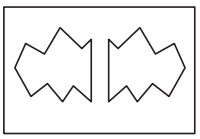
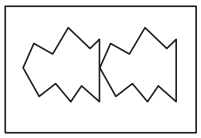
A) 11:25 **B**) 12:20 **C**) 11:10 **D**) 12:05

10. Kate bought three felt-tips, two pens and two rubbers for 11 Lt 60 ct. Ann bought one felt-tip, two pens and two rubbers, identical to those of Kate, for 8 Lt 40 ct. What is the price of one felt-tip?

A) 1 Lt 20 ct **B**) 1 Lt 50 ct **C**) 1 Lt 60 ct **D**) 3 Lt 20 ct

11. Ned folded a rectangular piece of paper in half and cut a figure out of it, as shown in the picture, and then unfolded the part of that piece that remained. Which of the following could be the result?



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

12. Mr. Smith has three daughters, of whom the youngest is 5 years old. The middle daughter is 4 years younger than the eldest one and 6 years older than the youngest one. How old is the eldest daughter of Mr. Smith?

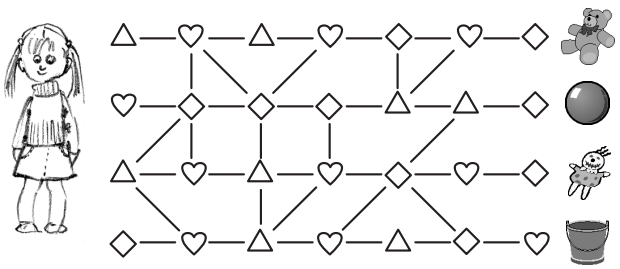
A) 10 **B**) 11 **C**) 9 **D**) 15

5-point questions

13. At the florist's all the flowers are displayed in three buckets. There were 16 flowers in one bucket, 11 flowers in the second bucket and 17 flowers in the third bucket. The flowers are sold only in bouquets of five. Suddenly the shop-keeper saw that she is not able to compose such a bouquet. How many flowers remain unsold?

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

14. To get her toy, little Ann has to follow the path marked by the consecutive signs △, ♡, ◇, △, ♡, ◇, △, ♡, ◇.



Which toy belongs to Ann?

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

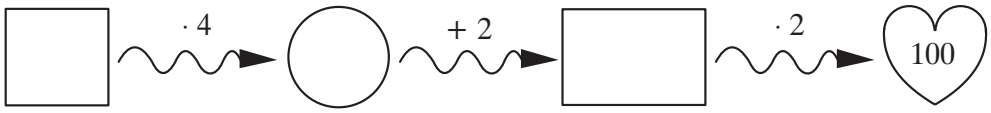
15. The dog Rex, the cat Ginger and four monkeys weigh together 24 kg. Rex and a monkey weigh 11 kg. Ginger together with two monkeys are one kilo lighter than Rex and a monkey. What is the weight of Ginger?

A) 3 kg **B**) 4 kg **C**) 5 kg **D**) 6 kg

16. Agnes, Camilla, Mike and Darius competed in an apple-eating contest, trying to eat as many apples as they could. Darius ate more apples than Camilla, while Mike was less successful than Agnes. If Darius did not win the contest, then who did?

A) Agnes **B**) Camilla **C**) Mike **D**) Impossible to determine

17. Which number has to be written in the square to obtain 100 after performing all the operations signified?



A) 11 **B**) 9 **C**) 14 **D**) 12

18. Paul and John constructed several buildings from identical wooden cubes. Paul's building is depicted in Figure 1. Its view from above is shown in Figure 2. John's building's view from above is shown in Figure 3. (Attention: the numbers in the figures tell how many cubes are placed one upon another in that place.)

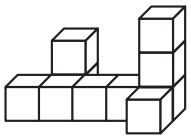


Fig. 1

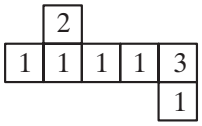


Fig. 2

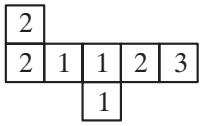
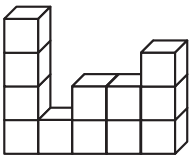


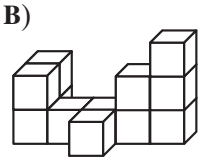
Fig. 3

Which of the following is John's building?

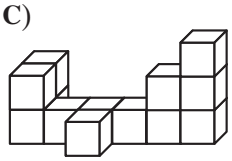
A)



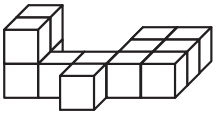
B)



C)



D)



Lietuvos Respublikos švietimo ir mokslo ministerija
Kengūros konkurso organizavimo komitetas
Matematikos ir informatikos institutas
Leidykla TEV

KANGAROO 2011

Minor
3 and 4 grades

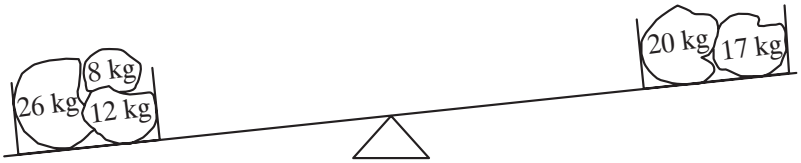
Time allowed: *75 min*
Calculators are not permitted

3-point questions

1. Basil wants to paint the word KANGAROO. He paints one letter each day. He starts on Wednesday. On what day will he paint the last letter?

A) Monday **B**) Tuesday **C**) Wednesday **D**) Thursday **E**) Friday

2. A caveman wants to balance two set of stones.



Which stone should he put on the right side to have both sides equally heavy?

A) 

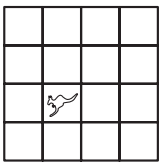
B) 

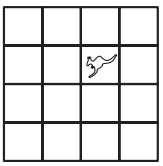
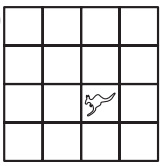
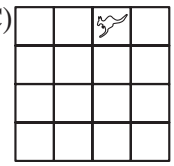
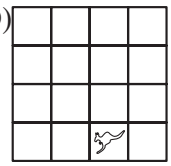
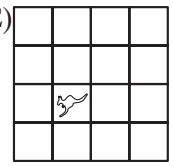
C) 

D) 

E) 

3. A toy is in a square as seen on the picture. A child moves the toy from one square to the next. He uses the following order first to the right, then upwards, then to the left, then downwards, and then to the right. Which of the following pictures shows where the toy will be at the end?

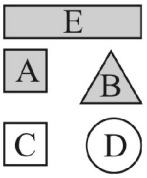


A) 
B) 
C) 
D) 
E) 

4. Simon got up one hour and a half ago. In three hours and a half, he will take the train to grandmother's. How long before the train departure did he get up?

A) 2 hours **B**) 3 hours and a half **C**) 4 hours
D) 4 hours and a half **E**) 5 hours

5. Maria described one of the five given figures in the following way. It is not a square. It's grey. It's either round or triangular. Which figure did she describe?



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

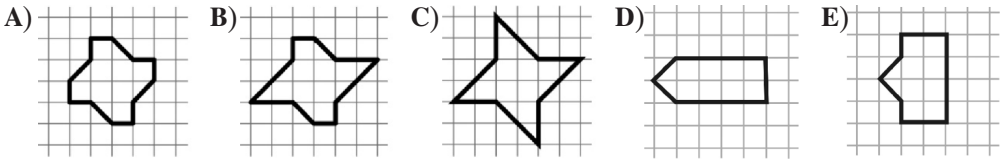
6. Lenka paid 1 litas and 50 cents for three scoops of ice-cream. Miso paid 2 litas and 40 cents for two cakes. How much did Igor pay for one scoop of ice-cream and one cake?

A) 1 Lt 70 ct **B**) 1 Lt 90 ct **C**) 2 Lt 20 ct **D**) 2 Lt 70 ct **E**) 3 Lt 90 ct

7. A tower clock strikes on the hour (that is at 8:00, 9:00, 10:00) as many times as the hour. It strikes also once when it is half past an hour (e.g. at 8:30). How many times did the clock strike from 7:55 to 10:45?

A) 6 **B**) 18 **C**) 27 **D**) 30 **E**) 33

8. Which figure has the largest area?

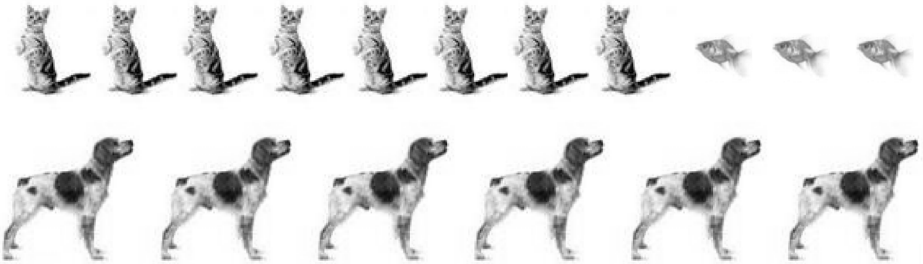


4-point questions

9. The poulterer has boxes of 6 eggs and boxes of 12 eggs. What is the least amount of boxes he needs to store 66 eggs?

A) 5 **B**) 6 **C**) 9 **D**) 11 **E**) 13

10. In a school class all pupils have at least one pet and at most two pets. The pupils have recorded how many pets they have all together.



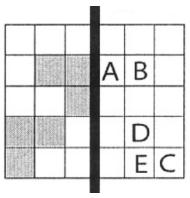
Among the pupils two have both a dog and a fish. Three of the pupils have both a cat and a dog. The remaining pupils have only one pet each. How many pupils are there in this class?

A) 11 **B**) 12 **C**) 13 **D**) 14 **E**) 17

11. There are 13 coins in John's pocket, each of them is either 5 or 10 cents. Which value cannot be the total value of John's coins?

A) 80 **B**) 60 **C**) 70 **D**) 115 **E**) 125

12. The sheet is folded along the thick line. Which letter will not be covered by a gray square?



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

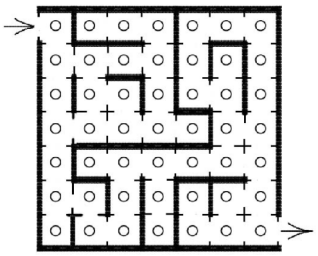
13. Ann, Bob, Cleo, Dido, Eef, and Fer each roll a die. They all get different numbers. The number Ann rolled is twice as much as Bob's. The number Ann rolled is three times as much as Cleo's. The number Dido rolled is four times as much as Eef's. What number did Fer roll?

A) 2 **B**) 3 **C**) 4 **D**) 5 **E**) 6

14. In a quiz show there are the following rules: every participant has 10 points at the beginning and has to answer 10 questions. For a correct answer 1 point is added and for an incorrect answer 1 point is taken away. Mrs. Smith had 14 points at the end of this quiz show. How many incorrect answers did she give?

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

15. At each square of the magic maze there is a piece of cheese. Mouse Ron wants to enter and go out taking as many pieces of cheese as he can. He cannot step on any square twice. What is the largest number of pieces of cheese he can get?



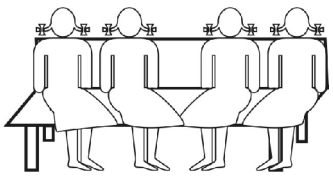
A) 17 **B**) 33 **C**) 37 **D**) 41 **E**) 49

16. During a party each of two identical cakes was divided into four equal pieces. Then each of these pieces was divided into three equal pieces. After that each of the participants of this party got such a piece of cake and three more pieces were left. How many people were at this party?

A) 24 **B**) 21 **C**) 18 **D**) 27 **E**) 13

5-point questions

17. Four girlfriends Masha (M), Sasha (S), Dasha (D) and Pasha (P) sit on a bench. First Masha exchanged places with Dasha. Then Dasha exchanged places with Pasha. At the end the girls sat on the bench in the following order from left to right: MSDP. In what order from left to right did they sit in the beginning?

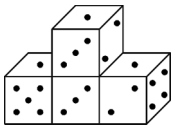


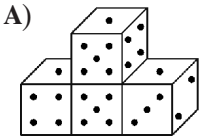
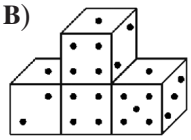
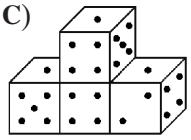
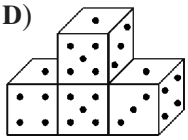
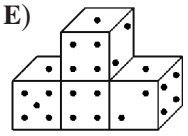
A) MSDP **B**) MDPS **C**) DSPM **D**) SMDP **E**) PMSD

18. How many times a day (24 hours) a digital watch with four digits shows the same digit in the four positions? (In the picture there is an example with two different digits.

A) 1 **B**) 24 **C**) 3 **D**) 5 **E**) 12

19. Four identical dice have been arranged in a structure as shown in the figure. The sum of points on any two opposite sides is equal to 7. How does this structure look like from behind?

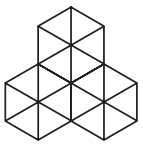


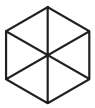
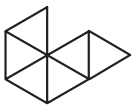
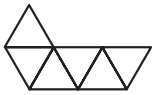
A)  **B)**  **C)**  **D)**  **E)** 

20. You have three cards as shown in the figure. You can form different numbers with them, for example 989 or 986. How many different 3 digit numbers can you form with these three cards?

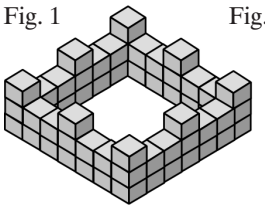
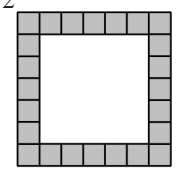
A) 4 **B**) 6 **C**) 8 **D**) 9 **E**) 12

21. Andra formed the ornament in the picture by using pieces of one single shape several times. The pieces cannot cover each other. Which of the following pieces cannot be used by Andra to create the ornament?



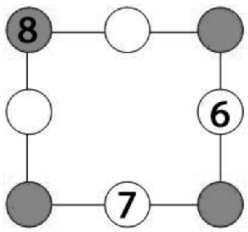
A)  **B)**  **C)**  **D)**  **E)** 

22. In picture 1 there is a castle built of cubes. When you look at the same castle from above it looks like in the picture 2. How many cubes were used to build the castle?

Fig. 1  Fig. 2 

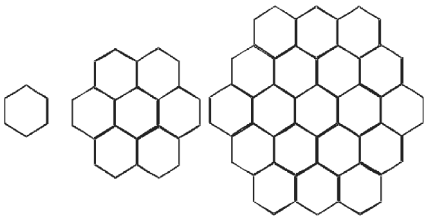
A) 56 **B**) 60 **C**) 64 **D**) 68 **E**) 72

23. John wrote 6, 7 and 8 in the circles as shown in the following picture. He will then write each of the numbers 1, 2, 3, 4 and 5 in the circles so that the sum of the numbers in each of the sides of the square is equal to 13. What will be the sum of the numbers in the shaded circles?



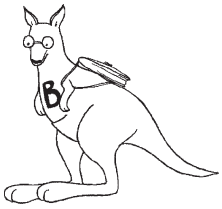
A) 12 **B**) 13 **C**) 14 **D**) 15 **E**) 16

24. Sylvia drew figures with hexagons like in the picture. How many hexagons will the fifth figure contain, if she continues with this pattern?



A) 37 **B**) 49 **C**) 57 **D**) 61 **E**) 64

Lietuvos Respublikos švietimo ir mokslo ministerija
Kengūros konkurso organizavimo komitetas
Matematikos ir informatikos institutas
Leidykla TEV



KANGAROO 2011

Benjamin
5 and 6 grades

Time allowed: *75 min*
Calculators are not permitted

3-point questions

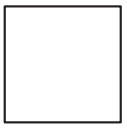
1. Basil wants to paint the word KANGAROO. He paints one letter each day. He starts on Wednesday. On what day will he paint the last letter?

A) Monday **B**) Tuesday **C**) Wednesday **D**) Thursday **E**) Friday

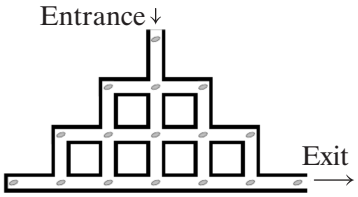
2. A motorcyclist rode a distance of 28 km in 30 minutes. At what average speed (km/h) did he drive?

A) 28 **B**) 36 **C**) 56 **D**) 58 **E**) 62

3. A square of paper is cut into two pieces using a straight line. Which of the following shapes cannot be the result of the cut?
A) Square **B**) Rectangle **C**) A right-angled triangle
D) Pentagon **E**) An isosceles triangle



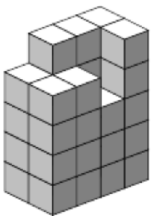
4. Hamster Fridolin sets out for the Land of Milk and Honey. His way to the legendary Land passes through a system of tunnels. What is the highest number of pumkin seeds he can collect if he is not allowed to take the same path or intersection twice?
A) 12 **B**) 13 **C**) 14 **D**) 15 **E**) 16

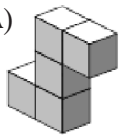


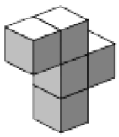
5. In Crazytown, the houses on the right side of Number Street have odd numbers. However, crazytowners don't use numbers containing the digit 3. The first house on the right side of the street is numbered 1. What is the number of the fifteenth house on the right side of the street?

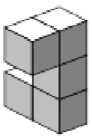
A) 29 **B**) 41 **C**) 43 **D**) 45 **E**) 47

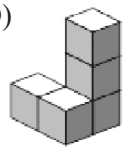
6. Which of the following pieces do I need to complete the cuboid?

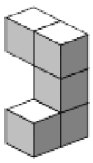


A) 

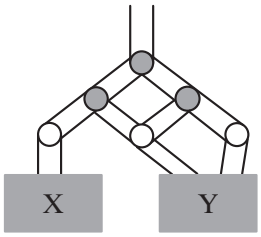
B) 

C) 

D) 

E) 

7. We pour 1000 litres of water into the top of the pipe. At every fork, the water splits into two equal parts. How many litres of water will reach container Y?
A) 500 **B**) 660 **C**) 666,67 **D**) 750 **E**) 800

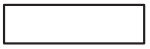
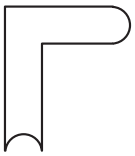
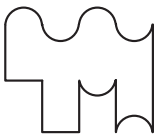


8. The date 01-03-05 (1 March 2005) consists of three consecutive odd numbers in increasing order. This is the first date with this feature in the 21st century. Including the date given as an example, how many dates expressed in the form dd-mm-yy have this feature in the 21st century?

A) 5 **B**) 6 **C**) 8 **D**) 13 **E**) 16

9. Four cardboard pieces are arranged to form a figure.

Which of the five figures below is impossible to make?

A) 
B) 
C) 
D) 
E) 

10. If Liza the cat only lazes around during the day, she drinks 60 ml of milk. If she catches mice, she drinks a third more milk. In the last two weeks she has been catching mice every other day. How much milk did she drink in the last two weeks?

A) 840 **B**) 980 **C**) 1050 **D**) 1120 **E**) 1960

4-point questions

11. Andrew wrote the letters of the word KANGAROO in cells, one letter per cell. He can write the first letter in any cell he wants. He writes every subsequent letter in a cell that has at least one point in common with the cell in which the letter before it was written. Which of the tables below cannot be Andrew's?

A)

K	*A*
N	*O*
O	*G*
R	*A*

B)

N	*G*
A	*A*
K	*R*
O	*O*

C)

O	*O*
K	*R*
A	*A*
G	*N*

D)

K	*A*
N	*G*
O	*O*
R	*A*

E)

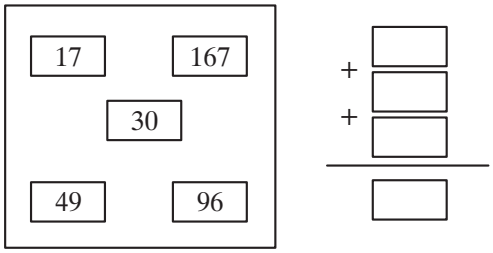
K	*O*
A	*O*
R	*N*
A	*G*

12. All 4-digit integers with the same digits as the number 2011 (two 1's, 0, and 2) are written in increasing order. What is the difference between the two neighbours of the number 2011 on this list?

A) 890 **B**) 891 **C**) 900 **D**) 909 **E**) 990

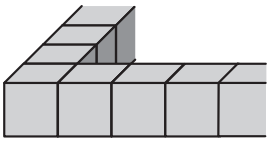
13. Move four of the numbers on the left into the cells on the right so that the addition is correct. Which number remains on the left?

A) 17 **B**) 30 **C**) 49 **D**) 96 **E**) 167



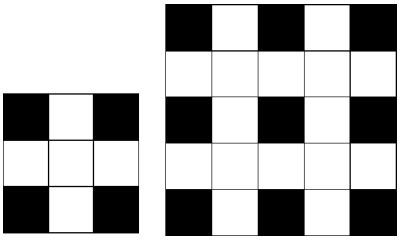
14. Nina used 36 identical cubes to build a fence of cubes around a square region (part of it is shown in the picture). How many cubes will she need to fill the region?

A) 30 **B**) 49 **C**) 64 **D**) 81 **E**) 100



15. Square floors are made of white and black tiles. Floors with 4 and 9 black tiles are shown in the picture. There is a black tile in each corner and all tiles around a black tile are white. How many white tiles are needed for a floor with 25 black tiles?

A) 25 **B**) 39 **C**) 45 **D**) 56 **E**) 72



16. Paul wanted to multiply an integer with 301, but he forgot the zero and multiplied it by 31 instead. The result he got was 372. What result was he supposed to get?

A) 3010 **B**) 3612 **C**) 3702 **D**) 3720 **E**) 30720

17. In a tournament FC Barcelona scored three goals and had one goal scored against it. It won one game, drew one game and lost one game. What was the score of the game FC Barcelona won?

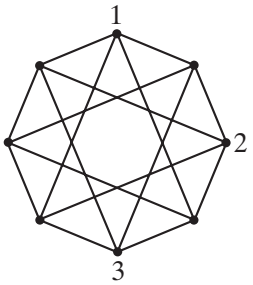
A) 2:0 **B**) 3:0 **C**) 1:0 **D**) 2:1 **E**) 0:1

18. We are given three points that form a triangle. We want to add one point to make a parallelogram. How many possibilities are there for the fourth point?

A) 1 **B**) 2 **C**) 3 **D**) 4 **E**) It depends on the initial triangle

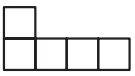
19. The numbers 1, 2, 3 or 4 should be written at each of the 8 marked points in the picture in such a way that the ends of each line should have different numbers. Three numbers have already been written. How many times does 4 appear in the picture?

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



20. Daniel wants to make a complete square using only pieces like the one in the picture. What is the smallest number of pieces he can use?

A) 8 **B**) 10 **C**) 12 **D**) 16 **E**) 20



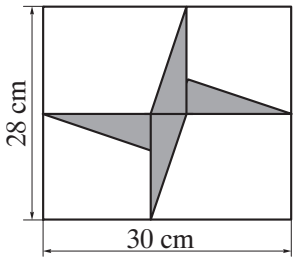
5-point questions

21. There are 10 pupils in a dance class. Their teacher has 80 jelly beans. If she gives each of the girls in her class the same number of jelly beans, there are 3 jelly beans left over. How many boys are there in the class, if in it there are at least 2 girls?

A) 1 **B**) 2 **C**) 3 **D**) 5 **E**) 6

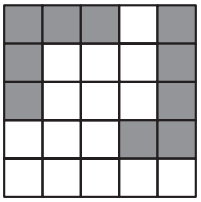
22. A cat has 7 kittens: white, black, red, white-black, white-red, black-red, and white-black-red. How many ways are there to choose 4 kittens so that any two among them have a common color?
A) 1 **B**) 3 **C**) 4 **D**) 6 **E**) 7

23. There are four identical right-angle triangles inside the rectangle, as shown in the picture. Find the total area of all the four triangles (cm^2).
A) 46 **B**) 52 **C**) 54 **D**) 56 **E**) 64

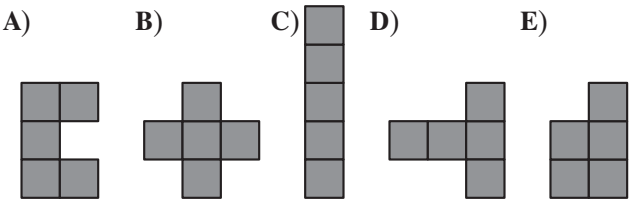


24. Alex says Pelle is lying. Pelle says Mark is lying. Mark says Pelle is lying. Tony says Alex is lying. How many boys are lying?
A) 0 **B**) 1 **C**) 2 **D**) 3 **E**) 4

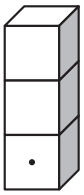
25. Lina has a square board with two pieces on it as shown in the picture. Which of the following 5 pieces should she place on the empty part of the board so that none of the remaining 4 pieces fit anymore?



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



26. The picture shows three regular dice stacked on top of each other. A regular die has the following property: the spots on any two opposite faces add up to 7. In this picture, the sum of the spots of any two faces that meet is 5. How many spots are on the top face of the top dice?
A) 2 **B**) 3 **C**) 4 **D**) 5 **E**) 6



27. I want to draw four circles on the blackboard such that any two of them have exactly one common point. What is the biggest number of points that can belong to more than one circle?
A) 1 **B**) 4 **C**) 5 **D**) 6 **E**) 8

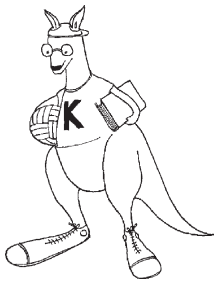
28. In one month there were 5 Saturdays and 5 Sundays, but only 4 Fridays and 4 Mondays. In the next month there will be
A) 5 Wednesdays **B**) 5 Thursdays **C**) 5 Fridays **D**) 5 Saturdays **E**) 5 Sundays

29. You are given four positive numbers a, b, c and d such that $a < b < c < d$. You are asked to increase one of them by 1 in such a way that, after increasing, the product of the four numbers is as small as possible. Which one should you increase?
A) Only a **B**) Only b **C**) Only c **D**) Only d **E**) Either b or c

30. How many integers can be formed with the digits 1, 2, 3, 4, 5 using each digit only once such that the first digit of the number is divisible by 1, the first two digits form a number divisible by 2, the first three digits form a number divisible by 3, the first four digits form a number divisible by 4 and the five digits form a number divisible by 5?
A) It is impossible **B**) 1 **C**) 2 **D**) 5 **E**) 10

Lietuvos Respublikos švietimo ir mokslo ministerija
Kengūros konkurso organizavimo komitetas
Matematikos ir informatikos institutas
Leidykla TEV

KANGAROO 2011



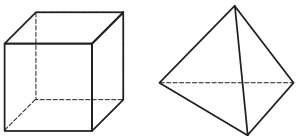
Time allowed: *75 min*
Calculators are not permitted

Cadet
7 and 8 grades

3-point questions

1. Which of the following has the largest value?

A) 2011^1 **B**) 1^{2011} **C**) $1 \cdot 2011$ **D**) $1 + 2011$ **E**) $1 : 2011$



2. Elsa plays with cubes and tetrahedrons. She has 5 cubes and 3 tetrahedrons. How many faces are there in total?

A) 42 **B**) 48 **C**) 50 **D**) 52 **E**) 56

3. A zebra crossing has alternating white and black stripes, each of width 50 cm. On a road the crossing starts and ends with a white stripe. The crossing has 8 white stripes. What is the width of the road?

A) 7 m **B**) 7,5 m **C**) 8 m **D**) 8,5 m **E**) 9 m

4. My calculator divides instead of multiplying and subtracts instead of adding. I type

$(12 \cdot 3) + (4 \cdot 2)$.

What does the calculator show?

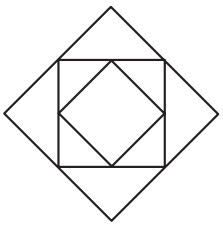
A) 2 **B**) 6 **C**) 12 **D**) 28 **E**) 38

5. My digital watch has just changed to show the time 20:11. How many minutes later will it next show a time with the digits 0, 1, 1, 2 in some order?

A) 40 **B**) 45 **C**) 50 **D**) 55 **E**) 60

6. The diagram shows three squares. The medium square joins the midpoints of the large square. The small square joins the midpoints of the medium square. The area of the small square in the figure is 6 cm^2. What is the difference (in cm^2) between the area of the medium square and the area of the large square?

A) 6 **B**) 9 **C**) 12 **D**) 15 **E**) 18



7. In my street there are 17 houses. I live in the last house on the even side, it is number 12. My cousin lives in the last house on the odd side; what number is his home?

A) 5 **B**) 7 **C**) 13 **D**) 17 **E**) 21

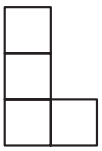
8. Felix the Cat, caught 12 fish in 3 days. Each day after the first he caught more fish than the previous day. On the third day he caught fewer fish than the first two days together. How many fish did Felix catch on the third day?

A) 5 **B**) 6 **C**) 7 **D**) 8 **E**) 9

9. From all 3-digit numbers with sum of digits equal to 8, the largest and the smallest are chosen. What is their sum?

A) 707 **B**) 907 **C**) 916 **D**) 1000 **E**) 1001

10. The diagram shows an L-shape made from four small squares. An extra small square is to be added to form a shape with a line of symmetry. In how many ways can this be done?



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

4-point questions

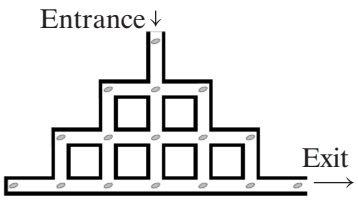
11. $\frac{2011 \cdot 2{,}011}{201{,}1 \cdot 20{,}11} =$

A) 0,01 **B**) 0,1 **C**) 1 **D**) 10 **E**) 100

12. Marie has 9 pearls that weigh 1 g, 2 g, 3 g, 4 g, 5 g, 6 g, 7 g, 8 g, and 9 g. She makes four rings with two pearls on each. The weight of the pearls on these four rings are 17 g, 13 g, 7 g and 5 g. What is the weight (in grams) of the remaining pearl?

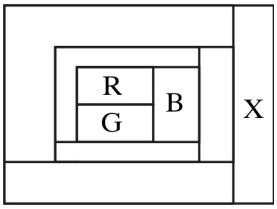
A) 1 **B**) 2 **C**) 3 **D**) 4 **E**) 5

13. Hamster Fridolin has to pass through a system of tunnels as shown in the picture. He is not allowed to return to an intersection where he has already been. At each intersection he finds a pumpkin seed. How many pumkin seeds can he collect at most?



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

14. Each region in the diagram has to be coloured with one of four colours: red (R), green (G), blue (B), yellow (Y). Any two regions that touch must have different colours. Then the colour of the region X is

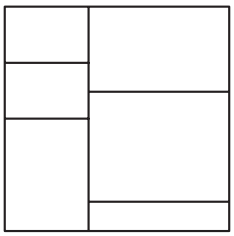


A) red **B**) blue **C**) green **D**) yellow
E) not possible to determine

15. Here is a list of marks: 17, 13, 5, 10, 14, 9, 12, 16. Which two marks can be removed without changing the average?

A) 12 and 17 **B**) 5 and 17 **C**) 9 and 16 **D**) 10 and 12 **E**) 10 and 14

16. A square piece of paper is cut into six rectangular pieces. The total length of the perimeters of the six rectangular pieces is 120 cm. Find the area (in cm^2) of the square piece of paper.



A) 48 **B**) 64 **C**) 110,25 **D**) 144 **E**) 256

17. In three games "Barcelona" scored 3 goals and let 1 goal in. In these three games, "Barcelona" won one game, drew one game and lost one game. What was the result of the won game?

A) 2:0 **B**) 3:0 **C**) 1:0 **D**) 2:1 **E**) 0:1

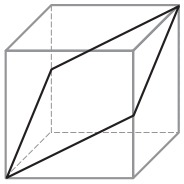
18. Lali draws a line segment MN of length 2 on a piece of paper. How many different points P can she draw on the paper so that the triangle MNP is right-angled and has area 1?

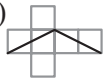
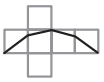
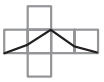
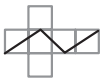
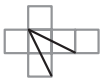
A) 2 **B**) 4 **C**) 6 **D**) 8 **E**) 10

19. The positive number a is less than 1, and the number b is greater then 1. Which of the following numbers has the largest value?

A) $a \cdot b$ **B**) $a + b$ **C**) $a : b$ **D**) b **E**) $a - b$

20. A cube is folded from the paper below. A dark line is then drawn so that it divides the surface of the cube into two identical parts. What does the paper look like after the cube is unfolded?



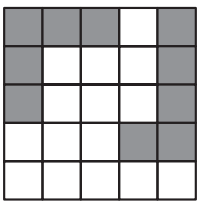
A)  **B)**  **C)**  **D)**  **E)** 

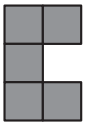
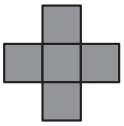
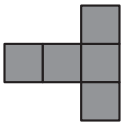
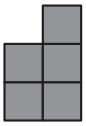
5-point questions

21. The five-digit number 24X8Y is divisible by 4, 5 and 9. What is the sum of the digits X and Y?

A) 13 **B**) 10 **C**) 9 **D**) 8 **E**) 4

22. Lina placed two tiles consisting of five small squares on a square board. Which of the following five tiles could she place on the empty part of the board in such a way that none of the remaining four tiles fit anymore?



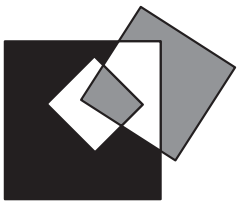
A)  **B)**  **C)**  **D)**  **E)** 

23. Each of the three blackbirds, Isaac, Max and Oscar, found a nest of their own. Isaac says: "I'm more than twice as far away from Max as I am from Oscar". Max says: "I'm more than twice as far away from Oscar as I am from Isaac". Oscar says: "I'm more than twice as far away from Max as I am from Isaac". At least two of them are telling the truth. Which one is lying?

A) Isaak **B**) Max **C**) Oscar **D**) None of them **E**) Impossible to tell

24. I draw a square with side 3 cm inside a square with side 7 cm. Then I draw another square with side 5 cm which intersects the first two squares. What is the difference (in cm^2) between the areas of the black part and the grey parts?

A) 0 **B**) 10 **C**) 11 **D**) 15 **E**) Impossible to determine



25. Myshko shoots at a target. He only hits 5, 8 and 10. Myshko hits 8 and 10 the same number of times. He scores 99 points in total, and 25% of his shots missed the target. How many times did Myshko shoot at the target?

A) 10 **B**) 12 **C**) 16 **D**) 20 **E**) 24

26. In a convex quadrilateral $ABCD$ with $AB = AC$, the following angles are known: $\angle BAD = 80^\circ$, $\angle ABC = 75^\circ$ ir $\angle ADC = 65^\circ$. What is the size of $\angle BDC$?

A) 10° **B**) 15° **C**) 20° **D**) 30° **E**) 45°

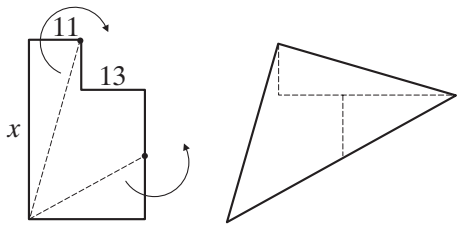
27. All 4-digit numbers the sum of whose digits is 4 are written in descending order. In which place in this sequence is the number 2011 situated?

A) 6th **B**) 7th **C**) 8th **D**) 9th **E**) 10th

28. What is the smallest positive integer value of the expression $\frac{K \cdot A \cdot N \cdot G \cdot A \cdot R \cdot O \cdot O}{G \cdot A \cdot M \cdot E}$ (different letters stand for different nonzero digits while equal letters stand for equal digits).

A) 1 **B**) 2 **C**) 3 **D**) 5 **E**) 7

29. The figure below consists of two rectangles. The lengths of two sides are marked: 11 and 13. The figure is cut into three parts and the parts are rearranged into a triangle.



What is the length of the side x?

A) 36 **B**) 37 **C**) 38 **D**) 39 **E**) 40

30. Mark plays a computer game on a 4×4 grid. When he clicks a cell it turns to red or blue. Only two blue cells can be found and they always have a common side. What is the least number of clicks that will always suffice to take to have both blue square on the screen if the game is played wisely?

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

Lietuvos Respublikos švietimo ir mokslo ministerija
Kengūros konkurso organizavimo komitetas
Matematikos ir informatikos institutas
Leidykla TEV

KANGAROO 2011

Time allowed: *75 min*
Calculators are not permitted

Junior
9 and 10 grades

3-point questions

1. A zebra crossing has white and black stripes, all of breadth 50 cm. On a road the crossing starts and ends with a white stripe. The crossing has 8 white stripes. What is the breadth of the road?

A) 7 m **B**) 7,5 m **C**) 8 m **D**) 8,5 m **E**) 9 m

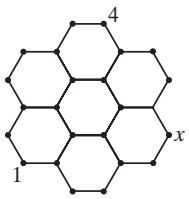
2. The rectangle has an area 13 cm^2. X and Y are the midpoints of the sides of the trapezoid. What is the area (in cm^2) of the trapezoid?

A) 24 **B**) 25 **C**) 26 **D**) 27 **E**) 28

3. Given the expressions $P = 2\times3+3\times4+4\times5$, $Q = 2^2+3^2+4^2$ and $R = 1\times2+2\times3+3\times4$, which of the following relationships are true?

A) $Q < P < R$ **B**) $P < Q = R$ **C**) $P < Q < R$ **D**) $R < Q < P$ **E**) $P = Q < R$

4. In the next picture there should be a number at each of the dots • in such a way that the sum of the ends of each segment is the same. Two of the numbers are already there. What goes in the place of x?



A) 1 **B**) 3 **C**) 4 **D**) 5 **E**) Not enough information

5. How many positive integers exist such that a remainder of division 31 by n is equal to 7?

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

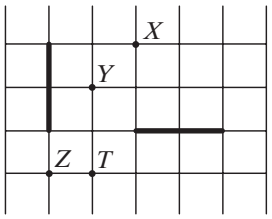
6. A rectangular mosaic with area 360 cm^2 is made from square tiles, all the same size. The mosaic is 24 cm high and 5 tiles wide. What is the area of each tile in cm^2?

A) 1 **B**) 4 **C**) 9 **D**) 16 **E**) 25

7. All 4-digit numbers whose sum of digits is 4 are written in descending order. In which place in this sequence is the number 2011 situated?

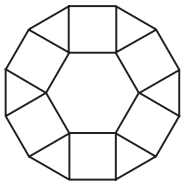
A) 6th **B**) 7th **C**) 8th **D**) 9th **E**) 10th

8. Each of the given two segments is a rotation image of the another one. Which of shown points may be centres of such rotations?



A) Only X **B**) Only X and Z **C**) Only X and T
D) Only T **E**) X, Y, Z and T

9. The diagram shows a shape consisting of a regular hexagon of side one unit, six triangles and six squares.What is the perimeter of the shape?



A) $6\left(1+\sqrt{2}\right)$ **B**) $6+3\sqrt{3}$ **C**) 12 **D**) $6+3\sqrt{2}$ **E**) 9

10. Three normal dice are piled on top of each other so that the sum of spots on the two faces that meet are always 5. The front face on the bottom dice shows one spot. How many spots does the top face on the top dice show?

A) 2 **B**) 3 **C**) 4 **D**) 5 **E**) 6

4-point questions

11. In a certain month there were 5 Mondays, 5 Tuesdays, and 5 Wednesdays. In the preceding month there were only 4 Sundays. Which of the following will the next month definitely include?

A) Exactly 4 Fridays **B**) Exactly 4 Saturdays **C**) 5 Sundays **D**) 5 Wednesdays
E) This situation is impossible

12. Three sportsmen participated in a race: Michael, Fernando and Sebastian. Right after the start Michael was the first, Fernando second, and Sebastian third. During the race Michael and Fernando overtook each other 9 times, Fernando and Sebastian 10 times, and Michael and Sebastian 11 times. In what order did they finish?

A) Michael, Fernando, Sebastian **B**) Fernando, Sebastian, Michael
C) Sebastian, Michael, Fernando **D**) Sebastian, Fernando, Michael
E) Fernando, Michael, Sebastian

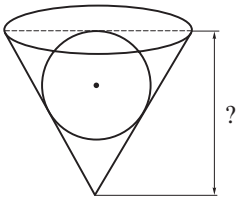
13. Given that $9^n+9^n+9^n=3^{2011}$, what is the value of n?

A) 1005 **B**) 1006 **C**) 2010 **D**) 2011 **E**) None of them

14. I have two cubes with the sides of length a dm and $a+1$ dm. The big cube is full of water and the small one is empty. I pour some water from the big cube into the small cube till this one is full, leaving 217 ℓ in the big cube. How much water was poured into the small cube?

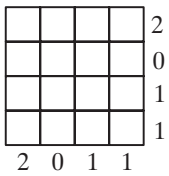
A) 243 ℓ **B**) 729 ℓ **C**) 125 ℓ **D**) 1331 ℓ **E**) 512 ℓ

15. A marble with radius 15 is rolled in a conical hole and fits exactly. Viewed from the side the conical hole is an equilateral triangle. How deep is the hole?



A) 45 **B**) $25\sqrt{3}$ **C**) $30\sqrt{2}$ **D**) 60 **E**) $60\left(\sqrt{3}-1\right)$

16. The cells of this 4×4-grid will be coloured black or white. Next to the rows and columns of this grid is indicated the number of cells in that column/row that must be black. In how many ways can this be done?



A) 0 **B**) 1 **C**) 3 **D**) 5 **E**) 9

17. What is the maximal number of consecutive 3-digit numbers that have at least one odd digit?

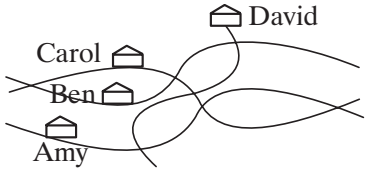
A) 1 **B**) 10 **C**) 110 **D**) 111 **E**) 221

18. Nick wants to write integers in cells of the 3×3 table so that the sums of the numbers in each 2×2 square equal 10. Five numbers he has already written in the table as it is shown in the figure. Find the sum of other four numbers.

1		0
	2	
4		3

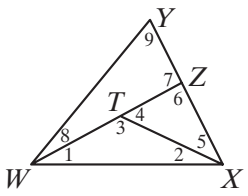
A) 9 **B**) 10 **C**) 11 **D**) 12 **E**) 13

19. During a bumpy sailing, Jane tried to sketch a map of her home village. She managed to draw the four streets, their seven crossings and the houses of her friends, but in reality Arrow Street, Nail Street and Ruler Street are all straight. The fourth street is Curvy Road. Who lives on Curvy Road?



A) Amy **B**) Ben **C**) Carol **D**) David
E) You need a better map to be able to tell

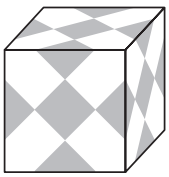
20. In triangle WXY, a point Z is chosen on the segment XY, then point T is chosen on the segment WZ. We thus obtain 9 angles denoted in the figure by the numbers $1, 2, \ldots, 9$. Find the minimum possible number of different values that the angles $1, 2, \ldots, 9$ could take.



A) 2 **B**) 3 **C**) 4 **D**) 5 **E**) 6

5-point questions

21. Simon had a glass cube with the edge 1 dm long. He stuck several congruent golden squares on the cube so that the cube looked the same from all the sides (see the picture). How many cm^2 are golden?



A) 37,5 **B**) 150 **C**) 225 **D**) 300 **E**) 375

22. Call the five-digit number $\overline{abcde}$ *interesting* if its digits are distinct and $a = b + c + d + e$. How many interesting numbers are there?

A) 72 **B**) 144 **C**) 168 **D**) 216 **E**) 288

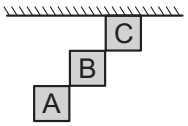
23. The number x and y are both greater than 1. Which of the following fractions has the greatest value?

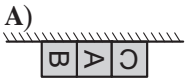
A) $\frac{x}{y+1}$ **B**) $\frac{x}{y-1}$ **C**) $\frac{2x}{2y+1}$ **D**) $\frac{2x}{2y-1}$ **E**) $\frac{3x}{3y+1}$

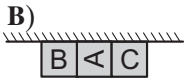
24. Mark plays a computer game on a 4×4 grid. When he clicks a cell it turns to red or blue. Only two blue cells can be found and they always have a common side. What is the least number of clicks that will always suffice to take to have both blue square on the screen if the game is played wisely?

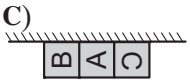
A) 9 **B**) 10 **C**) 11 **D**) 12 **E**) 13

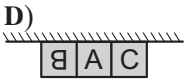
25. Three big boxes were delivered to a warehouse and put on the floor as shown from above in the top picture. The boxes have to be placed neatly along the wall in a certain order. They are so heavy that they can only be rotated around one of the bottom corners in a 90 degree angle. Which picture is possible?



A) 

B) 

C) 

D) 

E) All four pictures are possible

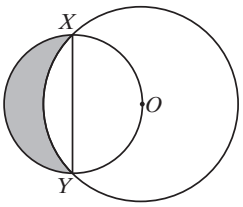
26. How many ordered pairs of natural numbers (x, y) satisfy the equation $\frac{1}{x} + \frac{1}{y} = \frac{1}{3}$?

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

27. For an integer $n \geqslant 2$ denote by $\langle n \rangle$ the biggest prime number, which does not exceed n. How many positive integers k satisfy the equation $\langle k+1 \rangle + \langle k+2 \rangle = \langle 2k+3 \rangle$?

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

28. Two circles are constructed as shown in the figure. The segment XY is the diameter of the smaller circle. The center O of the greater circle lies on the smaller circle, the radius of the greater circle is r. What is the area of the shaded region?



A) $\frac{\pi}{6} \cdot r^2$ **B)** $\frac{\pi\sqrt{3}}{12} \cdot r^2$ **C)** $\frac{1}{2} \cdot r^2$ **D)** $\frac{\sqrt{3}}{4} \cdot r^2$ **E)** Another answer

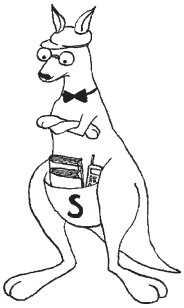
29. How many quadruples of edges of a cube possess the property that any two edges in such a quadruple have no common vertices?

A) 6 **B)** 8 **C)** 9 **D)** 12 **E)** 18

30. Find all n $(n < 9)$ such, that it is possible to mark some cells in a 5×5 square so that there are exactly n marked cells in each 3×3 square?

A) 1 **B)** 1 and 2 **C)** 1, 2 and 3 **D)** 1, 2, 7 and 8 **E)** All from 1 to 8

Lietuvos Respublikos švietimo ir mokslo ministerija
Kengūros konkurso organizavimo komitetas
Matematikos ir informatikos institutas
Leidykla TEV



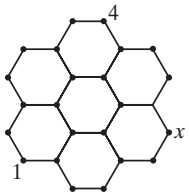
KANGAROO 2011

Student
11 and 12 grades

Time allowed: *75 min*
Calculators are not permitted

3-point questions

1. In the next picture there should be a number at each of the dots • in such a way that the sum of the numbers at the ends of each segment is the same. Two of the numbers are already there. What goes in the place of x?



A) 1 **B**) 3 **C**) 4 **D**) 5 **E**) Not enough information

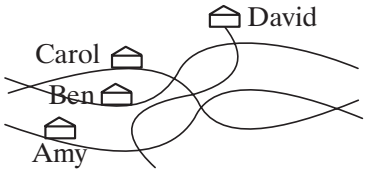
2. Three racers participated in a Formula -1 race: Michael (M), Fernando (F) and Sebastian (S). Right after the start Michael was the first, Fernando — the second, Sebastian — the third. During the course of the race Michael and Fernando overtook each other 9 times, Fernando and Sebastian — 10 times, and Michael and Sebastian — 11 times. In what order did the racers finish?

A) MFS **B**) FSM **C**) SMF **D**) SFM **E**) FMS

3. If $2^x = 15$, $15^y = 32$, then xy is equal to:

A) 5 **B**) $\log_2 15 + \log_{15} 32$ **C**) $\log_2 47$ **D**) 7 **E**) $\sqrt{47}$

4. Jane, who is not very good at drawing correctly, tried to sketch a map of her home village. She managed to draw the four streets, their seven crossings and the houses of her friends, but in reality Arrow Street, Nail Street and Ruler Street are all straight. The fourth street is Curvy Road. Who lives on Curvy Road?

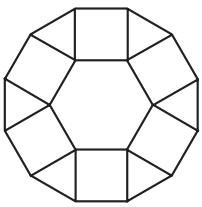


A) Amy **B**) Ben **C**) Carol **D**) David
E) We cannot decide from Jane's sketch

5. All 4-digit numbers the sum of whose digits is 4 are written in descending order. In which place in this sequence is the number 2011 situated?

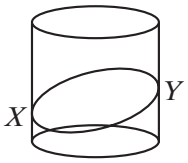
A) 6th **B**) 7th **C**) 8th **D**) 9th **E**) 10th

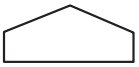
6. We are given a regular hexagon of side 1, 6 squares and 6 equilateral triangles as shown. What is the perimeter of the figure?



A) $6\left(1+\sqrt{2}\right)$ **B**) $6+3\sqrt{3}$ **C**) 12 **D**) $6+3\sqrt{2}$ **E**) 9

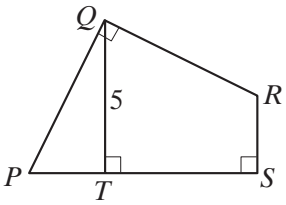
7. A rectangular piece of paper is wrapped around a cylinder and a plane cut through the points X and Y is made trough the cylinder as shown. The bottom part of the paper is then unwrapped. Which picture could be the result?



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

8. Find the area of quadrangle $PQRS$ (see the figure) such, that $PQ = QR$, $\angle PQR = \angle PSR = 90^\circ$, $QT \perp PS$ and $QT = 5$.

A) 20 **B**) 22.5 **C**) 25 **D**) 27.5 **E**) 30



9. Andrew wrote the odd numbers from 1 to 2011 on a board and then Bob erased all multiples of 3. How many numbers were left on the board?

A) 335 **B**) 336 **C**) 671 **D**) 1005 **E**) 1006

10. Max and Hugo throw a handful of dices to decide who shall be the first to jump into a cold lake. If there are no sixes it will be Max. If there is one six it will be Hugo and if there are more sixes they will not take a swim that day. How many dice should they throw if they want the risk of having to jump in first to be equally divided between the two of them?

A) 3 **B**) 5 **C**) 8 **D**) 9 **E**) 17

4-point questions

11. A rectangle was sectioned into three rectangles. One of them has size 7 by 11. Another one has size 4 by 8. Find the size of the third rectangle with the maximal area.

A) 1 by 11 **B**) 3 by 4 **C**) 3 by 8 **D**) 7 by 8 **E**) 7 by 11

12. Mike wants to write integers in the cells of the 3×3 table so that the sum of the numbers in each 2×2 square equals 10. Four numbers are already written in the table as it is shown in the figure. Which of the following values could be the sum of other five?

	2	
1		3
	4	

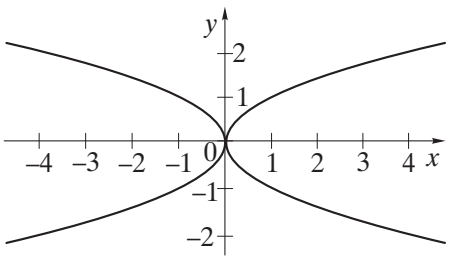
A) 9 **B**) 10 **C**) 12 **D**) 13 **E**) None of these is possible

13. 48 children went on a ski trip. Six of them had exactly one sibling on the trip, nine children went with exactly two siblings and four of them with exactly three siblings. The rest of the children didnt have any siblings on the trip. How many families went on this trip?

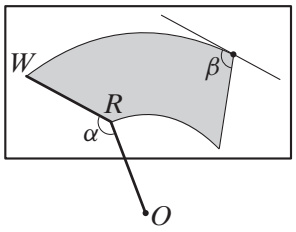
A) 19 **B**) 25 **C**) 31 **D**) 36 **E**) 48

14. How many of the graphs of functions $y = x^2$, $y = -x^2$, $y = \sqrt{x}$, $y = -\sqrt{x}$, $y = \sqrt{-x}$, $y = -\sqrt{-x}$, $y = \sqrt{|x|}$, $y = -\sqrt{|x|}$ are included in the figure on the right?

A) 0 **B**) 2 **C**) 4 **D**) 6 **E**) 8

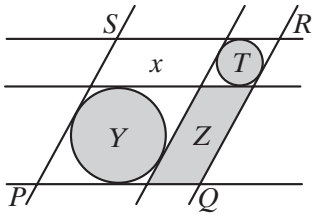


15. The rear windshield wiper of a car is constructed in such a way that the wiper blade RW and the connecting rod OR are of equal lengths and are joined at an angle α. The wiper pivots on the center O and clears the area as shown. Determine the angle β between the right-hand edge of the cleared area and the tangent of the curved upper edge.



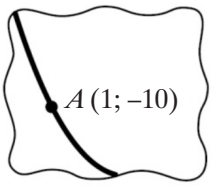
A) $\frac{3\pi-\alpha}{2}$ **B**) $\pi-\frac{\alpha}{2}$ **C**) $\frac{3\pi}{2}-\alpha$ **D**) $\frac{\pi}{2}+\alpha$ **E**) $\pi+\frac{\alpha}{2}$

16. We have three horizontal lines and three mutually parallel slanting lines. Both circles are tangent to four of the lines. Y, Z and T are areas of the shaded figures. W is the area of the parallelogram $PQRS$. What is the smallest number of areas Y, Z, T and W that must be known to be able to calculate the area of parallelogram x?



A) 1 **B**) 2 **C**) 3 **D**) 4
E) x cannot be calculated from Y, Z, T, and W

17. On the (x, y)-plane with axes positioned in a standard way, the point $A(1;-10)$ was marked on the parabola $y = ax^2 + bx + c$. After that, the coordinate axes and almost all of the parabola were erased. Which of the statements below can be false?



A) $a > 0$ **B**) $b < 0$ **C**) $a+b+c < 0$ **D**) $b^2 > 4ac$ **E**) $c < 0$

18. The sides PQ, QR, RS, ST, TU and UP of a hexagon are all tangent to a common circle. The lengths of the sides PQ, QR, RS, ST and TU are 4, 5, 6, 7 and 8 respectively. Then the length of side UP is

A) 9 **B**) 8 **C**) 7 **D**) 6 **E**) The length cannot be calculated from this information

19. Find the sum of all positive integers x smaller than 100 such that $x^2 - 81$ is a multiple of 100.

A) 200 **B**) 100 **C**) 90 **D**) 81 **E**) 50

20. The brothers Andrej and Brano gave truthful answers to a question about how many members their chess club has. Andrej said: "All the members of our club, except for five of them, are boys." Brano: "In every group of six members there are necessarily at least four girls." How many members does their chess club have?

A) 6 **B**) 7 **C**) 8 **D**) 12 **E**) 18

5-point questions

21. There are balls in a raffle bucket. One positive integer is written on each ball, a different number on each. A number divisible by 6 is written on 30 balls, a number divisible by 7 is written on 20 balls and a number divisible by 42 is written on 10 balls. At least how many balls must be in the bucket?

A) 30 **B**) 40 **C**) 53 **D**) 54 **E**) 60

22. Consider the two arithmetic sequences 5, 20, 35, ... and 35, 61, 87, ... How many different arithmetic sequences of positive integers exist having both of them as a subsequence?

A) 1 **B**) 3 **C**) 5 **D**) 26 **E**) Infinitely many

23. The sequence of numerical functions $f_1(x)$, $f_2(x)$, ... satisfies the following conditions $f_1(x) = x$; $f_{n+1}(x) = \frac{1}{1-f_n(x)}$, kai $n = 1, 2, \ldots$. Determine the value of $f_{2011}(2011)$?

A) 2011 **B**) $-\frac{1}{2010}$ **C**) $\frac{2010}{2011}$ **D**) 1 **E**) -2011

24. A box contains some red balls and some green balls. If we choose randomly two balls from the box, they are of the same colour with probability $\frac{1}{2}$. Which of the following could be the total number of the balls in the box?

A) 81 **B**) 101 **C**) 1000 **D**) 2011 **E**) 10001

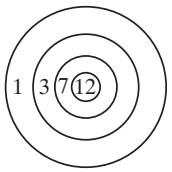
25. An airline company doesnt charge luggage fees if the luggage is under a certain weight limit. For every extra kilogram a fee is charged. The luggage of Mr. and Mrs. Trip weighed 60 kg and they paid 3 euro. Mr. Wanders luggage weighed the same but he paid 10,50 euro. What is the maximum weight of luggage one passenger doesn‘t have to pay for?

A) 10 **B**) 18 **C**) 20 **D**) 25 **E**) 39

26. What is the smallest positive integer value of the expression $\frac{K \cdot A \cdot N \cdot G \cdot A \cdot R \cdot O \cdot O}{G \cdot A \cdot M \cdot E}$ (different letters stand for different nonzero digits while equal letters stand for equal digits).

A) 1 **B**) 2 **C**) 3 **D**) 5 **E**) 7

27. Robin Hood shoots three arrows at a target, earning points for each shot as shown in the figure. How many different point totals can he obtain in this way?



A) 13 **B**) 17 **C**) 19 **D**) 20 **E**) 21

28. Let a, b and c be positive integers such that $a^2 = 2b^3 = 3c^5$. What is the minimum number of divisors of abc (including 1 and abc)?

A) 30 **B**) 49 **C**) 60 **D**) 77 **E**) 1596

29. Twenty different positive integers are written in a 4×5 table. Any two neighbours (numbers in cells with a common side) have a common divisor greater than 1. If n is the biggest number in the table find the least possible value of n.

A) 21 **B**) 24 **C**) 26 **D**) 27 **E**) 40

30. A $3 \times 3 \times 3$ cube is composed of 27 identical small cubes. A plane is perpendicular to a diagonal of the large cube and passes through its centre. How many small cubes does that plane intersect?

A) 17 **B**) 18 **C**) 19 **D**) 20 **E**) 21