Känguru der Mathematik 2010
Group Junior (Grades 9. and 10.)
Austria - 18.3.2010

- 3 Point Questions -

1) What is the result when 20102010 is divided by 2010?

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

2) Ivan gains 85% of the points in a test. Tibor gains in the same test 90% of the points but only one point more than Ivan. What is the maximum number of points that can be gained in this test?

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

3) Which number goes in the cell with the question mark if the sum of the numbers in both rows is equal?

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

A) 1010 **B)** 1020 **C)** 1910 **D)** 1990 **E)** 2000

4) The object pictured is made up of four equally sized cubes. Each cube has a surface area of 24 cm². What is the surface area of the object pictured?

A) 80 cm² **B)** 64 cm² **C)** 40 cm² **D)** 32 cm² **E)** 24 cm²

5) On each birthday Rosa gets as many roses as she is old in years. She still has all the dried flowers and there are now 120 of them. How old is she?

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

6) Six points are marked on a square grid as pictured. Which geometric figure cannot be drawn if only the marked points are allowed to be used as cornerpoints of the figure?

A) square **B)** parallelogram with different long sides

C) acute triangle **D)** obtuse triangle

E) all figures are possible

7) In the picture opposite we see that $1+3+5+7 = 4\times4$. How big is $1+3+5+7+\ldots+17+19$?

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

8) Brigitte goes on holiday to Verona and plans to cross all five of the famous old bridges over the Etsch (Adige) at least once. She starts at the train station and when she returns there she has crossed each of the five bridges but no others. During her walk she has crossed the river n times. What is a possible value for n?

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

9) In a box are 50 counters: white ones, blue ones and red ones. There are eleven times as many white ones as blue ones. There are less red ones than white ones, but more red ones than blue ones. By how much is the number of red counters less than the number of white ones in the box?

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

10) Which of the numbers a, b, c, d and e is biggest if $a - 1 = b + 2 = c - 3 = d + 4 = e - 4$?

A) a **B)** b **C)** c **D)** d **E)** e
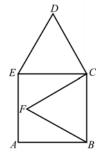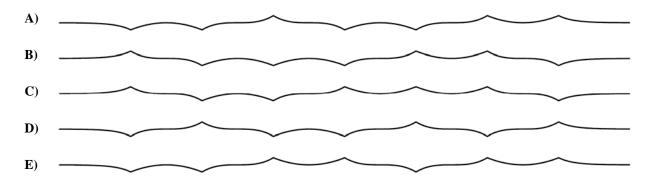
- 4 Point Questions -

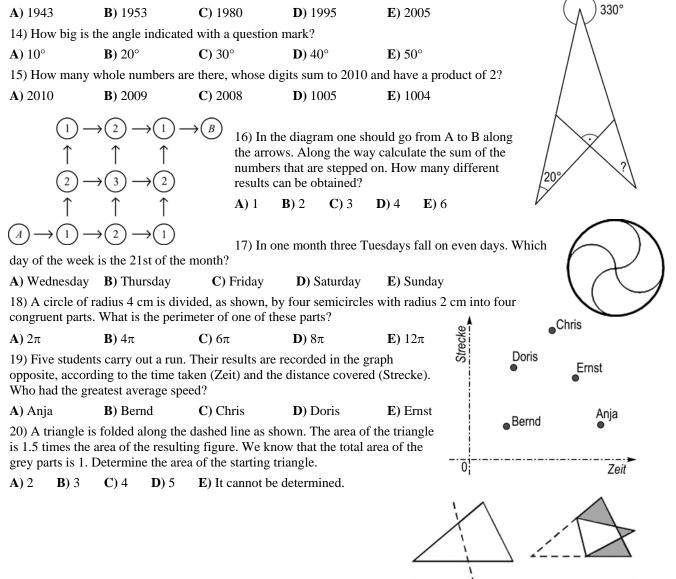11) In the figure, ABCE is a square. CDE and BCF are equilateral triangles. The length of AB is 1. How long is FD?

A) $\sqrt{2}$ **B)** $\dfrac{\sqrt{3}}{2}$ **C)** $\sqrt{3}$ **D)** $\sqrt{5}-1$ **E)** $\sqrt{6}-1$

12) A paperstrip is folded three times in the middle. It is then opened again and looked at from the side so that one can see all 7 folds from the side at the same time. Which of the following views is not a possible result?

A)

B)

C)

D)

E)

13) My teacher says that the product of his age and the age of his father is 2010. In which year could my teacher have been born?
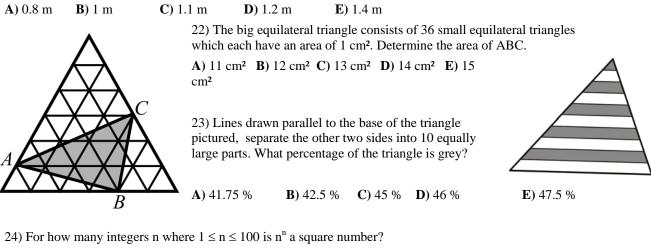
A) 1943 **B)** 1953 **C)** 1980 **D)** 1995 **E)** 2005

14) How big is the angle indicated with a question mark?

A) 10° **B)** 20° **C)** 30° **D)** 40° **E)** 50°

15) How many whole numbers are there, whose digits sum to 2010 and have a product of 2?

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

16) In the diagram one should go from A to B along the arrows. Along the way calculate the sum of the numbers that are stepped on. How many different results can be obtained?

A) 1 **B)** 2 **C)** 3 **D)** 4 **E)** 6

17) In one month three Tuesdays fall on even days. Which day of the week is the 21st of the month?

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

18) A circle of radius 4 cm is divided, as shown, by four semicircles with radius 2 cm into four congruent parts. What is the perimeter of one of these parts?

A) 2π **B)** 4π **C)** 6π **D)** 8π **E)** 12π

19) Five students carry out a run. Their results are recorded in the graph opposite, according to the time taken (Zeit) and the distance covered (Strecke). Who had the greatest average speed?

A) Anja **B)** Bernd **C)** Chris **D)** Doris **E)** Ernst

20) A triangle is folded along the dashed line as shown. The area of the triangle is 1.5 times the area of the resulting figure. We know that the total area of the grey parts is 1. Determine the area of the starting triangle.

A) 2 **B)** 3 **C)** 4 **D)** 5 **E)** It cannot be determined.

21) In front of a supermarket there are two rows of interconnected trolleys.The first one is 2.9 m long and consists of 10 trolleys. The second one is 4.9 m long and consists of twenty trolleys. How long is one trolley?

A) 0.8 m   **B)** 1 m   **C)** 1.1 m   **D)** 1.2 m   **E)** 1.4 m

22) The big equilateral triangle consists of 36 small equilateral triangles which each have an area of 1 cm². Determine the area of ABC.

A) 11 cm²   **B)** 12 cm²   **C)** 13 cm²   **D)** 14 cm²   **E)** 15 cm²

23) Lines drawn parallel to the base of the triangle pictured, separate the other two sides into 10 equally large parts. What percentage of the triangle is grey?

A) 41.75 %   **B)** 42.5 %   **C)** 45 %   **D)** 46 %   **E)** 47.5 %

24) For how many integers n where $1 \le n \le 100$ is n^n a square number?

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

25) Six-legged, seven-legged and eight-legged octopuses serve the king of the sea Neptun. The seven-legged ones always lie and the six-legged and the eight-legged ones always speak the truth. One day four octopuses meet. The blue one says: „We have 28 legs altogether." The green one says: „We have 27 legs altogether." The yellow one says: „We have 26 legs altogether." The red one says: „ We have 25 legs altogether." How many legs does the red octopus have?

A) 6   **B)** 7   **C)** 8   **D)** 6 or 8   **E)** cannot be determined.

26) In the figure $\alpha = 7°$. All lines OA_1, A_1A_2, A_2A_3, … are equally long. What is the maximum number of lines that can be drawn in this way if no two lines are allowed to intersect each other?

A) 10   **B)** 11   **C)** 12   **D)** 13   **E)** infinitely many

27) In a sequence the first three terms are 1, 2 and 3. From the fourth term onwards each subsequent term is calculated from the three previous terms. The rule is that the third term is subtracted from the sum of the first two. This way we obtain the sequence 1, 2, 3, 0, 5, –2, 7, … What is the 2010th term of this sequence?

A) –2006   **B)** 2008   **C)** –2002   **D)** –2004   **E)** another number

28) Along each side of a pentagon a positive integer is written. Numbers of adjacent sides never have a common factor bigger than 1 and non-adjacent sides always have a common factor bigger than 1. There are several possibilities for this situation but one of the following numbers can never be at one of the sides of the pentagon. Which one?
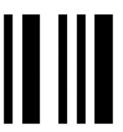
A) 15   **B)** 18   **C)** 19   **D)** 21   **E)** 22

29) How many three-digit numbers have the properties that their middle digit is the average of the two other digits?

A) 9   **B)** 12   **C)** 16   **D)** 25   **E)** 45

30) A barcode as pictured is made up of alternate black and white stripes. The code always starts and ends with a black stripe. Each stripe (black or white) has the width 1 or 2 and the total width of the barcode is 12. How many different barcodes of this kind are there if one reads from left to right?

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

KÄNGURU DER MATHEMATIK 2010
18.3.2010

Categorie: Junior, Grades: 9-10

Name:	
School:	
Class:	

Time allowed: 75 min.
Each correct answer, questions 1.-10.: 3 Points
Each correct answer, questions 11.-20.: 4 Points
Each correct answer, questions 21.-30.: 5 Points
Each question with no answer given: 0 Points
Each incorrect answer: Lose ¼ of the points for than question.
You begin with 30 points

**Please write the letter (A, B, C, D, E) of the correct answer
under the question number (1 to 30).
Write neatly and carefully!**

1	2	3	4	5	6	7	8	9	10

11	12	13	14	15	16	17	18	19	20

21	22	23	24	25	26	27	28	29	30