The Mathematics Kangaroo 2004
Juniors (grades 9 or 10)
18.3.2004

- 3-point questions-

1) How much is (1 – 2) – (3 – 4) – (5 – 6) – (7 – 8) – (9 – 10) – (11 – 12) ?

A) 13 B) 0 C) -6 D) 6 E) 4

2) Peter owns 2004 marbles. Half of them are blue, a quarter of them are red and one sixth of them are green. How many are a color other than blue, red or green?

A) 167 B) 334 C) 501 D) 1002 E) 1837

3) The surface of a pyramid consists of the base and 6 faces. How many edges does the pyramid have?

A) 8 B) 9 C) 12 D) 18 E) 21

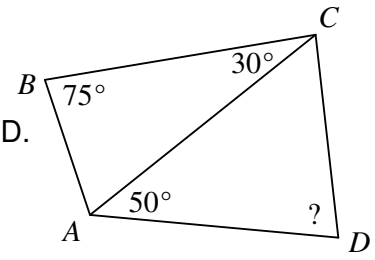
4) The base of a building is a rectangle with dimensions 40 m x 60 m. On an architect's drawing this rectangle appears with a perimeter of 100 cm. What scale was used for the architect's drawing ?

A) 1 : 100 B) 1 : 150 C) 1 : 160 D) 1 : 170 E) 1 : 200

5) Timmy und Tommy are playing ping-pong. If Timmy had 5 more points, he would have twice as many as Tommy. If he had 7 points less, he would have half as many as Tommy. How many points does Timmy have?

A) 5 B) 7 C) 9 D) 11 E) 15

6) In the drawing on the right some angles are given. BC = AD. What is the measure of angle ADC?

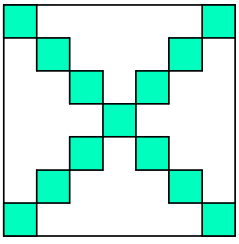


A) 30° B) 50° C) 55° D) 65° E) 70°

7) A basket contains 30 brown or yellow mushrooms. If you randomly select 12 mushrooms at least one of them will be brown. If you randomly select 20 mushrooms at least one of them will be yellow. How many brown mushrooms are in the basket?

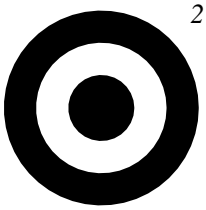
A) 11 B) 12 C) 19 D) 20 E) 29

8) A square has sides of length 2003 units. Along its diagonals are small colored unit squares, as indicated in the square on the right of side measure 7. How big is the remaining white area?



A) 2002^2 B) 2002×2001 C) 2003^2 D) 2003×2004 E) 2004^2

9) A target is made up of a black circle surrounded by a black and followed by a white ring. The width of each ring is equal to the radius of the inner circle. How many times the area of the small circle is the area of the black outer ring?



A) twice B) 3 times C) 4 times C) 5 times E) 6 times

10) Three girls have collected 770 walnuts, and want to divide them up in the ratio of their ages. For each 3 nuts Oxana takes, Irmi gets 4. For each 7 nuts Natalie takes Irmi gets 6. How many walnuts will the youngest of the three girls get?

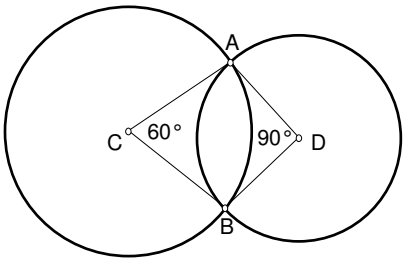
A) 264 B) 256 C) 218 D) 198 E) 180

- 4-point questions-

11) Each of 5 math students thinks of one of the numbers one, two or four. If the multiply the five numbers with each other a possible result could be...?

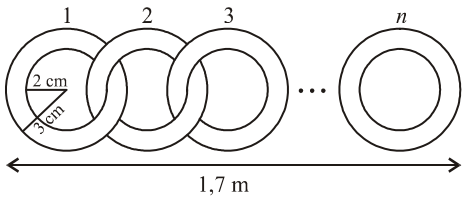
A) 100 B) 120 C) 256 D) 768 E) 2048

12) The circles with centers C or D intersect in points A and B. The measure of angle ACB is 60° und of angle ADB is 90°. The ratio of the radii is...?



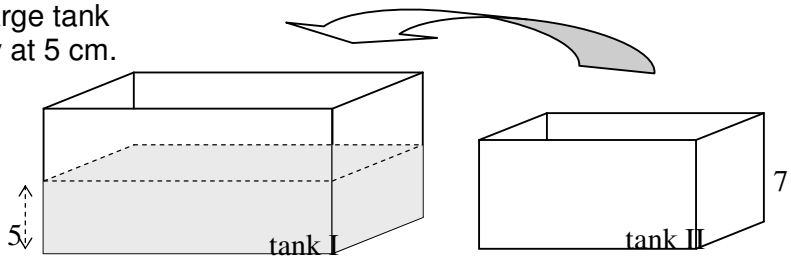
A) 4:3 B) $\sqrt{2}:1$ C) 3:2 D) $\sqrt{3}:1$ E) 2:1

13) Rings are connected to form a chain as indicated on the right. The length of the chain is 1,7 m. How many rings are necessary for that chain?



A) 21 B) 30 C) 17 D) 85 E) 42

14) The area of the base of the large tank is 2 dm. The water level is initially at 5 cm. The area of the base of the small tank is 1 dm, and the height is 7 cm. When the small tank is put into the large one, the water level rises, and some water will flow into the small tank. How high will the water level be in the small tank?

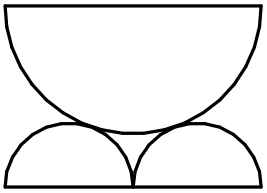


A) 1 cm B) 2 cm C) 3 cm D) 4 cm E) 5 cm

15) The hour hand of a clock is 4 cm long, the minute hand 8 cm. What is the ratio of the distances traveled by the tips of the hands between 2 o'clock and 5 o'clock ?

A) 1:2 B) 1:4 C) 1:6 D) 1:12 E) 1:24

16) Toni built a bench using three half logs. The diameter of each of the lower logs is 2 dm, the diameter of the top log is 4 dm. How high is the bench in dm?

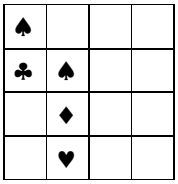


A) 3 B) $\sqrt{8}$ C) 2,85 D) $\sqrt{10}$ E) 2,5

17) For each correctly answered question in a 20 question quiz you get 7 points, and zero points for each question that was not answered. For each incorrectly answered questions 2 points are deducted. Andreas achieved 87 points. How many questions did he not answer at all?

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

18) Igor has 16 playing cards: 4 of each suit spades (♠), clubs (♣), diamonds (♦) and hearts (♥). He wants to put one card from each suit into each row or column in the square on the right. You can see how Igor has started. In how many ways can Igor finish the task?

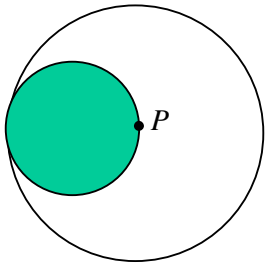


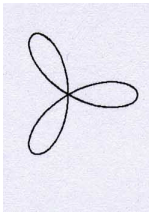
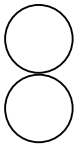
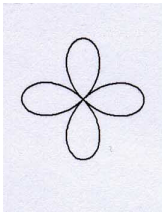
A) 1 B) 2 C) 4 D) 16 E) 128

19) How many numbers between 100 und 200, have only 2 or 3 as prime factors?

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

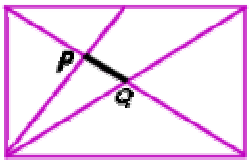
20) On the right you see two circles, the smaller touching the larger inside. The radius of the small circle is half the radius of the larger circle. The small circle rolls without gliding along the larger circle. What path does one point fixed on the smaller circle describe during that motion?



A) B)  C)  D) • E) 

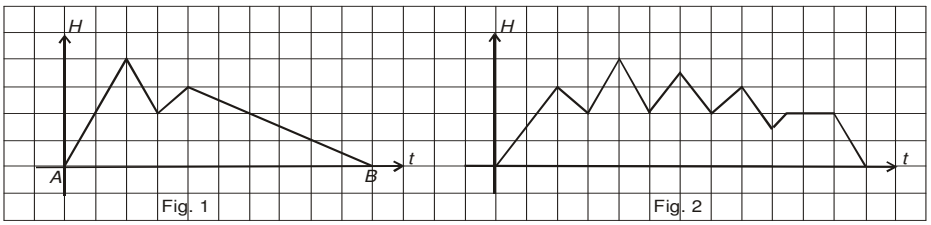
- 5-point questions-

21) In the rectangle on the right, the two diagonals are drawn and the line segment from one vertex to the midpoint of one side. How much longer than PQ is the diagonal?



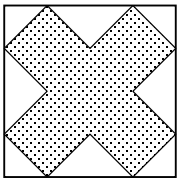
A) answer depends on the rectangle. B) 6 C) $\frac{13}{3}$ D) 4 E) 3

22) Fig 1 shows the profile of a mountain. An absent minded hiker hiked from A to B. Because he forgot something he had to return at least once. Fig.2 shows his height above sea level at different times. How many times did he turn back towards A?



A) once
B) twice
C) 3 times
D) 4 times
E) 5 times

23) On the right you see the drawing of an equilateral cross inscribed into a square. The cross has a perimeter of 36 cm. The area of the square in square centimeters is.... ?



A) 48 B) 72 C) 108 D) 115.2 E) 144

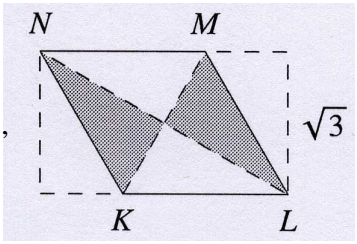
24) A three-digit number, n, not bigger than 200, with $(n+1)(n+2)(n+3)$ is divisible by 7.
How many such numbers exist?

A) 43 B) 31 C) 34 D) 28 E) 39

25) What is the best estimate of the length of a carpet that rolled up tightly makes a cylinder of diameter 1m?

A) 20m B) 50m C) 75m D) 150m E) 300m

26) By folding a rectangle as indicated on the right you produce the rhombus KLMN. The vertices now meet at the center of the rectangle. If the measure of the shorter side of the rectangle is $\sqrt{3}$, what is the area of the rhombus?



A) 3 B) $\sqrt{10}$ C) $3\sqrt{2}$ D) 4 E) $2\sqrt{3}$

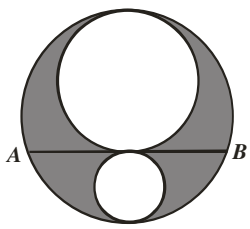
27) Given a sequence of 200 zeros. As a first step 1 is added to each number. As a second step 1 is added to every second number, starting from the very left. As a third step 1 is added to every third number, and so forth. Which is the 120th number from the very left after 200 steps ?

A) 16 B) 12 C) 20 D) 24 E) 32

28) $\overline{a_1a_2a_3a_4a_5a_6a_7a_8a_9a_{10}}$ is a 10-digit number whose digits are either 0 or 1 and $a_1 = 1$.
How many such numbers exist
such that $a_1 + a_3 + a_5 + a_7 + a_9 = a_2 + a_4 + a_6 + a_8 + a_{10}$?

A) 2^9 B) 126 C) 81 D) 32 E) 64

29) The area of the shaded region is 2π. The measure of AB is….?



A) 1 B) 2 C) 3 D) 4 E) ambiguous.

30) All natural numbers from 1 to 10 000 are written on a board. Numbers that are not divisible by 5 or 11 are erased. Which is the 2004th number?

A) 1000 B) 5000 C) 10 000 D) 6545 E) 7348