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19 March

EUROPEAN KANGAROO ARITHMETIC- AND MATHEMATICS CONTEST

Welcome to the Kangaroo, great that you join in!

- * You have 75 minutes. There are 30 questions. With every question one of the five options is the correct one.
- * Do what you can, don't be disappointed if you cannot answer everything.
- * You are not allowed to use a calculator; of course you may use scribbling paper.
- * Use a pencil to fill in the answer sheet carefully.
- * About scoring points:
 - * You start with 30 free points.
 - * Question 1 - 10: you will get 3 points for a correct answer; you will lose $\frac{3}{4}$ points for an incorrect one.
 - * Question 11 - 20: you will get 4 points for a correct answer; you will lose 1 point for an incorrect one.
 - * Question 21 - 30: you will get 5 points for a correct answer; you will lose $1\frac{1}{4}$ points for an incorrect one.
 - * If you don't answer a question, you neither gain nor lose points.
- * The answers will be on the website from March 23rd, www.math.kun.nl/kangoeroe
- * The scores and the prizes will arrive at schools in week 17.

Good luck and most of all: have fun!!

version 3
the Netherlands: 3, 4 & 5 havo/vwo
Flanders: 2nd & 3rd degree tso/aso

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01. $(1 - 2) - (3 - 4) - (5 - 6) - (7 - 8) - (9 - 10) - (11 - 12) = ?$
 A. -6 B. 0 C. 4 D. 6 E. 13

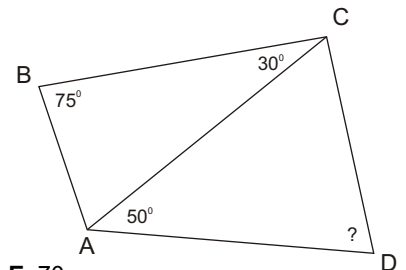
02. Hielke has 2004 marbles in the colours blue, red, green and white. Half of his marbles are blue, a quarter is red and one sixth is green. How many white marbles does Hielke have?
 A. 167 B. 334 C. 501 D. 1002 E. 1837

03. How many edges does a pyramid have which has seven faces?
 A. 8 B. 12 C. 14 D. 18 E. 21

04. The rectangular ground floor of a building is 60 m long and 40 m wide. On a map the ground floor is a rectangle with perimeter of 100 cm. What is the scale of the map?
 A. 1:2 B. 1:20 C. 1:100 D. 1:200 E. 1:1000

05. Tim and Tom are playing table tennis. We have a look at the score at a certain moment. If Tim had two points more, then he would have twice as many points as Tom. If Tim had four points less, then Tom would have twice as many points as Tim. How many points does Tim have?
 A. 2 B. 4 C. 6 D. 8 E. 10

06. In quadrilateral ABCD three angles are given: 30° , 50° , and 75° . Furthermore $BC = AD$. How many degrees is angle ADC?

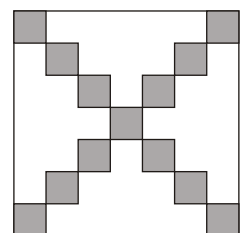


A. 30 B. 50 C. 55 D. 65 E. 70

07. In a fruit bowl there are apples and pears, 30 fruit in total. If we take 12 fruit from the bowl without looking, we definitely have an apple. If we take 20 fruit from the bowl, we will definitely have a pear. How many apples are in the bowl?
 A. 11 B. 12 C. 19 D. 20 E. 29

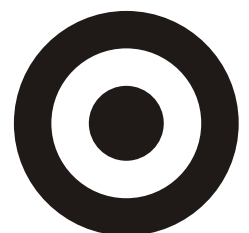
08. A square is drawn on a big white sheet of grid paper. One side is 2003 blocks long. Inside all blocks on the diagonals are coloured grey. Alongside you see such a square with sides of 7 blocks. How many blocks in the big square are white?

A. $2003^2 - 4 \times 1001$ B. 2001^2 C. 2001×2002
 D. $2003^2 - 2 \times 2003$ E. 2002^2



09. A dartboard consists of a black circle, a white ring and a black ring. The breadth of each of the two rings equals the radius of the black circle. The area of the black ring is times the area of the black circle.

A. 3 B. 4 C. 5 D. 6 E. 8

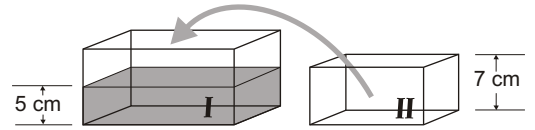


10. Three girls, Olivia, Ina and Nathalie, have been gathering nuts. They divide them in the ratio of their ages. For every 3 nuts that Olivia got, Ina got 4. For every 7 nuts that Nathalie got, Ina got 6. How many nuts did the youngest girl get?
 A. 180 B. 198 C. 218 D. 256 E. 264

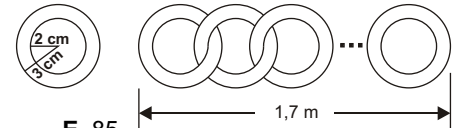


11. Five children have each chosen a number. They each had a choice from 1, 2 or 4. When the chosen numbers are multiplied together the outcome is one of the following numbers. Which number is it?
- A. 100 B. 120 C. 256 D. 768 E. 2048

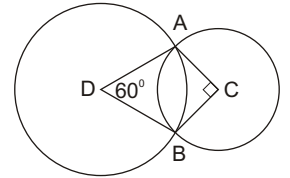
12. In aquarium I with a bottom of 2 dm^2 the water is 5 cm high. An empty aquarium II with a bottom of 1 dm^2 and a height of 7 cm is pressed on the bottom of aquarium I. The water in aquarium I rises and overflows into aquarium II. How high (in cm) will the water be in aquarium II?



- A. 1 B. 2 C. 3 D. 4 E. 5
13. A number of rings are linked into a chain as in the figure. The total length of the chain is 1.7 meter. How many rings does the chain consist of?

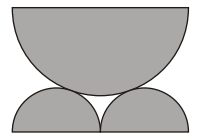


- A. 17 B. 21 C. 30 D. 42 E. 85
14. Two circles with centres C and D intersect at point A and point B. The angle drawn at C is 90° , the angle at D is 60° . What is the ratio of the areas of the circles?



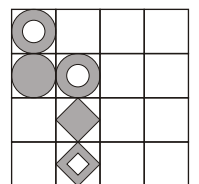
- A. 16:9 B. 2:1 C. 9:4 D. 3:1 E. 4:1
15. The hour hand of a clock is 4 cm long, the minute hand 8 cm. What is the ratio of the distances that the two hands move through between 2 and 5 o'clock in the afternoon?

- A. 1:2 B. 1:4 C. 1:6 D. 1:12 E. 1:24
16. Sietse constructs a bench from three halved tree trunks as in the figure. The diameter of the tree trunks underneath is 2 dm, the diameter of the top trunk is 4 dm. How high is the bench in dm?



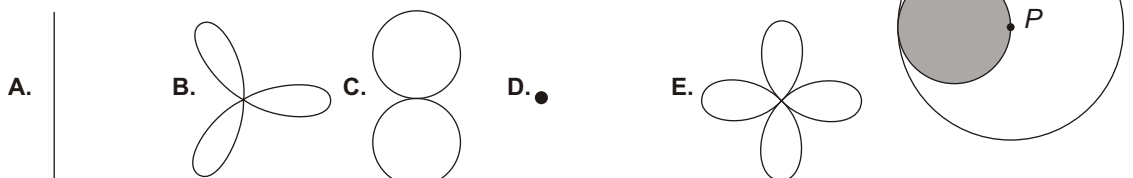
- A. $\sqrt{5}$ B. $\sqrt{6}$ C. $\sqrt{7}$ D. $\sqrt{8}$ E. $\sqrt{9}$
17. Hielke joined a quiz with 20 questions. Each correct answer scored 7 points, each wrong answer scored 2 minus points and a skipped answer means 0 points. Hielke scored 87 points. How many questions did he skip?
- A. 2 B. 3 C. 4 D. 5 E. 6

18. Esther has got 16 cards: 4 with a \blacklozenge , 4 with a \odot , 4 with a \bullet and 4 with a \blacklozenge . She places these cards in a square. In every row from left to right and in every column from top to bottom each symbol has to be present. On the right you can see how Esther started. In how many different ways can Esther complete the square?



- A. 1 B. 2 C. 4 D. 16 E. 128
19. Some numbers can only be written as a product of a power of 2 and a power of 3. E.g. $72 = 2^3 \times 3^2$ and $512 = 2^9 \times 3^0$. (To the power of 0 is allowed too.) How many of these numbers are there between 100 and 200?
- A. 2 B. 3 C. 4 D. 5 E. 6

20. The small circle rolls along the inside of the big circle. The radius of the big circle is twice the radius of the small circle. P is a point on the small circle. What does the trajectory of P look like?



21. A rectangle is divided into three regions by two lines: I, II and III (figure 1). One of the lines is a diagonal, the other one runs from an angle to the midpoint of a side. The other diagonal is partly in region II. What part of that diagonal is in region II?

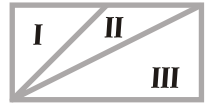


Fig. 1



Fig. 2

- A. 1/8 B. 1/7 C. 1/6 D. 1/5 E. 1/4

22. An absent minded mountaineer was walking on a mountain trail, which you can see in diagram 1. He walked from A to B, but every now and again he walked back along part of the trail to collect things he had lost along the road. In diagram 2 you can read the height H at each moment t. How many times did our absent minded mountaineer walk along the same part of the trail?

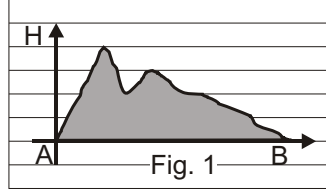


Fig. 1

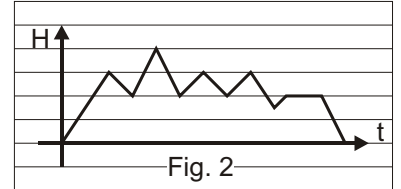


Fig. 2

23. We have a look at all numbers: that have four digits (and do not start with 0), are divisible by 12 and for which the digits add up to 6. How many of these numbers are there?

- A. 10 B. 12 C. 13 D. 15 E. 18

24. The number 5 has the following property: the product of its three consecutive numbers ($6 \times 7 \times 8 = 336$) is divisible by 7. The number 25 has this property as well. How many numbers are there between 100 and 220, which have this property?

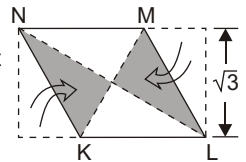
- A. 39 B. 42 C. 45 D. 48 E. 51

25. For the visit of the queen they rolled out the red carpet, which is 1 cm thick. Stiffly rolled up the carpet is a roll with diameter 50 cm. Which estimation for the length of the carpet is best?

- A. 5 m B. 12,5 m C. 19 m D. 37,5 m E. 75 m

26. Sietse has a rectangle of which the shorter side is $\sqrt{3}$. When he folds two opposite vertices to the middle of the rectangle a rhombus apparently appears: KLMN. What is the area of that rhombus?

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



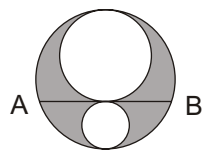
27. Positive numbers have been written on the six faces of a cube. At each vertex we write the product of the numbers on the three faces which meet there. Then we add the numbers at the vertices and we get sum 70. What is the sum of the numbers written on the faces?

- A. 10 B. 12 C. 14 D. 35 E. 70

28. How many numbers exist that have the following properties? The numbers have eight digits, all digits are 0 or 1, the first digit is a 1 and the sum of the digits on the even places equals the sum of the digits on the odd places.

- A. 16 B. 35 C. 49 D. 69 E. 128

29. Inside a circle there are two smaller circles; the circles are tangent to each other and the three centres are on one line. The area of the grey part is 2π . Line segment AB separates the two smaller circles; A and B are on the big circle. How long is line segment AB?



- A. 1 B. 2 C. 3 D. 4
E. that depends on the radii of the circles.

30. Hielke studies, in increasing order, all numbers from 1 till 100.000. He writes down every number that is divisible by 5 and/or 11 on a piece of paper. What is the 2004th number that he will write down?

- A. 5005 B. 5896 C. 6545 D. 7128 E. 7348