



EUROPEAN KANGAROO MATHEMATICS CONTEST

Friday March 21st 2003

Havo/vwo year 3,4 & 5

Welcome to the Kangaroo, great that you decided to participate!!

- * 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 and lose $\frac{3}{4}$ points for an incorrect one
 - * Question 11-20: You will get 4 points for a correct answer and lose 1 point for an incorrect one
 - * Question 21-30: You will get 5 points for a correct answer and 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 from March 25th on the website, www.sci.kun.nl/math/kangoeroe
- * The scores and the prizes will arrive at the schools in week 18.

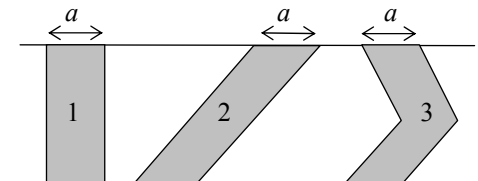
Good luck and most of all: Have fun!!

1. The slice of pie is 15% of the whole pie. How many degrees is the angle marked with a question mark?
A. 15 B. 20 C. 30 D. 45 E. 54



2. Minoes's garden has a circular flowerbed of diameter 1.2 metre. Minoes's neighbours also have a circular flowerbed, whose area is four times as big as the one in Minoes's garden. What is the diameter of the neighbours' flowerbed?
A. 2.4 m B. 3.6 m C. 4.8 m D. 6.4 m E. 9.6 m

3. The three strips between the two parallel lines all have width a at the top. Which strip has the largest area?
A. Strip 1 B. Strip 2 C. Strip 3.
D. You have to know a in order to answer this question
E. All strips have the same area.

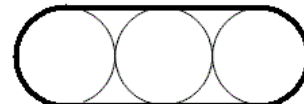
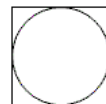


4. You throw two dice and you calculate the sum of the scores. Which of the following outcomes has the biggest probability?
A. 7 B. 8 C. 9 D. 10 E. 11
5. In triangle ABC angle C is three times as big as angle A and angle B is twice as big as angle A. What can you tell about triangle ABC?
A. the triangle is equilateral B. the triangle is isosceles
C. the triangle has an obtuse angle D. the triangle is right-angled
E. the triangle only has acute angles that are all different
6. An oil barrel, which is emptied for 30%, contains 30 litres more than filled for 30%. How many litres does the barrel contain when it is full?
A. 60 B. 75 C. 90 D. 100 E. 120

7. Three singers all sing a three-line song four times. All lines take as much time to sing. The second singer starts singing when the first singer starts the second line. The third singer starts singing when the first singer starts the third line. Which part of the total singing time do all three singers sing at the same time?

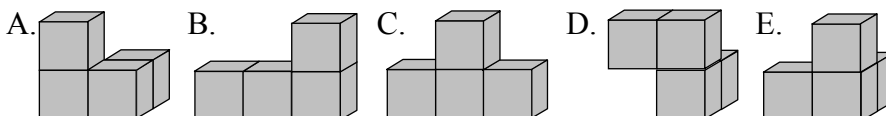
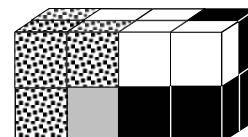
A. $\frac{4}{7}$ B. $\frac{3}{5}$ C. $\frac{7}{11}$ D. $\frac{5}{7}$ E. $\frac{4}{5}$

8. The area of the square is a and the area of the circle is b . What is the area of the region between the fat lines?



A. $3a$ B. $a + b$ C. $2a + b$ D. $a + 2b$ E. $3b$

9. The puzzle on the right consists of four pieces consisting of four cubes each. What does the grey piece look like?



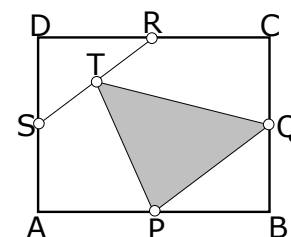
10. In the addition shown on the right, the letters X, Y and Z represent one of the digits 1, 2, 3, ..., 9. Different letters represent different digits. What digit does X represent?

A. 1 B. 2 C. 7 D. 8 E. 9

$$\begin{array}{r} XX \\ YY \\ ZZ \\ \hline ZYX \end{array}$$

11. In rectangle ABCD P, Q, R and S are the midpoints of the sides. T is the midpoint of line segment RS. The area of ABCD is 1. What is the area of $\triangle PQT$?

A. $\frac{1}{6}$ B. $\frac{1}{5}$ C. $\frac{1}{4}$ D. $\frac{5}{16}$ E. $\frac{3}{8}$



12. A kangaroo can jump from his hole to the meadow and back again in a quarter of an hour. From its hole its jumping speed is 5 m/s, back to its hole its jumping speed is 4 m/s. How many km is it from its hole to the meadow?

A. 0.9 B. 1.6 C. 2 D. 4.05 E. 8.1

13. Harry has written down a number consisting of 2003 ones. He multiplies that number by 2003 and then adds the digits of this product. What is the outcome?

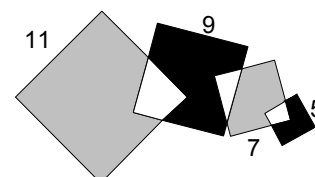
A. 10000 B. 10015 C. 10020 D. 10030 E. 2003×2003

14. Harry and Minoes both wrote the number 888 on a piece of paper. 888 is clearly divisible by 8. Harry changes two digits in order to get the biggest possible three-digit number that is still divisible by 8. Minoes changes two digits as well, but so that she gets the smallest possible number which is still divisible by 8. What is the difference between the two numbers Harry and Minoes made?

A. 800 B. 840 C. 856 D. 864 E. 888

15. The four overlapping squares have sides of 11, 9, 7 and 5 cm respectively. The total area of the grey parts is bigger than the total area of the black parts. By how many cm^2 ?

A. 25 B. 36 C. 49 D. 64
E. it depends on the area of the overlapping parts.

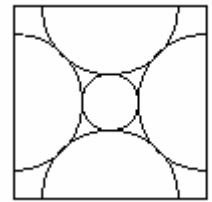


16. What is the outcome of the multiplication $(1 + \frac{1}{2}) \cdot (1 + \frac{1}{3}) \cdot \dots \cdot (1 + \frac{1}{2003})$?

A. 1001 B. 1002 C. 2002 D. 2003 E. 2004

17. The four half circles touch. They have radius one, and their centres are the midpoints of the sides of the square. How big is the radius of the small circle that touches each of the half circles?

A. $\sqrt{5} - 2$ B. $\sqrt{2} - 1$ C. $\frac{1}{2}\pi - 1$ D. $\sqrt{7} - 2$ E. $\sqrt{3} - 1$



18. Minoes writes down all four-digit numbers you can get by rearranging the digits of the number 2003 (they do not start with 0). She then adds all those numbers. What is the outcome?

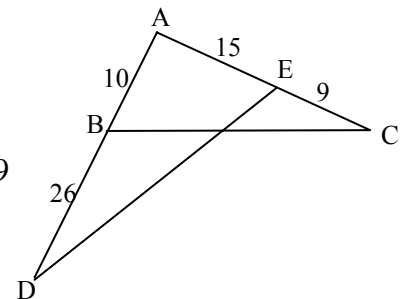
A. 1110 B. 5005 C. 5555 D. 15555 E. 16565

19. Harry writes down a sequence of numbers. He starts with 1 and then writes down 2. Every next number is made like this: He divides the last number but one that he wrote down by the number he wrote down last. Which is the 10th number he writes down?

A. $\frac{1}{2^{13}}$ B. $\frac{1}{2^{10}}$ C. 512 D. 1024 E. 2^{34}

20. What is the ratio of the area of triangle ADE and the area of triangle ABC?

A. 5 : 4 B. 15 : 10 C. 9 : 4 D. 7 : 3 E. 26 : 9

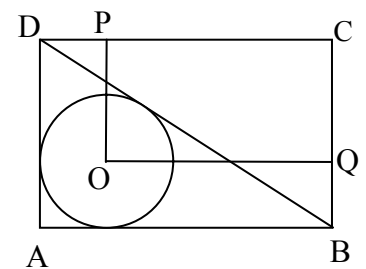


21. A box contains 2003 cards with the numbers from 1 to 2003. They are shuffled and then someone blindfolded picks two cards from the box, one after the other. What is the probability that the number on the second card is bigger than the number on the first card?

A. smaller than $\frac{1}{3}$ B. $\frac{1}{3}$ C. between $\frac{1}{3}$ and $\frac{1}{2}$ D. $\frac{1}{2}$ E. bigger than $\frac{1}{2}$

22. Rectangle ABCD on the right has area 36. The circle with centre O fits exactly inside triangle ABC. What is the area of rectangle OPCQ?

A. 18 B. $18\frac{1}{6}$ C. 6π D. 24 E. $12\sqrt{2}$



23. Each of the four children P, Q, R and S says a statement.
 P says: "Q, R and S are girls" Q says: "P, R and S are boys"
 R says: "P and Q lie" S says: "P, Q and R all speak the truth"
 How many children speak the truth?

A. 0 B. 1 C. 2 D. 3 E. you cannot tell

24. Minoes writes as many numbers as possible consisting of seven digits or less. She only uses the digits 0 and 1. How many times does Minoes write the digit 1?

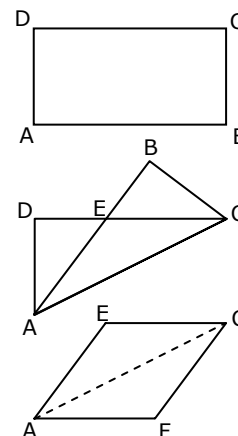
A. 128 B. 288 C. 448 D. 512 E. 896

25. Harry writes down a sequence of consecutive positive integers. Each number in the sequence has the property that the sum of its digits is not divisible by 5. How many numbers can he write down at most?

A. 4 B. 6 C. 7 D. 8 E. 9

26. A rectangular piece of paper ABCD of 12 by 24 cm is folded along diagonal AC. The pieces AED and ECB that are outside the double overlapped area are cut off. The piece of paper that is left is unfolded. You will get rhombus AFCE. How many cm is the side of this rhombus?

A. 14.7 B. 15 C. $7\sqrt{5}$ D. 15.7 E. 16



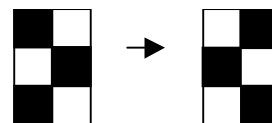
27. On a bookshelf are Maths books and Physics books, fifty in total. No two Physics books are next to each other and next to every Maths book is another Maths book. Which of the following statements is not true?

A. There are no less than 32 Maths books
 B. There are no more than 17 Physics books
 C. It is sure that there are 3 Maths books next to each other
 D. If there are 17 Physics books, one is either the first or the last one
 E. Out of every 9 books in a row at least 6 are Maths books.

28. Minoes chooses three numbers out of the numbers 1, 4, 7, 10, 13, 16, 19, 22, 25 and 28 and adds them. When she does so in all possible ways, how many different outcomes will she get?

A. 21 B. 22 C. 30 D. 120 E. 720

29. In the two 2x3 boards the white and the black squares are interchanged. Harry changes the board on the left into the board on the right in as little moves as possible. For every move the following rules apply:



1. exactly two adjacent squares (next to each other or above each other) change colours;
2. a black square changes to green, a green square changes to white, and a white square changes to black.

How many moves does Harry make?

A. 5 B. 6 C. 7 D. 8 E. 9

30. Four gardeners need four hours to weed four round flowerbeds with a diameter of 4 metres each. How many hours do six gardeners need to weed six round flowerbeds with a diameter of 6 metres each?

A. 4 B. 6 C. 9 D. 12 E. 15

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