

**European contest - game
"Math Kangaroo" 2003
Grades 9 and 10**

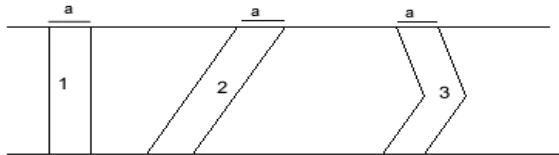
Part A: Each correct answer is worth 3 points.

1) A circular flowerbed in our garden has a diameter of 1.2 m. At a nearby park there is a circular flowerbed whose area is four times larger than the one in our garden. What is its diameter?

- A) 2.4 m B) 3.6 m C) 4.8 m D) 6.4 m E) 9.6 m



2) In the picture, three strips 1, 2, 3 are marked of the same horizontal width a . These strips connect the two parallel lines. Which strip has the biggest area?



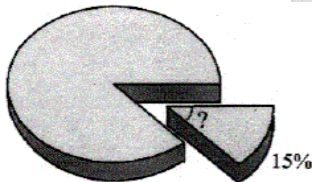
- A) All three strips have the same area. B) Strip 1. C) Strip 2. D) Strip 3.
E) It is impossible to answer without knowing a .

3) Which of the following numbers is odd for every integer n ?

- A) $2003n$ B) $n^2 + 2003$ C) n^3 D) $n + 2004$ E) $2n^2 + 2003$

4) 15% of a circular cake is cut as shown in the figure. What is the measure of the angle denoted by the question mark?

- A) 30° B) 45° C) 54° D) 15° E) 20°



5) In a triangle ABC the angle C is three times bigger than the angle A, the angle B is two times bigger than the angle A. Then the triangle ABC

- A) is equilateral B) is isosceles C) has an obtuse angle D) has a right-angle
E) has only acute angles

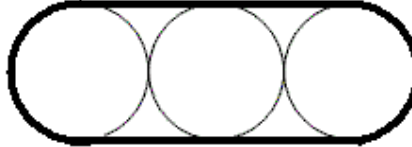
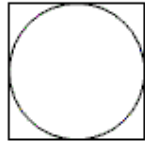
6) Three singers take part in a musical round of 3 equal lines, each finishing after singing the round through four times. The second singer begins when the first singer begins the second line; the third singer begins when the first singer begins the third line. The fraction of the total singing time that all three are singing at the same time is

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

7) A is the number 11111...1111 formed with 2003 digits equal to 1. What is the sum of the digits of the product $2003 \times A$?

- A) 10000 B) 10015 C) 10020 D) 10030 E) 2003×2003

8) The area of the square in the picture is a and the area of each of the circles is b . What is the area enclosed by the thick line?



A) $3b$

B) $2a+b$

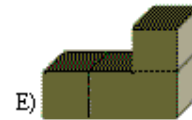
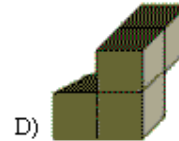
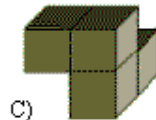
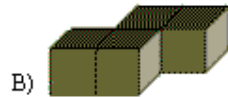
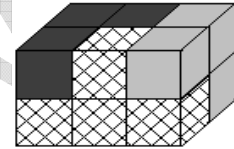
C) $a+2b$

D) $3a$

E) $a+b$

Part B: Each correct answer is worth 4 points.

9) Using 3 bricks each consisting of 4 little cubes a rectangular parallelepiped has been built (see picture). The crosshatched brick is completely visible, both others – partly visible. Which brick is the dark one?



10) In this addition each of the letters X, Y and Z represents a distinct non-zero digit. The letter X will then have to stand for...

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

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

11)) Consider all four-digit numbers that you can form taking each time the four digits of number 2003. Summing up all them you get:

A) 5005 B) 5555 C) 16665 D) 1110 E) 15555

12) A kangaroo runs toward a grazing land and back in 15 minutes. His speed on the way to the grazing land is 5 m/s, and on the way back is 4 m/s. The distance to the grazing land is:

A) 4.05 km B) 8.1 km C) 0.9 km D) 2 km E) impossible to determine

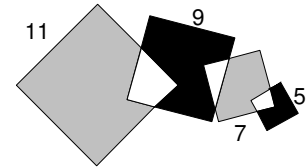
13) When a barrel is 30% empty it contains 30 litres more when it is 30% full. How many litres does the barrel hold when full?

A) 60 B) 75 C) 90 D) 100 E) 120

14) Ann and Barbara have the 3-digit number 888 which is clearly divisible by 8. Ann changes two of its digits in order to get the biggest 3-digit number, which is still divisible by 8. Barbara changes two of the digits of 888 in order to get the smallest 3-digit number, which is still divisible by 8. What is the difference of their two results?

A) 800 B) 840 C) 856 D) 864 E) 904

15) In the picture there are four overlapping squares with sides 11, 9, 7 and 5 cm long. How much greater is the sum of the two grey areas than the sum of the two black areas?



- A) 25 B) 36 C) 49 D) 64 E) 0

16) The value of the expression

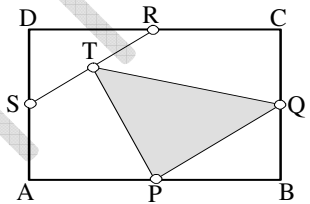
$$\left(1 + \frac{1}{2}\right) \cdot \left(1 + \frac{1}{3}\right) \cdot \dots \cdot \left(1 + \frac{1}{2003}\right)$$

is equal to

- A) 2004 B) 2003 C) 2002 D) 1002 E) 1001

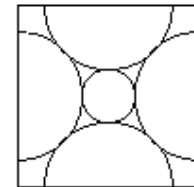
Part C: Each correct answer is worth 5 points.

17) In a rectangle ABCD, let P, Q, R and S be the midpoints of sides AB, BC, CD and AD, respectively, and let T be the midpoint of segment RS. Which fraction of the area of ABCD does triangle PQT cover?



- A) 5/16 B) 1/4 C) 1/5 D) 1/6 E) 3/8

18) The diagram shows four semicircles with radius 1cm. The centres of the semicircles are at the midpoints of the sides of a square. What is the radius of the circle, which touches all four semicircles?



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

19) The children A, B, C and D made the following assertions.

A: B, C and D are girls

B: A, C and D are boys

C: A and B are lying

D: A, B and C are telling the truth

How many of the children were telling the truth?

- A) 0 B) 1 C) 2 D) 3 E) It can't be determined

20) 12, 13 and 15 are the lengths (perhaps not in order) of two sides of an acute-angled triangle and of the height over the third side of triangle. Find the area of the triangle.

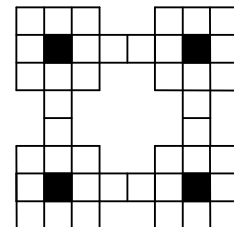
- A) 168 B) 80 C) 84 D) $6\sqrt{65}$ E) the area is not uniquely determined

21) We wrote down all the integers of 1 to 7 digits we can, using only the two digits 0 and 1. How many 1's did we write?

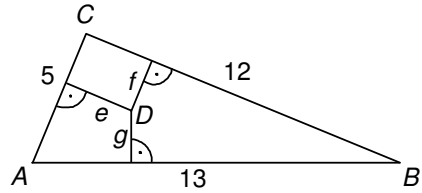
- A) 128 B) 288 C) 448 D) 512 E) 896

22) How many possibilities there exist to cover completely all white fields of this composite desk with the usual domino stones 1 x 2?

- A) 8 B) 16
C) 32 D) 64
E) 100



23) Let ABC be a triangle with area 30. Let D be any point in its interior and let e, f and g denote the distances from D to the sides of the triangle. What is the value of the expression $5e + 12f + 13g$?



- A) 120 B) 90
 C) 60 D) 30
 E) It is not possible to determine the value without knowing the exact location of D .

24) A computer is printing a list of the seventh powers of all natural numbers, i. e. the sequence $1^7, 2^7, 3^7, \dots$ etc. How many terms of this sequence are there between the numbers 5^{21} and 2^{49} ?

- A) 13 B) 8 C) 5
 D) 3 E) 2

Contest Game
“Math Kangaroo”
March 29, 2003

Answers
Grade 9-10

1	<u>A</u> B C D E	9	<u>A</u> B C D E	17	A <u>B</u> C D E
2	<u>A</u> B C D E	10	A B C <u>D</u> E	18	<u>A</u> B C D E
3	A B C D <u>E</u>	11	A B C D <u>E</u>	19	A <u>B</u> C D E
4	A B <u>C</u> D E	12	A B C <u>D</u> E	20	A B C <u>D</u> E
5	A B C <u>D</u> E	13	A <u>B</u> C D E	21	A B <u>C</u> D E
6	A B C <u>D</u> E	14	A B <u>C</u> D E	22	A <u>B</u> C D E
7	A <u>B</u> C D E	15	A B C <u>D</u> E	23	A B <u>C</u> D E
8	A <u>B</u> C D E	16	A B C <u>D</u> E	24	A B C D <u>E</u>