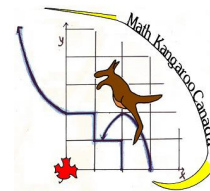


**International Contest-Game MATH KANGAROO
Canada, 2007**



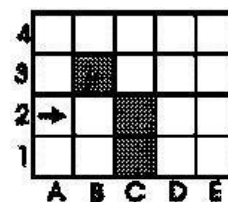
Grade 7 and 8

Part A: Each correct answer is worth 3 points.

1. What is the value of the expression $\frac{2007}{2+0+0+7}$?

- A) 1003 B) 75 C) 223 D) 213 E) 123

2. A robot starts walking on the table from square A2 at the direction of the arrow, as shown on the picture. It always goes forward. If it reaches a barrier, it always turns right. The robot will stop if he cannot go forward after turning right. On which square will it stop?

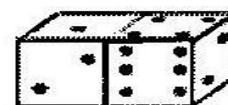


- A) B2 B) A1 C) E1 D) D1 E) It will never stop

3. Rose bushes were planted in a row, 2 m apart, on both sides of a road. How many bushes were planted along 20 m of the road?

- A) 22 B) 20 C) 12 D) 11 E) 10

4. A regular die has a total of 7 points on any two of its opposite faces. On the figure, two regular dice are placed, as shown. What is the sum of the points on all invisible faces of the dice?

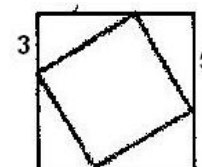


- A) 15 B) 12 C) 7 D) 27 E) another answer

5. The points A(2006, 2007), B(2007, 2006), C(-2006, -2007), D(2006, -2007), and E(2007, -2006) are plotted on a co-ordinate grid. Which of the segments is horizontal?

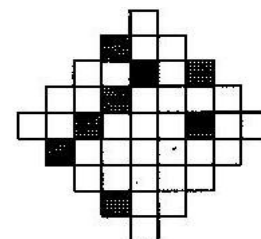
- A) AD B) BE C) BC D) CD E) AB

6. A small square is inscribed in a big one, as shown in the figure. The lengths of two of the segments are given (3 units and 5 units). What is the area (in square units) of the small square?



- A) 16 B) 28 C) 34 D) 36 E) 49

7. The figure on the right is composed of white and black unit squares. What is the least number of white squares to paint black for the figure to obtain a line of symmetry?



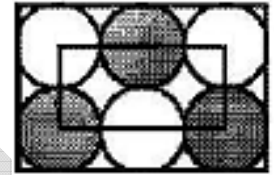
- A) 4 B) 6 C) 5 D) 2 E) 3

8. A number is called “palindrome” if it reads the same backwards as forwards. For example, 13931 is a palindrome. What is the difference between the least 5-digit palindrome number and the greatest 6-digit palindrome number?

- A) 989989 B) 989998 C) 998998 D) 999898 E) 999988

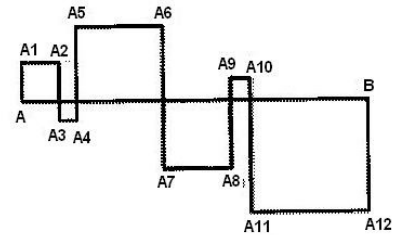
Part B: Each correct answer is worth 4 points.

9. Six identical circles are arranged, as shown on the figure. The circles touch the sides of a large rectangle as well as each other. The vertices of the small rectangle coincide with the centres of four of the circles. The perimeter of the small rectangle is 60 cm. What is the perimeter of the large rectangle?



- A) 160 cm B) 140 cm C) 120 cm D) 100 cm E) 80 cm

10. The squares on the figure are formed by intersecting the segment AB by the broken line $AA_1A_2\dots A_{12}B$. The length of AB is 24 cm. What is the length of the broken line $AA_1A_2\dots A_{12}B$?



- A) 48 cm B) 72 cm C) 96 cm D) 56 cm E) 106 cm

11. If x denotes any negative integer number, which of the following expressions will always have the greatest value?

- A) $x+1$ B) $2x$ C) $-2x$ D) $6x+2$ E) $x-2$

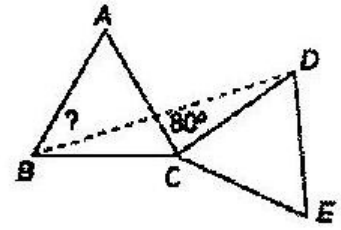
12. Six points are chosen on two parallel lines x and y , as follows: 4 points are on line x and two points are on line y . How many triangles with their vertices among the given points are there?

- A) 6 B) 8 C) 12 D) 16 E) 18

13. Five integer numbers are written around a circle in a way that no two or three adjacent numbers have a sum divisible by 3. How many of these five numbers are divisible by 3?

- A) 0 B) 1 C) 2 D) 3 E) Impossible to determine

14. In the figure, ABC and CDE are congruent equilateral triangles. If the measure of the angle ACD is 80° , what is the measure of angle ABD?

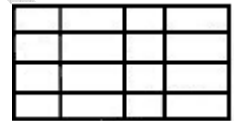


- A) 25° B) 30° C) 35° D) 40° E) 45°

15. What percent of all natural numbers from 1 to 10000 are perfect squares?
(Perfect square is a number that can be presented as a square of a natural number, for instance $100 = 10^2$).

- A) 1% B) 1.5% C) 2% D) 2.5% E) 5%

16. By drawing 9 lines (5 horizontal and 4 vertical) Peter can construct a table with 12 cells. If he had used 6 horizontal and 3 vertical lines, he would have constructed a table with 10 cells only. At most how many cells will there be in a table constructed by a total of 15 lines?



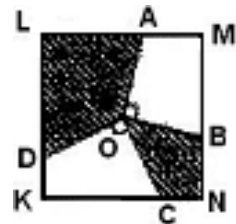
- A) 22 B) 30 C) 36 D) 40 E) 42

Part C: Each correct answer is worth 5 points.

17. A survey found that in 2006, $\frac{2}{3}$ of all customers preferred product A, and $\frac{1}{3}$ of all customers preferred product B. After a media campaign that promoted product B, a new survey in 2007 showed that $\frac{1}{4}$ of the customers who previously preferred product A are now buying product B. Which of the following statements is definitely true?

- A) $\frac{5}{12}$ of the customers buy product A, $\frac{7}{12}$ buy product B.
 B) $\frac{1}{4}$ of the customers buy product A, $\frac{3}{4}$ buy product B.
 C) $\frac{7}{12}$ of the customers buy product A, $\frac{5}{12}$ buy product B.
 D) $\frac{1}{2}$ of the customers buy product A, $\frac{1}{2}$ buy product B.
 E) $\frac{1}{3}$ of the customers buy product A, $\frac{2}{3}$ buy product B.

18. The segments OA, OB, OC, and OD are constructed from the centre O of the square KLMN to its sides, so that $OA \perp OB$ and $OC \perp OD$ (see the figure). The side of the square is 2. What is the total area of the shaded regions?



- A) 1 B) 2 C) 2.5 D) 2.25
 E) depends on the choice of the points B and C

19. A broken calculator does not display the digit 1. For example, if we type in the number 3131, only the number 33 is displayed, with no spaces. Mike typed a 6-digit number into this calculator, but only 2007 appeared on the display. How many numbers could have Mike typed?

- A) 12 B) 13 C) 14 D) 15 E) 16

20. It takes Angie 2 hours round trip to walk a tour that contains a horizontal section and a slope section. On the way there she walks up hill on the slope section, and on the way back, she walks down hill on the same section. If Angie's speed is 4 km/h on the flat section, 3 km/h climbing and 6 km/h going down, what is the total distance of the tour (round trip)?

- A) Impossible to determine B) 6 km C) 7.5 km D) 8 km E) 10 km

21. The first digit of a 4-digit number is equal to the number of zeroes in this number. The second digit of the number is equal to the number of digits 1, the third digit is equal to the number of digits 2, and the fourth digit represents the number of digits 3 in this number. How many numbers have this property?

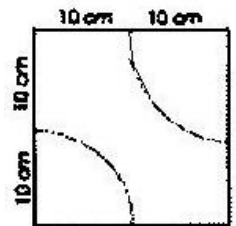
- A) 0 B) 2 C) 3 D) 4 E) 5

22. The table 3×3 contains nine natural numbers (see the picture). Nick and Peter erased four numbers each so that the sum of the numbers erased by Nick was three times as great as the sum of the numbers erased by Peter. What number remained in the table?

| | | |
|----|----|----|
| 4 | 12 | 8 |
| 13 | 24 | 14 |
| 7 | 5 | 23 |

- A) 4 B) 7 C) 14 D) 23 E) 24

23. On the picture, you can see a square tile, 20 cm × 20 cm. The design on the tile consists of two arcs of circles, as shown. If a table top with dimensions 80 cm × 80 cm is to be covered by these tiles so that some arcs connect in a curved line, what could be the maximum length of this line?



- A) 75π B) 100π C) 105π D) 110π E) Impossible to determine

24. A three – digit number has been divided by 9. The sum of the digits of the result was 9 less than the sum of the digits of the number. For how many three-digit numbers would this be true?

- A) 11 B) 5 C) 4 D) 2 E) 1

End of Problems

Bonus Problems

Bonus 1: Al and Bill together weigh less than Charlie and Dan; Charlie and Ed together weigh less than Frank and Bill. Which of the following sentences is certainly true?

- A) Al and Ed together weigh less than Frank and Dan;
- B) Dan and Ed together weigh more than Charlie and Frank;
- C) Dan and Frank together weigh more than Al and Charlie;
- D) Al and Bill together weigh less than Charlie and Frank;
- E) Al, Bill, and Charlie together weigh as much as Dan, Ed, and Frank.

Bonus 2: A positive integer number n has exactly 2 divisors, while the number $n+1$ has exactly 3 divisors. How many divisors does the number $n+2$ have?

- A) 2 B) 3 C) 4 D) 5 E) depends on the choice of n
-