# Canadian Math Kangaroo Contest

## 2014 Grade 9 and 10 Questions and Answers

YEAR 2014

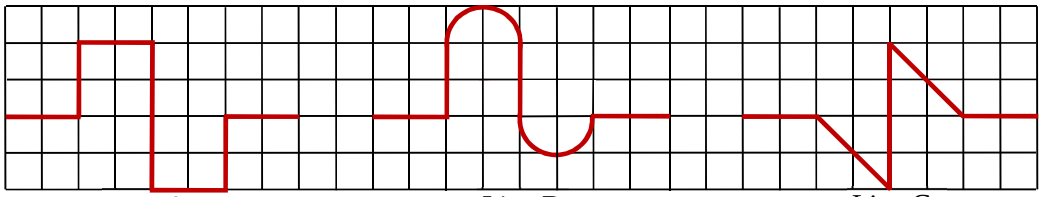
# Canadian Math Kangaroo Contest
# PROBLEMS

## Part A: Each correct answer is worth 3 points

**1.** The MSC Fabiola holds the record as being the largest container ship to enter San Francisco Bay. It carries 12500 containers, which, if placed end to end, would stretch about 75 km. On average, what is the length of one container?

(A) 6 m (B) 16 m (C) 60 m (D) 160 m (E) 600 m

**2.** If $a$, $b$ and $c$ denote the lengths of the lines A, B and C in the picture, then which of the following statements is correct?




(A) $a < b < c$ (B) $a < c < b$ (C) $b < a < c$
(D) $b < c < a$ (E) $c < b < a$

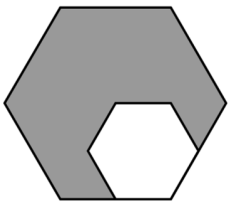
**3.** Which number is halfway between $\frac{2}{3}$ and $\frac{4}{5}$?

(A) $\frac{11}{15}$ (B) $\frac{7}{8}$ (C) $\frac{3}{4}$ (D) $\frac{6}{15}$ (E) $\frac{5}{8}$

**4.** In the number 2014, the last digit is greater than the sum of the other three digits. How many years ago did this last occur?

(A) 1 (B) 3 (C) 5 (D) 7 (E) 11

**5.** The length of the edges of the big regular hexagon is two times the length of the edges of the small regular hexagon. The small hexagon has an area of 4 cm$^2$. What is the area of the big hexagon?



(A) 16 cm$^2$ (B) 14 cm$^2$ (C) 12 cm$^2$ (D) 10 cm$^2$ (E) 8 cm$^2$

**6.** What is the negation of the statement "Everybody solved more than 20 problems"?

(A) Nobody solved more than 20 problems. (B) Somebody solved less than 21 problems.
(C) Everybody solved less than 21 problems. (D) Somebody solved exactly 20 problems.
(E) Somebody solved more than 20 problems.

**7.** How many digits are used to write the number $20^{11}$?
(A) 12 (B) 13 (C) 14 (D) 15 (E) 20

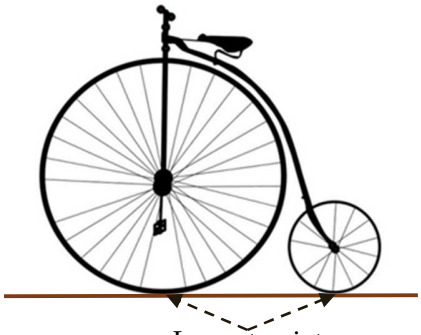
**8.** Tom drew a square in the coordinate plane. One of the diagonals of the square lies on the $x$-axis. The coordinates of the two vertices on the $x$-axis are $(-1,0)$ and $(5,0)$. Which of the following are the coordinates of another vertex of this square?
(A) $(2,0)$ (B) $(2,3)$ (C) $(2,-6)$ (D) $(3,5)$ (E) $(3,-1)$

**9.** In a certain village, the ratio between the number of adult men and the number of adult women is $2:3$ and the ratio between the number of adult women and the number of children is $8:1$. What is the ratio between the number of adults (men and women) and the number of children?
(A) $5:1$ (B) $10:3$ (C) $13:1$ (D) $12:1$ (E) $40:3$

**10.** Vivian wants to write the number 1000 as a sum of powers of 3. At least how many powers of 3 does she need?
(A) 2 (B) 3 (C) 4 (D) 5 (E) this is not possible

## Part B: Each correct answer is worth 4 points

**11.** The perimeter of the big wheel of this bicycle is 4.2m. The perimeter of its small wheel is 0.9m. At a certain moment, the valves of both wheels are at their lowest points. The bicycle starts rolling to the left. How many metres will the bicycle pass until both valves are at the same time at their lowest point, for the first time again?



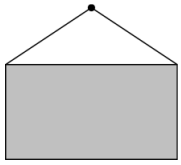

(A) 4.2 (B) 6.3 (C) 12.6 (D) 25.2 (E) 37.8

**12.** In the picture, there is a special die. Numbers on the opposite faces always make the same sum. The numbers that we cannot see in the picture are all prime numbers. Which number lies opposite to 14?


(A) 11 (B) 13 (C) 17 (D) 19 (E) 23

**13.** Ann has walked 8 km at a speed of 4 km/h. Now she will run some time with a speed of 8 km/h. How long does she have to run in order to have an overall average speed of 5 km/h?
(A) 15 min (B) 20 min (C) 30 min (D) 35 min (E) 40 min

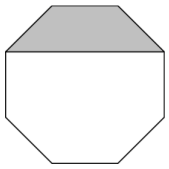
**14.** Paul put some rectangular paintings on the wall. For each picture, he put one nail into the wall 2.5m above the floor, and attached a 2m long string at the two upper corners. Which of the following pictures is closest to the floor (format: width in cm × height in cm)?



(A) $60 \times 40$ (B) $120 \times 50$ (C) $120 \times 90$ (D) $160 \times 60$ (E) $160 \times 100$

**15.** A new kind of crocodile has been discovered in Africa. The length of its tail is a third of its entire length. Its head is 93cm long and the head's length is a quarter of the crocodile`s length without its tail. How long is this crocodile in cm?
(A) 558 (B) 496 (C) 490 (D) 372 (E) 186

**16.** In the following figure there is a regular octagon. The shaded area measures 3 $cm^2$. Find the area of the octagon in $cm^2$.



(A) $8 + 4\sqrt{2}$ (B) 9 (C) $8\sqrt{2}$ (D) 12 (E) 14

**17.** A chess player played 40 games and scored 25 points. A win counts as one point, a draw counts as half a point, and a loss counts as zero points. What is the difference between the number of games won and the number of games lost?
(A) 5 (B) 7 (C) 10 (D) 12 (E) 15

**18.** Jane, Danielle and Hannah wanted to buy three identical hats. However, none of them had enough money to cover the price of one hat. Jane was short by a third of the price; Danielle – by a fourth, and Hannah – by a fifth. One week later, when there was a sale and the price of the hats was reduced by $9.40 per hat, the sisters combined their money and purchased all three hats, with no change left over. What was the price of one hat before the price reduction?
(A) $12 (B) $16 (C) $28 (D) $36 (E) $112

**19.** The average of 5 consecutive numbers is 100. What is the average of the three largest of these numbers?
(A) 99 (B) 100 (C) 101 (D) 102 (E) 303

**20.** The pupils in Kang Aroo School have invented a game - wallball. A wallball team has three players. The coach of the team has seven players at his disposal. But two of those players are twin brothers who have brought only one pair of shoes and cannot both play at the same time. How many teams of three players can the coach field?

(A) 20 (B) 30 (C) 40 (D) 120 (E) 210

## Part C: Each correct answer is worth 5 points

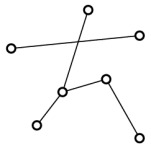
**21.** In the equation,

$$N \times U \times (M + B + E + R) = 33,$$

each letter stands for a different digit (0, 1, 2, ..., 9).
How many different ways are there to choose the values of the letters?

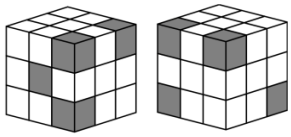
(A) 12 (B) 24 (C) 30 (D) 48 (E) 60

**22.** On the picture shown Kaan wants to add some line segments such that each of the seven points has the same number of connections to other points. What is the least number of line segments Kaan must draw?



(A) 4 (B) 5 (C) 6 (D) 9 (E) 10

**23.** The picture shows the same cube from two different views. It is built from 27 small cubes, some of them are grey and some are white. What is the largest number of grey cubes there could be?



(A) 5 (B) 7 (C) 8 (D) 9 (E) 10

**24.** On an island, frogs are always either green or blue. The number of blue frogs increased by 60% while the number of green frogs decreased by 60%. It turns out that the new ratio of blue frogs to green frogs is the same as the previous ratio in the opposite order (green frogs to blue frogs). By what percentage did the overall number of frogs change?

(A) 0% (B) 20% decrease (C) 20% increase (D) 25% increase (E) 25% decrease

**25.** Tom wrote down several distinct positive integers, not exceeding 100. Their product was not divisible by 18. At most how many numbers could he have written?

(A) 5 (B) 17 (C) 68 (D) 69 (E) 90

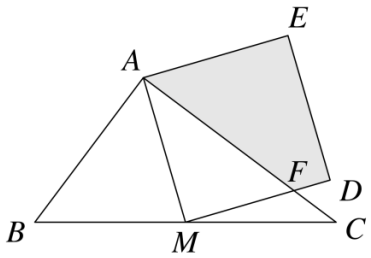
**26.** Any three vertices of a cube form a triangle. What is the number of all such triangles whose vertices are not all on the same face of the cube?

(A) 16 (B) 24 (C) 32 (D) 40 (E) 48

**27.** Consider the set of all the 7-digit numbers that can be obtained using, for each number, all the digits 1, 2, 3,..., 7. List the numbers of the set in increasing order and split the list exactly at the middle into two parts of the same size. What is the last number of the first half?

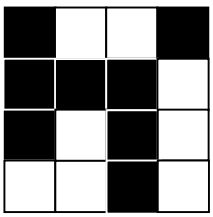
(A) 1234567 (B) 3765421 (C) 4123567 (D) 4352617 (E) 4376521

**28.** Let $ABC$ be a triangle such that $AB = 6$cm, $AC = 8$cm and $BC = 10$cm and $M$ be the midpoint of $BC$. $AMDE$ is a square, and $MD$ intersects $AC$ at point $F$. Find the area of quadrilateral $AFDE$ in cm$^2$.



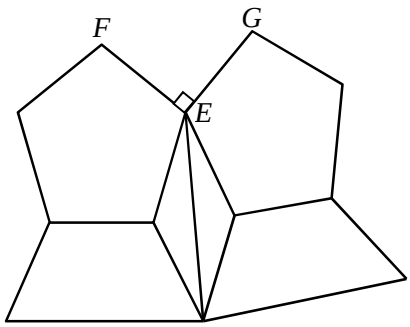

(A) $\frac{124}{8}$ (B) $\frac{125}{8}$ (C) $\frac{126}{8}$ (D) $\frac{127}{8}$ (E) $\frac{128}{8}$

**29.** The cells of the 4 × 4 table are coloured black and white as shown in the figure. In one move, one must recolor three arbitrarily chosen cells in their opposite colors. Find the least possible number of moves one needs to get a table which is coloured in the chess-board pattern.



(A) 1 (B) 2 (C) 3 (D) 4 (E) it is impossible to do

**30.** The dome of Canada's largest church, the Oratory St. Joseph in Montreal, is surrounded by a decorative ring-shaped motif composed of congruent regular pentagons, congruent isosceles triangles, and congruent isosceles trapezoids. The diagram shows a fragment of this motif.




If it is known that the angle FEG is right, how many triangles are there in the entire motif?

(A) 40 (B) 36 (C) 54 (D) 20 (E) Not enough information

# International Contest-Game
# Math Kangaroo Canada, 2014

## Answer Key
**Grade 9-10**

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|---|---|---|---|---|---|
| **1** | **A** B C D E | **11** | A B **C** D E | **21** | A B C **D** E |
| **2** | A B C D **E** | **12** | A B C D **E** | **22** | A B C **D** E |
| **3** | **A** B C D E | **13** | A B C D **E** | **23** | A B C **D** E |
| **4** | A B **C** D E | **14** | A B **C** D E | **24** | A **B** C D E |
| **5** | **A** B C D E | **15** | **A** B C D E | **25** | A B **C** D E |
| **6** | A **B** C D E | **16** | A B C **D** E | **26** | A B **C** D E |
| **7** | A B C **D** E | **17** | A B **C** D E | **27** | A B C D **E** |
| **8** | A **B** C D E | **18** | A B C **D** E | **28** | A **B** C D E |
| **9** | A B C D **E** | **19** | A B **C** D E | **29** | A B C **D** E |
| **10** | A B **C** D E | **20** | A **B** C D E | **30** | **A** B C D E |