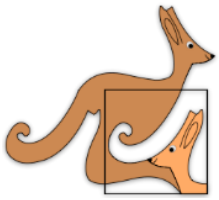


**INTERNATIONAL CONTEST-GAME**
**MATH KANGAROO**
**CANADA, 2020**

**INSTRUCTIONS**
**GRADE 9-10**

1. You have 75 minutes to solve 30 multiple choice problems. For each problem, decide which answer is correct and fill in (blacken) the oval that has the same letter as the appropriate answer. If you fill in (blacken) more than one oval for a question, your response will be marked as wrong.

1. Record your answers in the response form. Remember that this is the only sheet that is marked, so make sure you have all your answers transferred to that form before giving it back to the contest supervisor.
2. The problems are arranged in three groups. A correct answer of the first 10 problems is worth 3 points. A correct answer of problems 11-20 is worth 4 points. A correct answer of problems 21-30 is worth 5 points. For each incorrect answer, one point is deducted from your score. Each unanswered question is worth 0 points. To avoid negative scores, you start from 30 points. The maximum score possible is 150.
3. The use of external material or aid of any kind is **not permitted**.
4. The figures *are not* drawn to scale. They should be used only for illustration purposes.
5. Remember, you have about 2 to 3 minutes for each problem; hence, if a problem appears to be too difficult, save it for later and move on to another problem.
6. At the end of the allotted time, please **give the response form to the contest supervisor**.
7. Do not forget to pick up your Certificate of Participation on your way out!

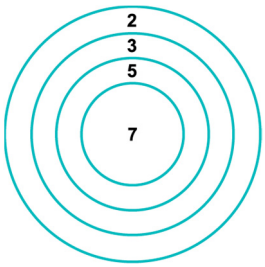
**Good luck!**

*Canadian Math Kangaroo Contest team*

# CANADIAN MATH KANGAROO CONTEST PROBLEMS

## PART A: EACH CORRECT ANSWER IS WORTH 3 POINTS

**1.** A dart-throwing competition was held at Ali's school. Each person's score was calculated by the product of the numbers that the darts had hit. Ali scored 18 in the competition. How many times did he throw?




(A) 12 (B) 9 (C) 6 (D) 3 (E) 2

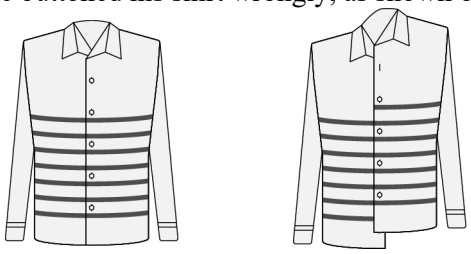
**2.** When the answers to the following calculations are put in order from smallest to largest, which will be in the middle?

(A) 1+2345 (B) 12+345 (C) 123+45 (D) 1234+5 (E) 12345

**3.** Who is the mother of the daughter of Anne's mom's mom?

(A) Anne's sister (B) Anne's niece (C) Anne's mother
(D) Anne's aunt (E) Anne's grandma

**4.** When Cosmo wears his new shirt properly, as shown on the left, the horizontal stripes form seven closed rings around his waist. This morning he buttoned his shirt wrongly, as shown on the right.



How many closed rings were there around Cosmo's waist this morning?

(A) 0 (B) 1 (C) 2 (D) 3 (E) 4

**5.** In the calculations shown each letter stands for a digit. They are used to make some two-digit numbers. The two numbers on the left have a total of 79. What is the total of the four numbers on the right?

$$\begin{array}{r} AB \\ +\,CD \\ \hline 79 \end{array} \qquad \begin{array}{r} AD \\ +\,CD \\ +\,AB \\ +\,CB \\ \hline ? \end{array}$$

(A) 79 (B) 158 (C) 869
(D) 1418 (E) 7979

**6.** The sum of four consecutive integers is 2. What is the least of these integers?

(A) $-3$ (B) $-2$ (C) $-1$ (D) 0 (E) 1

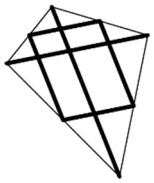
**7.** The years 2020 and 1717 both consist of a two-digit number repeated twice. How many years after 2020 will the next year be which has this property?

(A) 20 (B) 101 (C) 120 (D) 121 (E) 202

**8.** Mary had ten pieces of paper, some of which were squares, and the rest were triangles. She cuts three squares diagonally from corner to corner. She then counted the total number of vertices of the 13 obtained pieces of paper, which came to 42 vertices. How many triangles did she have before making the cuts?

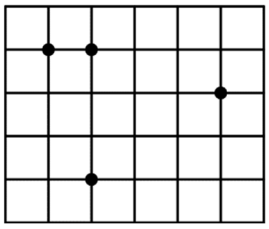
(A) 8 (B) 7 (C) 6 (D) 5 (E) 4

**9.** Martin made a kite by cutting a straight wooden pole into 6 pieces. He used two of them, of lengths 120 $cm$ and 80 $cm$, as the diagonals. The remaining four pieces connected the midpoints of the sides of the kite as shown. How long was the pole before it was cut?



(A) 300 $cm$ (B) 370 $cm$ (C) 400 $cm$ (D) 410 $cm$ (E) 450 $cm$

**10.** In the given grid of squares with side length 1, four points are marked. By forming a triangle using three of the given points, what is the smallest area that can be obtained?



(A) $\frac{1}{2}$ (B) 1 (C) $\frac{3}{2}$
(D) 2 (E) $\frac{5}{2}$

## PART B: EACH CORRECT ANSWER IS WORTH 4 POINTS

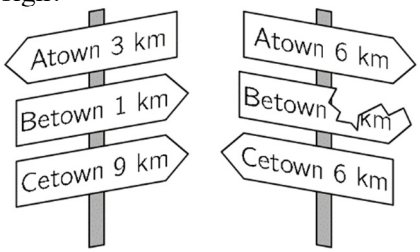
**11.** Helen wants to spend 18 consecutive days visiting her Grandma. Her Grandma reads her story books on story days Tuesday, Saturday and Sunday. If Helen wants to spend the greatest amount of story days with her Grandma, on which day of the week should she start her visit?

(A) Monday (B) Tuesday (C) Friday (D) Saturday (E) Sunday

**12.** If $a$, $b$, $c$ and $d$ are integers satisfying $ab = 2cd$, which of the following numbers could not be the value of the product $abcd$?

(A) 50 (B) 100 (C) 200 (D) 450 (E) 800

**13.** The shortest path from Atown to Cetown runs through Betown. Walking on this path from Atown to Cetown we would first find the signpost shown on the left. Later we would find the signpost shown on the right. What distance was written on the broken sign?



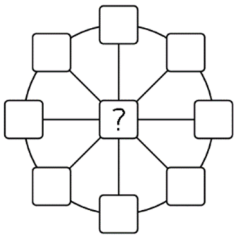

(A) 1 $km$ (B) 2 $km$ (C) 3 $km$ (D) 4 $km$ (E) 5 $km$

**14.** An isosceles triangle has a side of length 20 $cm$. Of the other two side lengths, one is equal to $2/5$ of the other. Which of the following values is the perimeter of this triangle?

(A) 36 $cm$ (B) 48 $cm$ (C) 60 $cm$ (D) 90 $cm$ (E) 120 $cm$

**15.** In each of the nine cells of the figure shown, a number shall be written so that the sum of the three numbers on each diameter is 13 and the sum of the eight numbers on the circumference is 40.

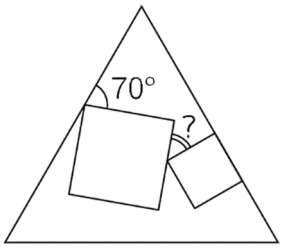
What number must be written in the central cell?




(A) 3 (B) 5 (C) 8 (D) 10 (E) 12

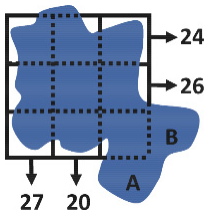
**16.** There are 13 balloons arranged in circle and numbered from 1 to 13 clockwise. Mary stands in the middle of the circle and pops every second balloon that is not yet popped, going clockwise. Thus, she pops balloon number 2 first, balloon number 4 next, etc.
Which are the next two balloons popped immediately after one another?
(A) 13 and 3 (B) 3 and 5 (C) 12 and 1 (D) 5 and 7 (E) 6 and 7

**17.** Two squares of different size are drawn inside an equilateral triangle. One side of one of these squares lies on one of the sides of the triangle as shown. What is the size of the angle marked by the question mark?
(A) $25^\circ$ (B) $30^\circ$ (C) $35^\circ$ (D) $45^\circ$ (E) $50^\circ$

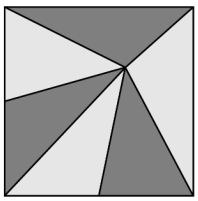



**18.** Luca began a 520 $km$ trip by car with 14 litres of fuel in the car tank. His car consumes 1 litre of fuel per 10 $km$. After driving 55 $km$, he reads a road sign showing the distances from that point to five petrol stations ahead on the road. These distances are 35 $km$, 45 $km$, 55 $km$, 75 $km$ and 95 $km$. The capacity of the car's fuel tank is 40 litres and Luca wants to stop just once to fill the tank. How far is the petrol station that he should stop at?
(A) 35 $km$ (B) 45 $km$ (C) 55 $km$ (D) 75 $km$ (E) 95 $km$

**19.** On each cell of a $3 \times 3$ square a number is placed. Unfortunately, the numbers are not visible because some ink was spilled over them. All we know is the sum of the numbers of each of the first two rows and of each of the first two columns, as shown.
If the sum of the numbers in the third column is $A$ and the sum of the numbers in the third row is $B$, what is the value of $A - B$?
(A) 1 (B) 3 (C) 13 (D) 21 (E) cannot be determined




**20.** A square shaped stained glass window of 81 $dm^2$ is made out of six triangles of equal area (see figure). A fly is sitting exactly on the spot where the six triangles meet.
How far from the bottom of the window is the fly sitting?
(A) 3 $dm$ (B) 5 $dm$ (C) 5.5 $dm$ (D) 6 $dm$ (E) 7.5 $dm$



**PART C: EACH CORRECT ANSWER IS WORTH 5 POINTS**

**21.** The sum of 101 consecutive integer numbers is 2020. What is the sum of the smallest and the largest?
(A) 20 (B) 40 (C) 101 (D) 202 (E) 303

**22.** A hare and a tortoise competed in a 5 $km$ race along a straight line. The hare is five times faster than the tortoise. The hare mistakenly started perpendicular to the route. After a while he realized his mistake, then turned and ran straight to the finish point. He arrived at the same time as the tortoise. What is the distance between the hare's turning point and the finish point?
(A) 11 $km$ (B) 12 $km$ (C) 13 $km$ (D) 14 $km$ (E) 15 $km$

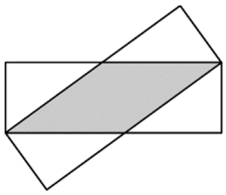
**23.** There are some squares and triangles on the table. Some of them are blue and the rest are red. Some of these figures are large and the rest are small. We know that

1. If the figure is large, it's a square;
2. If the figure is blue, it's a triangle.

Which of the statements must be true?

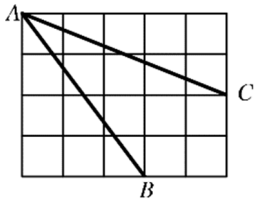
(A) All red figures are squares. (B) All squares are large.
(C) All small figures are blue. (D) All triangles are blue.
(E) All blue figures are small.

**24.** Two identical rectangles with sides of length 3 $cm$ and 9 $cm$ are overlapping as in the diagram. What is the area of the overlap (shared area) of the two rectangles?



(A) 12 $cm^2$ (B) 13.5 $cm^2$ (C) 14 $cm^2$ (D) 15 $cm^2$ (E) 16 $cm^2$

**25.** Given that the grid is square and $AB = 1$, find the value of $AC$.




(A) 1 (B) $\frac{5\sqrt{5}}{2}$ (C) $\frac{7}{5}$
(D) $2\sqrt{5}$ (E) $\frac{\sqrt{29}}{5}$

**26.** A large cube is built using 64 smaller identical cubes. Three of the faces of the large cube are painted. What is the maximum possible number of small cubes that have exactly one face painted?

(A) 27 (B) 28 (C) 32 (D) 34 (E) 40

**27.** In each of the squares, a number should be written so that the sums of the four numbers in each row and in each column are the same. What number goes into the shaded square?

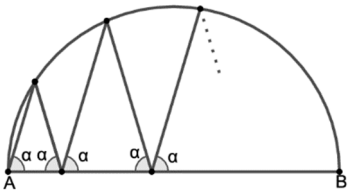
| | | | |
|---|---|---|---|
| 1 | | 6 | 3 |
| | 2 | 2 | 8 |
| | 7 | | 4 |
| | | 7 | |

(A) 5 (B) 6 (C) 7 (D) 8 (E) 9

**28.** Alice, Belle and Cathy had an arm-wrestling contest. In each game two girls wrestled, while the third rested. After each game, the winner played the next game against the girl who had rested. In total, Alice played 10 times, Belle played 15 times and Cathy played 17 times. Who lost the second game?

(A) Alice (B) Belle (C) Cathy
(D) either Alice or Belle could have lost the second game
(E) either Belle or Cathy could have lost the second game

**29.** A zig-zag line starts at the point $A$, at one end of the diameter $AB$ of a circle. Each of the angles between the zig-zag line and the diameter $AB$ is equal to $\alpha$ as shown. After four peaks, the zig-zag line ends at the point $B$. What is the size of angle $\alpha$?




(A) 60° (B) 72° (C) 75° (D) 80° (E) Another answer

**30.** Eight consecutive three-digit positive integers have the following property: each of them is divisible by its last digit. What is the sum of the digits of the smallest of the eight integers?

(A) 10 (B) 11 (C) 12 (D) 13 (E) 14

# For training purposes only!

International Contest-Game
Math Kangaroo Canada, 2020

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

| | | | | | |
|---|---|---|---|---|---|
| **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 |