



The CENTRE for EDUCATION  
in MATHEMATICS and COMPUTING  
*cemc.uwaterloo.ca*

# *Gauss Contest*

## *Grade 8*

*(The Grade 7 Contest is on the reverse side)*

**Wednesday, May 15, 2024**  
*(in North America and South America)*

**Thursday, May 16, 2024**  
*(outside of North America and South America)*



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**Time:** 1 hour

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Calculating devices are allowed, provided that they do not have any of the following features: (i) internet access, (ii) the ability to communicate with other devices, (iii) information previously stored by students (such as formulas, programs, notes, etc.), (iv) a computer algebra system, (v) dynamic geometry software.

### **Instructions**

1. Do not open the contest booklet until you are told to do so.
2. You may use rulers, compasses and paper for rough work.
3. Be sure that you understand the coding system for your answer sheet. If you are not sure, ask your teacher to explain it.
4. This is a multiple-choice test. Each question is followed by five possible answers marked **A, B, C, D,** and **E.** Only one of these is correct. When you have made your choice, enter the appropriate letter for that question on your answer sheet.
5. Scoring: Each correct answer is worth 5 in Part A, 6 in Part B, and 8 in Part C.  
There is *no penalty* for an incorrect answer.  
Each unanswered question is worth 2, to a maximum of 10 unanswered questions.
6. Diagrams are *not* drawn to scale. They are intended as aids only.
7. When your supervisor instructs you to start, you will have *sixty* minutes of working time.






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*The name, school and location of some top-scoring students will be published on the website, [cemc.uwaterloo.ca](http://cemc.uwaterloo.ca). On this website, you will also be able to find copies of past Contests and excellent resources for enrichment, problem solving and contest preparation.*

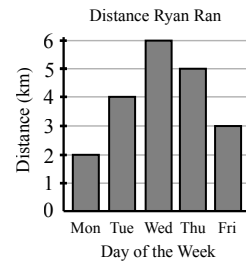
**Grade 8**

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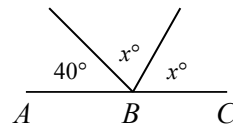
**Part A: Each correct answer is worth 5.**

1. How many 5 cent coins are needed to make 25 cents?  
(A) 1                      (B) 2                      (C) 3                      (D) 4                      (E) 5
2. Which of the following shapes has a vertical line of symmetry?  
(A)       (B)       (C)       (D)       (E) 
3. Which of the following numbers is largest?  
(A) 0.58                  (B) 1.32                  (C) 0.97                  (D) 1.03                  (E) 0.12
4. 50% of  $n$  is 2024. The value of  $n$  is  
(A) 2074                  (B) 24                      (C) 50                      (D) 4048                  (E) 4042

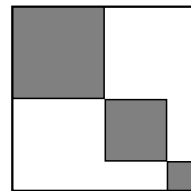
5. Ryan recorded the distance, in kilometres, that he ran on each day from Monday to Friday, as shown. The total distance that Ryan ran over the five days is  
(A) 14 km                  (B) 16 km                  (C) 18 km  
(D) 20 km                  (E) 22 km



6. When the number 11 is increased by 2 and the result is then multiplied by 3, the final result is  
(A) 35                      (B) 39                      (C) 28                      (D) 25                      (E) 363
7. The value of  $a$  that satisfies the equation  $15 + a = 10$  is  
(A)  $-10$                   (B)  $-5$                       (C) 0                          (D) 5                          (E) 10
8. In the diagram,  $\angle ABC$  is a straight angle. The value of  $x$  is  
(A) 80                      (B) 65                      (C) 75  
(D) 70                      (E) 60



9. In a drawer, the ratio of the number of spoons to the number of forks is 1 : 2. The total number of spoons and forks in the drawer *cannot* be equal to  
(A) 12                      (B) 6                          (C) 18                      (D) 10                      (E) 3
10. In the diagram, a square with side length 6 is partially shaded. The largest shaded region is a square with side length 3. The other two shaded regions are squares with side lengths 2 and 1. What is the total area of the unshaded region?  
(A) 12                      (B) 18                      (C) 22  
(D) 24                      (E) 30



## Part B: Each correct answer is worth 6.

11. In the sequence  $1, 3, 4, 7, \dots$ , each number beginning with the 4 is the sum of the two numbers before it. This means that the next number in the sequence is  $4 + 7 = 11$ . The smallest number greater than 100 that appears in the sequence is

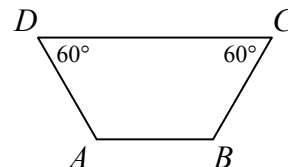
(A) 133      (B) 199      (C) 113      (D) 101      (E) 123

12. The number 385 has three prime factors. The sum of these prime factors is

(A) 21      (B) 26      (C) 25      (D) 23      (E) 22

13. Trapezoid  $ABCD$  can be divided into three equilateral triangles. If the perimeter of the trapezoid is equal to 840 cm, what is the length of  $AB$ ?

(A) 120 cm      (B) 140 cm      (C) 168 cm  
(D) 25 cm      (E) 210 cm



14. A container of ice cream can make 6 cones or it can make 4 sundaes. If 5 such containers of ice cream are used to make 12 cones, what is the greatest number of sundaes that can be made with the ice cream that remains?

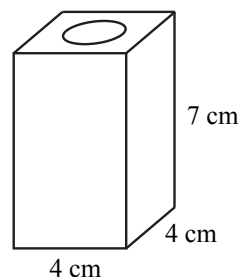
(A) 4      (B) 8      (C) 12      (D) 16      (E) 20

15. When a positive integer  $n$  is divided by 10, the remainder is 8. When  $n$  is divided by 5, the remainder is

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

16. A block of wood in the shape of a rectangular prism has length 4 cm, width 4 cm, and height 7 cm. A cylindrical hole with radius 1 cm is drilled through the centre, as shown. To the nearest  $\text{cm}^3$ , what is the volume of the block of wood after the hole is drilled? (Note: The volume of a cylinder with radius  $r$  and height  $h$  is  $\pi r^2 h$ .)

(A)  $90 \text{ cm}^3$       (B)  $122 \text{ cm}^3$       (C)  $106 \text{ cm}^3$   
(D)  $84 \text{ cm}^3$       (E)  $92 \text{ cm}^3$

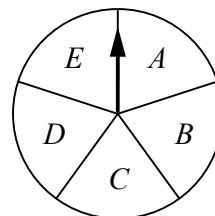


17. The Gaussbot factory assembles robots. Each robot comes in one of three colours: red, blue, or green. Each robot also has a number stamped on its head: 1, 2, 3, or 4. The  $n$ th robot assembled is the first robot to have the same colour and the same number as a previously assembled robot. What is the greatest possible value of  $n$ ?

(A) 11      (B) 12      (C) 13      (D) 7      (E) 8

18. A circular spinner is divided into five equal sections. An arrow is attached to the centre of the spinner and is positioned as shown. The arrow is spun clockwise, and it stops in the section labelled  $D$ . Which of the following could have been the angle of rotation?

(A)  $530^\circ$       (B)  $550^\circ$       (C)  $630^\circ$   
(D)  $675^\circ$       (E)  $700^\circ$



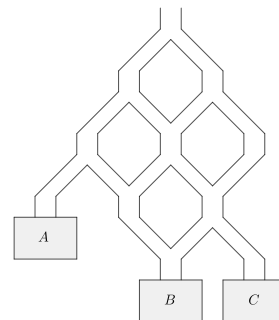
**Grade 8**

19. Three *different* integers in a list have a mean (average) of 50 and a range of 14. What is the smallest possible integer in the list?  
 (A) 40            (B) 43            (C) 39            (D) 42            (E) 41
20. Kiran has a box containing three different types of fruit: apples, pears, and bananas. In the box, 21 pieces of fruit are not apples, 25 pieces of fruit are not pears, and 28 pieces of fruit are not bananas. How many pieces of fruit are in the box?  
 (A) 53            (B) 32            (C) 46            (D) 37            (E) 51

**Part C: Each correct answer is worth 8.**

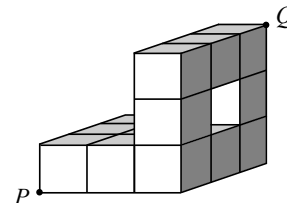
21. The prime factorization of  $6 \times 5 \times 4 \times 3 \times 2 \times 1$  can be written in the form  $2^a \times 3^b \times 5^c$ . The value of  $a + b + c$  is  
 (A) 6            (B) 7            (C) 9            (D) 5            (E) 8
22. The ratio of the number of quarters (worth \$0.25 each) to the number of dimes (worth \$0.10 each) to the number of nickels (worth \$0.05 each) in a jar is  $9 : 3 : 2$ . If the total value of the quarters and dimes is \$17.85, what is the total value of the nickels?  
 (A) \$0.45            (B) \$0.50            (C) \$0.70            (D) \$0.35            (E) \$0.55
23. Five *different* integers, each greater than 0, have a sum of 264. The greatest common divisor of these five positive integers is  $d$ . What is the sum of the digits of the largest possible value of  $d$ ?  
 (A) 4            (B) 3            (C) 8            (D) 2            (E) 6

24. A network of pathways lead from a single opening to three bins, labelled  $A$ ,  $B$ ,  $C$  as shown. If a ball is dropped into the opening, it will follow a path and land in one of the bins. Every time a path splits, it is equally likely for the ball to follow either of the downward paths. Ellen drops two balls, one after the other, into the opening. What is the probability that the two balls land in different bins?



- (A)  $\frac{17}{32}$             (B)  $\frac{27}{50}$             (C)  $\frac{25}{64}$   
 (D)  $\frac{1}{3}$             (E)  $\frac{15}{32}$

25. A figure is constructed using fourteen  $1 \times 1 \times 1$  cubes. Nine of the  $1 \times 1 \times 1$  cubes are used to make the bottom layer and five additional  $1 \times 1 \times 1$  cubes are positioned on top of the bottom layer. The figure is shown from two different perspectives. An ant begins at  $P$  and walks a distance  $d$  on the surface of the figure to arrive at  $Q$ . The smallest possible value of  $d$  is closest to



- (A) 6.43            (B) 6.40            (C) 6.71  
 (D) 6.66            (E) 6.48

