



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 13, 2015*

*(in North America and South America)*

*Thursday, May 14, 2015*

*(outside of North America and South America)*



UNIVERSITY OF  
**WATERLOO**

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**Time:** 1 hour

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**Calculators are allowed, with the following restriction: you may not use a device that has internet access, that can communicate with other devices, or that contains previously stored information. For example, you may not use a smartphone or a tablet.**

## **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 Web site, [cemc.uwaterloo.ca](http://cemc.uwaterloo.ca). You will also be able to find copies of past Contests and excellent resources for enrichment, problem solving and contest preparation.*

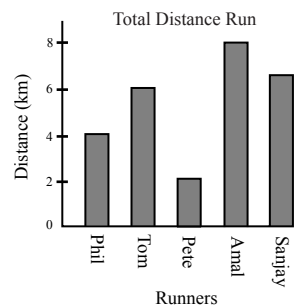
**Grade 8**

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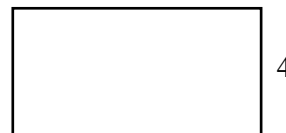
**Part A: Each correct answer is worth 5.**

1. The value of  $1000 + 200 - 10 + 1$  is  
 (A) 1191      (B) 1190      (C) 1189      (D) 1209      (E) 1211
2. What time is it 45 minutes after 10:20?  
 (A) 11:00      (B) 9:35      (C) 11:15      (D) 10:55      (E) 11:05
3. Which of the following is closest to 5 cm?  
 (A) The length of a full size school bus  
 (B) The height of a picnic table  
 (C) The height of an elephant  
 (D) The length of your foot  
 (E) The length of your thumb

4. The graph shows the total distance that each of five runners ran during a one-hour training session. Which runner ran the median distance?  
 (A) Phil      (B) Tom      (C) Pete  
 (D) Amal      (E) Sanjay

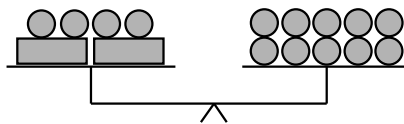


5. If  $x + 3 = 10$ , what is the value of  $5x + 15$ ?  
 (A) 110      (B) 35      (C) 80      (D) 27      (E) 50
6. A rectangle has a perimeter of 42 and a width of 4. What is its length?  
 (A) 19      (B) 17      (C) 34  
 (D) 21      (E) 38



7. The equal-arm scale shown is balanced. One has the same mass as

- (A)
- (B)
- (C)
- (D)
- (E)



8. At the beginning of the summer, Aidan was 160 cm tall. At the end of the summer, he measured his height again and discovered that it had increased by 5%. Measured in cm, what was his height at the end of summer?  
 (A) 168      (B) 165      (C) 160.8      (D) 172      (E) 170
9. If  $x = 4$  and  $y = 2$ , which of the following expressions gives the smallest value?  
 (A)  $x + y$       (B)  $xy$       (C)  $x - y$       (D)  $x \div y$       (E)  $y \div x$

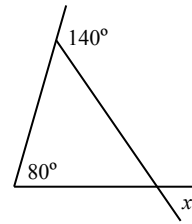
10. The number represented by  $\square$  so that  $\frac{1}{2} + \frac{1}{4} = \frac{\square}{12}$  is

(A) 3                      (B) 12                      (C) 9                      (D) 6                      (E) 15

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

11. In the diagram, the value of  $x$  is

(A) 40                      (B) 50                      (C) 60  
(D) 70                      (E) 80

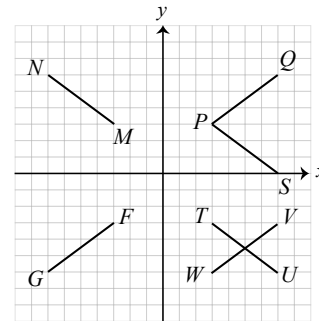


12. Zara's bicycle tire has a circumference of 1.5 m. If Zara travels 900 m on her bike, how many full rotations will her tire make?

(A) 900                      (B) 1350                      (C) 600                      (D) 450                      (E) 1200

13. In the graph shown, which of the following represents the image of the line segment  $PQ$  after a reflection across the  $x$ -axis?

(A)  $PS$                       (B)  $TU$                       (C)  $MN$   
(D)  $WV$                       (E)  $FG$



14. Carolyn has a \$5 bill, a \$10 bill, a \$20 bill, and a \$50 bill in her wallet. She closes her eyes and removes one of the four bills from her wallet. What is the probability that the total value of the three bills left in her wallet is greater than \$70?

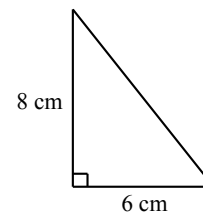
(A) 0.5                      (B) 0.25                      (C) 0.75                      (D) 1                      (E) 0

15. Two puppies, Walter and Stanley, are growing at different but constant rates. Walter's mass is 12 kg and he is growing at a rate of 2 kg/month. Stanley's mass is 6 kg and he is growing at a rate of 2.5 kg/month. What will Stanley's mass be when it is equal to Walter's?

(A) 24 kg                      (B) 28 kg                      (C) 32 kg                      (D) 36 kg                      (E) 42 kg

16. There is a square whose perimeter is the same as the perimeter of the triangle shown. The area of that square is

(A)  $12.25 \text{ cm}^2$                       (B)  $196 \text{ cm}^2$                       (C)  $49 \text{ cm}^2$   
(D)  $36 \text{ cm}^2$                       (E)  $144 \text{ cm}^2$



17. When expressed as a repeating decimal, the fraction  $\frac{1}{7}$  is written as  $0.142857142857\dots$  (The 6 digits 142857 continue to repeat.) The digit in the third position to the right of the decimal point is 2. In which one of the following positions to the right of the decimal point will there also be a 2?

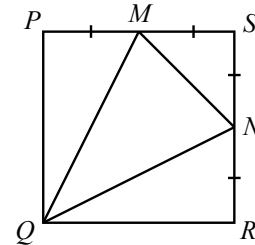
(A)  $119^{\text{th}}$                       (B)  $121^{\text{st}}$                       (C)  $123^{\text{rd}}$                       (D)  $125^{\text{th}}$                       (E)  $126^{\text{th}}$

Grade 8

18. The operation  $\Delta$  is defined so that  $a\Delta b = a \times b + a + b$ . For example,  $2\Delta 5 = 2 \times 5 + 2 + 5 = 17$ . If  $p\Delta 3 = 39$ , the value of  $p$  is  
 (A) 13            (B) 12            (C) 9            (D) 10.5            (E) 18
19. There are 3 times as many boys as girls in a room. If 4 boys and 4 girls leave the room, then there will be 5 times as many boys as girls in the room. In total, how many boys and girls were in the room originally?  
 (A) 15            (B) 20            (C) 24            (D) 32            (E) 40
20. A rectangle has side lengths 3 and 4. One of its vertices is at the point  $(1, 2)$ . Which of the following *could not* be the coordinates of one of its other vertices?  
 (A)  $(-3, -1)$     (B)  $(1, -5)$     (C)  $(5, -1)$     (D)  $(-2, 6)$     (E)  $(1, -1)$

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

21. In square  $PQRS$ ,  $M$  is the midpoint of  $PS$  and  $N$  is the midpoint of  $SR$ . If the area of  $\triangle SMN$  is 18, then the area of  $\triangle QMN$  is



- (A) 36            (B) 72            (C) 90  
 (D) 48            (E) 54
22. Exactly 120 tickets were sold for a concert. The tickets cost \$12 each for adults, \$10 each for seniors, and \$6 each for children. The number of adult tickets sold was equal to the number of child tickets sold. Given that the total revenue from the ticket sales was \$1100, the number of senior tickets sold was  
 (A) 110            (B) 20            (C) 40            (D) 2            (E) 18
23. The list of integers 4, 4,  $x$ ,  $y$ , 13 has been arranged from least to greatest. How many different possible ordered pairs  $(x, y)$  are there so that the average (mean) of these 5 integers is itself an integer?  
 (A) 7            (B) 8            (C) 9            (D) 10            (E) 11
24. Two joggers each run at their own constant speed and in opposite directions from one another around an oval track. They meet every 36 seconds. The first jogger completes one lap of the track in a time that, when measured in seconds, is a number (not necessarily an integer) between 80 and 100. The second jogger completes one lap of the track in a time,  $t$  seconds, where  $t$  is a positive integer. The product of the smallest and largest possible integer values of  $t$  is  
 (A) 3705            (B) 3762            (C) 2816            (D) 3640            (E) 3696
25. The *alternating sum* of the digits of 63195 is  $6 - 3 + 1 - 9 + 5 = 0$ . In general, the alternating sum of the digits of a positive integer is found by taking its leftmost digit, subtracting the next digit to the right, adding the next digit to the right, then subtracting, and so on. A positive integer is divisible by 11 exactly when the alternating sum of its digits is divisible by 11. For example, 63195 is divisible by 11 since the alternating sum of its digits is equal to 0, and 0 is divisible by 11. Similarly, 92807 is divisible by 11 since the alternating sum of its digits is 22, but 60432 is not divisible by 11 since the alternating sum of its digits is 9.

Lynne forms a 7-digit integer by arranging the digits 1, 2, 3, 4, 5, 6, 7 in random order. What is the probability that the integer is divisible by 11?

- (A)  $\frac{1}{35}$             (B)  $\frac{5}{42}$             (C)  $\frac{3}{35}$             (D)  $\frac{1}{42}$             (E)  $\frac{4}{35}$