Gauss Contest

Grade 7

(The Grade 8 Contest is on the reverse side)

Wednesday, May 10, 2017
(in North America and South America)

Thursday, May 11, 2017
(outside of North America and South America)

UNIVERSITY OF WATERLOO

Time: 1 hour   ©2016 University of Waterloo

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.

The name, school and location of some top-scoring students will be published on the Web site, cemc.uwaterloo.ca. You will also be able to find copies of past Contests and excellent resources for enrichment, problem solving and contest preparation.
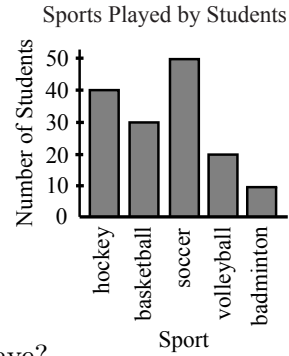
Scoring: There is *no penalty* for an incorrect answer.
        Each unanswered question is worth 2, to a maximum of 10 unanswered questions.

Part A: Each correct answer is worth 5.

1. The value of $(2 + 4 + 6) - (1 + 3 + 5)$ is

    (A) 0   **(B)** 3   **(C)** -3 **(D)** 21   **(E)** 111

2. Based on the graph shown, which sport is played by the most students?

   **(A)** hockey   **(B)** basketball   **(C)** soccer

    (D) volleyball   **(E)** badminton

    Sports Played by Students

3. Michael has \$280 in \$20 bills. How many \$20 bills does he have?

    (A) 10   **(B)** 12   **(C)** 14   **(D)** 16   **(E)** 18

4. When two integers between 1 and 10 are multiplied, the result is 14. What is the sum of these two integers?

    (A) 2   **(B)** 5   **(C)** 7   **(D)** 9   **(E)** 33

5. Three thousandths is equal to

    (A) 300   **(B)** 0.3   **(C)** 0.03   **(D)** 30   **(E)** 0.003

6. In the square shown, x is equal to

    (A) 0   **(B)** 45   **(C)** 60

    (D) 180   **(E)** 360
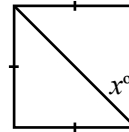
7. Which integer is closest in value to $\frac{35}{4}$?

    (A) 10   **(B)** 8   **(C)** 9   **(D)** 7   **(E)** 6

8. When $n = 101$, which of the following expressions has an even value?

    (A) $3n$ **(B)** $n + 2$ **(C)** $n - 12$ **(D)** $2n - 2$ **(E)** $3n + 2$

9. The sum of three consecutive integers is 153. The largest of these three integers is

    (A) 52   **(B)** 50   **(C)** 53   **(D)** 54   **(E)** 51

10. In the diagram, $\triangle PQR$ is equilateral and is made up of four smaller equilateral triangles. If each of the smaller triangles has a perimeter of 9 cm, what is the perimeter of $\triangle PQR$?

    (A) 15 cm   **(B)** 9 cm   **(C)** 36 cm

    (D) 27 cm   **(E)** 18 cm
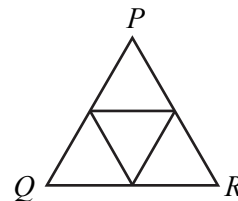
Part B: Each correct answer is worth 6.

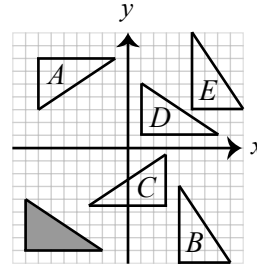11. The number that goes into the □ to make $\dfrac{3}{7} = \dfrac{\square}{63}$ true is

    (A) 27   **(B)** 9   **(C)** 59   **(D)** 63   **(E)** 3

12. At the Gaussian Store, puzzles cost $10 each or $50 for a box of 6 puzzles. If a customer would like exactly 25 puzzles, what is the minimum possible cost?

    (A) $210   **(B)** $230   **(C)** $250   **(D)** $220   **(E)** $200

13. When the shaded triangle shown is translated, which of the following triangles can be obtained?

    (A) A **(B)** B **(C)** C

    (D) D **(E)** E

14. When the time in Toronto, ON is 1:00 p.m., the time in Gander, NL is 2:30 p.m. A flight from Toronto to Gander takes 2 hours and 50 minutes. If the flight departs at 3:00 p.m. (Toronto time), what time will the flight land in Gander (Gander time)?

    (A) 7:20 p.m.   **(B)** 5:00 p.m.   **(C)** 6:20 p.m.   **(D)** 5:20 p.m.   **(E)** 8:50 p.m.

15. Five students ran a race. Ryan was faster than Henry and Faiz. Henry was slower than Faiz. Toma was faster than Ryan but slower than Omar. Which student finished fourth?

    (A) Faiz   **(B)** Henry   **(C)** Omar   **(D)** Ryan   **(E)** Toma

16. A circular spinner is divided into 20 equal sections, as shown. An arrow is attached to the centre of the spinner. The arrow is spun once. What is the probability that the arrow stops in a section containing a number that is a divisor of 20?

    (A) $\frac{12}{20}$ **(B)** $\frac{14}{20}$ **(C)** $\frac{15}{20}$

   **(D)** $\frac{7}{20}$ **(E)** $\frac{6}{20}$
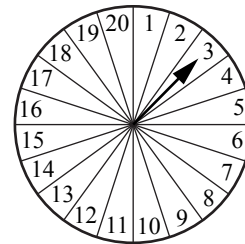
17. The mean (average) of the four integers $78, 83, 82,$ and x is 80. Which one of the following statements is true?

    (A) x is 2 greater than the mean
    (B) x is 1 less than the mean
    (C) x is 2 less than the mean
   **(D)** x is 3 less than the mean
    (E) x is equal to the mean

18. Sara goes to a bookstore and wants to buy a book that is originally priced at $100. Which of the following options gives her the best discounted price?

    (A) A discount of 20%
    (B) A discount of 10%, then a discount of 10% off the new price
    (C) A discount of 15%, then a discount of 5% off the new price
    (D) A discount of 5%, then a discount of 15% off the new price
    (E) All four options above give the same price

19. Two sheets of 11 cm × 8 cm paper are placed on top of each other, forming an overlapping 8 cm × 8 cm square in the centre, as shown. The area of rectangle $WXYZ$ is

(A) $88 \, \text{cm}^2$ (B) $112 \, \text{cm}^2$ (C) $136 \, \text{cm}^2$

(D) $121 \, \text{cm}^2$ (E) $176 \, \text{cm}^2$
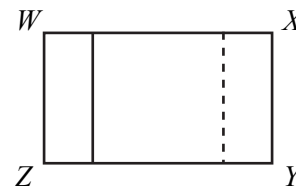
20. Betty and Ann are walking around a rectangular park with dimensions 600 m by 400 m, as shown. They both begin at the top left corner of the park and walk at constant but different speeds. Betty walks in a clockwise direction and Ann walks in a counterclockwise direction. Points P, Q, R, S, T divide the bottom edge of the park into six segments of equal length. When Betty and Ann meet for the first time, they are between Q and R. Which of the following could be the ratio of Betty's speed to Ann's speed?
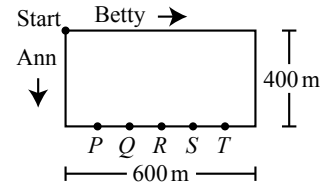
(A) $5 : 3$ (B) $9 : 4$ (C) $11 : 6$

(D) $12 : 5$ (E) $17 : 7$

Part C: Each correct answer is worth 8.

21. Rectangles that measure 4×2 are positioned in a pattern in which the top left vertex of each rectangle (after the top one) is placed at the midpoint of the bottom edge of the rectangle above it, as shown. When a total of ten rectangles are arranged in this pattern, what is the perimeter of the figure?
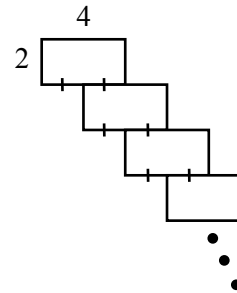
(A) 48   (B) 64   (C) 90

(D) 84   (E) 100

22. In the six-digit number $1ABCDE$, each letter represents a digit. Given that $1ABCDE \times 3 = ABCDE1$, the value of $A + B + C + D + E$ is

(A) 29   (B) 26   (C) 22   (D) 30   (E) 28

23. Given 8 dimes (10 ¢ coins) and 3 quarters (25 ¢ coins), how many different amounts of money can be created using one or more of the 11 coins?

(A) 27   (B) 29   (C) 35   (D) 26   (E) 28

24. Four vertices of a quadrilateral are located at $(7, 6)$, $(-5, 1)$, $(-2, -3)$, and $(10, 2)$. The area of the quadrilateral in square units is

(A) 60   (B) 63   (C) 67   (D) 70   (E) 72

25. Ashley writes out the first 2017 positive integers. She then underlines any of the 2017 integers that is a multiple of 2, and then underlines any of the 2017 integers that is a multiple of 3, and then underlines any of the 2017 integers that is a multiple of 5. Finally, Ashley finds the sum of all the integers which have *not* been underlined. What is this sum?

(A) $542\,708$ (B) $543\,213$ (C) $542\,203$ (D) $543\,326$ (E) $543\,618$