Canadian Mathematics Competition

An activity of the Centre for Education
in Mathematics and Computing,
University of Waterloo, Waterloo, Ontario

Gauss Contest (Grade 8)

(The Grade 7 Contest is on the reverse side)

Wednesday, May 14, 2008

Time: 1 hour   ©2008 Waterloo Mathematics Foundation

Calculators are permitted.

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.

Please see our Web site: http://www.cemc.uwaterloo.ca. The Gauss Report will list the names of some top-scoring students. You will also be able to find copies of past Contests and excellent resources for enrichment, problem solving and contest preparation.
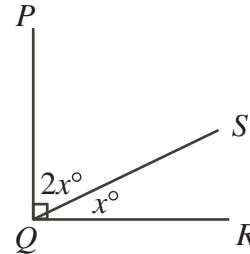
Grade 8

Part A: Each correct answer is worth 5.

1. The value of $8 \times (6 - 4) + 2$ is

   (A) 46   **(B)** 20   **(C)** 18   **(D)** 12   **(E)** 56

2. A regular polygon has perimeter 108 cm and each side has length 12 cm. How many sides does this polygon have?

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

3. In the diagram, $\angle PQR = 90°$. The value of x is

   (A) 30   **(B)** 60   **(C)** 90

   (D) 10   **(E)** 45

4. The value of $(1 + 2)^2 - (1^2 + 2^2)$ is

   (A) 14   **(B)** 4   **(C)** 2   **(D)** 12   **(E)** 1

5. When the numbers $0.28, -0.2, 2.8, -8.2$ are listed in increasing order, the correct order is

   (A) -8.2 , -0.2 , 0.28, 2.8
   (B) 2.8 , 0.28, -0.2 , -8.2
   (C) -8.2 , -0.2 , 2.8 , 0.28
   (D) 2.8 , 0.28, -8.2 , -0.2
   (E) -0.2 , -8.2 , 0.28, 2.8

6. In the table, what number should be placed in the box?

   (A) 27   **(B)** 247   **(C)** 79

   (D) 19   **(E)** 129

n	$n^3 + n - 1$
1	1
2	9
3	29
4	67
5	☐

7. The circle graph shows the favourite ice cream flavours of those surveyed. What fraction of people surveyed selected either chocolate or strawberry as their favourite flavour of ice cream?

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

   **(D)** $\frac{3}{4}$ **(E)** $\frac{5}{8}$
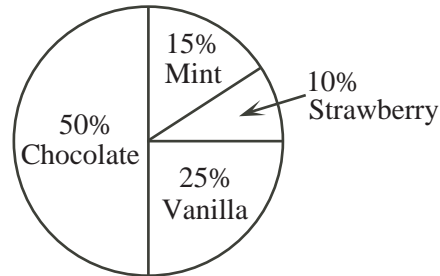
8. A number is multiplied by 5 and then 9 is subtracted from the result, giving 51. What is the original number?

   (A) 210   **(B)** 8.4   **(C)** 65   **(D)** 12   **(E)** 15

9. Danny weighs 40 kg. Steven weighs 20% more than Danny. Steven's weight is
   (A) 50 kg **(B)** 60 kg **(C)** 48 kg **(D)** 32 kg **(E)** 72 kg

10. The numbers 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13 are written on separate cards and placed face down on a table. A card is chosen at random and flipped over. What is the probability that the number on this card is a prime number?
    (A) $\frac{2}{11}$ **(B)** $\frac{4}{11}$ **(C)** $\frac{6}{11}$ **(D)** $\frac{3}{11}$ **(E)** $\frac{5}{11}$


Part B: Each correct answer is worth 6.

11. In the diagram, the rectangular solid has side lengths 1 m, 20 cm and 50 cm. The volume of the solid, in cubic centimetres, is
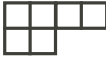   **(A)** 170 **(B)** 7000 **(C)** 1 000 000
    (D) 100 000 **(E)** 10 000
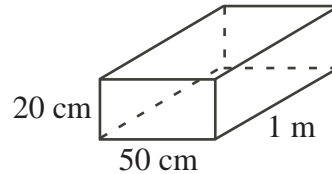
12. As a fund raiser, Gaussville Elementary School bought 8-slice pizzas for $6.85 each. The school bought 55 pizzas and sold every slice. If each slice sold for $1, the school's profit was
    (A) $55.00 **(B)** $57.75 **(C)** $60.50 **(D)** $63.25 **(E)** $66.00

13. In the diagram, RSP is a straight line and $\angle QSP = 80°$. The measure of $\angle PQR$ is
    (A) 120° **(B)** 90° **(C)** 80°
    (D) 60° **(E)** 75°
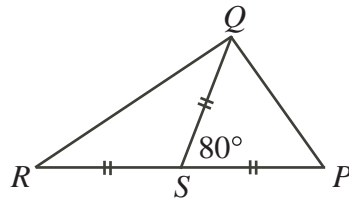
14. Amos is reading a 400 page book. On Monday, he reads 40 pages. On each day after the first, the number of pages that he reads is 20 more than on the previous day. Amos finishes the book on
    (A) Friday **(B)** Saturday **(C)** Sunday **(D)** Monday **(E)** Thursday

15. Abby has 23 coins. The coins have a total value of $4.55. If she has only quarters (worth 25 cents each) and nickels (worth 5 cents each), how many quarters does she have?
    (A) 15 **(B)** 17 **(C)** 18 **(D)** 16 **(E)** 21

16. A 4×4 square grid can be entirely covered by three non-overlapping pieces made from 1×1 squares. If the first two pieces are ⊞ and ⊞ , the third piece is
    (A) **(B)** **(C)** **(D)** **(E)**
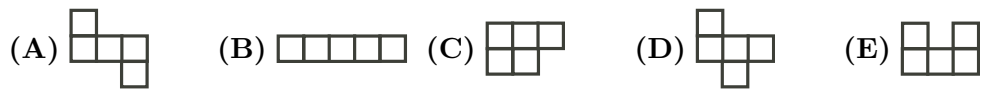
17. The decimal expansion of $\frac{2}{13}$ is the repeating decimal $0.\overline{153846}$. What digit occurs in the 2008th place after the decimal point?
    (A) 8 **(B)** 6 **(C)** 5 **(D)** 4 **(E)** 3

18. Andrea has finished the third day of a six-day canoe trip. If she has completed $\frac{3}{7}$ of the trip's total distance of 168 km, how many km per day must she average for the remainder of her trip?
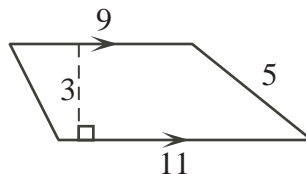   **(A)** 29 **(B)** 24 **(C)** 27 **(D)** 32 **(E)** 26

19. In the addition of three-digit numbers shown, the letters x and y represent different digits.

$$\begin{array}{cccc} & 3 & x & y \\ + & y & x & 3 \\ \hline 1 & x & 1 & x \end{array}$$

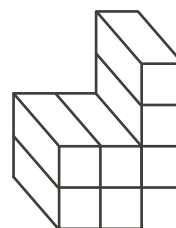The value of $y - x$ is

(A) 3   (B) -5 (C) 7   (D) -7 (E) 2

20. What is the area of the figure shown?

(A) 45   (B) 55   (C) 27

(D) 30   (E) 33

Part C: Each correct answer is worth 8.

21. In the diagram, the object is made up of seven $1 \times 1 \times 2$ solids. What is the total surface area of the object?

(A) 42   (B) 40   (C) 38

(D) 48   (E) 70

22. A 3×3 grid is filled with the digits 1, 2 and 3 so that each number appears once in in each row and column. Two different examples are

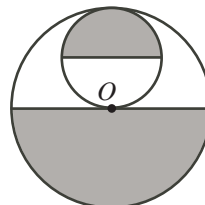| 1	2	3
3	1	2
2	3	1

and

3	2	1
2	1	3
1	3	2

.

How many different ways are there of filling the grid?

(A) 14   (B) 12   (C) 10   (D) 8   (E) 6

23. In the diagram, each circle is divided into two equal areas and O is the centre of the larger circle. The area of the larger circle is 64π. The total area of the shaded regions is

(A) 34π (B) 36π (C) 44π

(D) 40π (E) 33π

24. The sum of all of the digits of the integers from 98 to 101 is

$$9 + 8 + 9 + 9 + 1 + 0 + 0 + 1 + 0 + 1 = 38$$

The sum of all of the digits of the integers from 1 to 2008 is

(A) 30 054   (B) 27 018   (C) 28 036   (D) 30 036   (E) 28 054

25. Chantelle had two candles, one of which was 32 cm longer than the other.
She lit the longer one at 3 p.m. and lit the shorter one at 7 p.m.
At 9 p.m., they were both the same length.
The longer one was completely burned out at 10 p.m. and the shorter one was completely burned at midnight.
The two candles burned at different, but constant, rates.
What was the sum of the original lengths of the two candles?

(A) 42 cm   (B) 48 cm   (C) 60 cm   (D) 80 cm   (E) 52 cm