Gauss Contest

Grade 7

(The Grade 8 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**

Time: 1 hour   ©2014 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.
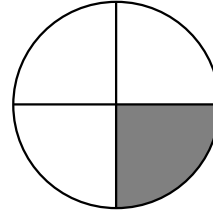
Grade 7

Part A: Each correct answer is worth 5.

1. In the diagram, the fraction of the circle that is shaded
    is equal to

    (A) $\frac{1}{2}$ **(B)** $\frac{1}{3}$ **(C)** $\frac{1}{4}$

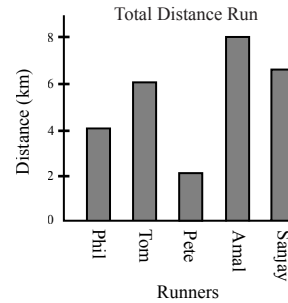   **(D)** $\frac{1}{6}$ **(E)** $\frac{1}{8}$

2. The value of $10 \times (5 - 2)$ is

    (A) 13   **(B)** 70   **(C)** 7   **(D)** 30   **(E)** 50

3. The graph shows the total distance that each of five
    runners ran during a one-hour training session. Which
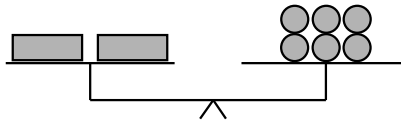   runner ran the least distance?

    (A) Phil   **(B)** Tom   **(C)** Pete

    (D) Amal   **(E)** Sanjay

4. The equal-arm scale shown is balanced.
    One [ ] has the same mass as

    (A) ⚪⚪
    (B) ⚪⚪⚪
    (C) ⚪⚪⚪⚪
    (D) ⚪⚪⚪⚪⚪
    (E) ⚪⚪⚪⚪⚪⚪

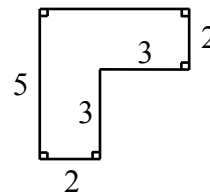5. Which of the following is closest to 5 cm?

    (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

6. The number of centimetres in 3.5 metres is

    (A) 350   **(B)** 30.5   **(C)** 3.05   **(D)** 3.50   **(E)** 305

7. The perimeter of the figure shown is

    (A) 18   **(B)** 17   **(C)** 23

    (D) 20   **(E)** 25

8. Hannah scored 312 points during the basketball season. If her average (mean) was
    13 points per game, how many games did she play?

   **(A)** 24   **(B)** 41   **(C)** 17   **(D)** 13   **(E)** 30

9. The number 6 has exactly four positive divisors: $1, 2, 3$, and 6. How many positive
    divisors does 20 have?

    (A) 2   **(B)** 6   **(C)** 3   **(D)** 5   **(E)** 8

10. How many different 3-digit whole numbers can be formed using the digits 4, 7 and 9, assuming that no digit can be repeated in a number?

    (A) 6   **(B)** 3   **(C)** 5   **(D)** 12   **(E)** 9

Part B: Each correct answer is worth 6.

11. At Gaussville School, a total of 480 students voted for their favourite subject. The results are summarized in the pie chart shown. How many students voted for math?

    (A) 184   **(B)** 192   **(C)** 96

    (D) 144   **(E)** 288
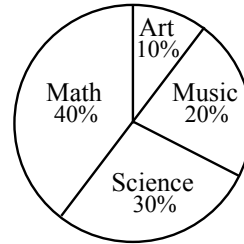
12. A piece of paper is folded in half, creating two layers of paper. The paper is then folded in half again. This is continued until the paper has been folded in half a total of five times. The total number of layers of paper in the folded sheet is

    (A) 16   **(B)** 32   **(C)** 25   **(D)** 8   **(E)** 64

13. How many even whole numbers between 1 and 99 are multiples of 5?

    (A) 5   **(B)** 7   **(C)** 9   **(D)** 11   **(E)** 13

14. In the 3×3 table shown, the numbers 1, 2 and 3 are placed so that each number occurs only once in each row and only once in each column. The value of $X + Y$ is

    (A) 3   **(B)** 2   **(C)** 5

    (D) 6   **(E)** 4

15. In the rectangle shown, the area of the shaded region is

    (A) $60 \, \text{cm}^2$ **(B)** $20 \, \text{cm}^2$ **(C)** $30 \, \text{cm}^2$

   **(D)** $40 \, \text{cm}^2$ **(E)** $50 \, \text{cm}^2$
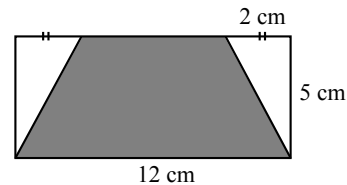
16. You have exactly \$4.40 (440 ¢) in quarters (25 ¢ coins), dimes (10 ¢ coins), and nickels (5 ¢ coins). You have the same number of each type of coin. How many dimes do you have?

    (A) 20   **(B)** 11   **(C)** 10   **(D)** 12   **(E)** 4

17. One corner of a cube is cut off, creating a new triangular face, as shown. How many edges does this new solid have?

    (A) 18   **(B)** 14   **(C)** 24

    (D) 15   **(E)** 13
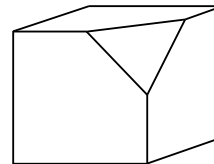
18. In the graph shown, which of the following represents the image of the line segment PQ after a reflection across the x-axis?

    (A) PS **(B)** TU **(C)** MN

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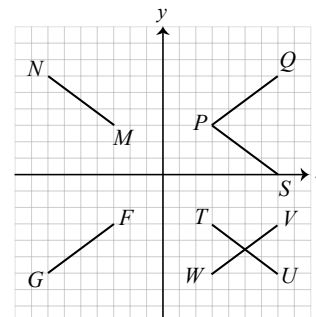
19. When expressed as a repeating decimal, the fraction $\frac{1}{7}$ is written as $0.142857142857\ldots$ (The 6 digits 142857 continue to repeat.) The digit in the third position to the right of the decimal point is 2. In which one of the following positions to the right of the decimal point will there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

    (A) 119th **(B)** 121st **(C)** 123rd **(D)** 125th **(E)** 126th

20. In a triangle, the measure of one of the angles is $45°$. The measures of the other two angles in the triangle are in the ratio $4:5$. What is the measure of the largest angle in the triangle?

   **(A)** $80°$ **(B)** $90°$ **(C)** $75°$ **(D)** $85°$ **(E)** $100°$

Part C: Each correct answer is worth 8.

21. The numbers 1 through 25 are arranged into 5 rows and 5 columns in the table below.

1	2	3	4	5
10	9	8	7	6
11	12	13	14	15
20	19	18	17	16
21	22	23	24	25

    What is the largest possible sum that can be made using five of these numbers such that no two numbers come from the same row and no two numbers come from the same column?

    (A) 75   **(B)** 73   **(C)** 71   **(D)** 70   **(E)** 68

22. The width of a rectangle is doubled and the length is halved. This produces a square with a perimeter of P. What is the perimeter of the original rectangle?

    (A) P **(B)** $2P$ **(C)** $\frac{1}{2}P$ **(D)** $\frac{5}{4}P$ **(E)** $\frac{5}{2}P$

23. A palindrome is a positive integer that is the same when read forwards or backwards. The numbers 101 and 4554 are examples of palindromes. The ratio of the number of 4-digit palindromes to the number of 5-digit palindromes is

    (A) $4:5$ **(B)** $5:2$ **(C)** $2:7$ **(D)** $4:3$ **(E)** $1:10$

24. In the diagram, rectangle $PQRS$ is made up of six identical squares. Points U, V, W, X, Y, and Z are midpoints of sides of the squares, as shown. Which of the following triangles has the greatest area?
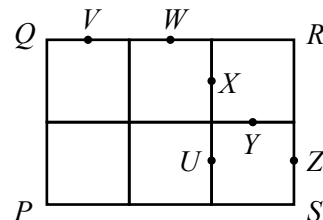
    (A) PVU **(B)** PXZ **(C)** PVX

    (D) PYS **(E)** PQW

25. Two different 2-digit positive integers are called a *reversal pair* if the position of the digits in the first integer is switched in the second integer. For example, 52 and 25 are a reversal pair. The integer 2015 has the property that it is equal to the product of three different prime numbers, two of which are a reversal pair. Including 2015, how many positive integers less than $10\,000$ have this same property?

    (A) 18   **(B)** 14   **(C)** 20   **(D)** 17   **(E)** 19