Gauss Contest

Grade 8

(The Grade 7 Contest is on the reverse side)

Wednesday, May 14, 2014
(in North America and South America)

Thursday, May 15, 2014
(outside of North America and South America)

UNIVERSITY OF
WATERLOO

WATERLOO
MATHEMATICS

Deloitte.

Time: 1 hour © 2013 University of Waterloo

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.

The name, school and location of some top-scoring students will be published on the Web site, http://www.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 number $10\,101$ is equal to

   (A) $1000 + 100 + 1$ **(B)** $1000 + 10 + 1$ **(C)** $10\,000 + 10 + 1$
   (D) $10\,000 + 100 + 1$ **(E)** $100\,000 + 100 + 1$

2. One scoop of fish food can feed 8 goldfish. How many goldfish can 4 scoops of fish food feed?

   (A) 12   **(B)** 16   **(C)** 8   **(D)** 64   **(E)** 32

3. The value of $(2014 - 2013) \times (2013 - 2012)$ is

   (A) 0   **(B)** 1   **(C)** 2   **(D)** 2014   **(E)** -1

4. In a right-angled triangle, the measure of one angle is $55°$. The measure of the smallest angle in this triangle is

   (A) $1°$ **(B)** $25°$ **(C)** $45°$ **(D)** $35°$ **(E)** $90°$

5. Which of the following integers is closest to zero?

   (A) -1101 **(B)** 1011 **(C)** -1010 **(D)** -1001 **(E)** 1110

6. The value of y that satisfies the equation $5y - 100 = 125$ is

   (A) 45   **(B)** 100   **(C)** 25   **(D)** -25 **(E)** -5

7. How many prime numbers are there between 10 and 30?

   (A) 4   **(B)** 7   **(C)** 6   **(D)** 3   **(E)** 5

8. The perimeter of the isosceles triangle shown is 53 cm. The value of x is

   (A) 11   **(B)** 21   **(C)** 20
   (D) 19   **(E)** 31

   x cm

   11 cm

9. Consider the set of fractions $\left\{\frac{3}{7}, \frac{3}{2}, \frac{6}{7}, \frac{3}{5}\right\}$. Ordered from smallest to largest, the set is

   (A) $\left\{\frac{3}{7}, \frac{3}{5}, \frac{6}{7}, \frac{3}{2}\right\}$ **(B)** $\left\{\frac{3}{2}, \frac{3}{5}, \frac{6}{7}, \frac{3}{7}\right\}$ **(C)** $\left\{\frac{3}{2}, \frac{3}{5}, \frac{3}{7}, \frac{6}{7}\right\}$
   (D) $\left\{\frac{3}{5}, \frac{3}{7}, \frac{6}{7}, \frac{3}{2}\right\}$ **(E)** $\left\{\frac{3}{7}, \frac{3}{5}, \frac{3}{2}, \frac{6}{7}\right\}$

10. The ratio of the number of girls to the number of boys in a class of 24 students is $3 : 5$. How many fewer girls than boys are in the class?

    (A) 2   **(B)** 4   **(C)** 5   **(D)** 6   **(E)** 8
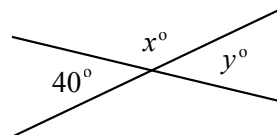
Part B: Each correct answer is worth 6.

11. John was born on a Wednesday. Alison was born 72 days later. On what day of the week was Alison born?

    (A) Thursday **(B)** Monday **(C)** Sunday **(D)** Saturday **(E)** Friday

12. If two straight lines intersect as shown, then $x - y$ is

    (A) 0   **(B)** 40   **(C)** 80

    (D) 60   **(E)** 100

13. In which set of scores is the median greater than the mean?

    (A) $10, 20, 40, 40, 40$ **(B)** $40, 50, 60, 70, 80$ **(C)** $20, 20, 20, 50, 80$

    (D) $10, 20, 30, 100, 200$ **(E)** $50, 50, 50, 50, 100$

14. Betty is making a sundae. She must randomly choose one flavour of ice cream (chocolate or vanilla or strawberry), one syrup (butterscotch or fudge) and one topping (cherry or banana or pineapple). What is the probability that she will choose a sundae with vanilla ice cream, fudge syrup and banana topping?

    (A) $\frac{1}{18}$ **(B)** $\frac{1}{6}$ **(C)** $\frac{1}{8}$ **(D)** $\frac{1}{9}$ **(E)** $\frac{1}{12}$

15. The point $A(1, 2)$ is reflected in the y-axis. The new coordinates are

    (A) $(1, 2)$ **(B)** $(-1, 2)$ **(C)** $(-1, -2)$

    (D) $(1, -2)$ **(E)** $(1, -1)$
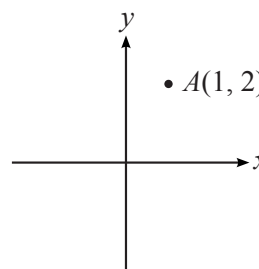
16. In the diagram, $ABCD$ is a rectangle. If the area of triangle ABP is 40, then the area of the shaded region is

    (A) 20   **(B)** 40   **(C)** 60

    (D) 50   **(E)** 80
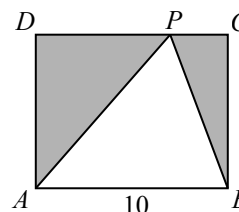
17. On a science test, Janine got 80% of the 10 multiple choice questions correct and 70% of the 30 short answer questions correct. What percentage of the 40 questions on the test did she answer correctly?

    (A) 74%   **(B)** 72.5%   **(C)** 76%   **(D)** 73%   **(E)** 73.5%

18. A rectangle whose side lengths are whole numbers has area 48 cm^2. The perimeter of this rectangle is 32 cm. Measured in cm, the positive difference between the length and the width of the rectangle is

    (A) 47   **(B)** 2   **(C)** 22   **(D)** 8   **(E)** 13

19. A bicycle at Store P costs $200. The regular price of the same bicycle at Store Q is 15% more than it is at Store P. The bicycle is on sale at Store Q for 10% off of the regular price. What is the sale price of the bicycle at Store Q?

    (A) $230.00   (B) $201.50   (C) $199.00   (D) $207.00   (E) $210.00

20. Of the five answers shown, which is the largest amount of postage you *cannot* make using only 5¢ and 8¢ stamps?

    (A) 19¢   (B) 22¢   (C) 27¢   (D) 39¢   (E) 43¢

Part C: Each correct answer is worth 8.

21. The diagram shown consists of circles with radius $1\,\text{cm}$ and semi-circles with radius $1\,\text{cm}$. The total shaded area, in cm^2, is

    (A) 10π (B) 9.5π (C) 9π

    (D) 8.5π (E) 8π
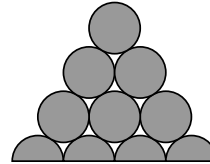
22. Beginning with a $3\,\text{cm}$ by $3\,\text{cm}$ by $3\,\text{cm}$ cube, a $1\,\text{cm}$ by $1\,\text{cm}$ by $1\,\text{cm}$ cube is cut from one corner and a $2\,\text{cm}$ by $2\,\text{cm}$ by $2\,\text{cm}$ cube is cut from the opposite corner, as shown. In cm^2, what is the surface area of the resulting solid?
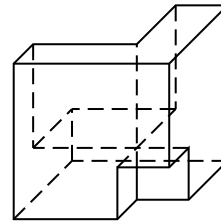
    (A) 42   (B) 45   (C) 48

    (D) 51   (E) 54

23. The sum of the first 100 positive integers is 5050. That is, $1+2+\cdots+99+100 = 5050$. What is the sum of the first 100 positive *odd* integers?

    (A) 5050   (B) 10 000   (C) 10 050   (D) 10 100   (E) 10 150

24. Grids are formed using 1×1 squares. The grid shown to the right contains squares of sizes 1×1, 2×2, 3×3, and 4×4, for a total of exactly 30 squares. Which of the following grids contains exactly 24 squares?

    (A)   (B)   (C)

    (D)   (E)

25. Residents were surveyed in order to determine which flowers to plant in the new Public Garden. A total of N people participated in the survey. Exactly $\frac{9}{14}$ of those surveyed said that the colour of the flower was important. Exactly $\frac{7}{12}$ of those surveyed said that the smell of the flower was important. In total, 753 people said that both the colour and smell were important. How many possible values are there for N?

    (A) 22   (B) 23   (C) 21   (D) 24   (E) 25