The CENTRE for EDUCATION
in MATHEMATICS and COMPUTING
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Gauss Contest

(Grade 8)

(The Grade 7 Contest is on the reverse side)

Wednesday, May 11, 2011

Time: 1 hour

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.

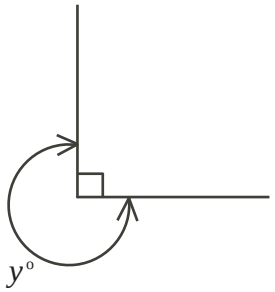
Scoring: There is *no penalty* for an incorrect answer.
Each unanswered question is worth 2, to a maximum of 10 unanswered questions.

Part A: Each correct answer is worth 5.

1. If $\frac{8}{12} = \frac{\square}{3}$, then the value represented by $\square$ is
   (A) 24 **(B)** 1 **(C)** 12 **(D)** 2 **(E)** 4

2. Ground beef sells for \$5.00 per kg. How much does 12 kg of ground beef cost?
   (A) \$5.00 **(B)** \$12.00 **(C)** \$60.00 **(D)** \$17.00 **(E)** \$2.40

3. In the diagram, the value of y is
   (A) 60 **(B)** 100 **(C)** 120
   (D) 180 **(E)** 270



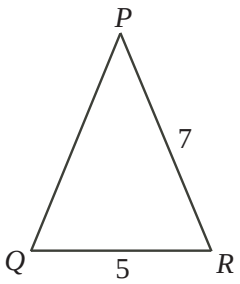
4. The largest number in the list $\left\{\frac{3}{10}, \frac{9}{20}, \frac{12}{25}, \frac{27}{50}, \frac{49}{100}\right\}$ is
   (A) $\frac{3}{10}$ **(B)** $\frac{9}{20}$ **(C)** $\frac{12}{25}$ **(D)** $\frac{27}{50}$ **(E)** $\frac{49}{100}$

5. A bag contains 15 balls. Exactly 3 of these balls are red. Alex reaches into the bag and randomly selects one of the balls. What is the probability that the ball that Alex selects is red?
   (A) $\frac{1}{5}$ **(B)** $\frac{4}{5}$ **(C)** $\frac{1}{15}$ **(D)** $\frac{1}{4}$ **(E)** $\frac{14}{15}$

6. If Clara doubles a number and then adds 3, the result is 23. The original number is
   (A) 13 **(B)** 10 **(C)** 49 **(D)** 17 **(E)** 20

7. A recipe calls for $4\frac{1}{2}$ cups of flour. If you only make half of the recipe, then how many cups of flour do you need?
   (A) $2\frac{1}{2}$ **(B)** $2\frac{1}{4}$ **(C)** 9 **(D)** 2 **(E)** $2\frac{3}{4}$

8. In the diagram, $\angle PQR = \angle PRQ$. If $QR = 5$ and $PR = 7$, then the perimeter of $\triangle PQR$ is
   (A) 12 **(B)** 14 **(C)** 17
   (D) 18 **(E)** 19



9. There are 15 girls in a class of 27 students. The ratio of boys to girls in this class is
   (A) 4 : 5 **(B)** 5 : 3 **(C)** 3 : 4 **(D)** 4 : 9 **(E)** 9 : 5

10. Five children had dinner. Chris ate more than Max. Brandon ate less than Kayla. Kayla ate less than Max but more than Tanya. Which child ate the second most?
    (A) Brandon **(B)** Chris **(C)** Kayla **(D)** Max **(E)** Tanya

Part B: Each correct answer is worth 6.

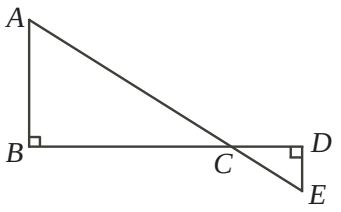
11. Which of the following expressions is equal to 5?
(A) $(2 \times 3)^2$ **(B)** $3 + 2^2$ **(C)** $2^3 - 1$
(D) $3^2 - 2^2$ **(E)** $(3 + 2)^2$

12. Nick charges \$7 for travel costs and then \$10 per hour for babysitting. Which expression always represents the number of dollars that Nick charges for y hours of babysitting?
(A) $10y + 7$ **(B)** $y + 7$ **(C)** $17y - 7$ **(D)** $10y - 7$ **(E)** $17y$

13. Kalob's window measures 50 cm × 80 cm. Which of the following measurements would give an area that is exactly double the area of his window?
(A) 25 cm × 160 cm **(B)** 40 cm × 100 cm **(C)** 50 cm × 160 cm
(D) 100 cm × 160 cm **(E)** 50 cm × 120 cm

14. March 3, 2009 or 3/3/09 was called a "square root day" because the day and the month are both the square root of the last two digits of the year. The number of square root days between January 1, 2012 and December 31, 2099 is
(A) 2 **(B)** 3 **(C)** 4 **(D)** 5 **(E)** 6

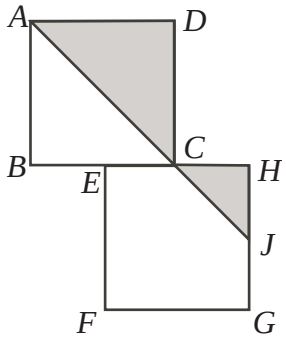
15. In the diagram, AE and BD are straight lines that intersect at C. If $BD = 16$, $AB = 9$, $CE = 5$, and $DE = 3$, then the length of AC is
(A) 11 **(B)** 12 **(C)** 15
(D) 17 **(E)** 16



16. Beatrix is twice the height of Violet, and Violet is $\frac{2}{3}$ the height of Georgia. What fraction of Georgia's height is Beatrix's height?
(A) $\frac{9}{7}$ **(B)** $\frac{2}{3}$ **(C)** $\frac{4}{3}$ **(D)** $\frac{5}{4}$ **(E)** $\frac{3}{2}$

17. If x is a number between 0 and 1, which of the following represents the smallest value?
(A) x **(B)** x^2 **(C)** $2x$ **(D)** $\sqrt{x}$ **(E)** $\frac{1}{x}$

18. Squares $ABCD$ and $EFGH$ are equal in area. Vertices B, E, C, and H lie on the same straight line. Diagonal AC is extended to J, the midpoint of GH. The fraction of the two squares that is shaded is
(A) $\frac{5}{8}$ **(B)** $\frac{1}{3}$ **(C)** $\frac{2}{5}$
(D) $\frac{5}{16}$ **(E)** $\frac{3}{8}$



19. How many positive integers less than 400 can be created using only the digits 1, 2 or 3, with repetition of digits allowed?
(A) 30 **(B)** 33 **(C)** 36 **(D)** 39 **(E)** 42

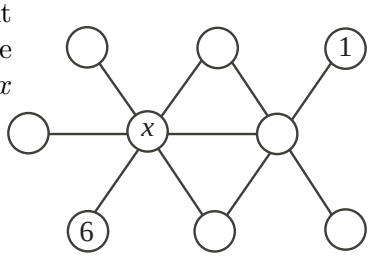
20. The heights of 12 boys and 10 girls in a class are recorded. The average height of all 22 students in the class is 103 cm. If the average height of the boys is 108 cm, then the average height of the girls is
(A) 96 cm **(B)** 97 cm **(C)** 98 cm **(D)** 99 cm **(E)** 100 cm

Part C: Each correct answer is worth 8.

21. A collection of coins includes only pennies (1¢), nickels (5¢), dimes (10¢) and quarters (25¢). Using the coins in this collection, it is possible to create any amount of money less than one dollar (100¢). What is the smallest possible number of coins in the collection?

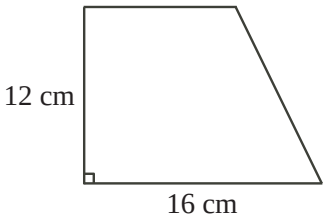
(A) 10 **(B)** 7 **(C)** 11 **(D)** 13 **(E)** 12

22. In the diagram, each of the integers 1 through 9 is to be placed in one circle so that the integers in every straight row of three joined circles add to 18. The 6 and 1 have been filled in. The value of the number represented by x is



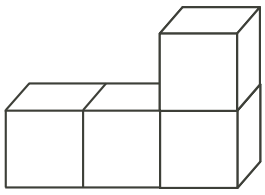
(A) 4 **(B)** 5 **(C)** 7
(D) 8 **(E)** 3

23. The trapezoid shown has a height of length 12 cm, a base of length 16 cm, and an area of 162 cm^2. The perimeter of the trapezoid is



(A) 51 cm **(B)** 52 cm **(C)** $49.\overline{6}$ cm
(D) 50 cm **(E)** 56 cm

24. Ada has a set of identical cubes. She makes solids by gluing together 4 of these cubes. When cube faces are glued together, they must coincide. Each of the 4 cubes must have a face that coincides with a face of at least one of the other 3 cubes. One such solid is shown. The number of unique solids that Ada can make using 4 cubes is



(A) 5 **(B)** 6 **(C)** 7
(D) 8 **(E)** 10

25. Daryl first writes the perfect squares as a sequence

$$1, 4, 9, 16, 25, 36, 49, 64, 81, 100, \ldots$$

After the number 1, he then alternates by making two terms negative followed by leaving two terms positive. Daryl's new sequence is

$$1, -4, -9, 16, 25, -36, -49, 64, 81, -100, \ldots$$

What is the sum of the first 2011 terms in this new sequence?

(A) $-4\,042\,109$ **(B)** $-4\,047\,638$ **(C)** $-4\,038\,094$
(D) $-4\,044\,121$ **(E)** $-4\,046\,132$