



The CENTRE for EDUCATION
in MATHEMATICS and COMPUTING
cemc.uwaterloo.ca

Gauss Contest

Grade 7

(The Grade 8 Contest is on the reverse side)

Wednesday, May 15, 2019
(in North America and South America)

Thursday, May 16, 2019
(outside of North America and South America)



UNIVERSITY OF
WATERLOO

Time: 1 hour

©2018 University of Waterloo

Calculating devices are allowed, provided that they do not have any of the following features: (i) internet access, (ii) the ability to communicate with other devices, (iii) information previously stored by students (such as formulas, programs, notes, etc.), (iv) a computer algebra system, (v) dynamic geometry software.

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.

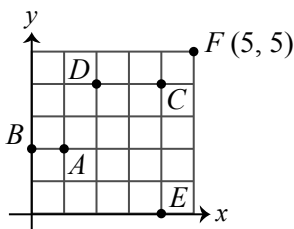
Grade 7

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

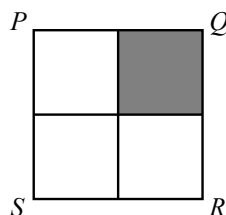
Part A: Each correct answer is worth 5.

1. Erin receives \$3 a day. How many days will it take Erin to receive a total of \$30?
 (A) 8 (B) 12 (C) 14 (D) 27 (E) 10

2. In the diagram, point F has coordinates $(5, 5)$. The point with coordinates $(2, 4)$ is located at
 (A) A (B) B (C) C
 (D) D (E) E

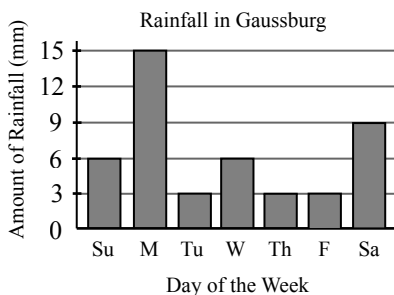


3. In the diagram, square $PQRS$ is divided into four identical squares. What percentage of square $PQRS$ is shaded?
 (A) 33% (B) 40% (C) 25%
 (D) 50% (E) 15%



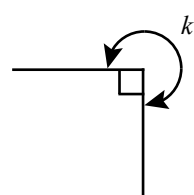
4. The value of $0.9 + 0.09$ is
 (A) 1.08 (B) 0.909 (C) 1.8 (D) 0.99 (E) 0.18

5. Based on the graph shown, what is the mode for the amount of rainfall for the week?
 (A) 9 mm (B) 12 mm (C) 3 mm
 (D) 15 mm (E) 6 mm



6. If $x = 3$, which of the following is true?
 (A) $2x = 5$ (B) $3x - 1 = 8$ (C) $x + 5 = 3$ (D) $7 - x = 2$ (E) $6 + 2x = 14$
7. When two numbers are added, the result is -26 . If one of the numbers is 11, what is the other number?
 (A) -37 (B) 37 (C) -15 (D) 15 (E) -48
8. Joshua is reading a 396-page book. He has read the first third of the book only. How many pages does he have left to read to finish the rest of the book?
 (A) 264 (B) 124 (C) 250 (D) 199 (E) 244

9. In the diagram, the value of k is
 (A) 180 (B) 210 (C) 240
 (D) 270 (E) 300



10. The mean (average) of the numbers 20, 30, 40 is equal to the mean of the numbers
 (A) 28, 30, 31 (B) 24, 30, 38 (C) 22, 30, 39
 (D) 23, 30, 37 (E) 25, 30, 34

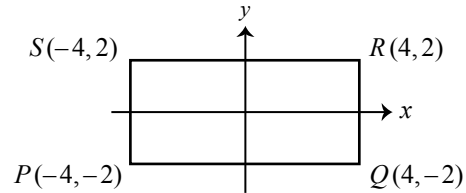
Part B: Each correct answer is worth 6.

11. The value of $\sqrt{81}$ is equal to

(A) 3 (B) 3^2 (C) 3^3 (D) 3^4 (E) 3^5

12. In the diagram, what is the area of rectangle $PQRS$?

(A) 36 (B) 32 (C) 40
 (D) 20 (E) 44

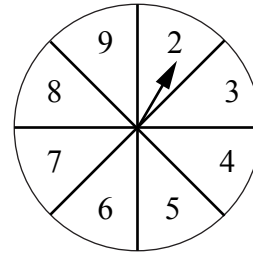


13. A piano has 52 white keys that occur in a repeating pattern of ABCDEFG. The first white key is A. What letter is associated with the 33rd white key?

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

14. A circular spinner is divided into 8 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 prime number that is odd?

(A) $\frac{1}{8}$ (B) $\frac{2}{8}$ (C) $\frac{3}{8}$
 (D) $\frac{4}{8}$ (E) $\frac{7}{8}$



15. Canadian currency has coins with values \$2.00, \$1.00, \$0.25, \$0.10, and \$0.05. Barry has 12 coins including at least one of each of these coins. What is the smallest total amount of money that Barry could have?

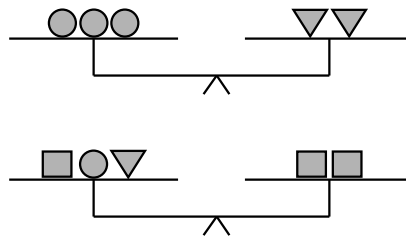
(A) \$3.75 (B) \$3.90 (C) \$3.70 (D) \$3.40 (E) \$3.95

16. A positive integer whose digits are the same when read forwards or backwards is called a *palindrome*. For example 474 and 222 are palindromes. How many palindromes are there between 100 and 1000?

(A) 10 (B) 90 (C) 100 (D) 900 (E) 1000

17. The two equal-arm scales shown are balanced. Of the following, $\bigcirc \nabla \nabla \nabla$ has the same mass as

(A) $\square \square \square$
 (B) $\nabla \nabla \square \square$
 (C) $\bigcirc \bigcirc \bigcirc \bigcirc$
 (D) $\bigcirc \bigcirc \bigcirc \square$
 (E) $\bigcirc \bigcirc \bigcirc$



18. A rectangle has length x and width y . A triangle has base 16 and height x . If the area of the rectangle is equal to the area of the triangle, then the value of y is

(A) 16 (B) 4 (C) 8 (D) 12 (E) 32

19. Each of a , b , c , and d is a positive integer and is greater than 3. If

$$\frac{1}{a-2} = \frac{1}{b+2} = \frac{1}{c+1} = \frac{1}{d-3}$$

then which ordering of these four numbers is correct?

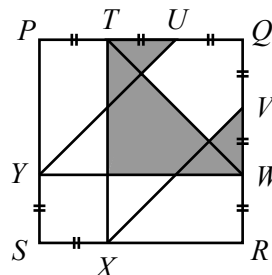
- (A) $a < b < c < d$ (B) $c < b < a < d$ (C) $b < a < c < d$
 (D) $d < a < c < b$ (E) $b < c < a < d$
20. The positive integer n has exactly 8 positive divisors including 1 and n . Two of these divisors are 14 and 21. What is the sum of all 8 positive divisors of n ?
- (A) 35 (B) 47 (C) 53 (D) 96 (E) 103

Part C: Each correct answer is worth 8.

21. Kathy owns more cats than Alice and more dogs than Bruce. Alice owns more dogs than Kathy and fewer cats than Bruce. Which of the statements *must* be true?
- (A) Bruce owns the fewest cats.
 (B) Bruce owns the most cats.
 (C) Kathy owns the most cats.
 (D) Alice owns the most dogs.
 (E) Kathy owns the fewest dogs.
22. Each of the integers 334 and 419 has digits whose product is 36. How many 3-digit positive integers have digits whose product is 36?
- (A) 21 (B) 15 (C) 18 (D) 24 (E) 12

23. Points T, U, V, W, X, Y lie on square $PQRS$, as shown. If $PT = TU = UQ = QV = VW = WR = XS = SY$, what fraction of the area of square $PQRS$ is shaded?

- (A) $\frac{5}{18}$ (B) $\frac{1}{3}$ (C) $\frac{2}{9}$
 (D) $\frac{1}{4}$ (E) $\frac{1}{6}$



24. A dot starts at $(20, 19)$. It can move one unit vertically or horizontally to one of the points $(21, 19)$, $(19, 19)$, $(20, 20)$, or $(20, 18)$. From there it can move two units in either direction that is perpendicular to the first move. All moves thereafter increase in length by one unit (three units, four units, five units, etc.) and must be perpendicular to the direction of the previous move. The dot stops after ten moves. Which of the following final locations is *not* possible?
- (A) $(27, 33)$ (B) $(30, 40)$ (C) $(21, 21)$ (D) $(42, 44)$ (E) $(37, 37)$
25. An $8 \times 8 \times n$ rectangular prism is made up from $1 \times 1 \times 1$ cubes. Suppose that A is the surface area of the prism and B is the combined surface area of the $1 \times 1 \times 1$ cubes that make up the prism. What is the sum of the values of n for which $\frac{B}{A}$ is an integer?
- (A) 86 (B) 90 (C) 70 (D) 78 (E) 96