



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

Gauss Contest

Grade 8

(The Grade 7 Contest is on the reverse side)

Wednesday, May 16, 2018
(in North America and South America)

Thursday, May 17, 2018
(outside of North America and South America)



UNIVERSITY OF
WATERLOO

Time: 1 hour

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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) previously stored information 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.

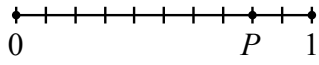
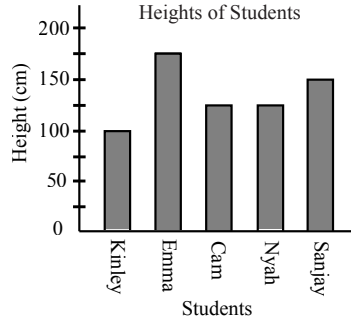
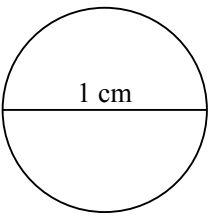
The name, school and location of some top-scoring students will be published on the Web site, cemc.uwaterloo.ca. You will also be able to find copies of past Contests and excellent resources for enrichment, problem solving and contest preparation.

Grade 8

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.

- The cost of 1 melon is \$3. What is the cost of 6 melons?
 (A) \$12 (B) \$15 (C) \$18 (D) \$21 (E) \$24
 - In the diagram, the number line is divided into 10 equal parts. The numbers 0, 1 and P are marked on the line. What is the value of P ?
 (A) 0.2 (B) 0.6 (C) 0.7
 (D) 0.8 (E) 0.9
- 
- The value of $(2 + 3)^2 - (2^2 + 3^2)$ is
 (A) 50 (B) 12 (C) 15 (D) -15 (E) -12
 - Lakshmi is travelling at 50 km/h. How many kilometres does she travel in 30 minutes?
 (A) 30 km (B) 50 km (C) 25 km (D) 150 km (E) 100 km
 - Evgeny has 3 roses, 2 tulips, 4 daisies, and 6 lilies. If he randomly chooses one of these flowers, what is the probability that it is a tulip?
 (A) $\frac{3}{15}$ (B) $\frac{12}{15}$ (C) $\frac{6}{15}$ (D) $\frac{4}{15}$ (E) $\frac{2}{15}$
 - The heights of five students at Gleeson Middle School are shown in the graph. The range of the heights is closest to
 (A) 75 cm (B) 0 cm (C) 25 cm
 (D) 100 cm (E) 50 cm
- 
- The circle has a diameter of 1 cm, as shown. The circumference of the circle is between
 (A) 2 cm and 3 cm
 (B) 3 cm and 4 cm
 (C) 4 cm and 5 cm
 (D) 5 cm and 6 cm
 (E) 6 cm and 8 cm
- 
- Rich and Ben ate an entire chocolate cake. The ratio of the amount eaten by Rich to the amount eaten by Ben is 3 : 1. What percentage of the cake did Ben eat?
 (A) 66% (B) 50% (C) 75% (D) 25% (E) 10%
 - The 26 letters of the alphabet are written in order, clockwise around a circle. The *ciphertext* of a message is created by replacing each letter of the message by the letter that is 4 letters clockwise from the original letter. (This is called a *Caesar cipher*.) For example, the message *ZAP* has ciphertext *DET*. What is the ciphertext of the message *WIN*?
 (A) *ALN* (B) *ZLN* (C) *AMR* (D) *AMQ* (E) *ZMQ*

Grade 8

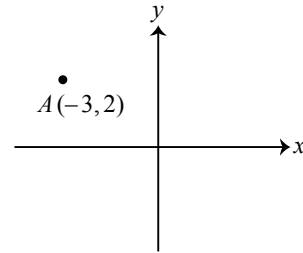
10. The sum of 3 consecutive even numbers is 312. What is the largest of these 3 numbers?
 (A) 54 (B) 106 (C) 86 (D) 108 (E) 102

Part B: Each correct answer is worth 6.

11. If $4x + 12 = 48$, the value of x is
 (A) 12 (B) 32 (C) 15 (D) 6 (E) 9
12. There is a 3 hour time difference between Vancouver and Toronto. For example, when it is 1:00 p.m. in Vancouver, it is 4:00 p.m. in Toronto. What time is it in Vancouver when it is 6:30 p.m. in Toronto?
 (A) 9:30 p.m (B) 2:30 p.m. (C) 3:30 p.m. (D) 8:30 p.m. (E) 4:30 p.m.
13. Mateo and Sydney win a contest. As his prize, Mateo receives \$20 every hour for one week. As her prize, Sydney receives \$400 every day for one week. What is the difference in the total amounts of money that they receive over the one week period?
 (A) \$560 (B) \$80 (C) \$1120 (D) \$380 (E) \$784
14. The number 2018 has exactly two divisors that are prime numbers. The sum of these two prime numbers is
 (A) 793 (B) 1011 (C) 38 (D) 209 (E) 507
15. Five classmates, Barry, Hwan, Daya, Cindy, and Ed will compete in a contest. There are no ties allowed. In how many ways can first, second and third place awards be given out?
 (A) 6 (B) 60 (C) 125 (D) 3 (E) 27
16. There are several groups of six integers whose product is 1. Which of the following cannot be the sum of such a group of six integers?
 (A) -6 (B) -2 (C) 0 (D) 2 (E) 6

17. A translation moves point $A(-3, 2)$ to the right 5 units and up 3 units. This translation is done a total of 6 times. After these translations, the point is at (x, y) . What is the value of $x + y$?

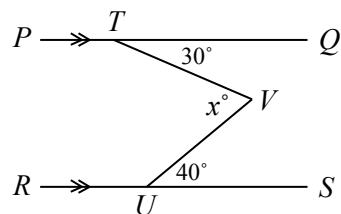
- (A) 34 (B) 49 (C) 53
 (D) 47 (E) 43



18. The volume of a rectangular prism is 30 cm^3 . The length of the prism is doubled, the width is tripled, and the height is divided by four. The volume of the new prism is
 (A) 31 cm^3 (B) 120 cm^3 (C) 60 cm^3 (D) 90 cm^3 (E) 45 cm^3
19. The mean (average) height of a group of children would be increased by 6 cm if 12 of the children in the group were each 8 cm taller. How many children are in the group?
 (A) 16 (B) 14 (C) 21 (D) 26 (E) 9

20. Line segments PQ and RS are parallel. Points T, U, V are placed so that $\angle QTV = 30^\circ$, $\angle SUV = 40^\circ$, and $\angle TVU = x^\circ$, as shown. What is the value of x ?

- (A) 80 (B) 85 (C) 65
 (D) 70 (E) 75



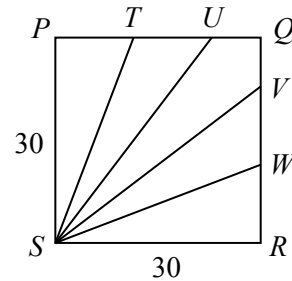
Part C: Each correct answer is worth 8.

21. A bag contains marbles of five different colours. One marble is chosen at random. The probability of choosing a brown marble is 0.3. Choosing a brown marble is three times as likely as choosing a purple marble. Choosing a green marble is equally likely as choosing a purple marble. Choosing a red marble is equally likely as choosing a yellow marble. The probability of choosing a marble that is either red or green is

(A) 0.2 (B) 0.25 (C) 0.35 (D) 0.4 (E) 0.55

22. Square $PQRS$ has side length 30, as shown. The square is divided into 5 regions of equal area: $\triangle SPT$, $\triangle STU$, $\triangle SVW$, $\triangle SWR$, and quadrilateral $SUQV$. The value of $\frac{SU}{ST}$ is closest to

(A) 1.17 (B) 1.19 (C) 1.21
(D) 1.23 (E) 1.25



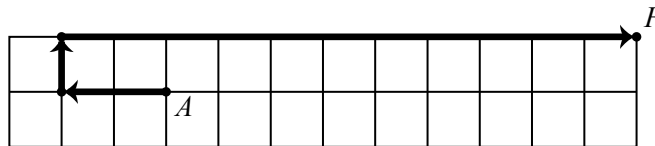
23. The smallest positive integer n for which $n(n+1)(n+2)$ is a multiple of 5 is $n = 3$. All positive integers, n , for which $n(n+1)(n+2)$ is a multiple of 5 are listed in increasing order. What is the 2018th integer in the list?

(A) 3362 (B) 3360 (C) 3363 (D) 3361 (E) 3364

24. Lynne chooses four distinct digits from 1 to 9 and arranges them to form the 24 possible four-digit numbers. These 24 numbers are added together giving the result N . For all possible choices of the four distinct digits, what is the largest sum of the distinct prime factors of N ?

(A) 157 (B) 148 (C) 127 (D) 146 (E) 124

25. In the 2×12 grid shown, Ashley draws paths from A to F along the gridlines.



In every path,

- there are two or more arrows arranged head to tail,
- the tail of the first arrow starts at A and the head of the last arrow ends at F ,
- two consecutive arrows must be perpendicular to one another,
- no two arrows can intersect at more than one point, and
- all arrows have different lengths.

The path from A to F shown consists of arrows of three different lengths: left 2, up 1, right 11. How many different paths are there from A to F ?

(A) 54 (B) 55 (C) 56 (D) 57 (E) 58