



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 10, 2017

(in North America and South America)

Thursday, May 11, 2017

(outside of North America and South America)



UNIVERSITY OF
WATERLOO

Time: 1 hour

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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 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.

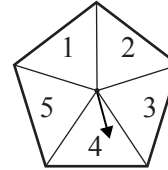
1. Michael has \$280 in \$20 bills. How many \$20 bills does he have?

(A) 10 (B) 12 (C) 14 (D) 16 (E) 18

2. The value of $4^2 - 2^3$ is

(A) 8 (B) 2 (C) 4 (D) 0 (E) 6

3. A pentagon is divided into 5 equal sections, as shown. An arrow is attached to the centre of the pentagon. The arrow is spun once. What is the probability that the arrow stops in the section numbered 4?



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

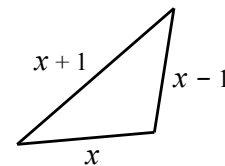
4. There are 160 students in grade 8 at Murray Public School. If exactly 10% of these students are on the school's chess team, how many grade 8 students are on the team?

(A) 26 (B) 16 (C) 20 (D) 12 (E) 18

5. 44×22 is equal to

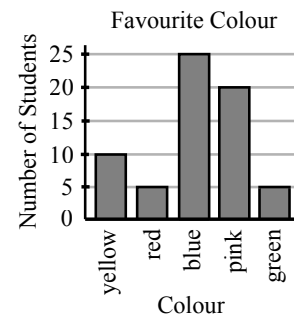
(A) 88×2 (B) 88×11 (C) 88×20 (D) 88×44 (E) 88×40

6. If the perimeter of the triangle shown is 21, what is the value of x ?



(A) 3 (B) 7 (C) 8
 (D) 13 (E) 16

7. Students were surveyed about their favourite colour and the results are displayed in the graph shown. What is the ratio of the number of students who chose pink to the number of students who chose blue?



(A) 4 : 5 (B) 3 : 5 (C) 1 : 5
 (D) 2 : 5 (E) 5 : 3

8. When a number is tripled and then decreased by 6, the result is 15. The number is

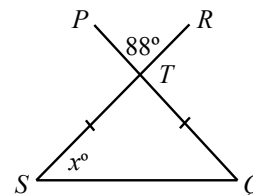
(A) 8 (B) 6 (C) 5 (D) 7 (E) 9

9. Tian measured her steps and found that it took her 625 steps to walk 500 m. If she walks 10 000 steps at this same rate, what distance will she walk?

(A) 6.4 km (B) 6.25 km (C) 7.5 km (D) 8 km (E) 7.2 km

10. Line segments PQ and RS intersect at T , as shown. If $TS = TQ$ and $\angle PTR = 88^\circ$, the value of x is

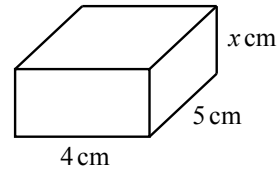
(A) 44 (B) 46 (C) 88
 (D) 45 (E) 50



Part B: Each correct answer is worth 6.

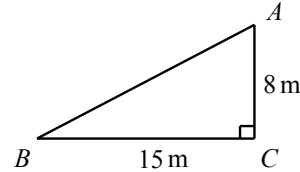
11. The volume of the rectangular prism shown is 60 cm^3 .
What is the value of x ?

(A) 1 (B) 4 (C) 6
(D) 3 (E) 2



12. In the diagram shown, David begins at A and walks in a straight line to C , and then walks in a straight line from C to B . Cindy also begins at A and walks in a straight line to B . How much farther does David walk than Cindy?

(A) 0 m (B) 2 m (C) 4 m
(D) 6 m (E) 7 m



13. The sum of the first 100 positive integers (that is, $1+2+3+\dots+99+100$) equals 5050. The sum of the first 100 positive multiples of 10 (that is, $10+20+30+\dots+990+1000$) equals

(A) 10 100 (B) 5950 (C) 50 500 (D) 6050 (E) 45 450

14. There are 20 pens to be given away to 4 students. Each student receives a different number of pens and each student receives at least one pen. What is the largest number of pens that a student can receive?

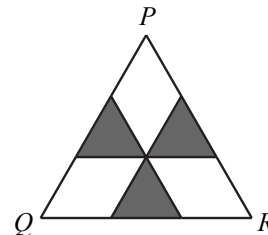
(A) 17 (B) 15 (C) 14 (D) 8 (E) 5

15. The number of even integers between 1 and 103 is the same as the number of odd integers between 4 and

(A) 104 (B) 102 (C) 100 (D) 108 (E) 106

16. In the diagram, $\triangle PQR$ is equilateral and has side length 6 cm. Each of the shaded triangles is equilateral and has side length 2 cm. What fraction of the area of $\triangle PQR$ is shaded?

(A) $\frac{3}{7}$ (B) $\frac{1}{3}$ (C) $\frac{1}{2}$
(D) $\frac{3}{5}$ (E) $\frac{2}{3}$



17. On coach Wooden's basketball team:

- Meghan is the tallest player,
- Meghan's height is 188 cm, and
- Avery is the shortest player.

When used with the information above, which of the following single statements is enough to determine Avery's height?

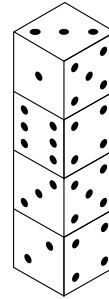
(A) The median of the players' heights is 170 cm
(B) The mode of the players' heights is 160 cm
(C) The mean of the players' heights is 165 cm
(D) The range of the players' heights is 33 cm
(E) There are 10 players on the team

Grade 8

18. Brodie and Ryan are driving directly towards each other. Brodie is driving at a constant speed of 50 km/h. Ryan is driving at a constant speed of 40 km/h. If they are 120 km apart, how long will it take before they meet?
 (A) 1 h 12 min (B) 1 h 25 min (C) 1 h 15 min (D) 1 h 33 min (E) 1 h 20 min
19. In a group of seven friends, the mean (average) age of three of the friends is 12 years and 3 months and the mean age of the remaining four friends is 13 years and 5 months. In months, the mean age of all seven friends is
 (A) 156 (B) 154 (C) $155\frac{1}{2}$ (D) 157 (E) 155
20. In the six-digit number $1ABCDE$, each letter represents a digit. Given that $1ABCDE \times 3 = ABCDE1$, the value of $A + B + C + D + E$ is
 (A) 29 (B) 26 (C) 22 (D) 30 (E) 28

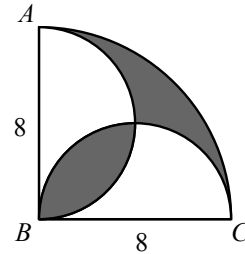
Part C: Each correct answer is worth 8.

21. The number of dots on opposite faces of a regular die add to 7. Four regular dice are arranged as shown. Which of the following could be the sum of the number of dots hidden between the dice?
 (A) 22 (B) 26 (C) 24
 (D) 21 (E) 23



22. The values 2, 3, 4, and 5 are each assigned to exactly one of the letters $V, W, X,$ and Y to give $Y^X - W^V$ the greatest possible value. The value of $X + V$ is equal to
 (A) 5 (B) 6 (C) 7 (D) 8 (E) 9
23. Mike and Alain play a game in which each player is equally likely to win. The first player to win three games becomes the champion, and no further games are played. If Mike has won the first game, what is the probability that Mike becomes the champion?
 (A) $\frac{1}{4}$ (B) $\frac{5}{8}$ (C) $\frac{11}{16}$ (D) $\frac{3}{5}$ (E) $\frac{3}{4}$

24. In the diagram, ABC is a quarter of a circle with radius 8. A semi-circle with diameter AB is drawn, as shown. A second semi-circle with diameter BC is also drawn. The area of the shaded region is closest to
 (A) 22.3 (B) 33.5 (C) 25.1
 (D) 18.3 (E) 20.3



25. Brady is stacking 600 plates in a single stack. Each plate is coloured black, gold or red. Any black plates are always stacked below any gold plates, which are always stacked below any red plates. The total number of black plates is always a multiple of two, the total number of gold plates is always a multiple of three, and the total number of red plates is always a multiple of six. For example, the plates could be stacked with:
- 180 black plates below 300 gold plates below 120 red plates, or
 - 450 black plates below 150 red plates, or
 - 600 gold plates.

In how many different ways could Brady stack the plates?

- (A) 5139 (B) 5142 (C) 5145 (D) 5148 (E) 5151