



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

Pascal Contest

(Grade 9)

Wednesday, February 26, 2025
(in North America and South America)

Thursday, February 27, 2025
(outside of North America and South America)



UNIVERSITY OF
WATERLOO

Time: 60 minutes

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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) 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 response form. If you are not sure, ask your teacher to clarify it. All coding must be done with a pencil, preferably HB. Fill in circles completely.
4. On your response form, print your school name and city/town in the box in the upper right corner.
5. **Be certain that you code your name, age, grade, and the Contest you are writing in the response form. Only those who do so can be counted as eligible students.**
6. Part A and Part B of this contest are multiple choice. Each of the questions in these parts is followed by five possible answers marked **A**, **B**, **C**, **D**, and **E**. Only one of these is correct. After making your choice, fill in the appropriate circle on the response form.
7. The correct answer to each question in Part C is an integer from 0 to 99, inclusive. After deciding on your answer, fill in the appropriate two circles on the response form. A one-digit answer (such as “7”) must be coded with a leading zero (“07”).
8. 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.
9. Diagrams are *not* drawn to scale. They are intended as aids only.
10. When your supervisor tells you to begin, you will have 60 minutes of working time.
11. You may not write more than one of the Pascal, Cayley and Fermat Contests in any given year.

Do not discuss the problems or solutions from this contest online for the next 48 hours.

The name, grade, school and location, and score range of some top-scoring students will be published on our website, cemc.uwaterloo.ca. In addition, the name, grade, school and location, and score of some top-scoring students may be shared with other mathematical organizations for other recognition opportunities.

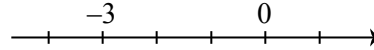
Scoring: There is *no penalty* for an incorrect answer.
 Each unanswered question is worth 2, to a maximum of 10 unanswered questions.

Part A: Each correct answer is worth 5.

1. The value of $(2 \times 0) + (2 \times 5)$ is
 (A) 0 (B) 7 (C) 10 (D) 12 (E) 20

2. How many of the numbers $-4, -2, -3.5, -2.5,$ and 6 are to the left of -3 when placed on the number line?

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

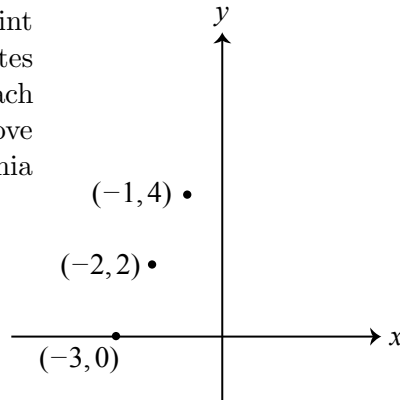


3. If $18 + 18 + 18 = 3x$, then x is equal to
 (A) 3 (B) 6 (C) 12 (D) 18 (E) 36

4. How many multiples of 5 are between 8 and 58?
 (A) 12 (B) 6 (C) 11 (D) 8 (E) 10

5. Cynthia graphs a sequence of points. The first point has coordinates $(-3, 0)$, the second point has coordinates $(-2, 2)$, and the third point has coordinates $(-1, 4)$. Each point after the first is 1 unit to the right and 2 units above the previous point. What is the fourth point that Cynthia graphs?

- (A) $(1, 5)$ (B) $(-4, -2)$ (C) $(2, 6)$
 (D) $(0, 5)$ (E) $(0, 6)$



6. If $4^3 = 8^a$, the value of a is
 (A) $\sqrt{3}$ (B) 2 (C) 3 (D) 4 (E) 6

7. The Grade 8 and Grade 9 students at Pascal S.S. were surveyed about puzzles. Their responses are summarized in the chart shown, but two of the entries in the chart were erased. In total, how many Grade 9 students were surveyed?

- (A) 140 (B) 125 (C) 116
 (D) 160 (E) 149

	Like	Don't Like
Grade 8		92
Grade 9	68	
TOTAL	125	140

8. Rachel, Christophe and Alfonzo are paid to organize some books. In total, they are paid \$50. Alfonzo is paid \$14. Rachel is paid twice what Christophe is paid. How much is Christophe paid?

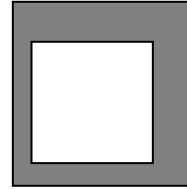
- (A) \$10 (B) \$12 (C) \$14 (D) \$16 (E) \$18

9. Suppose that $6x + 3 = y$, where x is a positive integer. A possible value of y is

- (A) 18 (B) 32 (C) 38 (D) 45 (E) 55

10. A small square is drawn inside a larger square, as shown. The area of the shaded region and the area of the unshaded region are each 18 cm^2 . What is the side length of the larger square?

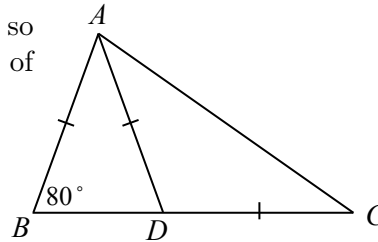
(A) 3 cm (B) 4 cm (C) 6 cm
 (D) 9 cm (E) 12 cm



Part B: Each correct answer is worth 6.

11. In the diagram, point D lies on side BC of $\triangle ABC$ so that $AB = AD = CD$. If $\angle ABC = 80^\circ$, the measure of $\angle ACD$ is

(A) 20° (B) 60° (C) 80°
 (D) 100° (E) 40°

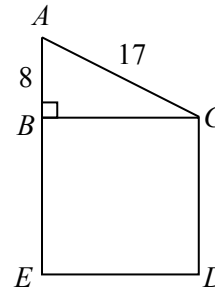


12. The sum of 10 positive integers is 30. What is the largest number that can be used in this sum?

(A) 17 (B) 19 (C) 21 (D) 23 (E) 25

13. In the diagram, $\triangle ABC$ is right-angled at B and $BCDE$ is a square. If $AB = 8$ and $AC = 17$, the area of square $BCDE$ is

(A) 60 (B) 81 (C) 225
 (D) 289 (E) 353



14. The Edmonston Eulers hockey team played 5 games with an average of 3 goals per game. How many goals do they need to score in their 6th game to increase their average to 4 goals per game?

(A) 3 (B) 5 (C) 7 (D) 9 (E) 11

15. Three students took a 3-question quiz. Their teacher recorded their answers in a chart:

	Question #1	Question #2	Question #3
Student A	15	36	24
Student B	20	38	24
Student C	15	54	24

Each student answered exactly 2 questions correctly. What is the sum of the correct answers to the 3 questions?

(A) 75 (B) 77 (C) 80 (D) 82 (E) 93

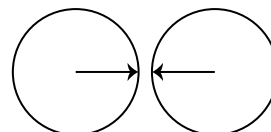
16. A total of 34 students, including Pedro and Hwie-Lie, are sitting side-by-side in a row of chairs. Pedro counted 23 students, including Hwie-Lie, to his left. Hwie-Lie counted 15 students, including Pedro, to her right. How many students are seated between Pedro and Hwie-Lie?

(A) 4 (B) 2 (C) 8 (D) 11 (E) 15

17. If n is a positive integer, the notation $n!$ (read “ n factorial”) is used to represent the product of the integers from 1 to n . That is, $n! = n \times (n-1) \times (n-2) \times \cdots \times 3 \times 2 \times 1$. For example, $5! = 5 \times 4 \times 3 \times 2 \times 1 = 120$. If $n! = 3! \times 5! \times 7!$, the value of n is

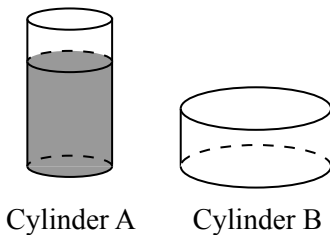
(A) 7 (B) 8 (C) 9 (D) 10 (E) 11

18. Two circular dials are positioned next to each other, and an arrow is drawn on each dial, as shown. The left dial rotates counterclockwise at 20° per second and the right dial rotates clockwise at 8° per second. What is the minimum number of seconds that must pass before the arrows are pointing directly towards each other again?



(A) 90 (B) 45 (C) 180
(D) 810 (E) 18

19. Two cylinders are standing on a flat table. Cylinder A has radius 2 and height 8. Cylinder B has radius 8 and height 2. Cylinder A is $\frac{3}{4}$ full of water and Cylinder B is empty.



Cylinder A

Cylinder B

If all of the water from Cylinder A is then poured into Cylinder B, what fraction of Cylinder B is full of water?

(The volume of a cylinder with radius r and height h is $\pi r^2 h$.)

(A) $\frac{3}{16}$ (B) $\frac{1}{4}$ (C) $\frac{1}{2}$ (D) $\frac{3}{4}$ (E) $\frac{5}{16}$

20. A drawer contains 5 black socks, 3 gold socks, 2 white socks, and no other socks. Jack randomly removes 3 socks from the drawer. What is the probability that these 3 socks are not all the same colour?

(A) $\frac{7}{8}$ (B) $\frac{9}{10}$ (C) $\frac{11}{12}$ (D) $\frac{37}{40}$ (E) $\frac{109}{120}$

Part C: Each correct answer is worth 8.

Each correct answer is an integer from 0 to 99, inclusive.

A one-digit answer (such as “7”) must be coded with a leading zero (“07”).

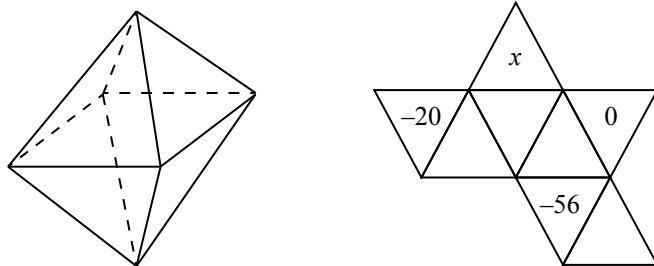
Note: The integer formed by the rightmost two digits of 12 345 is 45.

The integer formed by the rightmost two digits of 6307 is 7, coded 07.

21. The side lengths of a rectangle are positive integers. The perimeter is a multiple of 7 and the area is a multiple of 9. What is the smallest possible perimeter?
22. A robot is programmed to complete the following sequence of steps:
- Step 1: Move 2 m in the direction it is facing.
 - Step 2: Turn 90° to the left.
 - Step 3: Move 4 m in the direction it is facing.

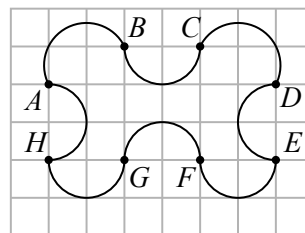
The robot starts facing north and completes this sequence of 3 steps a total of 26 times. When it has completed these steps, the robot is x m from its starting point. What is the value of x^2 ?

23. The three-dimensional figure represented below on the left has 8 triangular faces and is called an octahedron. A number is written on each face. The number on each face is equal to the sum of the numbers on the faces that share an edge with that face. Irina unfolded the octahedron and erased the numbers on five of its faces, giving the net shown below on the right.



What number did Irina erase from the face labelled x ?

24. In the diagram, a figure is drawn on a 6×8 grid using eight semi-circles whose diameters are AB , BC , CD , DE , EF , FG , GH , and HA . Suppose that the area of the figure is x and that y is the closest integer to $100x$. What is the sum of the digits of y ?



25. For how many ordered triples (A, B, C) of integers with $0 \leq A \leq 9$ and $0 \leq B \leq 9$ and $0 \leq C \leq 9$ is the sum of three six-digit positive integers

$$7A6 B5C + 2B9 C5A + 7C1 A6B$$

divisible by 36?



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For students...

Thank you for writing the 2025 Pascal Contest! Each year, more than 265 000 students from more than 80 countries register to write the CEMC's Contests.

Encourage your teacher to register you for the Fryer Contest which will be written in April.

Visit our website cemc.uwaterloo.ca to find

- More information about the Fryer Contest
- Free copies of past contests
- Information about careers in and applications of mathematics and computer science

For teachers...

Visit our website cemc.uwaterloo.ca to

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