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

Pascal Contest

(Grade 9)

Thursday, February 23, 2012
(in North America and South America)

Friday, February 24, 2012
(outside of North America and South America)

UNIVERSITY OF WATERLOO

WATERLOO MATHEMATICS

Time: 60 minutes
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 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 left corner.
5. **Be certain that you code your name, age, sex, grade, and the Contest you are writing in the response form. Only those who do so can be counted as eligible students.**
6. 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. After making your choice, fill in the appropriate circle on the response form.
7. 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.
8. Diagrams are *not* drawn to scale. They are intended as aids only.
9. When your supervisor tells you to begin, you will have *sixty* minutes of working time.

The names of some top-scoring students will be published in the PCF Results on our Web site, http://www.cemc.uwaterloo.ca.

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

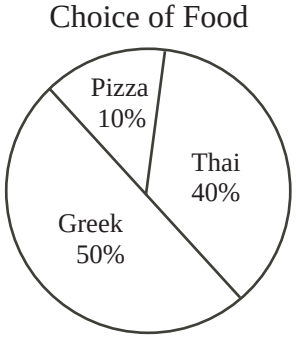
Part A: Each correct answer is worth 5.

1. The value of $\dfrac{1+(3\times 5)}{2}$ is

   (A) 2 **(B)** 3 **(C)** 6 **(D)** 8 **(E)** 16

2. The circle graph shows the results of asking 200 students to choose pizza, Thai food, or Greek food. How many students chose Greek food?

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



3. Which of the following is *not equal* to a whole number?

   (A) $\frac{60}{12}$ **(B)** $\frac{60}{8}$ **(C)** $\frac{60}{5}$ **(D)** $\frac{60}{4}$ **(E)** $\frac{60}{3}$

4. If 7:30 a.m. was 16 minutes ago, in how many minutes will it be 8:00 a.m.?

   (A) 12 **(B)** 14 **(C)** 16 **(D)** 24 **(E)** 46

5. The expression $8\times 10^5+4\times 10^3+9\times 10+5$ is equal to

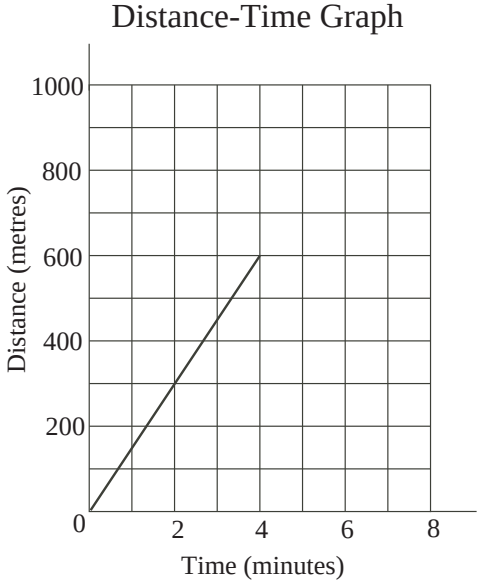
   (A) 804 095 **(B)** 804 905 **(C)** 804 950 **(D)** 840 095 **(E)** 840 950

6. What is the difference between the largest and smallest of the numbers in the list 0.023, 0.302, 0.203, 0.320, 0.032?

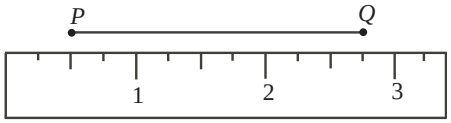
   (A) 0.090 **(B)** 0.270 **(C)** 0.343 **(D)** 0.288 **(E)** 0.297

7. Anna walked at a constant rate. The graph shows that she walked 600 metres in 4 minutes. If she continued walking at the same rate, how far did she walk in 6 minutes?

   (A) 700 m **(B)** 750 m **(C)** 800 m **(D)** 900 m **(E)** 1000 m



8. According to the ruler shown, what is the length of PQ?



(A) 2.25 **(B)** 2.5 **(C)** 2.0
(D) 1.5 **(E)** 1.75

9. If $y = 1$ and $4x - 2y + 3 = 3x + 3y$, what is the value of x?

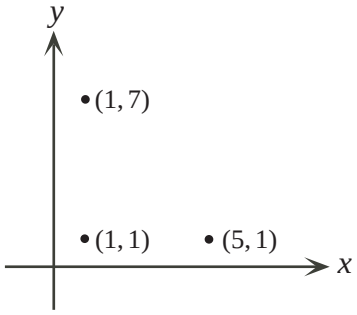
(A) -2 **(B)** 0 **(C)** 2 **(D)** 4 **(E)** 8

10. At the Lacsap Hospital, Emily is a doctor and Robert is a nurse. Not including Emily, there are five doctors and three nurses at the hospital. Not including Robert, there are d doctors and n nurses at the hospital. The product of d and n is

(A) 8 **(B)** 12 **(C)** 15 **(D)** 16 **(E)** 20

Part B: Each correct answer is worth 6.

11. Points with coordinates $(1, 1)$, $(5, 1)$ and $(1, 7)$ are three vertices of a rectangle. What are the coordinates of the fourth vertex of the rectangle?



(A) $(1, 5)$ **(B)** $(5, 5)$ **(C)** $(5, 7)$
(D) $(7, 1)$ **(E)** $(7, 5)$

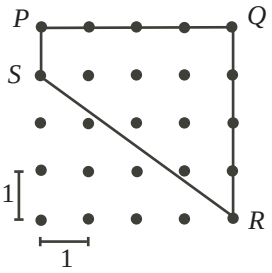
12. Seven students shared the cost of a \$26.00 pizza. Each student paid either \$3.71 or \$3.72. How many students paid \$3.72?

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

13. The operation ∇ is defined by $g \nabla h = g^2 - h^2$. For example, $2 \nabla 1 = 2^2 - 1^2 = 3$. If $g > 0$ and $g \nabla 6 = 45$, the value of g is

(A) 39 **(B)** 6 **(C)** 81 **(D)** 3 **(E)** 9

14. In the diagram, the horizontal distance between adjacent dots in the same row is 1. Also, the vertical distance between adjacent dots in the same column is 1. What is the perimeter of quadrilateral $PQRS$?

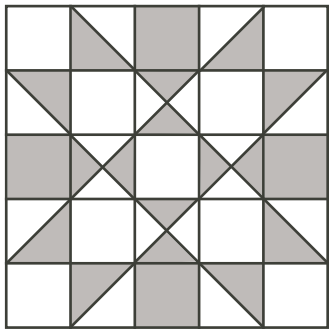


(A) 12 **(B)** 13 **(C)** 14
(D) 15 **(E)** 16

15. A hockey team has 6 more red helmets than blue helmets. The ratio of red helmets to blue helmets is 5 : 3. The total number of red helmets and blue helmets is

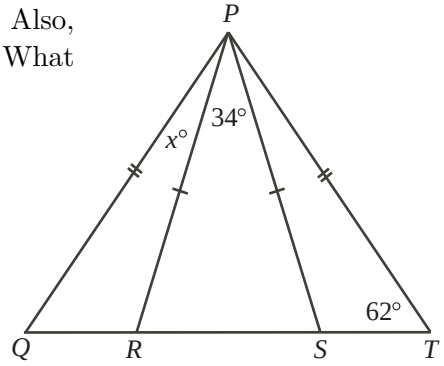
(A) 16 **(B)** 18 **(C)** 24 **(D)** 30 **(E)** 32

16. The diagram shows a square quilt that is made up of identical squares and two sizes of right-angled isosceles triangles. What percentage of the quilt is shaded?



(A) 36% **(B)** 40% **(C)** 44%
(D) 48% **(E)** 50%

17. In the diagram, points R and S lie on QT. Also, $\angle PTQ = 62°$, $\angle RPS = 34°$, and $\angle QPR = x°$. What is the value of x?

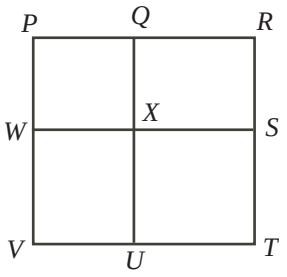


(A) 11 **(B)** 28 **(C)** 17
(D) 31 **(E)** 34

18. The entire exterior of a solid $6 \times 6 \times 3$ rectangular prism is painted. Then, the prism is cut into $1 \times 1 \times 1$ cubes. How many of these cubes have no painted faces?

(A) 16 **(B)** 32 **(C)** 36 **(D)** 50 **(E)** 54

19. In the diagram, rectangle $PRTV$ is divided into four rectangles. The area of rectangle $PQXW$ is 9. The area of rectangle $QRSX$ is 10. The area of rectangle $XSTU$ is 15. What is the area of rectangle $WXUV$?



(A) 6 **(B)** $\frac{27}{2}$ **(C)** 14
(D) $\frac{50}{3}$ **(E)** $\frac{95}{2}$

20. When the three-digit positive integer N is divided by 10, 11 or 12, the remainder is 7. What is the sum of the digits of N?

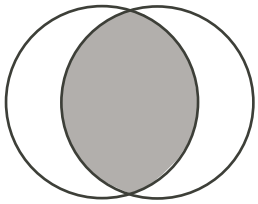
(A) 15 **(B)** 17 **(C)** 23 **(D)** 11 **(E)** 19

Part C: Each correct answer is worth 8.

21. A string has been cut into 4 pieces, all of different lengths. The length of each piece is 2 times the length of the next smaller piece. What fraction of the original string is the longest piece?

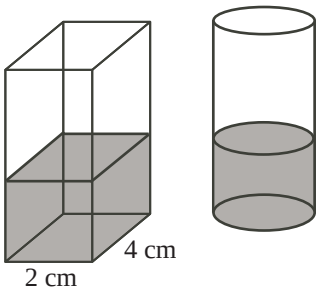
(A) $\frac{8}{15}$ **(B)** $\frac{2}{5}$ **(C)** $\frac{1}{2}$ **(D)** $\frac{6}{13}$ **(E)** $\frac{1}{4}$

22. Two circles with equal radii intersect as shown. The area of the shaded region equals the sum of the areas of the two unshaded regions. If the area of the shaded region is 216π, what is the circumference of each circle?



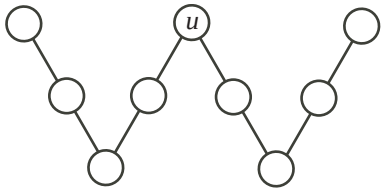
(A) 18π **(B)** 27π **(C)** 36π
(D) 108π **(E)** 324π

23. Mike has two containers. One container is a rectangular prism with width 2 cm, length 4 cm, and height 10 cm. The other is a right cylinder with radius 1 cm and height 10 cm. Both containers sit on a flat surface. Water has been poured into the two containers so that the height of the water in both containers is the same. If the combined volume of the water in the two containers is 80 cm^3, then the height of the water in each container is closest to



(A) 6.8 cm **(B)** 7.2 cm **(C)** 7.8 cm
(D) 8.2 cm **(E)** 8.6 cm

24. The smallest of nine consecutive integers is 2012. These nine integers are placed in the circles to the right. The sum of the three integers along each of the four lines is the same. If this sum is as small as possible, what is the value of u?



(A) 2012 **(B)** 2013 **(C)** 2014
(D) 2015 **(E)** 2016

25. There are four people in a room.
For every two people, there is a 50% chance that they are friends.
Two people are *connected* if:
- they are friends, or
- a third person is friends with both of them, or
- they have different friends who are friends of each other.

What is the probability that every pair of people in this room is connected?

(A) $\frac{18}{32}$ **(B)** $\frac{20}{32}$ **(C)** $\frac{22}{32}$ **(D)** $\frac{19}{32}$ **(E)** $\frac{21}{32}$

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