Canadian Mathematics Competition

An activity of the Centre for Education in Mathematics and Computing, University of Waterloo, Waterloo, Ontario

Pascal Contest (Grade 9)

Tuesday, February 20, 2007

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, city/town, and province 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 official contestants.**
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.

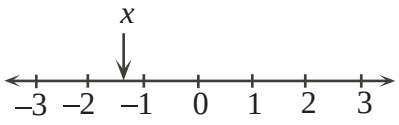
Scoring:	There is *no penalty* for an incorrect answer. Each unanswered question is worth 2, to a maximum of 10 unanswered questions.

Part A: Each correct answer is worth 5.

1. The value of $3 \times (7 - 5) - 5$ is

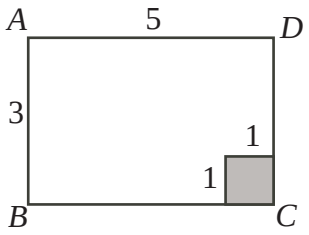
   (A) 11 **(B)** 1 **(C)** -30 **(D)** 11 **(E)** -1

2. Which of the following is the best estimate for the value of x shown on the number line?



   (A) 1.3 **(B)** -1.3 **(C)** -2.7
   (D) 0.7 **(E)** -0.7

3. What fraction of the area of rectangle $ABCD$ is the area of the shaded square?



   (A) $\frac{1}{15}$ **(B)** $\frac{1}{8}$ **(C)** $\frac{1}{10}$
   (D) $\frac{1}{4}$ **(E)** $\frac{1}{12}$

4. The value of $2^5 - 5^2$ is

   (A) 0 **(B)** -3 **(C)** -7 **(D)** 3 **(E)** 7

5. The table shows the pay Leona earned for two different shifts at the same fixed hourly rate. How much will she earn for a five hour shift at this rate?

Shift	Total Pay
3 hours	\$24.75
6 hours	\$49.50

   (A) \$43.75 **(B)** \$46.25 **(C)** \$38.75
   (D) \$36.25 **(E)** \$41.25

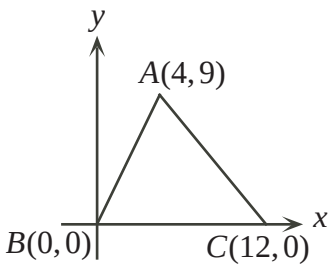
6. The value of $\dfrac{\sqrt{64} + \sqrt{36}}{\sqrt{64 + 36}}$ is

   (A) $\frac{7}{5}$ **(B)** $\frac{16}{5}$ **(C)** $\frac{1}{5}$ **(D)** $\frac{24}{5}$ **(E)** $\frac{14}{5}$

7. Megan inherits \$1 000 000 and Dan inherits \$10 000. Each donates 10% of his or her inheritance to charity. In total, they donate

   (A) \$101 000 **(B)** \$110 000 **(C)** \$100 000 **(D)** \$11 000 **(E)** \$10 100

8. In the diagram, what is the area of $\triangle ABC$?



   (A) 36 **(B)** 54 **(C)** 108
   (D) 72 **(E)** 48

9. The value of $\frac{5}{8} - \frac{1}{16}$ is

(A) larger than $\frac{3}{4}$ **(B)** larger than $\frac{3}{5}$ **(C)** larger than $\frac{5}{9}$
(D) less than $\frac{1}{2}$ **(E)** less than $\frac{7}{16}$

10. If $M = 2007 \div 3$, $N = M \div 3$, and $X = M - N$, then the value of X is

(A) 669 **(B)** 223 **(C)** 1338 **(D)** 892 **(E)** 446

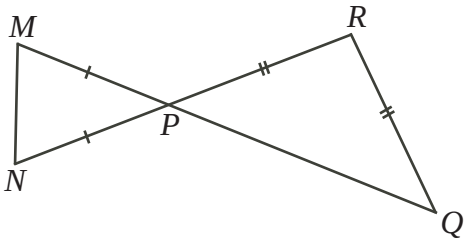
Part B: Each correct answer is worth 6.

11. The mean (average) of 6, 9 and 18 is equal to the mean (average) of 12 and y. What is the value of y?

(A) 22 **(B)** 21 **(C)** 10 **(D)** 11 **(E)** 5

12. In the diagram, if $\angle PQR = 48°$, what is the measure of $\angle PMN$?

(A) 60° **(B)** 42° **(C)** 48°
(D) 66° **(E)** 84°



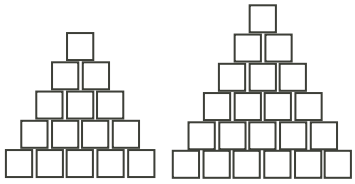
13. The sum of two different prime numbers is 10. The product of these two numbers is

(A) 24 **(B)** 21 **(C)** 16 **(D)** 9 **(E)** 7

14. At Webster High School, the ratio of males to females writing the Pascal Contest is 3 : 7. If there are 21 males writing the Contest, what is the *total* number of students writing?

(A) 30 **(B)** 25 **(C)** 49 **(D)** 70 **(E)** 79

15. Clara knocks over the two stacks of blocks shown in the diagram. She then uses the blocks to build a similar stack whose top layer has one block and each layer below has one more block than the layer above it. If she builds the largest possible stack, how many blocks will be left over?



(A) 0 **(B)** 1 **(C)** 2
(D) 3 **(E)** 4

16. In the table, the sum of the numbers in each row, column and diagonal is the same. What is the value of $P + Q + R + S$?

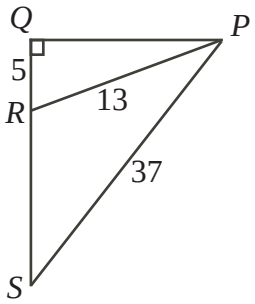
P	4	Q
10	16	22
R	28	S

(A) 56 **(B)** 60 **(C)** 64
(D) 68 **(E)** 72

17. Norine can retire when her age and the number of years that she has worked add to 85. At present, she is 50 years old and has worked for 19 years. If she works continuously until she retires, how old will she be when she can retire?

(A) 53 **(B)** 54 **(C)** 58 **(D)** 66 **(E)** 69

18. In the diagram, what is the perimeter of $\triangle PQS$?

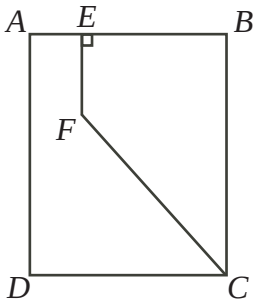


(A) 74 **(B)** 55 **(C)** 80
(D) 84 **(E)** 97

19. The reciprocal of $\frac{3}{10}$ is $\left(\frac{1}{x}+1\right)$. What is the value of x?

(A) $\frac{7}{3}$ **(B)** $\frac{3}{13}$ **(C)** $\frac{3}{7}$ **(D)** $\frac{5}{3}$ **(E)** $\frac{3}{5}$

20. In the diagram, rectangle $ABCD$ is divided into two regions, $AEFCD$ and $EBCF$, of equal area. If $EB = 40$, $AD = 80$ and $EF = 30$, what is the length of AE?



(A) 20 **(B)** 24 **(C)** 10
(D) 15 **(E)** 30

Part C: Each correct answer is worth 8.

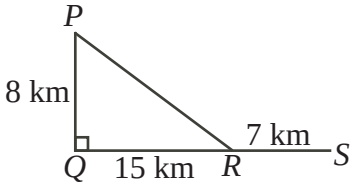
21. P, Q, R, S, and T are five *different* integers between 2 and 19 inclusive.

- P is a two-digit prime number whose digits add up to a prime number.
- Q is a multiple of 5.
- R is an odd number, but not a prime number.
- S is the square of a prime number.
- T is a prime number that is also the mean (average) of P and Q.

Which number is the largest?

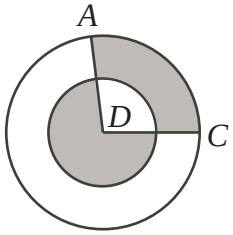
(A) P **(B)** Q **(C)** R **(D)** S **(E)** T

22. Asafa ran at a speed of 21 km/h from P to Q to R to S, as shown. Florence ran at a constant speed from P directly to R and then to S. They left P at the same time and arrived at S at the same time. How many minutes after Florence did Asafa arrive at point R?



(A) 0 **(B)** 8 **(C)** 6
(D) 7 **(E)** 5

23. In the diagram, two circles, each with centre D, have radii of 1 and 2. The total area of the shaded regions is $\frac{5}{12}$ of the area of the larger circle. What is a possible measure of $\angle ADC$?



(A) 108° **(B)** 120° **(C)** 90°
(D) 150° **(E)** 135°

24. Starting with the "1" in the centre, the spiral of consecutive integers continues, as shown. What is the sum of the number that appears directly above 2007 and the number that appears directly below 2007?

17	16	15	14	13	
↓	5	4	3	12	
	6	1	2	11	
	7	8	9	10	

(A) 4014 **(B)** 4016 **(C)** 4018
(D) 4020 **(E)** 4022

25. How many four-digit positive integers x are there with the property that x and $3x$ have only even digits? (One such number is $x = 8002$, since $3x = 24006$ and each of x and $3x$ has only even digits.)

(A) 82 **(B)** 84 **(C)** 86 **(D)** 88 **(E)** 90

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For students...

Thank you for writing the 2007 Pascal Contest!
In 2006, more than 90 000 students around the world registered to write the Pascal, Cayley and Fermat Contests.

Encourage your teacher to register you for Fryer Contest which will be written on April 18, 2007.
Visit our website

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- **More information about the Fryer Contest**
- **Free copies of past Contests**
- **Workshops to help you prepare for future Contests**
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