

THE CALGARY MATHEMATICAL ASSOCIATION
29TH JUNIOR HIGH SCHOOL MATHEMATICS CONTEST
 April 27, 2005

NAME: _____
 PLEASE PRINT (First name Last name)

GENDER: M F

SCHOOL: _____

GRADE: _____
 (7,8,9)

- You have 90 minutes for the examination. The test has two parts: PART A — short answer; and PART B — long answer. The exam has 9 pages including this one.
- Each correct answer to PART A will score 5 points. You must put the answer in the space provided. No part marks are given.
- Each problem in PART B carries 9 points. You should show all your work. Some credit for each problem is based on the clarity and completeness of your answer. You should make it clear why the answer is correct.

PART A has a total possible score of 45 points.

PART B has a total possible score of 54 points.

- You are permitted the use of rough paper. Geometry instruments are not necessary. References including mathematical tables and formula sheets are **not** permitted. Simple calculators without programming or graphic capabilities **are** allowed. Diagrams are not drawn to scale. They are intended as visual hints only.
- When the teacher tells you to start work you should read all the problems and select those you have the best chance to do first. You should answer as many problems as possible, but you may not have time to answer all the problems.

BE SURE TO MARK YOUR NAME AND SCHOOL AT THE TOP OF THIS PAGE.
THE EXAM HAS 9 PAGES INCLUDING THIS COVER PAGE.

Please return the entire exam to your supervising teacher at the end of 90 minutes.

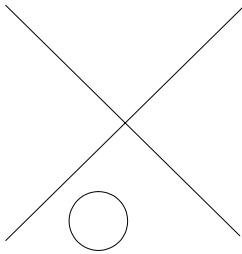
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PART A _____×5	B1	B2	B3	B4	B5	B6	TOTAL (max: 99)

PART A: SHORT ANSWER QUESTIONS

A1 Boris asks you to lend him a certain amount of money between 1 cent and 10 cents inclusive. What is the smallest number of Canadian coins you need to have in order to be able to give Boris exactly what he asks you for, regardless of what it is?

A2 Two prime numbers P and Q have the property that both their sum and their difference are again prime numbers. What are P and Q ?

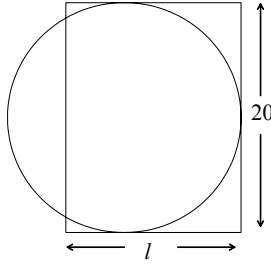
A3 In the figure, the two straight lines extend infinitely in both directions. How many circles could you draw that are tangent to the given circle and to both of the lines (that is, that just touch the circle and each of the lines)?



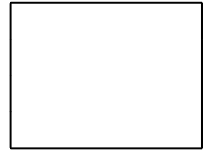
A4 Three cards each have one of the digits from 1 through 9 written on them. When the cards are arranged in some order they make a three-digit number. The largest number that can be made plus the second largest number that can be made is 1233.

What is the largest number that can be made?

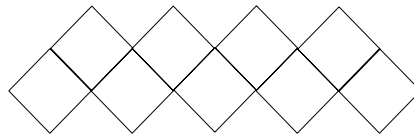
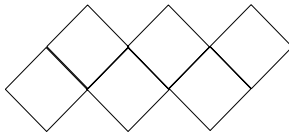
- A5** In the figure, the circle and the rectangle have the same area. What is the length l ?



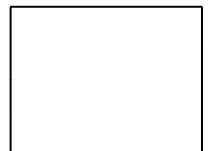
- A6.** On each day that Adrian does his homework his mother gives him \$4, and on days he doesn't she takes \$1 away from him. After 30 days Adrian notices that he has the same amount of money as when he started even though he has spent nothing and had no other source of income. On how many of the 30 days did he do his homework?



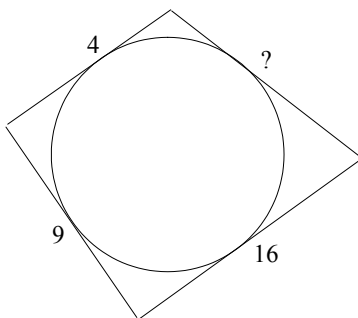
- A7** Below are two zig-zag shapes made of identical little squares 1 cm on a side. The first shape has 6 squares and a perimeter of 14 cm. The second has 9 squares and a perimeter of 20 cm. What is the perimeter of the zig-zag shape with 15 squares?



- A8** You begin counting on your left hand starting with the thumb, then the index finger, the middle finger, the ring finger, then the little finger, and back to the thumb, and so on. (Thumb, index, middle, ring, little, ring, middle, index, thumb, index, ...) What is the 2005th finger you count?

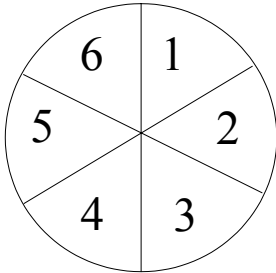


- A9** A quadrilateral circumscribes a circle. Three of its sides have length 4, 9 and 16 cm, as shown. What is the length in cm of the fourth side?

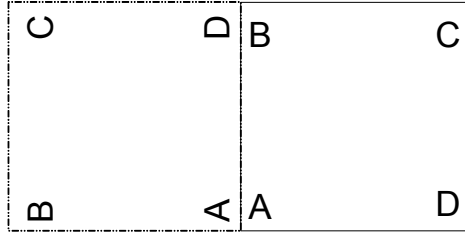


PART B: LONG ANSWER QUESTIONS

- B1** A pizza is cut into six pie-shaped pieces. Trung can choose any piece to eat first, but after that, each piece he chooses must have been next to a piece that has already been eaten (to make it easy to get the piece out of the pan). In how many different orders could he eat the six pieces?



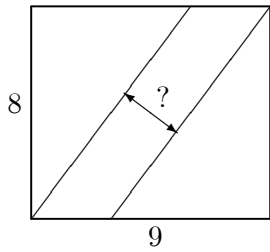
- B2** (a) A square of side length 1 metre, with corners labelled A , B , C , D as shown, is sitting flat on a table. It is rotated counterclockwise about its corner A through an angle of 90° (as shown in the figure), then rotated counterclockwise about B through 90° , then counterclockwise about C through 90° , and finally counterclockwise about D through 90° . After each rotation, how far away is the corner A from where it was at the beginning?



- (b) The same question, only all the rotations are through 90° **clockwise**.

B3 Semra's score on a math test was recorded incorrectly by the teacher. Her real score was exactly four times the score that the teacher recorded. When the teacher corrected her mistake, the average score of the class went up by 2 points. There are 24 students in Semra's class (including Semra). What was Semra's real score on the math test?

B4 The picture shows an 8 by 9 rectangle cut into three pieces by two parallel slanted lines. The three pieces all have the same area. How far apart are the slanted lines?



B5 (a) Find all the integers x so that

$$2 \leq \frac{2005}{x} \leq 5.$$

That is, find all integers x so that the fraction 2005 over x lies between 2 and 5 inclusive. How many such integers x are there?

(b) Find a positive integer N so that there are exactly 25 integers x satisfying

$$2 \leq \frac{N}{x} \leq 5.$$

B6 Amy, Bart and Carol are eating carrot sticks. Amy ate half the number that Bart ate, plus one-third the number that Carol ate, plus one. Bart ate half the number that Carol ate, plus one-third the number that Amy ate, plus two. Carol ate half the number that Amy ate, plus one-third the number that Bart ate, plus three. How many carrot sticks did they eat altogether?