

# Bergen County Mathematics League

Good Luck To You



Good Luck To All

**Contest #4 (Calculators Allowed)**

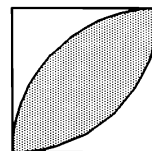
**2009-2010**

**Part I** *Time Limit: 12 minutes*

Answers must be exact *or* have 4 (or more) significant digits, correctly rounded.

4-1. What is the numerical value of  $\log_{2009}2009$ ?

4-2. In the diagram, the arcs of two congruent circles intersect and the region between them is shaded. The circles are centered at opposite vertices of a square whose side is a radius of each circle. If the area of the square is 4, what is the area of the shaded region?



**Part II** *Time Limit: 12 minutes*

Answers must be exact *or* have 4 (or more) significant digits, correctly rounded.

4-3. What is the only quadrant that has no points on the graph of  $(x-8)^2 + (y+6)^2 = 9^2$ ?

4-4. If  $2009^x + 2009^y = 9$  and  $2009^{x+y} = 8$ , what is the value of  $2009^{2x} + 2009^{2y}$ ?

**Part III** *Time Limit: 12 minutes*

Answers must be exact *or* have 4 (or more) significant digits, correctly rounded.

4-5. For what ordered pair of integers  $(A,B)$  is  $x^3+7x^2+Ax+B$  divisible by  $x^2+1$ ?

4-6. Altogether how many different handshakes would occur if each person in a group of 20 people shakes hands once with every other person in the group?

**Notice: A question on the next meet will repeat the theme of question 4-2.**

## Answers

4-1. 1

4-2.  $2\pi - 4 \approx 2.283185307 \dots$

4-3. II or second

4-4. 65

4-5. (1,7)

4-6. 190