

# Pizza and Problems

Spring 2009

Assigned on: March 6, 2009

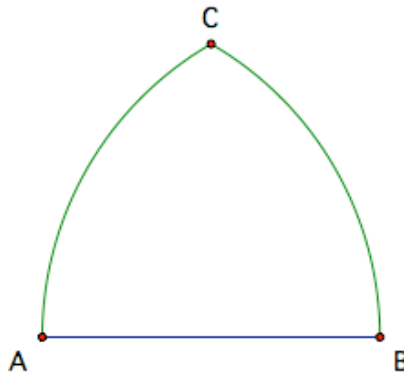
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**PROBLEM 1** From a starting number, Cindy was supposed to subtract 3, and then divide by 9, but instead, Cindy subtracted 9, then divided by 3, getting 43. If the correct instructions were followed, what would the result be?

**PROBLEM 2** Tina randomly selects two distinct numbers from the set  $\{1, 2, 3, 4, 5\}$ , and Sergio randomly selects a number from the set  $\{1, 2, \dots, 10\}$ . What is the probability that Sergio's number is larger than the sum of the two numbers chosen by Tina?

**PROBLEM 3** Let  $A$ ,  $M$ , and  $C$  be nonnegative integers such that  $A + M + C = 12$ . What is the maximum value of  $AMC + AM + MC + AC$ ?

**PROBLEM 4** Circular arcs  $AC$  and  $BC$  have centers at  $B$  and  $A$ , respectively. Construct a circle that is tangent to the arc  $AC$ , the arc  $BC$ , and segment  $AB$ . If the length of arc  $BC$  is 12, find the circumference of the circle.



**PROBLEM 5** Through a point on the hypotenuse of a right triangle, lines are drawn parallel to the legs of the triangle so that the triangle is divided into a square and two smaller right triangles. The area of one of the two small right triangles is  $m$  times the area of the square. Find the ratio of the area of the other small right triangle to the area of the square.

**PROBLEM 6** Let  $f$  be a function satisfying  $f(xy) = f(x)/y$  for all positive real numbers  $x$  and  $y$ . If  $f(500) = 3$ , what is the value of  $f(600)$ ?

**PROBLEM 7** A point  $P$  is selected at random from the interior of the pentagon with vertices  $A = (0, 2)$ ,  $B = (4, 0)$ ,  $C = (2\pi + 1, 0)$ ,  $D = (2\pi + 1, 4)$ , and  $E = (0, 4)$ . What is the probability that  $\angle APB$  is obtuse?

**PROBLEM 8** The fifth and eighth terms of a geometric sequence of real numbers are  $7!$  and  $8!$ , respectively. What is the first term?

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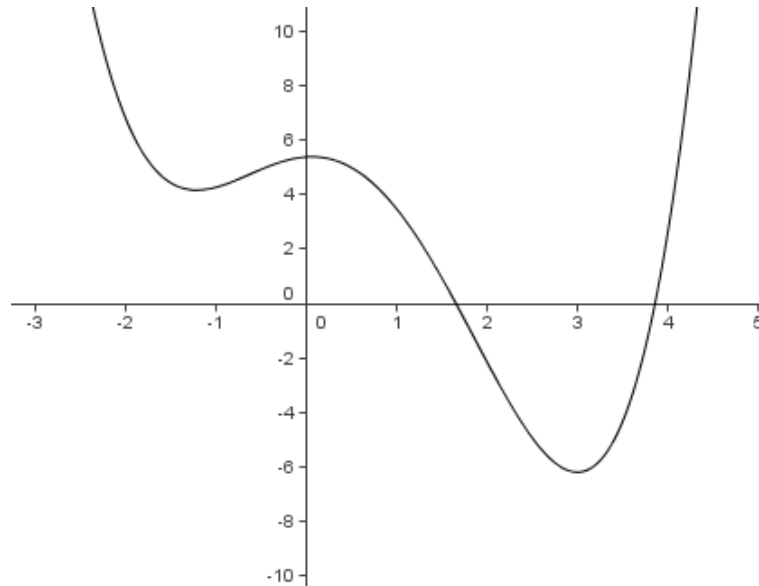
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**PROBLEM 9** For each positive integer  $n$ , let  $f(n) = n^4 - 360n^2 + 400$ . What is the sum of all values of  $f(n)$  that are prime numbers?

**PROBLEM 10** The graph below shows a portion of the curve defined by the quartic polynomial  $p(x) = x^4 + ax^3 + bx^2 + cx + d$ .



Which of the following is the smallest?

- (a)  $p(-1)$
- (b) The product of the zeros of  $p$
- (c) The product of the non-real zeros of  $p$
- (d) The sum of the coefficients of  $p$
- (e) The sum of the real zeros of  $p$

### 1 Wiki Page

Our wiki page for Pizza and Problems is located at the following URL:

[http://msenux.redwoods.edu/wiki/index.php/Pizza\\_and\\_Problems](http://msenux.redwoods.edu/wiki/index.php/Pizza_and_Problems)

If you are interested in editing solutions on this page, you need an account. If you wish an account, post an email to [david-arnold@redwoods.edu](mailto:david-arnold@redwoods.edu) that includes a username and password which you wish to use to log into the wiki.