

Names:

High School:

**Group Work (11th and 12th grades) Nov. 11, 2009**

**Time: 40 Minutes**

1. For what values of  $x$  is  $x^2 - 6x + 8 > 0$ ?
2. If  $a$  and  $b$  are the roots of the equation  $x^2 - px + q = 0$ , find the quadratic polynomial equation whose roots are  $a + \frac{1}{b}$  and  $b + \frac{1}{a}$ .

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3. Find three positive numbers that form a geometric progression if their sum is 21 and the sum of their reciprocals is  $\frac{7}{12}$ .
4. Find a four-digit number which is perfect square and all four digits are even. Can you do this as well if all four digits are odd?

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5. Find all whole number pairs having the property that the sum of the two numbers is equal to their product.
6. The sum of the reciprocals of three natural numbers is equal to one. What are the numbers?

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7. Find the sum

$$1 + 2 + 3 + 4 + \cdots + 999 + 1000$$

8. Suppose  $f(x)$  is a positive function that has  $f'(x) = 0$  if and only if  $x = 1, 2$ . Find all solutions to

$$\frac{d}{dx} \ln \sqrt{3f(x) + 2} = 0.$$