

Junior-Senior Individual Test

Directions: Please answer all questions on the answer sheet provided. All answers must be written legibly in the correct blanks on the answer sheet and in simplest form. **Exact** answers are to be given unless otherwise specified in the question. No units of measurement are required. Each problem has the same point-value.

1. Find the sum of all distinct values of x such that $\left[\log_k(x^2)\right](\log_{12} k) = 2$.
2. Let $i = \sqrt{-1}$. Then $-2i^2 + (\sqrt{-4})(\sqrt{4}) - (\sqrt{-3})(\sqrt{-3}) - 2i^5 = a + bi$, where a and b are real numbers. Find

the value of $(3a + 2b)$.

3. If x is an integer, find the sum of all distinct values of x such that $\frac{x-4}{x-9} - 3 \geq 0$.

4. In the diagram, A , B , and D lie on the circle with center O .



10. Find the value of $\log_{27} \left(9 \left(\frac{1}{27} \right)^{-2} \right)$. Give your answer as a fully reduced **improper** fraction.
11. Find the eighth term of an arithmetic progression whose first term is 3 and whose 31st term is 73. Give your answer as a fully reduced **improper** fraction.
12. Suppose that $\frac{8!}{3!k!} = 56$. Find the value of k .
13. When 1, 2, 3, 4, and 5 are substituted for x in a polynomial expression for x , the results are, respectively, _____

Name: _____

Team Code: _____

**2014 John O'Bryan Mathematical Competition
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~~Note: All answers must be written legibly in the correct blanks on the answer sheet and in student files.~~

Exact answers are to be given unless otherwise specified in the question. No units of measurement are required. Each problem has the same point-value.

1. _____

11. _____

Name: ANSWERS

Team Code: _____

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