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 $\left[\log_k\left(x^2\right)\right]\left(\log_{12} k\right)=2$.

2. Let $i=\sqrt{-1}$. Then $-2i^2+\left(\sqrt{-4}\right)\left(\sqrt{4}\right)-\left(\sqrt{-3}\right)\left(\sqrt{-3}\right)-2i^5=a+bi$, 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:

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1. _____ 11. _____

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