

Team Members: _____

School: _____

1. Determine whether $1/\sqrt{2} - 1/\sqrt{6}$ is less than, or greater than, $3/10$.

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2. Find the sum of the squares of all the real number solutions to the equation $x^{256} - 256^{32} = 0$.

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3. If $x = \frac{1+\sqrt{2008}}{2}$, what is the value of $(4x^3 - 2011x - 2008)^{2009}$?

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4. An integer between 100000 and 200000 becomes three times as big when we move the one from the first position to the last position. What is the integer?

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5. What is the largest positive integer k for which 5^k divides $1000!$ (Note: $n!$ is defined by $n! = n(n-1)(n-2)\cdots 3 \cdot 2 \cdot 1$)?

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6. Which is larger, $10^{1/10}$ or $2^{1/3}$?

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7. For what values of the positive number a does the system of equations

$$x^2 = y^2$$

$$(x - a)^2 + y^2 = 1$$

have exactly zero, one, two, three, four solutions respectively?

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8. Three watchmen were guarding an apple orchard. A thief sneaked in and stole some apples. On the way out, he was caught by each of the three guards in turn. To each of them, he gave half of the apples he had left at that point, plus two more. He left with one apple. How many apples had the thief originally stolen?

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9. What is the largest number of pigeon holes that can be occupied by 100 pigeons if each hole is occupied, but no two holes contain the same number of pigeons?

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10. One hundred students, no two of whom have the same height, are arranged in desks for a test. The desks are laid out in a ten by ten grid. We select two students from this group as follows.

First we select the tallest student in each row in our grid, and from this group of ten we take the shortest. Call this student A.

Next, with the students back in their original positions, we select the shortest student in each column, and from this group of ten, we take the tallest. Call this student B.

Which student is taller, A or B?