Directions: You have 15 minutes to complete these 8 problems. All answers must be written in accordance with the conventions on the Conventions page on the MSJHSSBMTTPSTMT website. A decimal answer is required for all problems. All answers are positive real numbers. Write all of your answers on the answer sheet. You may only use scratch paper provided by the MSJHSSBMTTPSTMT. No calculators allowed.

1. Estimate $\sqrt{39}$.

2. Estimate $\log_{10} 100!$.

3. It is a somewhat well-known fact that the 256th level of Pac-Man, due to an overflow error, is unbeatable, which means there is a maximum score for the arcade version of Pac-Man. What is it? It may be helpful to note that normal pellets are worth 10 points, power pellets are worth 50 points, ghosts are worth 200 points and double per power pellet round, and fruits range from 100 to 5000 points.

4. There is one real root of the cubic polynomial $x^3 - 2012x^2 + 13371337x - 42424242$. What is it?

5. Define a *word* to be a maximal-length contiguous string of letters (uppercase or lowercase) and/or apostrophes, but not other characters/whitespace such as hyphens, spaces, slashes, numbers, or line breaks. Notably, this means that an English word split by a hyphen and a line break due to word wrap would count as two words, and variables affect the word count. Multiplication signs are considered as special characters. How many words are in the MSJHSSBMTTPSTMT Fall 2012 Mental Math Round handout?

6. Fairly recently, the viral video "Gangnam Style" by PSY overtook the previous YouTube video champion "Baby" by Justin Bieber. As of 1:12 AM, December 10, 2012, Gangnam Style has 923,003,408 views, and Baby has only 810,176,066 views (it is in second place). Out of the top 30 videos, an overwhelming majority of them are music videos. However, the 7th place video, featuring a baby biting someone's finger, is not. How many views does it have?

7. The Rule of 72 states that given $x\%$ compound interest, it will take about $72/x$ compounding cycles to double your money. For instance, if you have 3% compound interest compounded yearly, it will take about 24 years to double your money. In actuality, for smaller x, 72 turns out to be a bit too high (especially with the bank interest rates so low these days). As x approaches 0, the number of 72 actually tends towards a smaller number, N. Estimate $72 - N$.

8. Estimate $\sqrt{2}^{\sqrt{2}}$.