Qualifying Test for *Who Wants to Be a Mathematician*

Student Name:	*Grade:*
High School:	
High School Address:	*State and zip*:
Teacher:	*Teacher Phone:*
Teacher Email Address:	

Test-taker acknowledges that, if selected as a contestant for the AMS's *Who Wants to Be a Mathematician* contest, which selection belongs solely to the AMS based on the questions below and on the attached test, he/she will abide by the rules of the contest and that the decisions of the AMS as to prizes and eligibility thereto are solely at the discretion of the AMS.

What's your favorite subject in school? _____

What's your favorite non-school activity? _____

_____

If you won the top prize, what would you do with the $5000? (in 30 words or less)

_____

_____

_____

Fill in the blank (many correct answers possible):

"How, I, wish, I, could, enumerate, _____"

You don't have to show your work on the test paper. Just write the final answer. No calculators. You have ten minutes (for the problems on the next page). Good luck!

Return completed test(s)—so that they arrive by Oct. 22—to Mike Breen; c/o American Mathematical Society; 201 Charles St.; Providence, RI 02904.

1. In how many points does the line $x + y = 2$ intersect the circle $x^2 + y^2 = 2$? _____

2. What is the largest four-digit prime number less than 2010? _____ .

3. How many five-letter "words" (any strings of five characters from the English alphabet) strictly alternate between vowels and consonants (one example is "mimes")? _____ (You may leave your answer in factored form; consider the letter y to be a consonant.)

4. What is the highest power of 2 that divides 100! (without remainder)? _____

5. Put the following mathematicians in order according to their year of birth, starting with the first born: A. Emmy Noether, B. Leonhard Euler, C. John Nash, D. Archimedes. (use the indicated letters) _____

6. Solve for x: $2x^3 - 3x^2 - 8x = 3$.

7. How many vertical asymptotes does the graph of $y = \tan(\sec x)$ have in the interval $\left[0, \frac{\pi}{2}\right)$?

_____

8. Put the following events in order from the least likely to the most likely (use the indicated letters):

   E: Rolling four fair six-sided dice and getting a sum of 5.
   F: 10 fair two-sided coins landing "heads"
   G: Choosing a palindrome (a number that reads the same backwards and forwards) at random from among all seven-digit numbers

9. The area of a circle inscribed in an equilateral triangle is 1 sq. ft. What is the perimeter of the triangle? _____

10. Which of the following is the negation of the statement "For every x there is a y such that if x has property **P** then y has property **Q**"? (Circle the letter of your answer.)
   A. There is an x such that for every y, x has property **P** and y does not have property **Q**
   B. For every x there is no y such that x has property **P** and y has property **Q**
   C. There is an x such that for every y, if x does not have property **P** then y does not have property **Q**

Thank you for participating.