

1. What is the tens digit (the digit second from the right) of  $11^{2009}$ ? \_\_\_\_\_ .
2. What is the radius of the circle with equation  $x^2 - 4x = 1 - y^2 - 6y$ ? \_\_\_\_\_
3. How many vertices does a regular icosahedron have? \_\_\_\_\_
4.  $\cos\left(2\sin^{-1}\frac{1}{5}\right) =$  \_\_\_\_\_
5. Put the following mathematicians in order according to their year of birth, starting with the first born: Galois, Gauss, Hilbert, Newton. \_\_\_\_\_
6. Find a fourth-degree polynomial with real coefficients that has  $i$  and  $2-i$  as roots. (Do not leave your answer in factored form.)

Ans: \_\_\_\_\_

7. A triangle, M, is formed from  $\triangle ABC$  by constructing segments that connect the midpoints of the three sides. What is the ratio of the area of M to the area of  $\triangle ABC$ ? \_\_\_\_\_
8. How many odd numbers are in the 17<sup>th</sup> row of Pascal's triangle (where the 0<sup>th</sup> row is **1** and the 1<sup>st</sup> row is **1 1**)? \_\_\_\_\_
9. A Pythagorean triple  $(a, b, c)$  consists of three positive integers such that  $a^2 + b^2 = c^2$ . Write all Pythagorean triples that contain the number 37. (Consider triples in which  $a$  and  $b$  are interchanged to be equal, that is  $(3, 4, 5)$  and  $(4, 3, 5)$  are regarded as one triple.)

Ans: \_\_\_\_\_

10. A googol (in base ten) is 1 followed by one hundred zeros. Within ten, how many digits are there in a googol written in base five? \_\_\_\_\_

*Thank you for participating.*

***Return completed test(s)—so that they arrive by Oct. 20, 2009—to Mike Breen; c/o American Mathematical Society; 201 Charles St.; Providence, RI 02904.***