

Student Name: \_\_\_\_\_

1. What is the sum of all the natural numbers from 250 to 750 inclusive?

Answer: \_\_\_\_\_

2. Determine the number of divisors of  $15!$  ( $15! = 15 \times 14 \times \dots \times 1$ ) that are also perfect squares.

Answer: \_\_\_\_\_

3. Determine the units digit of  $2012^{2011}$ .

Answer: \_\_\_\_\_

4. How many real number solutions does  $x^2 + \sqrt{x^4 + 3} = 1$  have?

Answer: \_\_\_\_\_

5. Grace walks up an escalator that is moving up. When she walks at 1 step per second, she takes 20 steps to reach the top. When she walks at 2 steps per second, she takes 32 steps to reach the top. Assuming that Grace never skips a step and that the speed of the escalator is constant, how many steps does the escalator have?

Answer: \_\_\_\_\_

6. Let  $n = 2^{31}3^{19}$ . How many positive integer divisors of  $n^2$  do not divide  $n$ ?

Answer: \_\_\_\_\_

7. Larry lives on the  $xy$  plane and he owns a pogo stick. He can jump 3 or 7 steps to the right, or 5 steps up. How many possible ways are there for Larry to go from the origin  $(0, 0)$  to  $(25, 25)$ ? (You can leave your answer in terms of factorials)

Answer: \_\_\_\_\_

8. What is the edge length of the largest regular tetrahedron that fits inside a  $1 \times 1 \times 1$  cube?

Answer: \_\_\_\_\_