1 Patterns with Exponents

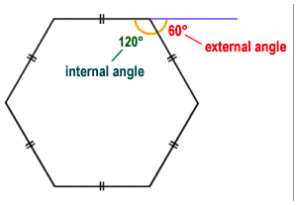
A base is a number that you multiply. An exponent tells us how many times to multiply by that number. For example, in 2^3, 2 is the base and 3 is the exponent, and it means 2*2*2, since we multiply three 2s together. When we say "2 to the power of 3," we mean 2^3.

1. What is the last digit in 9^{123}? (This means $9 \times 9 \times \ldots 9 \times 9$ where there are 123 9's.)
2. What is the last digit in 5^{11}?
3. What is the last digit in 7^{2013}?
4. What is the **second to last** digit in 6^{17}?
5. What is the **last two** digits in 7^{999}?
6. Find the sum of
   a) the first 10 multiples of 2,
   b) the first 10 multiples of 3, and
   c) the first 10 multiples of 5.
7. What is the last two digits in 41^{2789}? (Pssst... I'd be really surprised if you figured this out)

2 Other Questions

1. Find the sum of the numbers from 1 to 19. Hint: Don't actually add them all...
2. Now, find the sum of the numbers from 1 to 99.
3. For each set of pictures, what number will you write in the place of X to continue the pattern?

4. As the above picture shows, polygons have both internal and external angles. In a regular polygon, all the sides have the same length and all the angles have the same measure; for example, a triangle would have external angles of 120 degrees, a square 90 degrees, and a pentagon 72 degrees. With this in mind, take a look at the following pattern, which contains the external angles of various polygons: 120, 90, 72, 60, x, 45, 40, 36, y, 30, z, ... What are the values of x, y, and z? (Hint: Fractions might be easier to work with here!)



5. What are the next six numbers in this pattern?
6. What is the sum of all the odd numbers from 37 to 135, inclusive? (count 37 and 135 as well.)
7. What is the number under the car?