Name:

Place Values

One difference between our number system and Roman numerals is that we have *place values*. You've heard of these - ones, tens, hundreds, etc. This may seem basic to you, but we are going to review place values before talking about other number systems because **understanding place values in our number system will help you to learn numbers in other bases and different number systems more easily.**

Because our numbers are in base ten, they can be broken up as follows:

$$342 = 3 \cdot 100 + 4 \cdot 10 + 2 \cdot 1,$$

splitting the number into hundreds (10^2), tens (10^1) and ones (10^0).

Below, you are going to practice splitting up numbers in this way. I did the first two for you:

1. $561 = 5 \cdot 100 + 6 \cdot 10 + 1$

2. $0.909 = 9 \cdot (1/10) + 0 \cdot (1/100) + 9 \cdot (1/1000)$

3. $3{,}333 =$

4. $20{,}000 =$

5. $8.41 =$

6. $24{,}689 =$

Now we're going to review and talk about exponents a little bit, because they can be used to write place values in an easier way. Remember, and exponent means to multiply a number by itself that many times. For example:

$$2^3 = 2 \cdot 2 \cdot 2 = 8.$$

Compute the following exponential expressions:

1. $3^2 = 3 \cdot 3 = 9$
2. $1^5 = 1 \cdot 1 \cdot 1 \cdot 1 \cdot 1 = 1$
3. $5^2 =$
4. $6^1 = 6$
5. $111^1 =$
6. $10^1 =$
7. $10^2 =$
8. $10^3 =$
9. $10^4 =$
10. $10^5 =$
11. $10^{-6} =$
12. $2^0 =$
13. $1,000,000,003^0 =$

Okay, now you're ready to write your list of numbers, using exponents, to show the base 10 structure:

1. $561 = 5 \cdot 10^2 + 6 \cdot 10^1 + 1 \cdot 10^0$
2. $0.909 = 9 \cdot 10^{-1} + 0 \cdot 10^{-2} + 9 \cdot 10^{-3}$
3. $3{,}333 =$
4. $20{,}000 =$
5. $8.41 =$
6. $24{,}689 =$