Powers!

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EXPONENTS ARE ... POWERFUL!

1. Let's start by talking like a mathematician. We need to introduce two words:

   "**base**"

   "**power**"

2. Most of the time, exponents are just a shorthand for multiplication. See if you can write out the following examples using *multiplication* instead of *exponents*.

   2^4 =

   3^4 =

   5^3 =

   10^4 =

   3^{25} =

3. In those examples, the *exponent* told you how many times to use the *base* in your multiplication problem. But there is one special case we need to just memorize.

   8^0 =

   5^0 =

   16^0 =

4. So what makes exponents exciting?

4a. Suppose you wanted to travel from planet Earth to planet Saturn. Roughly how many miles would you need to travel? (It's okay to guess.) Can you write that number down with exponents? Without? Which is easier?

4b. I have a cold. I came to school anyway and caused two friends to get sick. The next day, my two friends came to school and each infected two other friends. If this pattern continues, how many kids will get sick on Friday? What about the next Friday? The one after that? (Anyone have a tissue?)

DON'T GET TRICKED!

1. $2 \cdot 2^5 = 2^?$

2. $4^5 \div 4 = 4^?$

3. $2^5 \cdot 2^5 = 2^?$

4. $8^5 \cdot 2^3 = 8^?$

5. $8^5 \cdot 2^3 = 2^?$

6. $3^5 \cdot 3^3 = 3^?$

7. $3^2 + 3^5 = 3^?$

8. $8^4 - 8^2 = 8^?$

9. $100 = 2^?5^?$

10. $72 \times 81 = 3^?2^?$

11. $32 \times 45 = 36 \times ??$

READING AND COMPARING NUMBERS ... oh my!

1. Which of the following is ***BIGGEST***?

2^6 3^5

5^3 6^2

2. Is x^4 always bigger than x^2 ?

3. Which of these is equal to one-half of 4^{10}?

2^{10} 2^{18}

2^{19} 4^5

4. Which of these is smallest?

$5^5 \cdot 3^5$ $9^5 \cdot 6^5$

$8^5 \cdot 2^5$ $3^5 \cdot 2^5$

5. Choose the ***largest*** number:

4^8 8^4 2^8 16^2

6. Without doing the math, can you predict which of these is ***greater***?

$(7^7 + 8^8)$ 9^9

7. Without doing the math, can you predict which of these is ***greater***?

2^{333} 3^{222}

8. The number 100 has 2 zeros on the righthand side of the number. The number 2,800 has 2 zeros on the righthand side of the number. The number 13,400,000 has 5 zeros on the righthand side of the number. Without doing the math, can you predict how many zeros there will be on the righthand side of the answer to these math problems?

$25 \times 5 \times 2 =$

$32 \times 50 \times 12 \times 15 \times 90 =$

9. IF YOU KNOW DECIMALS ....
Without doing the math, can you predict which of these is ***greater***?

$(0.999)^{1001}$ $(1.01)^{900}$

10. IF YOU KNOW FRACTIONS ...
Simplify this!

$$\frac{2^{2008} + 2^{2008} + 2^{2008} + 2^{2008}}{2^{2012}}$$

11. IF YOU *REALLY* KNOW FRACTIONS ....
Try this one.

$$\frac{2^{2013} - 2^{2011}}{2^{2010} + 2^{2009}}$$