**Introducing the Exponent Laws**

**Multiplying Powers:**

| Multiplying Powers Rule: |
|---|
| |

$2^3 \times 2^2 =$

$4^4 \times 4^3 =$

$5^2 \times 2^2 =$

1. Simplify if possible.

a) $2^4 \times 2^3 =$ b) $5^8 \times 5 \times 5^6 =$ c) $6^5 \times 2 \times 6^4$

**Dividing Powers:**

| Dividing Powers Rule: |
|---|
| |

$\frac{2^5}{2^3} =$

$\frac{3^4}{5^2} =$

2. Simplify if possible.

a) $\frac{4^3}{4^2} =$ b) $\frac{10^{50}}{10^{46}} =$ c) $\frac{3^5 \times 3^{15}}{3^{10}}$ d) $\frac{7^6}{7^6}$ e) $\frac{4^3}{4^5}$

3. Use examples 2d and 2e to determine the following rules:

| Zero exponent law: | Negative exponent law: |
|---|---|
| | |

**Scientific Notation:**

4. Convert to scientific notation:

Distance from earth to the sun is about 93 000 000 mi.

Mass of a hydrogen atom is about 0.00000000000000000000000017 g.

5. Convert to decimal notation:

$6.402 \times 10^{14} =$ $5 \times 10^{-8} =$

6. Multiply and divide in scientific notation:

a) $(1.12\times10^{-8})(5\times10^{-7}) =$ b) $(9.1\times10^{-17})(8.2\times10^{3}) =$

c) $\frac{(4.2\times10^{5})}{(2.1\times10^{-8})} =$ d) $\frac{(1.1\times10^{-4})}{(2\times10^{-7})}$

Assignment:

1. (a) $2^2 \times 2^2$

   (b) $3^2 \times 2^3$

   (c) $5^7 \times 5^7$

   (d) $6^4 6^0 6^0$

   (e) $4^3 \times 6^5 \times 4^2$

   (f) $3^3 3^{-3}$

   (g) $7^4 7^7 7^{-9}$

2. (a) $\frac{3^5}{3^4}$

   (b) $\frac{7^2}{7^2}$

   (c) $\frac{8^1}{8^7}$

   (d) $\frac{3^2}{3^{-2}}$

   (e) $\frac{1^{738293}}{1^{45802}}$

   (f) $\frac{6^{-5}}{6^{-8}}$

3. (a) $10^6$

   (b) $3^5$

   (c) $21^0$

   (d) $71^1$

   (e) $0^1$

   (f) $1^0 + 2^0 + 3^0 + 4^0 + 5^0$

   (g) $4^2 + 9^2 - 3^2$

4. If you have $0 < 10^n < 1\ 000\ 000\ 000$. What is the max value of $3^{-n}$?

5. Multiply. Leave answer in scientific notation.

   a) $(2.3\times10^{6})(4.2\times10^{-11})$

   b) $(6.5\times10^{3})(5.2\times10^{-8})$

   c) $(2.34\times10^{-8})(5.7\times10^{-4})$

   d) $(3.26\times10^{-6})(8.2\times10^{9})$

6. Divide. Leave answer in scientific notation.

   a) $\frac{8.5\times10^{8}}{3.4\times10^{5}}$

   b) $\frac{5.1\times10^{6}}{3.4\times10^{3}}$

   c) $\frac{4.0\times10^{-6}}{8.0\times10^{-3}}$

   d) $\frac{7.5\times10^{-9}}{2.5\times10^{-4}}$

7. Calculate. Leave answer in scientific notation.

   a) $\frac{(6.1\times10^{4})(7.2\times10^{-6})}{9.8\times10^{-4}}$

   b) $\frac{(8.05\times10^{-11})(5.9\times10^{7})}{3.1\times10^{14}}$

8. The distance light travels in 100 yr is approximately $5.87 \times 10^{14}$ mi.

   a) How far does light travel in 13 weeks?

   b) Calculate the number of kilometers light travels in 13 weeks given 1 mile = 1.609 kilometers.

*Challenge:* Compare $8 \times 10^{-90}$ and $9 \times 10^{-91}$. Which is the larger value? How much larger? Write scientific notation for the difference