PROPERTIES OF EXPONENTS

MULTIPLYING POWERS WITH LIKE BASES

An exponent indicates how many times the base is a factor. In the expression 2^3, the base is 2 and the exponent is 3. The exponent is indicating that the base 2 is a factor 3 times, that is $2 \cdot 2 \cdot 2$.

The expression $^4 \cdot ^3$ can be expanded and simplified in the following way

$$^4 \cdot ^3 = \quad . \quad . \quad . \quad . \quad . \quad . \quad = \ ^7$$

^{4} has four factors of and is being multiplied to ^{3} which has three factors of , so there is a total of seven factors of .

PRODUCT OF POWERS

When

EXERCISES:

(1) $^4 \ ^6$ (2) $(2^{\ 3\ \ 4})(3^{\ 5\ \ 8})$ (3) $^{3/5} \ ^{2/5}$

DIVIDING POWERS WITH LIKE BASES

The expression $\frac{5}{3}$ can be expanded and simplified in the following way:

$$\frac{5}{3} = \frac{\cdot\ \cdot\ \cdot\ \cdot}{\cdot\ \cdot} = \frac{\cdot\ \cdot\ \cdot}{\cdot\ \cdot\ \cdot}\cdot\ \cdot = \frac{\cdot}{1} = \ ^{2}$$

Note that the exponent of the result ^{2} is the difference between the exponents of ^{5} and ^{3}.

QUOTIENT OF POWERS

When dividing two powers with the same base, subtract the exponents.

$$\frac{\ }{\ } = \ ^{-}$$

Examples: Simplify.

a) $\frac{^{12}}{3}$

$= \ ^{12-3}$

$= \ ^{9}$

b) $\frac{2^{17\ 9}}{2^{13\ 4}}$

$= 2^{17-13}\cdot\ ^{9-4}$

$= 2^{4\ 5}$

$= 16\ ^{5}$

c) $\frac{(\ +\ )^{7}}{(\ +\ )^{2}}$

$= (\ +\ )^{7-2}$

$= (\ +\ )^{5}$

d) $\frac{^{4/3}}{_{1/3}}$

$= \ ^{(\frac{4}{3}-\frac{1}{3})}$

e) $\frac{3^{2\ 8\ 12}}{3^{\ 2\ 7}}$

$= 3^{2@1}\ \$$

EXERCISES:

(4) $\frac{2^{7\ 10\ 15}}{2^{\ 5\ 7}}$

(5) $\frac{^{3\ 9}}{_{4}}$

(6) $\frac{(\ -8)^{9}}{(\ -8)^{5}}$

RAISING A PRODUCT OR QUOTIENT TO A POWER

The expression $(2^{4})^{3}$ can be expanded and simplified the following way:

$(2^{4}$

NEGATIVE EXPONENTS

EXERCISES:

(15) $(3 \cdot 3^{-3})$ (16) $\frac{5^{-8}}{5^{-3}}$ (17) $(3^{3})^{-2}$ (18) $\left(\frac{2^{2} \cdot 2^{-5}}{3^{0} \cdot 3}\right)^{-3}$

Answers