$a^m \times a^n = a^{m+n}$ $\quad (a^m b^n)^p = a^{mp} b^{np}$

$\frac{a^m}{a^n} = a^{m-n}$ $\quad \left(\frac{a^m}{b^n}\right)^p = \frac{a^{mp}}{b^{np}}$

$(a^m)^n = a^{mn}$ $\quad a^0 = 1$

Numbers, Radicals, and Exponents
LESSON FIVE - *Exponents I*
Lesson Notes

Introduction

Exponent Laws I

a) Product of Powers

$2^3 \times 2^4 =$

$\left(\frac{3}{4}\right)^5 \left(\frac{3}{4}\right)^2 =$

General Rule:

b) Quotient of Powers

$(-6)^8 \div (-6)^5 =$

$\frac{7^9}{7^7} =$

General Rule:

c) Power of a Power

$(2^5)^3 =$

$\left((-3)^2\right)^4 =$

General Rule:

d) Power of a Product

$(a^2 b^5)^3 =$

$(4a^3 b^2)^4 =$

General Rule:

e) Power of a Quotient

$\left(\frac{a^3}{b^5}\right)^3 =$

$\left(\frac{2a^6}{3b^4}\right)^3 =$

General Rule:

f) Exponent of Zero

$2^0 =$

$\left(\frac{3mn^2}{7p^6q^4}\right)^0 =$

General Rule:

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$a^m \times a^n = a^{m+n}$ $\quad \left(a^m b^n\right)^p = a^{mp} b^{np}$

$\frac{a^m}{a^n} = a^{m-n}$ $\quad \left(\frac{a^m}{b^n}\right)^p = \frac{a^{mp}}{b^{np}}$

$\left(a^m\right)^n = a^{mn}$ $\quad a^0 = 1$

Example 1

Simplify each of the following expressions.

a) $2^3 \times 2^4$

b) $\frac{3^9}{3^6}$

c) $\left(\frac{2a^2}{b}\right)^3$

d) $3\left(3^5\right)$

e) $\frac{7^4}{7}$

f) $\left(3a^2\right)^3$

$a^m \times a^n = a^{m+n}$ $\quad \left(a^m b^n\right)^p = a^{mp} b^{np}$

$\frac{a^m}{a^n} = a^{m-n}$ $\quad \left(\frac{a^m}{b^n}\right)^p = \frac{a^{mp}}{b^{np}}$

$\left(a^m\right)^n = a^{mn}$ $\quad a^0 = 1$

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Example 2

Simplify each of the following expressions.

a) $5\left(3a^2b\right)$

b) $\left(4a\right)\left(4b^2\right)$

c) $\left(7a^2b^5\right)\left(-3ab^6\right)$

d) $\frac{36ab^2}{6b}$

e) $\frac{10a^8b}{15a^6c}$

f) $\frac{\left(3ab\right)\left(2ab\right)^2}{2\left(ab\right)^3}$

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$a^m \times a^n = a^{m+n}$ $\quad \left(a^m b^n\right)^p = a^{mp} b^{np}$

$\frac{a^m}{a^n} = a^{m-n}$ $\quad \left(\frac{a^m}{b^n}\right)^p = \frac{a^{mp}}{b^{np}}$

$\left(a^m\right)^n = a^{mn}$ $\quad a^0 = 1$

Example 3

Simplify each of the following expressions.

a) $\left(3a^2b^3\right)^2$

b) $\left(\frac{4a}{5b}\right)^2$

c) $\left(\frac{16a^2b^5}{20ab^3}\right)^3$

d) $\left(-\frac{3a}{2b}\right)^0$

e) $\left(\frac{2a}{b}\right)^2 (ab)^0 \left(-\frac{1}{2}\right)^3$

f) $\frac{1}{25a^6}\left(5a^5\right)^2$

$a^m \times a^n = a^{m+n}$ $\quad \left(a^m b^n\right)^p = a^{mp} b^{np}$

$\frac{a^m}{a^n} = a^{m-n}$ $\quad \left(\frac{a^m}{b^n}\right)^p = \frac{a^{mp}}{b^{np}}$

$\left(a^m\right)^n = a^{mn}$ $\quad a^0 = 1$

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Example 4

For each of the following, find a value for ***m*** that satisfies the equation.

a) $\left(a^2\right)^m = a^{10}$

b) $a^{2m} \times a^8 = a^{14}$

c) $\left(\frac{a^7}{a^{3m}}\right) = a$

d) $\left(\frac{a^m \times a^{2m}}{a}\right) = a^{20}$