4.1 Exponent Rules

In multiplication, the terms that are multiplied together are called the base
A repeated multiplication of equal factors can be expressed as a power

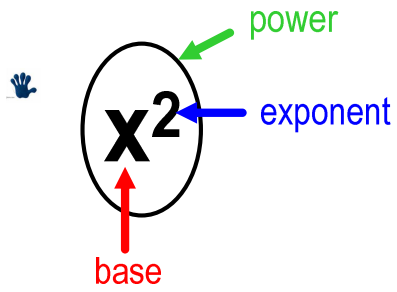
2x2x2x2x2=

→ 2 is the base
→ 5 is the exponent
→ 2^5 is the power

3x3x3x3x3x3x3x3x3= 3^9

(-5)(-5)(-5)(-5)(-5)= $(-5)^5$

axaxaxaxaxaxaxa.....xa= a^n
n times



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Remember exponents affect ONLY the number it touches in a power:

$-2^3 = -2 \times 2 \times 2 = -8$

$(-2)^3 = (-2)(-2)(-2) = -8$

$-5^2 = -5 \times 5 = -25$

$(-5)^2 = (-5)(-5) = 25$

Very important when you have neg. base and even exponent

Also Remember
If you can't see an exponent it is 1
ie $3 = 3^1$ $x = x^1$

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The Exponent Rules

Collecting Like terms!

You can only add/subtract powers when both the base and the exponents are the same! (like terms!)

$a^n + a^m =$ $a^n + a^m$ but $a^2 + a^2 =$ $2a^2$

CAN'T COMBINE

MULTIPLYING powers with the SAME base

Keep the base the same and **ADD** the exponents

$$a^p \times a^r = a^{p+r}$$

Example

$(2^3)(2^7) = 2^{10}$

DIVIDING powers with the SAME base

Keep the base the same and **SUBTRACT** the exponents

$$a^p \div a^r = a^{p-r}$$

Example

$\frac{3^6}{3^4} = 3^2$

Power of a power

Keep the base the same and **MULTIPLY** the exponents

$$(a^p)^r = a^{p \times r}$$

Example

$(5^2)^3 = 5^6$

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Ex 1. Write as a single power then evaluate the following:

a) $3^2 \times 3^4$
$= 3^6$
$= 729$

b) $2^8 \div 2^5$
$= 2^3$
$= 8$

c) $(0.1)^2 \times (0.1)$
$= (0.1)^3$
$= 0.001$

d) $(-5)^2 \times (-5)$
$= (-5)^3$
$= -125$

e) $(-5)^2 \times (-5)^2$
$= (-5)^4$
$= 625$

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WORKBREAK - Simplify then evaluate

a) $= 4^2 \times 4^3$
$= 4^5$
$=1024$

b) $8^{16} \div 8^{13}$
$= 8^3$
$= 512$

c) $(5^2)^3$
$= 5^6$
$=15625$

d) $(4^1)^5$
$= 4^5$
$=1024$

e) $10^{12} \div 10^4 \div 10^5$
$= 10^3$
$=1000$

f) $(-3)^3 \times (-3)^2$
$= (-3)^5$
$= -243$

g) $(-5)^4 \div (-5)^2$
$= (-5)^2$
$= 25$

h) $2^3 \times 3^2$
$= 8 \times 9$
$= 72$
NOT same base, can't use exp. laws

i) $6^2 + 6^3$
$= 36 + 216$
$= 252$
NOT multiplication can't use exp. laws

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Extend the rules:

Power of a product:

Keep the base the same and the exponent goes to each part of the base

$$(ab)^m = a^m b^m$$

Example

$(x^2y)^3 = x^{2\times 3}y^3$
$= x^6y^3$

Power of a quotient:

Keep the base the same and the exponent goes to each part of the base

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

Example

$\left(\frac{2}{7}\right)^2 = \frac{2^2}{7^2}$

Putting the rules together:

Ex: Simplify

a) $\left(\frac{2}{3}\right)^7 \div \left(\frac{2}{3}\right)^5$

BONUS

b) $\left(\frac{1}{3^2}\right)^4 = \frac{1^4}{3^8}$

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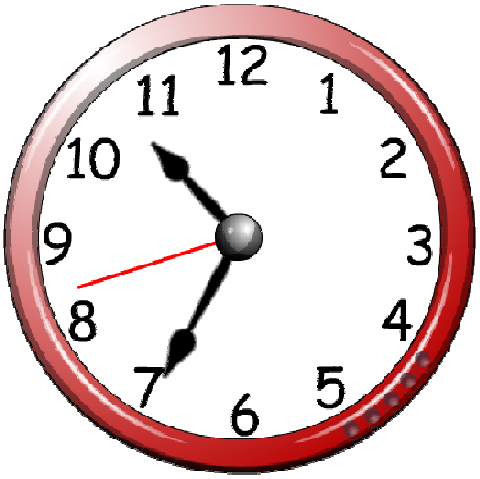
Homework:

p. 360# 1-3 eoo,5 eoo, 8, 9, 16b, 17



eoo?

"Every other one!"

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