<u>2.3 Exponent Laws with variables</u>
<u>Day 1</u>

RECALL
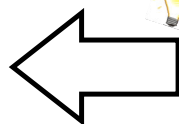Ex. 1 Write as single power.
 a) $(2^3)(2^4)$

$$= 2^{3+4}$$
$$= 2^7$$

Multiplying Powers

To multiply powers with the same base, add the exponents.

The Product Rule
$$m^a \times m^b = m^{a+b}$$

Notice the base STAYS THE SAME

Cannot add the exponents because the bases are NOT the same.

 b) $(x^2)(x^3)$

$$= x^{2+3}$$
$$= x^5$$

c) $x^2\, y^3$

Can't
Simplify

 d) $(x^7)(x^{-2})$

$$= x^{7+(-2)}$$
$$= x^5$$

e) $(m^3)(m^{-4})(m^6)$

$$= m^{3-4+6}$$
$$= m^5$$

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Ex. 2 Write as a single power, without changing the base.

RECALL

a) $4^5 \div 4^2$

$$= 4^{5-2}$$

$$= 4^3$$

Notice: The base STAYS THE SAME

b) $x^6 \div x^3$

$$= x^3$$

> **Dividing Powers**
>
> To divide powers with the same base, subtract the exponents.
>
> **The Quotient Rule**
>
> $$m^a \div m^b = m^{a-b}, \quad m \neq 0$$

Ex. 3 Write as a single power.

a) $\dfrac{x^{10}}{x^7}$

$$= x^3$$

b) $x^{\textcircled{8}} \cdot x^{\textcircled{3}} \div x^4$

$$= x^{11} \div x^4$$

$$= x^7$$

c) $\dfrac{x^3}{x^{-11}}$

$$= x^{3-(-11)}$$

$$= x^{14}$$

e) $\dfrac{x^{-2}}{x^{-5}}$

$$= x^{-2-(-5)}$$

$$= x^3$$

f) $\dfrac{x^5 y^2}{x^1 y^{-6}}$

$$= x^4 y^8$$

- **Coefficients** are the numbers in front of the powers.
- You cannot use exponent laws to simplify powers with <u>different bases</u>.

Ex. 4 Simplify, using the exponent laws. Careful with the coefficients!

Multiply the coefficients   Add Exponents   Divide the coefficients   Subtract the exponents

$$3m^2 \cdot 4m^5 \qquad \frac{50m^8}{2m^3}$$

Ex. 5 Simplify.

a) $\left(3m^4n^{-1}\right)\left(2m^3n^5\right)$

$= (3)(2)\, m^4 m^3\, n^{-1} n^5$

$= 6\, m^7 n^4$

b) $\dfrac{m^7n^3}{m^{-2}n^1} = m^{7-(-2)}\, n^{3-1}$

$= m^9 n^2$

reduce fraction

c) $\dfrac{-36a^{10}b^{-2}}{9b^{-4}a^7}$

$-\dfrac{36}{9} \cdot \dfrac{a^{10}}{a^7} \cdot \dfrac{b^{-2}}{b^{-4}}$

$= -4a^3b^2$

d) $\dfrac{4ab^3c^2}{12ab^{-2}}$

$= \dfrac{1}{3}\, a\, b^5 c^2$

$= \dfrac{1}{3} b^5 c^2$

e) $\dfrac{-2p^3m}{16m^5p^4}$

$= -\dfrac{1}{8}\, p^{-1}\, m^{-4}$

$= -\dfrac{1}{8}\, \dfrac{1}{p}\, \dfrac{1}{m^4}$

$= -\dfrac{1}{8pm^4}$

f) $\dfrac{(-8c^3d)(-4c^2d^2)}{(2c^{-2}d)}$

$= \dfrac{32c^5d^3}{2c^{-2}d}$

$= 16c^7d^2$

g) $\dfrac{(-3m^6n^{-2})(-6n^5m)}{(-36m^{-2}n)}$

$= \dfrac{18m^7n^3}{-36m^{-2}n}$

$= -\dfrac{1}{2}m^9 n^2$

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