# Curriculum Outcome

(N1) Demonstrate an understanding of powers with integral bases (excluding base 0) and whole number exponents by: representing repeated multiplication using powers; using patterns to show that a power with an exponent of zero is equal to one; solving problems involving powers.

(N2) Demonstrate an understanding of operations on powers with integral bases (excluding base 0) and whole number exponents.

**Student Friendly:**
**“Laws of exponents :**
**What happens to the exponent when you multiply like bases?"**

# Things to remember about exponents:

**1.** Any base without an exponent has an "invisible" exponent of **1**.

EXAMPLE: $8 = 8^1$ $x = x^1$

**2.** Any base with an exponent **0**, equals **1**.

EXAMPLE: $6^0 = 1$ $(-6)^0 = 1$ $x^0 = 1$

**3.** Be careful when dealing with negative numbers with exponents.

EXAMPLE: $(-3)^2 = (-3)x(-3) = 9$

$-3^2 = -(3^2) = -(3x3) = -9$

$-x^2 = -(x^2)$

What does an EXPONENT mean?

$6^4$

(6)(6)(6)(6)

What does an EXPONENT mean?

$t^4$

(t)(t)(t)(t)

# Exponent Laws 1

Write each expression as a **product**

1) $r^3 \times r^2$

(r)(r)(r) (r)(r)

$r^5$

2) $r^2 \times r^5$

(r) (r) x (r)(r)(r)(r)(r)

$r^7$

Do you notice anything???

# Product Rule

To multiply powers with the **SAME** base, add the exponents.

$$a^m \times a^n = a^{m+n}$$

must be the same base

Example:

$$(-u)^4 \times (-u)^5$$

$$= (-u)^9$$

## Write each of the following as a single power

1) $a^2 \times a^4$ = $a^6$

2) $(-y)^5 \times (-y)^3$ = $(-y)^8$

3) $y^5 \times y$ = $y^6$


Remember: Numbers go with Numbers
Letters go with letters

$(3y^6)(5y^4)$

$= 15y^{10}$

$(2d^{14})(2d^9)$

$= 4d^{23}$

# What happens when we divide powers with the same base?

1) $\frac{r^6}{r^2}$

$$\frac{r \times r \times r \times r \times r \times r}{r \times r}$$

$$= r^4$$

2) $\frac{(-d)^7}{(-d)^5}$

$$\frac{(-d)(-d)(-d)(-d)(-d)(-d)(-d)}{(-d)(-d)(-d)(-d)(-d)}$$

$$= (-d)^2$$

Do you notice anything???

# Quotient Rule

To divide powers with the **SAME** base, subtract the exponents.

$$a^m \div a^n = a^{m-n}$$

must be the same base

Example: $\frac{(w)^{12}}{(w)^3} = w^9$

# Write each of the following as a single power

1) $\dfrac{h^9}{h^4}$

$= h^5$

2) $\dfrac{(-t)^7}{(-t)^3}$

$= (-t)^4$

$(x^5)(x^6) + (x^3)(x^4)$

$x^{11} + x^7$

EXAMPLES:

1. $(x^5)(x^6)$

$= x^{11}$

2. $-y^3 \cdot y^5$

$= -y^8$

3. $\frac{x^{10}}{x^6}$

$= x^4$

4. $\frac{y^7}{y^4}$

$= y^3$

5. $\frac{-2x^2 \cdot x^4}{x^3}$

$= \frac{-2x^6}{x^3}$

$= -2x^3$

6. $y^2 + y^3 \cdot y^2$

$= y^2 + y^5$

TRY THIS!

$$\frac{3X^{13} \cdot 6X^{2}}{2X^{3}}$$

$$= \frac{18\,x^{15}}{2x^{3}}$$

$$= 9x^{12}$$

TRY THIS!

$$\frac{-8X^2 \cdot 4X^7}{2X^2}$$

$$= \frac{-32\ x^9}{2x^2}$$

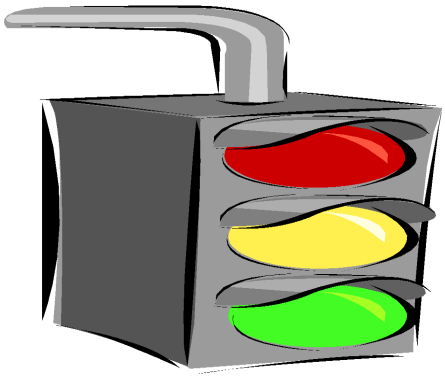
$$= -16x^7$$

$(5x^3y^2)(2x^6y^5)$

$10x^9y^7$

$$\left[\frac{6x^5y^2 \cdot 5x^3y^8}{10x^4y^5}\right] = \frac{30x^8y^{10}}{10x^4y^5}$$

$$= 3x^4y^5$$



Class/Homework

STUDY RULES
&

Worksheet

Product and
Quotient Rule