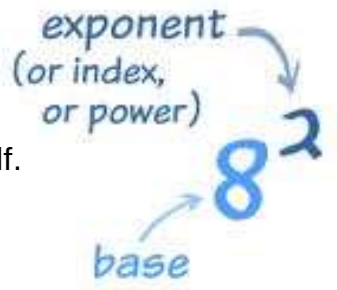
Name: _____ Date: _____ Block: _____

Chapter 4.2: Exponent Laws (Integral Exponents)

Focus on:

- Applying the exponent laws to expressions using rational numbers or variables as bases and integers as exponents
- Converting a power with a negative exponent to an equivalent power with a positive exponent
- Solving problems with integral exponents



Vocabulary:

Exponent: The number of times you _____ the base in a power by itself.

Power: An expression made up of a _____ and an _____ .

Product: The result obtained by _____ two or more numbers together.

Quotient: The result of _____ of one number by another.

Sum: The result of _____ of numbers.

Difference: The result from _____ of numbers.

Exponent Laws (P.164)

1. Product of Powers
   - Add the exponents

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

2. Quotient of Powers
   - Subtract the exponents

$$\frac{a^m}{a^n} = a^{m-n}, a \neq 0$$

3. Power of a Power
   - Multiply the exponents

$$(a^m)^n = a^{mn}$$

4. Power of a Product
   - Distribute the exponent to the different bases

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

5. Power of a Quotient
   - Distribute the exponent to the different bases

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

Example 1: Simplify as a power with a positive single exponent.

a) $(0.8^2)(0.8^{-7})$ b) $(0.3^{-3})(0.3^5)$ c) $2^2 + 3^2$

Example 2: Simplify as a power with a positive single exponent.

a) $\frac{4^3}{4^2}$ b) $\frac{(2^2)(2)}{2^4}$ c) $3^2 - 2^2$

Example 3: Simplify as a power with a positive single exponent.

a) $(n^2)^3$ b) $(n^{-4})^{-3}$ c) $(x^2y)^3$

Exponent Laws (P.164)

6. **Powers with Negative Exponents**

When x is any non-zero number and n is a rational number, x^{-n} is the reciprocal of x^n.

That is, $x^{-n} = \frac{1}{x^n}$ and $\frac{1}{x^{-n}} = x^n, x \neq 0$

7. Zero Exponent Law

- Anything to the power of 0 = 1
- Example: $2^0 = ?$

Example 4: Evaluate

a) 412^0 b) 80^0 c) $(x^3y^2z^2)^0$

d) 8^{-2} e) $(2 \times 3)^{-2}$ f) $(-3)^4 \times 4^{-2}$

Example 5: Simplifying Algebraic Expressions

Simplify the following algebraic expressions.

a) $\frac{(x^3)(x^4)}{x^{-2}}$

b) $(x^3y^2)(x^2y^4)$

c) $(m^4n^{-2})(m^2n^{-3})$

d) $\frac{(6x^4y^3)}{14xy^2}$

Example 6: Combining All the Rules

Simplify the following algebraic expressions.

a) $\left(\frac{a^{-3}b}{c^2}\right)^{-4} \cdot \left(\frac{c^5}{a^4b^{-3}}\right)^{-1}$

b) $\frac{(2a^{-1}b^4c^{-3})^{-2}}{(4a^2bc^{-4})^2}$

Example 7: Apply Powers with Integral Exponents

It is estimated that there are 117 billion grasshoppers in an area of 39000 km^2 of Saskatchewan. Approximately how many grasshoppers are there per square kilometer?

Homework:

P. 169 #1, 2, 3

#4, 5, 6 (pick 3)

7, 8, 9, 10, 12, 13, 20

Quiz next class!! (4.1 – 4.2)