

**Algebra II**

**Bell Ringer**

What Quadrants are the solutions in?

$y \geq -2x + 3$  and  $y < x - 7$

I and IV

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**Algebra II 1-5 Properties of Exponents**

Expanded form:  $2^4 = 2 \cdot 2 \cdot 2 \cdot 2 = 16$

$x^4 = x \cdot x \cdot x \cdot x$

A. Write in expanded form:

Ex 1.  $x^4 \cdot x^3 = x^7$   
 $x \cdot x \cdot x \cdot x \cdot x \cdot x \cdot x = x^7$

Ex 2.  $(4y)^3 = 64y^3$   
 $4y \cdot 4y \cdot 4y = 64y^3$

Ex 3.  $-a^2 = -1 \cdot a \cdot a = -a^2$

Ex 4.  $2y^2(x-3)^3 = 2y \cdot y \cdot (x-3) \cdot (x-3) \cdot (x-3)$

Ex 5.  $(2x)^5 = 32x^5$   
 $2^5 \cdot x^5 = 32x^5$

Ex 6.  $3b^4 = 3b \cdot b \cdot b \cdot b$

Ex 7.  $-(2x-1)^3 y^2 =$

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**Negative Exponents**

Find the following on your calculator

1.  $2^2 = 4$     2.  $2^3 = 8$     No decimals

3.  $2^{-2} = \frac{1}{4}$     4.  $2^{-3} = \frac{1}{8}$

So, what happens when you have a negative exponent?  
 (What do I do when my children are negative?)

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B. Simplify negative exponents.

1.  $2^{-3} = \frac{1}{2^3} = \frac{1}{8}$

2.  $-\left(\frac{3}{4}\right)^{-4} = -\left(\frac{3^{-4}}{4^{-4}}\right) = -\left(\frac{4^4}{3^4}\right) = -\frac{256}{81}$

3.  $\left(\frac{1}{3}\right)^{-2} = \frac{1^{-2}}{3^{-2}} = \frac{3^2}{1^2} = \frac{9}{1} = 9$

4.  $(-5)^{-5} = \frac{1}{(-5)^5} = -\frac{1}{3125}$

5.  $(-6)^0 = 1$

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**Properties of Exponents.**

- Multiply**  $x^3 \cdot x^{10} = x^{13}$
- Divide**  $\frac{x^{10}}{x^3} = x^7$   $x^3 \cdot x^3 \cdot x^3 \cdot x^3$
- Power to Power**  $(x^3)^4 = x^{12}$
- Distribute**  $(2x^3y^4)^2 = 2^2x^6y^8 = 4x^6y^8$

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**C. Properties of Exponents**

Property	Example	Operation	Hint
Product of powers	$x^2 \cdot x^3 = x^5$	Add the exponents	$x^2 = x \cdot x$ $x^3 = x \cdot x \cdot x$
Quotient of powers	$x^5 / x^3 = x^2$	Subtract exponents	$x^5 = x \cdot x \cdot x \cdot x \cdot x$ $x^3 = x \cdot x \cdot x$
Power of a power	$(x^3)^4 = x^{12}$	Multiply exponents	$x^5 \cdot x^5 \cdot x^5 = x^{15}$
Power of a product	$(xy)^3 = x^3y^3$	distribute the exponent	$(x^2)^3 = x^6$ $(y^3)^2 = y^6$
Power of a quotient	$(x/y)^5 = x^5/y^5$	Distribute exponent	$(x^5)^2 = x^{10}$ $(y^2)^3 = y^6$

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**Simplify:**

- $2x^3y(-5xy^2) = -10x^4y^3$
- $(5x^6y^2)^3 = 5^3x^{18}y^6 = 125x^{18}y^6$
- $\frac{4u^4v^{-1}}{2u^4v} = \frac{2u^4v^{-1}}{2u^4v} = \frac{1}{v^2}$
- $(-2a^3b)^{-3} = (-2)^{-3}a^{-9}b^{-3} = \frac{1}{(-2)^3a^9b^3} = -\frac{1}{8a^9b^3}$
- $4\left(\frac{ab^4}{b^3}\right)^2 = 4(a^2b^2) = 4a^2b^2$
- $-2a(ab^3)^2 = -2a(a^2b^6) = -2a^3b^6$
- $\frac{x^{-2}y^{-3}}{x^5y^{-6}} = \frac{y^3}{x^7}$

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- $x^{-1/3} = \frac{1}{x^{1/3}}$
- $(x^9y^{12}z^3)^{1/3} = x^3y^4z$
- $(x^8)^{-1/4} = x^{-2} = \frac{1}{x^2}$
- $\left(\frac{a}{b^8}\right)^{1/4} = \frac{a^{1/4}}{b^2}$
- $12^{2/3} \cdot 12^{1/6} = 12^{5/6}$
- $y^{1/3} \cdot y^{-1/3} = y^0 = 1$
- $(8^{12})^{1/4} = 8^3$
- $-3x^{1/3} \cdot 4x^{1/6} = -12x^{1/2}$

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**Conclusion**

1. What do you do when you multiply with exponents?  
*add exponents*
2. What do you do when you divide with exponents?  
*subtract*
3. What do you do when you have a power to a power?  
*Multiply*
4. Can you have negative exponents?  
*No*
5. What do you do if you have a negative exponent?  
*Goes to different level*
6. What do we do with exponents that are fractions?  
*Get common denominators*

**Assignment**

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