

## Warm Up

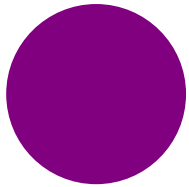
$$1) (4^2)^3$$
$$16^3 \rightarrow 4^6$$

$$2) 5^3 \cdot 5^{-1}$$
$$5^2 = 25$$

$$3) \sqrt{81} = 9$$

$$4) \sqrt[3]{8} = 2$$

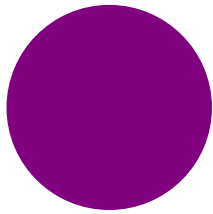
Welcome Back!



## Semester Breakdown

# 4 Tests

- Trigonometry
- Rational Exponents & Radical Function
- Exponential & Logarithmic Functions
- Rational Functions



## Grading

Test 60%

Final 20%

Homework/ DLT/ Classwork 20%

## Retake Policy

\*Two unit tests per semester.

\*You must complete the following prior to test  
retake day:

- Fully correct all the mistakes from the test.
- All Daily Learning Target quizzes from the unit must be corrected.
- All homework from the unit must be completed.
- Complete an additional review assignment

## Chapter 6 Section 1

### Objectives:

- \*Evaluate  $n$ th roots.
- \*Evaluate expressions with rational exponents.
- \*Use/Apply the properties of Exponents.



## PROPERTIES OF EXPONENTS

Let  $a$  and  $b$  be real numbers and let  $m$  and  $n$  be integers.

**Product of Powers Property**  $a^m \cdot a^n = a^{m+n}$

**Power of a Power Property**  $(a^m)^n = a^{mn}$

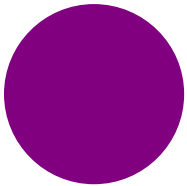
**Power of a Product Property**  $(ab)^m = a^m b^m$

**Negative Exponent Property**  $a^{-m} = \frac{1}{a^m}$

**Zero Exponent Property**  $a^0 = 1$

**Quotient of Powers Property**  $\frac{a^m}{a^n} = a^{m-n}$

**Power of a Quotient Property**  $\left(\frac{a}{b}\right)^m = \frac{a^m}{b^m}$



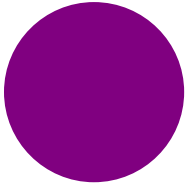
## Product of Powers

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

Ex 1:  $5^3 \cdot 5^2$   $5^5$

Ex 2:  $(-4) \cdot 2^5$   $-4 \cdot 32$

Ex 3:  $b^{-4}b^2b^6$   $b^4$



## Power of a Power

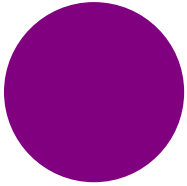
$$(a^m)^n = a^{mn}$$

$$\text{Ex: } (4^2)^4$$

48

$$\text{Ex: } (x^{-3})^{-2}$$





## Power of a Product

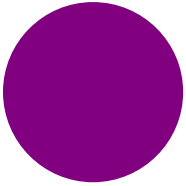
$$(ab)^m = a^m b^m$$

$$\text{Ex: } (2 \cdot 4)^2$$

$$8^2$$
$$64$$

$$2^2 \cdot 4^2$$
$$4 \cdot 16$$
$$64$$

$$\text{Ex: } (x^{-2}y^{-3})^{-1}$$

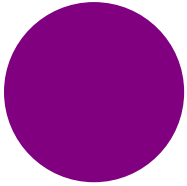


## Quotient of Powers

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

Ex:  $\frac{6^2}{6^{-4}}$   $6^6$

Ex 2:  $\frac{a^2b^6}{ab^{-4}}$   $a^1b^{10}$

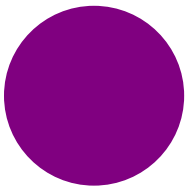


## Power of a Quotient

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

$$\text{Ex: } \left(\frac{2}{9}\right)^3 = \frac{2^3}{9^3} = \frac{8}{729}$$

$$\text{Ex 2: } \left(\frac{x^2y^4}{xy^{-2}}\right)^2$$



## Negative Exponents

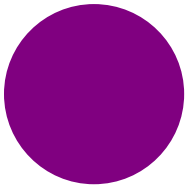
$$a^{-m} = \frac{1}{a^m}$$

Ex:  $7^{-2} = \frac{1}{7^2} = \frac{1}{49}$

$$x^{-1/2} = \frac{1}{x^{1/2}} = \frac{1}{\sqrt{x}}$$

Ex 2:  $x^{-1/2}$

Ex 3:  $\frac{1}{(ab)^{-2}}$



Zero Exponent  
 $a^0 = 1$

Ex:  $(-214)^0$

Ex 2:  $(ab)^0$


 TOYO

Putting it all together!

$$\text{Ex: } \left( \frac{2x^4y^{-2}}{x^3y^6} \right)^3$$

$$\left( 2x^1y^{-8} \right)^3$$

$$\left( \frac{2x^1}{y^8} \right)^3 = \frac{8x^3}{y^{24}}$$

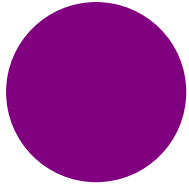
$$\text{Ex 2: } \frac{(x^{-3}y^3)^2}{x^5y^6}$$

$$\frac{x^{-6}y^6}{x^5y^6} = x^{-11} = \frac{1}{x^{11}}$$

# **Green Exponent WS**

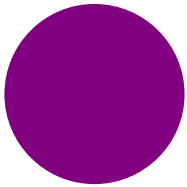
(10 minutes)

-Finish for homework.



What is the difference between simplifying & evaluating expressions?





What are some examples of perfect squares?

Evaluate  $1^2=$   
 $2^2=$   
 $3^2=$   
 $4^2=$   
 $5^2=$   
 $6^2=$   
 $7^2=$   
 $8^2=$   
 $9^2=$   
 $10^2=$

$11^2=$   
 $12^2=$   
 $13^2=$   
 $14^2=$   
 $15^2=$   
 $16^2=$   
 $17^2=$   
 $18^2=$   
 $19^2=$   
 $20^2=$

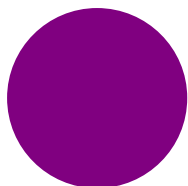


Evaluate	$1^2 =$	1	$11^2 =$	121
	$2^2 =$	4	$12^2 =$	144
	$3^2 =$	9	$13^2 =$	169
	$4^2 =$	16	$14^2 =$	196
	$5^2 =$	25	$15^2 =$	225
	$6^2 =$	36	$16^2 =$	256
	$7^2 =$	49	$17^2 =$	289
	$8^2 =$	64	$18^2 =$	324
	$9^2 =$	81	$19^2 =$	361
	$10^2 =$	100	$20^2 =$	400



## Common Perfect Squares, Cubes, Fourth Powers, and Fifth Powers

<u>number</u>	<u>square</u>	<u>cube</u>	<u>4<sup>th</sup> power</u>	<u>5<sup>th</sup> power</u>
2	4	8	16	32
3	9	27	81	243
4	16	64	256	
5	25	125	625	
6	36	216		
7	49			
8	64			
9	81			
10	100			
11	121			
12	144			
13	169			
14	196			
15	225			
16	256			
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19	361			
20	400			



## Rational Exponents

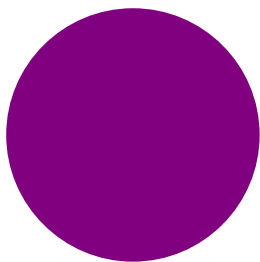
$$x^{\frac{a}{b}} = \sqrt[b]{x^a}; (n \neq 0)$$

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Exponent

Radical Symbol

Radicand



## Find nth roots

Real number $a$	Integer $n$	Root(s) of $a$	Example
$a > 0$	$n > 0$ , $n$ is even.	$\sqrt[n]{a}$ , $-\sqrt[n]{a}$	$\sqrt[4]{81} = 3$ , $-\sqrt[4]{81} = -3$
$a > 0$ or $a < 0$	$n$ is odd.	$\sqrt[n]{a}$	$\sqrt[3]{-8} = -2$
$a < 0$	$n$ is even.	No real roots	$\sqrt{-4}$ is not a real number.
$a = 0$	$n$ is even or odd.	$\sqrt[n]{0} = 0$	$\sqrt[3]{0} = 0$

Ex:  $n=3$ ,  $a=-216$

Ex 2:  $n=4$ ,  $a=81$

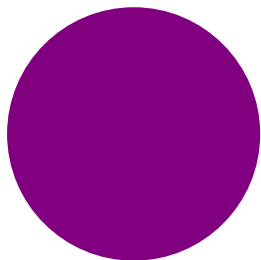


## Find nth roots

Real number $a$	Integer $n$	Root(s) of $a$	Example
$a > 0$	$n > 0, n$ is even.	$\sqrt[n]{a}, -\sqrt[n]{a}$	$\sqrt[4]{81} = 3, -\sqrt[4]{81} = -3$
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Ex:  $n=5, a=243$

Ex:  $\sqrt[4]{-64}$



## Rational exponents

$$a^{m/n} = (a^{1/n})^m = (\sqrt[n]{a})^m$$

$$a^{-m/n} = \frac{1}{a^{m/n}} = \frac{1}{(a^{1/n})^m} = \frac{1}{(\sqrt[n]{a})^m}, a \neq 0$$

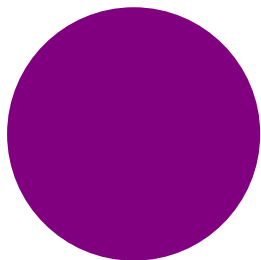
Rational Exponent Form

Radical Form

Ex:  $16^{3/2}$

Ex 2:  $32^{-3/5}$





## Rational exponents

$$a^{m/n} = (a^{1/n})^m = (\sqrt[n]{a})^m$$

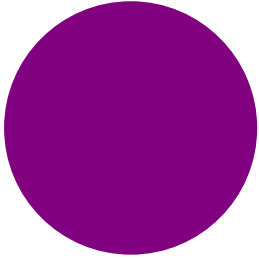
$$a^{-m/n} = \frac{1}{a^{m/n}} = \frac{1}{(a^{1/n})^m} = \frac{1}{(\sqrt[n]{a})^m}, a \neq 0$$

Rational Exponent Form

Radical Form

Ex 3:  $4^{5/2}$

Ex 4:  $9^{-1/2}$



## Rational exponents

$$a^{m/n} = (a^{1/n})^m = (\sqrt[n]{a})^m$$

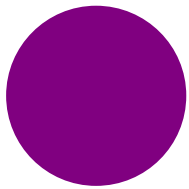
$$a^{-m/n} = \frac{1}{a^{m/n}} = \frac{1}{(a^{1/n})^m} = \frac{1}{(\sqrt[n]{a})^m}, a \neq 0$$

Ex 5:  $81^{3/4}$

Rational Exponent Form

Radical Form

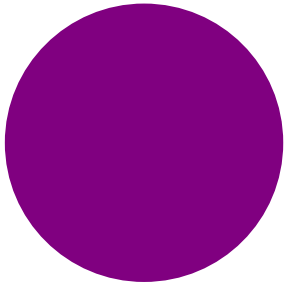
Ex 6:  $(\sqrt[4]{16})^5$



Evaluating expressions using a calculator.

Ex:  $25^{-1/3}$

Ex 2:  $\sqrt[5]{32,768}$



HOMEWORK

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