

Warm Up

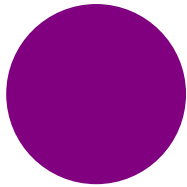
1)  $(4^2)^3$

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

3)  $\sqrt{81}$

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

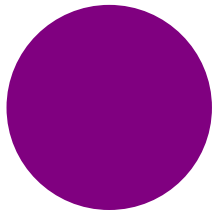
Welcome Back!



## 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**      $(a^m)^n = a^{mn}$

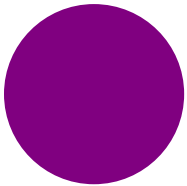
**Power of a Product Property**      $(ab)^m = a^m b^m$

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

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

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

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



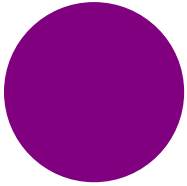
## Product of Powers

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

$$\text{Ex 1: } 5^3 \cdot 5^2$$

$$\text{Ex 2: } (-4) \cdot 2^5$$

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



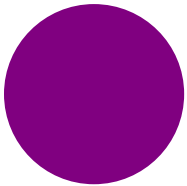
## Power of a Power

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

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

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



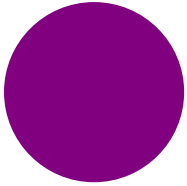


## Power of a Product

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

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

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

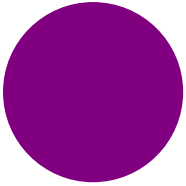


## Quotient of Powers

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

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

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

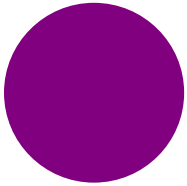


## Power of a Quotient

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

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

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



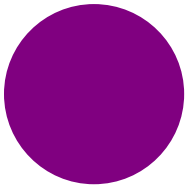
## Negative Exponents

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

Ex:  $7^{-2}$

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!

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

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

# **Green Exponent WS**

(10 minutes)

-Finish for homework.

**X**

Tic Tac Toe

**O**



(26)  $4y^{-2}$

$$\frac{4}{y^2}$$

(27)

$$\frac{1}{5x^{-2}}$$

$$\frac{1}{5}x^2$$

(37)

$$\frac{3xy^4}{2x^5y} \cdot \frac{6x^5y^2}{4y}$$

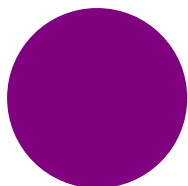
$$\frac{18x^6y^6}{8x^5y^2}$$

$$\frac{9x^1y^4}{4}$$

(39)

$$\frac{55}{2} \cdot \frac{4}{5^8}$$

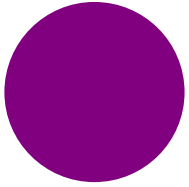
$$\frac{2}{5^3} \cdot \frac{2}{5^5} \cdot \frac{4}{5^8}$$



What is the difference between simplifying & evaluating expressions?

$$\frac{x^6}{x^2} = x^4$$

$$\frac{2^4}{2^2} = \frac{16}{4} = 4$$



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

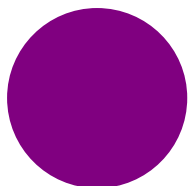
$$1^2 = \sqrt{1}$$
$$2^2 = 4$$
$$3^2 = 9$$
$$4^2 = 16$$
$$5^2 = 25$$
$$6^2 = 36$$
$$7^2 = 49$$
$$8^2 = 64$$
$$9^2 = 81$$
$$10^2 = 100$$

$$11^2 = 121$$
$$12^2 = 144$$
$$13^2 = 169$$
$$14^2 = 196$$
$$15^2 = 225$$
$$16^2 = \sqrt{256} = 16$$
$$17^2 = 289$$
$$18^2 = 324$$
$$19^2 = 361$$
$$20^2 = 400$$



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

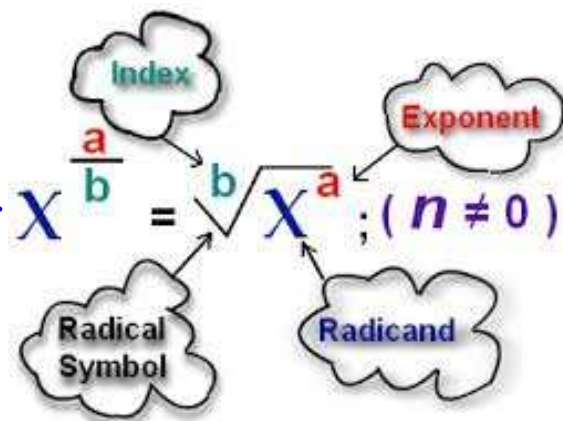
<u>number</u>	<u>square</u>	<u>cube</u>	<u>4<sup>th</sup> power</u>	<u>5<sup>th</sup> power</u>
2	4	8	16	32
3	9	27	81	243
4	16	64	256	
5	25	125	625	
6	36	216		
7	49			
8	64			
9	81			
10	100			
11	121			
12	144			
13	169			
14	196			
15	225			
16	256			
17	289			
18	324			
19	361			
20	400			



# Rational Exponents

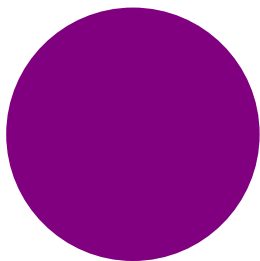
$$\sqrt[3]{x^2} = \sqrt[3]{4}$$

$$(x^2)^{1/2} = 4^{1/2}$$



$$\sqrt[3]{x^2} = x^{2/3}$$

$$(\sqrt[n]{x})^a$$



Find nth roots

$$\sqrt[n]{a}$$

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.	$\sqrt[n]{0} = 0$	$\sqrt[5]{0} = 0$

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

$$\sqrt[3]{-216} = -6$$

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

$$\sqrt[4]{81} = 3$$

$$\begin{array}{r} \sqrt[3]{11} \\ \sqrt[5]{11} \\ \sqrt[6]{11} \\ \sqrt[9]{11} \end{array}$$





## Find nth roots

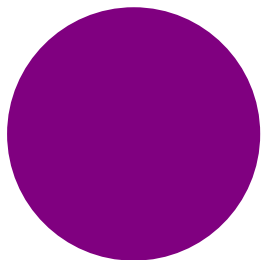
Real number $a$	Integer $n$	Root(s) of $a$	Example
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$a < 0$	$n$ is even.	No real roots	$\sqrt{-4}$ is not a real number.
$a = 0$	$n$ is even or odd.	$\sqrt[n]{0} = 0$	$\sqrt[5]{0} = 0$

Ex:  $n=5, a=243$

$$\sqrt[5]{243} = 3$$

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

no real roots



## 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:  $16^{3/2}$

Rational Exponent Form ~~≠~~

$$16^{3/2}$$

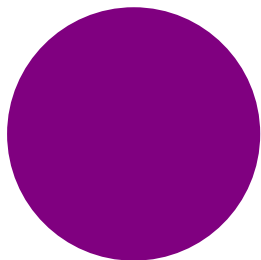
Radical Form  $\sqrt{\quad}$

$$\sqrt[2]{16^3} \text{ or } (\sqrt{16})^3$$

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

$$\frac{1}{32^{3/5}}$$

$$\frac{1}{(\sqrt[5]{32})^3} \text{ or } \frac{1}{\sqrt[5]{32^3}}$$



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

Rational Exponent Form

$$4^{5/2}$$

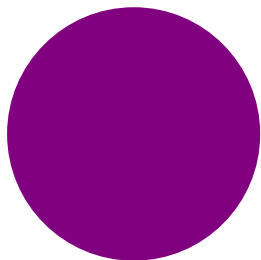
Radical Form

$$(\sqrt[2]{4})^5$$

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

$$\frac{1}{9^{1/2}}$$

$$\frac{1}{\sqrt[2]{9}} \quad \frac{1}{\sqrt{9}}$$



## 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

$$81^{3/4}$$

Radical Form

$$\left(\sqrt[4]{81}\right)^3$$

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

$$16^{5/4}$$

$$\left(\sqrt[4]{16}\right)^5$$

Evaluate without a calculator.

Ex:  $16^{3/2}$

$$\left(\sqrt{16}\right)^3$$

$$4^3$$

$$\textcircled{64}$$

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

$$\frac{1}{9^{1/2}}$$

$$\frac{1}{\sqrt{9}} = \frac{1}{3}$$

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

$$\frac{1}{32^{3/5}} = \frac{1}{\left(\sqrt[5]{32}\right)^3}$$

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

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

$$\sqrt[4]{81}^3$$

$$3^3$$

$$27$$

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

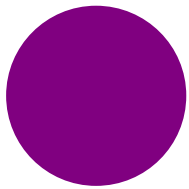
$$\left(\sqrt{4}\right)^5$$

$$2^5 = \textcircled{32}$$

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

$$2^5$$

$$32$$



Evaluating expressions using a calculator.

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

*· 341*

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

*8*

Solve the equation. Round the result to two decimal places.

Do you remember?  $\sqrt{x^2} = \sqrt{16}$

$$x = \pm 4$$

$$(x^2)^{1/2} = (16)^{1/2}$$

$$x = 16^{1/2}$$

$$x = \pm 4$$

$$1) \sqrt[3]{x^3} = \sqrt[3]{125}$$

$$x = 5$$

$$2) 5x^3 = 1080$$

$$\sqrt[3]{x^3} = \sqrt[3]{\frac{1080}{5}}$$

$$x = 6$$

$$3) x^6 + 36 = 100$$

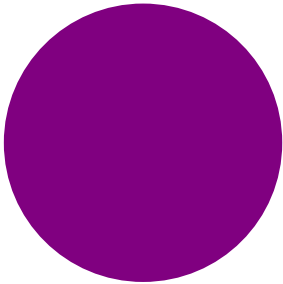
$$\sqrt[6]{x^6} = \sqrt[6]{100 - 36}$$

$$x = \pm 2$$

$$4) x^6 - 34 = 181$$

$$\sqrt[6]{x^6} = \sqrt[6]{181 + 34}$$

$$x = \pm 2.45$$



HOMEWORK

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