

# Algebra 1R

Eighth Grade

Mr. Lumanauw

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# Multiplication Table

X	0	1	2	3	4	5	6	7	8	9	10	11	12
0	0	0	0	0	0	0	0	0	0	0	0	0	0
1	0	1	2	3	4	5	6	7	8	9	10	11	12
2	0	2	4	6	8	10	12	14	16	18	20	22	24
3	0	3	6	9	12	15	18	21	24	27	30	33	36
4	0	4	8	12	16	20	24	28	32	36	40	44	48
5	0	5	10	15	20	25	30	35	40	45	50	55	60
6	0	6	12	18	24	30	36	42	48	54	60	66	72
7	0	7	14	21	28	35	42	49	56	63	70	77	84
8	0	8	16	24	32	40	48	56	64	72	80	88	96
9	0	9	18	27	36	45	54	63	72	81	90	99	108
10	0	10	20	30	40	50	60	70	80	90	100	110	120
11	0	11	22	33	44	55	66	77	88	99	110	121	132
12	0	12	24	36	48	60	72	84	96	108	120	132	144

# Priority Standards

8.G.7 - Apply the Pythagorean Theorem to determine unknown side lengths in right triangles in real-world and mathematical problems in two and three dimensions.

8.G.8 - Apply the Pythagorean Theorem to find the distance between two points in a coordinate system.

# Unit 2 - Exponents, Square Roots, Pythagorean Theorem

## Real Life Scenario

You and two friends have been hired to design a ramp for a Monster Truck company. The company initially want three designs submitted for their review. They provide you with the dimensions of the height and the starting point for the truck and ask you to determine the amount of material they will need to purchase for the incline of the ramp.

## Essential Question

1. How do we approximate irrational numbers?
2. How do we solve for the missing side of a right triangle in a real life situation or on the coordinate grid?

# Exponents and Multiplication Worksheet

Kuta Software - Infinite Pre-Algebra  
 Exponents and Multiplication  
 Name \_\_\_\_\_  
 Date 9/17/13 Period \_\_\_\_\_

Simplify. Your answer should contain only positive exponents.

1)  $4^2 \cdot 4^3$   
 $4^{2+3} = 4^5 = 16^2 = 256$

2)  $4 \cdot 4^5$   
 $4^{1+5} = 4^6 = 64$

3)  $3^2 \cdot 3^2$   
 $3^{2+2} = 3^4 = 9^2 = 81$

4)  $2 \cdot 2^2 \cdot 2^3$   
 $2^{1+2+3} = 2^6 = 32$

5)  $2n^4 \cdot 5n^4$   
 $25n^{4+4}$   
 $10n^8$

6)  $6r \cdot 5r^2$   
 $6 \cdot 5 r^{1+2}$   
 $30r^3$

7)  $2n^4 \cdot 6n^4$   
 $26n^{4+4}$   
 $12n^8$

8)  $6k^2 \cdot k$   
 $6k^{2+1}$   
 $6k^3$

9)  $5b^2 \cdot 8b$   
 $5 \cdot 8 \cdot b^{2+1}$   
 $40b^3$

10)  $4x^2 \cdot 3x$   
 $4 \cdot 3 x^{2+1}$   
 $12x^3$

11)  $6x \cdot 2x^2$   
 $6 \cdot 2 x^{1+2}$   
 $12x^3$

12)  $6x \cdot 6x^3$   
 $6 \cdot 6 x^{1+3}$   
 $36x^4$

13)  $7u^3 \cdot 10u^2v^3 \cdot 8uv^3$   
 $7 \cdot 10 \cdot 8 u^{3+2+1} v^{3+3+3}$   
 $560u^6v^9$

14)  $9xy^2 \cdot 9x^2y^2$   
 $9 \cdot 9 x^{1+2} y^{2+2}$   
 $81x^3y^4$

15)  $6m^3n^3 \cdot 8m^2n^3$   
 $6 \cdot 8 m^{3+2} n^{3+3}$   
 $48m^5n^6$

16)  $6x^2 \cdot 6x^3y^4$   
 $6 \cdot 6 x^{2+3} y^4$   
 $36x^5y^4$

17)  $7u^2v^3 \cdot 9uv^3$   
 $7 \cdot 9 u^{2+1} v^{3+3}$   
 $63u^3v^6$

18)  $uv \cdot 4uv^5$   
 $4 \cdot u^{1+1} v^{1+5}$   
 $4u^2v^6$

19)  $10xy^2 \cdot 8x^2y^3$   
 $10 \cdot 8 x^{1+2} y^{2+3}$   
 $80x^3y^5$

20)  $3u^4v^3 \cdot 7u^2v^3$   
 $3 \cdot 7 \cdot u^{4+2} v^{3+3}$   
 $21u^6v^6$

21)  $(2x^2)^2$   
 $2^2 x^{2 \cdot 2}$   
 $4x^4$

22)  $(p^4)^4$   
 $p^{4 \cdot 4} = p^{16}$

23)  $(k^3)^4$   
 $k^{3 \cdot 4}$   
 $k^{12}$

24)  $(7k)^2$   
 $7^2 k^2 = 49k^2$

25)  $(x^2)^4$   
 $x^{2 \cdot 4} = x^8$

26)  $(2b^4)^4$   
 $2^4 b^{4 \cdot 4} = 16b^{16}$

# Multiplication Properties of Exponents Date: 9-16-13

Cues

Notes

Objective

Students will simplify expressions using the multiplication properties of exponents.

Algebra Standard

8.EE.1

Exponent Review

$5^4$  or  $y$  ← exponent or power  
 Base

$3^4 = 3 \cdot 3 \cdot 3 \cdot 3$   
 $y^5 = y \cdot y \cdot y \cdot y \cdot y$

Example 1  
 Write in Exponent Form

(a)  $5 \cdot 5 = 5^2$   
 (b)  $x \cdot x \cdot x \cdot x = x^4$   
 (c)  $(2b)(2b)(2b)(2b)(2b) = (2b)^5$   
 (d)  $(4y)^3 = 64y^3$

Example 2

(a)  $3^2 = 9$   
 (b)  $4^2 \cdot (-4)^2 = 16$   
 (c)  $(-2)^5 = -32$   
 (d)  $(4y)^3 = 64y^3$

If:  
 Base is Negative  
 and the exponent is:  
 @ Even, the answer is positive  
 @ Odd, the answer is negative

Product of Powers Property

$x^3 \cdot x^4 = (x \cdot x \cdot x) \cdot (x \cdot x \cdot x \cdot x) = x^{(3+4)} = x^7$

↑ same base

When multiplying terms with the same base,  
 add the exponents.  
 $x^a \cdot x^b = x^{a+b}$

Example 3 Simplify

(1)  $7^2 \cdot 7^4 = 7^{2+4} = 7^6$   
 (2)  $3x^3 \cdot 6x^5 = 18x^{3+5} = 18x^8$   
 (3)  $y^2 \cdot 2y^3 \cdot 3y^4 = 6y^{2+3+4}$   
 (4)  $2^2x^3y^5 \cdot 2^3xy^2 = 2^5x^4y^7 = 32x^4y^7$

2nd + 4th

Power of a Power Property

$(a^2)^3$  ← Power is 3  
 Base is  $a^2$

$(a^2)(a^2)(a^2) = a^{(2+2+2)} = a^{(2)(3)} = a^6$

When finding a power of a power, multiply the exponents.  
 $(x^a)^b = x^{a \cdot b}$

Example 4 Simplify

(a)  $(5^3)^4 = 5^{3 \cdot 4} = 5^{12}$   
 (b)  $[(-2)^5]^7 = (-2)^{5 \cdot 7} = (-2)^{35}$   
 (c)  $(z^2)^3 = z^{(2 \cdot 3)} = z^6$

2nd only

Summary

The power tells how many times to multiply the base by. When multiplying two terms with the same base, add the exponents. If a power is raised to another power, multiply the exponents.

$$x^2 \cdot x^3 = x^{2+3} = x^5$$

$$(x^2)^3 = x^{2 \cdot 3} = x^6$$

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# Homework

Date: 9-23-13

Cues

Notes

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even, 48, 52

Summary

<b>Topic:</b>	<b>Exponents with Multiplication and Division</b>
<b>Objective</b>	To multiply and divide powers.
<b>Standard</b>	8.EE.1
<b>Exponent of 1</b>	If the exponent is 1, then you just have the variable or constant itself.
<b>Example</b>	$x^1 = x$ $2^1 = 2$ $4x = 4^1 x^1$ **We usually don't write the "1"***
<b>Exponent of 0</b>	If the exponent is 0, then the answer is 1.
<b>Example</b>	$y^0 = 1$ $5^0 = 1$ $(2x)^0 = 1$
<b>Multiplying variables with exponents</b>	So, how do you multiply this: $(y^2)(y^3)$ The simplest method is to just ADD THE EXPONENTS! $y^2 y^3 = y^{2+3} = y^5$
<b>Practice 1</b>	$(x^3 y^5)(x^2 y z) =$ $x^3 x^2 y^5 y^1 z^1 = x^{3+2} y^{5+1} z = x^5 y^6 z$
<b>Practice 2</b>	$(2xy)(4y) =$ $(2)(4)(x)(y)(y) = 8xy^2$

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# Topic:

# Exponents with Multiplication and Division

Objective

To multiply and divide powers.

cont.

Standard

8.EE.1

Practice 3

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

$$(3)(4)(x^2)(x^2)(y^2) = 12x^{2+2}y^2 = 12x^4y^2$$

Dividing Variables with Exponents

So, how do you do this?

$$y^3 = \cancel{(y)}(\cancel{y})(y) = y$$

$$y^2 = \cancel{(y)}(\cancel{y})$$

OR you could have done it like this:

$$\frac{y^3}{y^2} = y^{3-2} = y^1 = y$$

Practice 4

$$\frac{x^3yz^2}{xy^2z^2} = x^{3-1}y^{1-2}z^{2-2}$$

$$= \frac{x^2}{y}$$

Practice 5

$$\frac{7c^9}{21c^3} = \frac{7}{21}c^{9-3} = \frac{1}{3}c^6 = \frac{c^6}{3}$$

# Homework

Date: 9-24-13

Cues

Notes

Page 222, #20-38  
even, 57

Summary

Cues

Notes

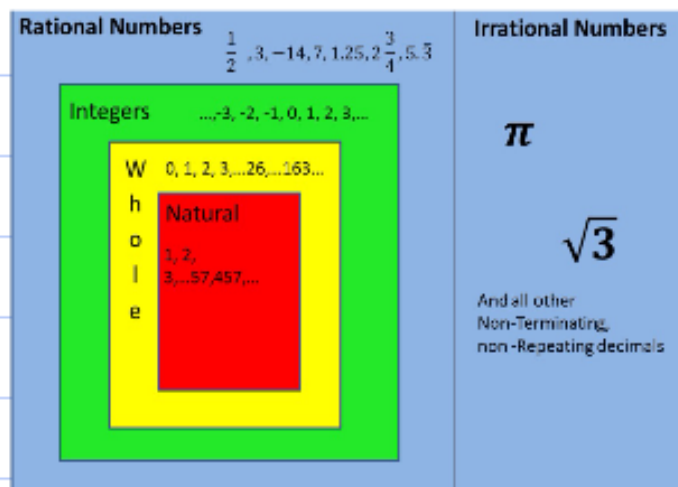
# Objective

To write fractions as decimals and vice versa.

# Standard

8.NS.1

# Real Numbers



# Fractions, Decimals, & Percents

## Changing Percents to Fractions

- Drop the % sign.
- Put the number over 100.
- Reduce.

~~8%~~

~~120%~~

$$\frac{8}{100} = \frac{2}{25}$$

$$\frac{120}{100} \stackrel{\div 20}{=} \frac{6}{5} = 1\frac{1}{5}$$

Summary

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cont.

## Changing Fractions to Decimals

Notes

- Perform Long Division, **Bottom out** – **Top in**.

$$\frac{19}{6} \rightarrow \begin{array}{r} 3 \cdot 1\bar{6} \\ 6 \overline{) 19.00} \\ \underline{18} \phantom{00} \\ 10 \phantom{00} \\ \underline{6} \phantom{00} \\ 40 \phantom{00} \\ \underline{36} \phantom{00} \\ 4 \phantom{00} \end{array}$$

## Changing Decimals to Fractions

Here's another one:

$$.5 = \frac{5}{10} \leftarrow \text{Hey, this guy simplifies!}$$

↑  
tenths ( $\frac{1}{10}$ )

$$.5 = \frac{5}{10} \div \frac{5}{5} = \frac{1}{2}$$

$$\text{So, } .5 = \frac{1}{2}$$

One more:

$$.325$$

↑  
Last spot  $\rightarrow \frac{1}{1000}$

$$.325 = \frac{325}{1000} \div \frac{25}{25} = \frac{13}{40}$$

↑  
Reduce it!

Summary



# Warm Up - Square Roots

9-25-13

Draw a square with an area of 9 units squared.

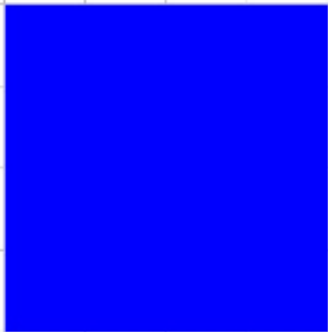


$$3 \cdot 3 = 9$$

$$\sqrt{9} = 3$$

← The length of a side

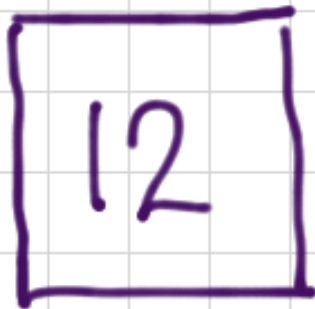
Draw a square with an area of 16 units squared.



$$4 \cdot 4 = 16$$

$$\sqrt{16} = 4$$

Draw a square with an area of 12 square units.



$$\approx 3.4$$

# Irrational Numbers

Date: 9-25-13

Cues

Notes

Objective

To compare and order real numbers.

Standards

Identifying Rational and Irrational Numbers

a)  $\sqrt{2} \rightarrow$  irrational because 2 is a positive integer but not a perfect square.

b)  $-\frac{1}{9} \rightarrow$  rational because it is a quotient of 2 integers.

c)  $-\sqrt{169} \rightarrow$  rational because  $-\sqrt{169} = -13$ .

d)  $1.2112112\dots \rightarrow$  irrational because it is not terminating and not repeating.

Summary

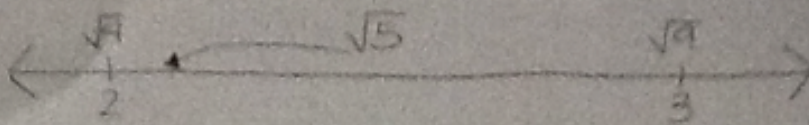
Cues

Math Notes:  $\pi$

### Estimating Square Roots

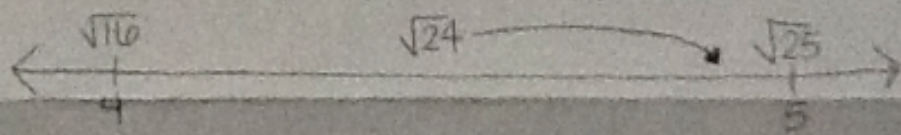
Use a number line

1.  $\sqrt{5} \approx 2.1$



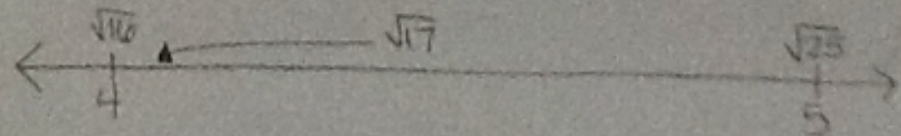
A number line with arrows at both ends. There are two tick marks labeled 2 and 3. Above the tick mark 2 is the label  $\sqrt{4}$ , and above the tick mark 3 is the label  $\sqrt{9}$ . A curved arrow starts at the tick mark 3 and points to the left, ending at a point between 2 and 3. Above this arrow is the label  $\sqrt{5}$ .

2.  $\sqrt{24} \approx 4.9$



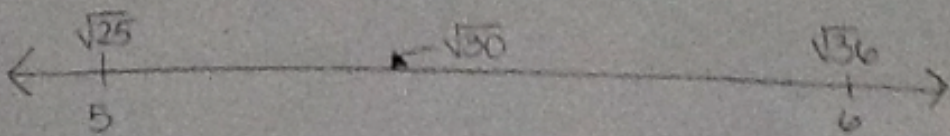
A number line with arrows at both ends. There are two tick marks labeled 4 and 5. Above the tick mark 4 is the label  $\sqrt{16}$ , and above the tick mark 5 is the label  $\sqrt{25}$ . A curved arrow starts at the tick mark 5 and points to the left, ending at a point between 4 and 5. Above this arrow is the label  $\sqrt{24}$ .

3.  $\sqrt{17} \approx 4.1$



A number line with arrows at both ends. There are two tick marks labeled 4 and 5. Above the tick mark 4 is the label  $\sqrt{16}$ , and above the tick mark 5 is the label  $\sqrt{25}$ . A curved arrow starts at the tick mark 5 and points to the left, ending at a point between 4 and 5. Above this arrow is the label  $\sqrt{17}$ .

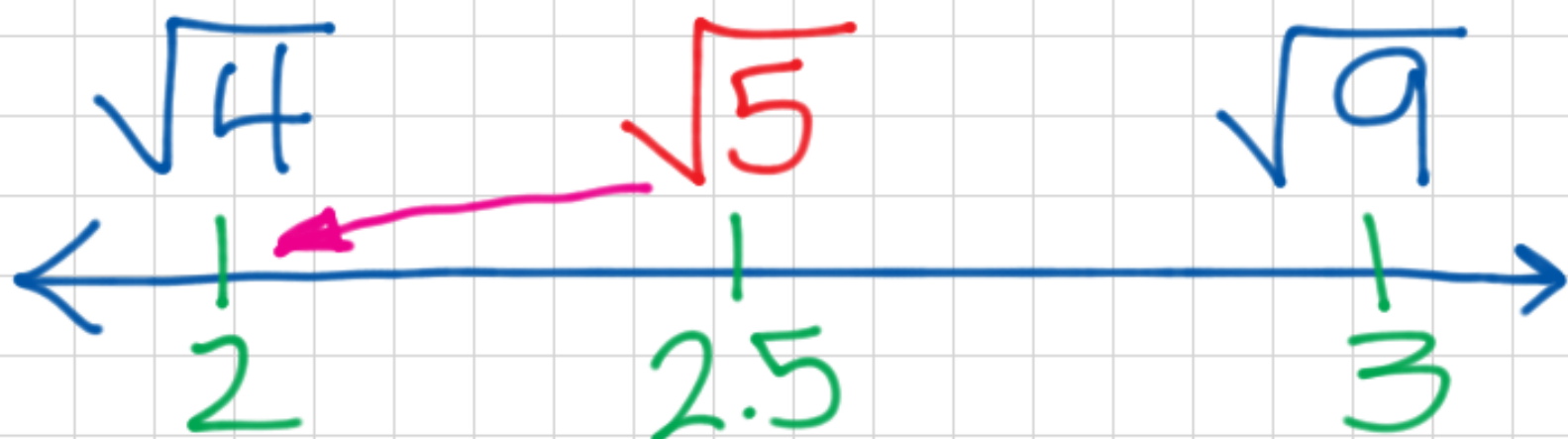
4.  $\sqrt{30} \approx 5.4$



A number line with arrows at both ends. There are two tick marks labeled 5 and 6. Above the tick mark 5 is the label  $\sqrt{25}$ , and above the tick mark 6 is the label  $\sqrt{36}$ . A curved arrow starts at the tick mark 6 and points to the left, ending at a point between 5 and 6. Above this arrow is the label  $\sqrt{30}$ .

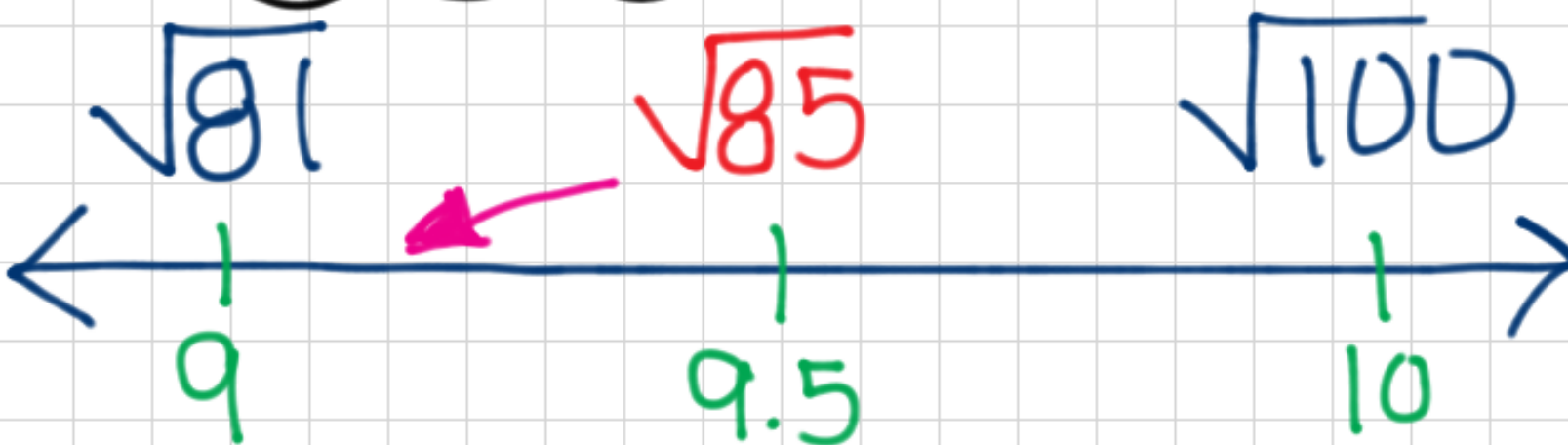
Summary

## Irrational Numbers, cont.



$\sqrt{5}$  is between 2 and 3.

$$\sqrt{5} \approx 2.1$$



$\sqrt{85}$  is between 9 and 10.

$$\sqrt{85} \approx 9.3$$

Cues

Notes

Page 456

#42, 44, 45-50 all, 54-57 all

Summary

# Square Roots

Date: 9-26-13

Cues

Notes

Objective

To find and approximate square roots of numbers.

Standard

8.EE.1

Radical Expression

An expression that involves a square root sign.  $\sqrt{2x^2+5}$

Square Roots

Reals	
Rationals	Irrationals
$\sqrt{0} = 0$	$\sqrt{2} \approx 1.414$
$\sqrt{1} = 1$	$\sqrt{3} \approx 1.732$
$\sqrt{4} = 2$	$\sqrt{5} \approx 2.236$
$\sqrt{9} = 3$	$\sqrt{6} \approx 2.449$
$\sqrt{16} = 4$	$\sqrt{7} \approx 2.646$
$\sqrt{25} = 5$	$\sqrt{8} \approx 2.828$

**EXAMPLE #1 Evaluate the Radical Expression**

Evaluate the Expression

a)  $\sqrt{0} = 0$

f)  $2 + \sqrt{9} = 2 + 3$   
 $= 5$

b)  $-\sqrt{49} = -7$

c)  $\pm\sqrt{81} = \pm 9$

g)  $3 \pm \sqrt{25} = 3 \pm 5$

d)  $\sqrt{256} = 16$

$3 + 5 = 8$   
 $3 - 5 = -2$

e)  $\pm\sqrt{169} = \pm 13$

Summary

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# Square Roots, cont.

Date: 9-26-13

## EXAMPLE #2 Evaluate the Radical Expressions

- Evaluate the expression when  $a = 12$  and  $b = 4$

$$\sqrt{a + b}$$

$$\sqrt{12 + 4}$$

$$\sqrt{16}$$

4

$$\sqrt{b^2 - a}$$

$$\sqrt{4^2 - 12}$$

$$\sqrt{16 - 12}$$

$$\sqrt{4}$$

2

$$3\sqrt{ab + 1}$$

$$3\sqrt{(12)(4) + 1}$$

$$3\sqrt{48 + 1}$$

$$3\sqrt{49}$$

$$3 \cdot 7$$

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## EXAMPLE #3 Solve Quadratic Equations

Solve each equation

a)  $x^2 = 16$

$$\sqrt{x^2} = \sqrt{16}$$

$$|x| = 4$$

$$x = \pm 4$$

b)  $p^2 = 225$

$$\sqrt{p^2} = \sqrt{225}$$

$$|p| = 15$$

$$p = \pm 15$$

c)  $k^2 = 15$

$$\sqrt{k^2} = \sqrt{15}$$

$$|k| = \sqrt{15}$$

$$k = \pm \sqrt{15}$$

d)  $x^2 = -4$

No real solution

e)  $x^2 = 0$

$$x = 0$$