

Monday, August 6, 2018

Convert to decimals: $\frac{3}{5}$ $-\frac{2}{7}$ $\frac{12}{21}$

Convert to fractions: **0.247**

12.35

Jul 31-4:26 PM

Day 3 - Irrational Numbers

An **irrational #s** is:

- Any number that **can** be expressed in the form of a fraction.
- In decimal form, these decimals are **non-repeating, non-terminating**.
- In radical form, these radicals are unable to be simplified to an **perfect square** like...

Examples: $m = 3.141592653589793238462643$
 $e = 2.718281828459045235360287$
 $\sqrt{2} = 1.4142135623706914880168$

Estimating Irrational Numbers
 Use your calculator to estimate the following irrational numbers, round to the nearest hundredth.

1) $\sqrt{3} = 1.73$ 2) $\sqrt{77} = 8.77$ 3) $\sqrt{79} = 8.89$ 4) $\sqrt{87} = 9.33$

Graphing Irrational Numbers on a Number Line
 When graphing irrational numbers, always remember to convert to a **decimal** first (if not already in this form), this helps you to gauge its numerical position.

Graph the following irrational numbers on the number line.

1) $\sqrt{37} = 6.08$ 2) $\sqrt{29} = 5.39$ 3) $\sqrt{11} = 3.32$

Computing Rational and Irrational Numbers
 Put the following numbers in order from least to greatest (remember to convert to a decimal first!).

0 $\sqrt{10} = 3.16$ $\frac{22}{7} = 3.14$ $\frac{10}{3} = 3.33$ $3\pi = 9.42$ $\frac{22}{6} = 3.66$

$14 = 14$ $1, 2, 3, 4$ $3 = 3$

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The Real Number System

Mark an X for each category that applies.

Number	Real	Rational	Irrational	Integer	Natural
1	-6	X		X	X
2	$\frac{62}{1}$	X		X	X
3	0	X		X	X
4	$\pi/2$		X		
5	2.7	X		X	X
6	$2/5$	X		X	X
7	$\sqrt{7}$		X		
8	$\sqrt{25}$	X		X	X
9	1	X		X	X
10	$\frac{1}{2}$	X		X	X
11	-3	X		X	X
12	4.7	X		X	X
13	$3\pi/4$		X		
14	1%	X		X	X
15	$9/2$	X		X	X
16	$4\frac{1}{2}$	X		X	X
17	4.5	X		X	X
18	$5/2$	X		X	X
19	$2\sqrt{3}/3$		X		
20	$2/3$	X		X	X
21	$12.5/8$	X		X	X
22	1,000,000	X		X	X
23	-4982	X		X	X
24	17.1	X		X	X
25	-17.1	X		X	X
26	-3	X		X	X
27	-9	X		X	X
28	$3/1$	X		X	X
29	3.0	X		X	X
30	$-15/3$	X		X	X

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Tuesday, August 7, 2018

Classify the following into as many categories as possible:
 rational, irrational, integer, whole, and natural

$3/5$ -12.643 $0.4517248...$

-16 14π $\sqrt{27}$

Jul 31-4:26 PM

UNIT 1 QUIZ REVIEW

Compare using $<$, $>$, or $=$.
 $\sqrt{1} = 1$ $-2 < 4$ $3 > -6$ $0 < -3$

Find the absolute value of the following numbers.
 $|25| = 25$ $|-8| = 8$ $|7| = 7$

Give the opposite of each number.
 $5 = 45$ $-12 = 12$ $-6 = 6$ $0 = 0$

Classify the following into as many categories as possible: Rational, Irrational, Integer, Whole, Natural.
 Irrationals \rightarrow non-terminating, non-repeating decimal

$9 = -4.5$ $10 = 8$

RATIONAL numbers CAN be: (Circle all that apply)
 Written as fractions Terminating decimals Integers Perfect squares
 Written as repeating decimals Written as terminating decimals Written as repeating decimals

Can we classify zero?
Rational, Whole, Integer

Convert the following fractions into decimals.
 $11 \frac{11}{12} = 0.71$ $12 \frac{1}{12} = 1.16$ $13 \frac{-2}{12} = -0.4$

Convert the following decimals into fractions.
 $14.523 = \frac{623}{100}$ $15.025 = \frac{1}{40}$ $16.-0.7 = \frac{-7}{10}$

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UNIT 1 Quiz #1

Classifying Numbers.
 Classify each number as rational or irrational:
 1) $\frac{1}{2}$ 2) $3.4872872...$ 3) $3\sqrt{100}$

Name all the sets of numbers to which each belongs. (Irrational, Rational, Integers, Whole, Natural)
 4) $\frac{22}{7}$ 5) $\sqrt{400}$ 6) 16π

Operations with Rational Numbers.
 Evaluate the following expressions:
 7) $|-47|$ 8) $||-1|$ 9) $|4.23|$

Find the Opposite of each number:
 10) 27.4 11) -24 12) 0

Converting and Rounding Numbers.
 Convert the following fractions into decimals to the nearest hundredth.
 13) $\frac{52}{24}$ 14) $\frac{115}{24}$ 15) $2\frac{1}{2}$

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Wednesday, August 8, 2018

Determine the prime factorization of the following numbers:

$40 = 2 \cdot 2 \cdot 2 \cdot 5$ $52 = 2 \cdot 2 \cdot 13$ $64 = 2^6$ $125 = 5^3$
 (Handwritten prime factorizations for 40, 52, 64, and 125)

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Quiz Review ?

4) $\frac{22}{7}$ IRRATIONAL < Now ending nonrepeating
 $3.142857143...$
 6) 16π IRRATIONAL
 50.26548246

Aug 8-9:01 AM

Foundations of Algebra Unit 1 - Rational and Irrational Numbers

Day 5 - Simplifying Radical Expressions

A radical is any number with a radical symbol ($\sqrt{\quad}$).

or is the coefficient. Technically, it is being multiplied by $\sqrt{\quad}$.

radical symbol

A radical expression is an expression (coefficients and/or variables) with a radical.

index

radical symbol

radicand

$4\sqrt{10} = 4\sqrt{10}$

10 is the radicand. The radicand is the number "in the house"

Square Root Table

	1	2	3	4	5	6	7	8	9	10	11
Squares each of the following numbers:	1	2 ²	3 ²	4 ²	5 ²	6 ²	7 ²	8 ²	9 ²	10 ²	11 ²
Draw and square a number and square:	1	4	9	16	25	36	49	64	81	100	121
Perfect Squares	1	4	9	16	25	36	49	64	81	100	121
Take the square root of each perfect square:	$\sqrt{1}$	$\sqrt{4}$	$\sqrt{9}$	$\sqrt{16}$	$\sqrt{25}$	$\sqrt{36}$	$\sqrt{49}$	$\sqrt{64}$	$\sqrt{81}$	$\sqrt{100}$	$\sqrt{121}$
Square Roots	1	2	3	4	5	6	7	8	9	10	11

Perfect Squares are the product of a number multiplied by itself ($4 \cdot 4 = 16$) is the perfect square.

Think about the process we just performed: **Number \rightarrow Squared \rightarrow Square Root \rightarrow Same Number**

A root and an exponent are **inverses** of each other (they undo each other). Therefore, square roots and squaring a number are **inverses** or they undo each other. Just like adding and subtracting undo each other.

Estimating Square Roots

Sometimes the radicand is not a perfect square, cube, etc. In some of these cases, we may be asked to estimate the square root. The square root has to be in between two **numbers**. So think about the perfect squares that are **less than** or **greater than** the number.

Example: $\sqrt{55}$
 So 55 is between 49 and 64, so therefore the $\sqrt{55}$ has to be between 7 and 8.

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Foundations of Algebra Unit 1 - Rational and Irrational Numbers

Practice: 1) $\sqrt{45}$ 2) $\sqrt{80}$ 3) $\sqrt{100}$ 4) $\sqrt{105}$

between 4 3 5 $9 \cdot 5 = 45$ $8 \cdot 10 = 80$ $10 \cdot 10 = 100$ $10 \cdot 11 = 110$

When are Radical Expressions in Simplest Form?

A **Radical Expression** is in simplest form if:

- No perfect square factors other than 1 are in the radicand (ex. $\sqrt{25} = \sqrt{5 \cdot 5}$)
- No perfect squares are **under** the radical.
- No radicals are in the **denominator**.

Prime Factorization

One of the first steps to simplifying radicals is finding the prime factorization of the radicand. You may remember this as creating a factor tree to find the prime factors. What are prime factors?

A **prime factor** is a number greater than one that only has the factors of **one** and **itself**.

Examples: 2, 3, 5, 7, 11, 13.

Practice: Find the prime factorization of each number.

1) $45 = 2 \cdot 3 \cdot 3 \cdot 3$ $80 = 2 \cdot 2 \cdot 2 \cdot 2 \cdot 5$ $105 = 3 \cdot 5 \cdot 7$

$\sqrt{45} = \sqrt{3 \cdot 3 \cdot 3} = 3\sqrt{3}$ $\sqrt{80} = \sqrt{2 \cdot 2 \cdot 2 \cdot 2 \cdot 5} = 4\sqrt{5}$ $\sqrt{105} = \sqrt{3 \cdot 5 \cdot 7} = \sqrt{105}$

Simplifying Radicals

olded Example: Simplify $\sqrt{108}$

Step 1: Find the prime factorization of the number inside the radical.

Step 2: Determine the index of the radical. Since we are only talking about square roots, the index will be 2, which means we will circle all of our two's of a kind.

Step 3: Move each circled pair of numbers or variables from inside the radical to outside the radical. List your circled pair as just one factor outside the radical.

Step 4: Simplify the expressions both inside and outside the radical by multiplying.

$\sqrt{108} = \sqrt{2 \cdot 2 \cdot 3 \cdot 3 \cdot 3} = 2 \cdot 3 \sqrt{3} = 6\sqrt{3}$

$\sqrt{108} = 6\sqrt{3}$

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Foundations of Algebra Unit 1 - Rational and Irrational Numbers

Practice: Simplify:

1) $\sqrt{45}$ 2) $\sqrt{98}$ 3) $\sqrt{48}$ 4) $\sqrt{190}$ 5) $\sqrt{20}$ 6) $\sqrt{75}$

7) $\sqrt{99}$ 8) $\sqrt{108}$ 9) $\sqrt{125}$

10) $\sqrt{12}$ 11) $\sqrt{200}$ 12) $\sqrt{12}$

Pick a column

$\sqrt{45} = \sqrt{3 \cdot 3 \cdot 5} = 3\sqrt{5}$

$\sqrt{98} = \sqrt{2 \cdot 7 \cdot 7} = 7\sqrt{2}$

$\sqrt{48} = \sqrt{2 \cdot 2 \cdot 2 \cdot 2 \cdot 3} = 4\sqrt{3}$

$\sqrt{190} = \sqrt{2 \cdot 5 \cdot 19} = \sqrt{190}$

$\sqrt{20} = \sqrt{2 \cdot 2 \cdot 5} = 2\sqrt{5}$

$\sqrt{75} = \sqrt{3 \cdot 5 \cdot 5} = 5\sqrt{3}$

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Foundations of Algebra Unit 1 - Rational and Irrational Numbers

Day 5 - Simplifying Radical Expressions

Simplify:

1. $\sqrt{18}$ 2. $\sqrt{48}$ 3. $\sqrt{64}$

4. $\sqrt{125}$ 5. $\sqrt{81}$ 6. $\sqrt{54}$

7. $\sqrt{63}$ 8. $\sqrt{27}$ 9. $\sqrt{121}$

10. $\sqrt{40}$ 11. $-\sqrt{26}$ 12. $\sqrt{150}$

13. $-\sqrt{90}$ 14. $\sqrt{188}$ 15. $\sqrt{36}$

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Thursday, August 9, 2018

Use prime factorization to simplify the following radicals

Simplify:

1. $\sqrt{18}$ 2. $\sqrt{125}$ 3. $\sqrt{72}$ 4. $\sqrt{180}$

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Foundations of Algebra Unit 1 - Rational and Irrational Numbers Notes

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Day 6 - Simplifying Radical Expressions with Variables

When simplifying radical expressions, you simplify the variables using the same method as you did previously (Remember $\sqrt{x^2} = x$; square and square roots undo each other).
 If I see x^2 , that just means _____
 If I see x^3 , that just means _____
 The _____ of the variable tells us how many times to multiply the variable by _____.

Simplify the following radical expressions.

1. $\sqrt{x^2}$ 2. $\sqrt{27}$ 3. $\sqrt{y^2x^3}$

Understanding Exponents

For some, listing out the variables may be beneficial. Others may see a pattern for when we have variables as our radicand and choose to follow that pattern as their method.

When we have variables as the radicand, we want to pay attention to their exponents.
 When we have an **even exponent**, we are going to take _____ out and there will be nothing left under the radical.
 When we have an **odd exponent**, we are going to leave _____ under the radical and take _____ of the rest out.

Observe Example 1 above, $\sqrt{x^4}$. What was the exponent of the variable? _____ How many 'x's did we take out? _____ Was there anything left under the radical? _____

Observe Example 2 above, $\sqrt{27}$. What was the exponent of the variable? _____ How many 'y's did we take out? _____ Was there anything left under the radical? _____

Practice: Simplify the following radical expressions.

1. $\sqrt{x^{10}}$ 2. $\sqrt{75}$ 3. $\sqrt{a^3}$ 4. $\sqrt{x^{11}y^2}$

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Foundations of Algebra Unit 1 - Rational and Irrational Numbers Notes

Putting It All Together

When simplifying radical expressions, you simplify **BOTH** the coefficients and variables using the same method as you did previously (Remember $\sqrt{x^2} = x$; square and square roots undo each other). **Remember, anything that is left over stays under the radical.**

a. $\sqrt{9x^3}$ b. $\sqrt{4x^4}$ c. $\sqrt{32z^7}$

d. $\sqrt{45y^2}$ e. $\sqrt{108x^2y^3}$ f. $3\sqrt{12x^3}$

g. $3\sqrt{180z^4}$ h. $-2\sqrt{36t^3s^4}$ i. $5\sqrt{20x^2y^3z^2}$

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Foundations of Algebra Unit 1 - Rational and Irrational Numbers Practice

Name: _____ Date: _____

Day 6 - Simplifying Radical Expressions with Variables

RADICALS ARE IN SIMPLEST FORM WHEN...

- Ⓝ NO perfect square factors other than 1 are under the radical.
- Ⓝ NO fractions are under the radical.
- Ⓝ NO radicals are in the denominator.

Simplify:

1. $\sqrt{x^2}$	2. $\sqrt{49x^2}$	3. $\sqrt{81y^2}$
4. $\sqrt{16x^2}$	5. $\sqrt{25z^2}$	6. $\sqrt{18x^2y^2}$
7. $\sqrt{90x^2y}$	8. $\sqrt{24x^2y^2}$	9. $-2\sqrt{15x^2y^2}$

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Foundations of Algebra Unit 1 - Rational and Irrational Numbers Practice

10. $\sqrt{198x^2y^2}$	11. $\sqrt{450z^2}$	12. $3\sqrt{48y^2z^2}$
13. $\sqrt{48a^2b^2c^2}$	14. $\sqrt{27x^2}$	15. $\sqrt{12y^2z^2}$
16. $\sqrt{81z^2w^2}$	17. $\sqrt{54x^2}$	18. $\sqrt{128x^2y^2z^2}$
19. $\sqrt{54x^2}$	20. $\sqrt{98a^2b^2c^2}$	21. $\sqrt{48x^2y^2z^2}$

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Friday, August 10, 2018

Simplify the following radicals

1. $\sqrt{a^2b^4}$ 2. $\sqrt{49a^8x^{12}}$

3. $\sqrt{32m^7n^{11}}$ 4. $\sqrt{20x^{10}y^5}$

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Foundations of Algebra Unit 1 – Rational and Irrational Numbers Notes
 Name: _____ Date: _____

Day 7 – Radical Operations

Yesterday, we learned how to simplify radicals. Today, we are going to learn some operations we can perform with radicals. The first operation we will explore is multiplication.

The _____ of _____ states the square root of a product equals the product of the square roots of the factors.

$$\sqrt{ab} = \sqrt{a}\sqrt{b} \text{ where } a \geq 0 \text{ and } b \geq 0$$

When multiplying radicals, follow the following rules:

Multiplying Radicals – RULES

1. Multiply the _____ together.
2. Multiply the _____ together.
3. _____ the radical.

Directions: Multiply the following radicals. Make sure they are in simplest form.

a. $\sqrt{2}\sqrt{18}$ b. $\sqrt{5}\sqrt{10}$ c. $\sqrt{8}\sqrt{32}$

d. $4\sqrt{6} + 4\sqrt{6}$ e. $-\sqrt{6} + 3\sqrt{8}$ f. $6\sqrt{15} + \sqrt{10}$

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Foundations of Algebra Unit 1 – Rational and Irrational Numbers Notes
 Name: _____ Date: _____

Multiplying Radicals with Variables

Recall: Do you remember what the rule is when you multiply two variables with exponents together? Work through the following examples to come up with the rule for multiplying exponents.

1. $x^2 \cdot x^3 =$
2. $a^2 \cdot a^4 =$
3. $y^2 \cdot y^3 \cdot z^4 =$

Law of Exponents: When multiplying expressions with the same bases, _____ the exponents.

$$x^m \cdot x^n =$$

Directions: Multiply the following radicals. Make sure they are in simplest form.

a. $\sqrt{2}\sqrt{8}\sqrt{2}$ b. $\sqrt{3}\sqrt{15}$ c. $5\sqrt{3}\sqrt{4}\sqrt{32}$

d. Challenge: $-\sqrt{8}\sqrt{5} + -\sqrt{12}\sqrt{2}$

Adding and Subtracting Radicals

To add and subtract radicals, you have to use the same concept of combining "like terms", in other words, your radicands must be the same before you can add or subtract.

Explore: Simplify the following expressions:

a. $4x + 6x$ b. $5x^2 - 2x^2$ c. $8x^2 + 3x - 4x^2$

Adding/Subtracting Radicals – RULES

1. _____ all radicals.
2. Then add/subtract the _____ radicals.

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Foundations of Algebra Unit 1 – Rational and Irrational Numbers Notes
 Name: _____ Date: _____

Practice:

a. $2\sqrt{5} + 6\sqrt{5}$ b. $3\sqrt{7} + 2\sqrt{7}$ c. $4\sqrt{13} - 6\sqrt{13}$

d. $6\sqrt{7} + 8\sqrt{10} - 3\sqrt{7}$ e. $11\sqrt{5} - 2\sqrt{50}$ f. $3\sqrt{3} + 6\sqrt{27}$

g. $3\sqrt{5} + 2\sqrt{500}$ h. $3\sqrt{3} - 2\sqrt{12}$ i. $12\sqrt{50} + 6\sqrt{2}$

Putting it all Together

a. $\sqrt{12}(\sqrt{9} - \sqrt{4})$ b. $\sqrt{3}(\sqrt{3} + 2\sqrt{5})$ c. $\sqrt{5}(\sqrt{10} + \sqrt{15})$

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Foundations of Algebra Unit 1 – Rational and Irrational Numbers Practice
 Name: _____ Date: _____

Day 7 – Operations with Radicals

Multiply each expression.

1. $8\sqrt{3} \cdot 5\sqrt{2}$	2. $-4\sqrt{5} \cdot 9\sqrt{6}$	3. $3\sqrt{8} \cdot 2\sqrt{5}$
4. $-6\sqrt{32}(-6\sqrt{2})$	5. $\sqrt{2x} \cdot \sqrt{6x}$	6. $\sqrt{30x} \cdot \sqrt{3x^2}$
7. $\sqrt{15x^2} \cdot \sqrt{10x^2}$	8. $\sqrt{8x^2} \cdot \sqrt{4x}$	9. $5\sqrt{xy} \cdot 3\sqrt{xy^2}$
10. $\sqrt{2x} \cdot \sqrt{6x}$	11. $\sqrt{10xy} \cdot \sqrt{2xy^2}$	12. $\sqrt{5}(\sqrt{15} + \sqrt{2})$
13. $\sqrt{2}(\sqrt{8} - 5)$	14. $\sqrt{3}(1 + \sqrt{27})$	15. $8\sqrt{3}(2\sqrt{3} + \sqrt{8})$

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Foundations of Algebra Unit 1 – Rational and Irrational Numbers Practice
 Name: _____ Date: _____

Simplify each expression.

1. $\sqrt{150} - 2\sqrt{24}$	2. $-2\sqrt{90} - 5\sqrt{40}$	3. $3\sqrt{98} - 6\sqrt{18}$
4. $\sqrt{20} - 15\sqrt{7} - 5\sqrt{20} + 3\sqrt{7}$	5. $-9\sqrt{3} + 4\sqrt{7} - 4\sqrt{3} + 2\sqrt{7}$	
6. $x\sqrt{27} + \sqrt{75x^2} + 2x\sqrt{12}$	7. $x\sqrt{63} - x\sqrt{28} + x\sqrt{700}$	
8. $5\sqrt{8xy} + 9\sqrt{200xy} + \sqrt{32xy}$	9. $-2\sqrt{64} + 7\sqrt{150} + 3\sqrt{144}$	
10. $-10\sqrt{9x} + 3\sqrt{36x} - \sqrt{50x}$	11. $5\sqrt{120x} + 12\sqrt{75x} - 4\sqrt{250x}$	

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