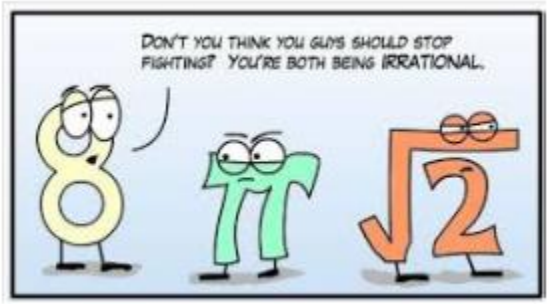
The Real Number System and Pythagorean Theorem
Unit 9 Part B



Standards:

8.NS.1 Know that numbers that are not rational are called irrational. Understand informally that every number has a decimal expansion; for rational numbers show that the decimal expansion repeats eventually, and convert a decimal expansion which repeats eventually into a rational number.

8.NS.2 Use rational approximations of irrational numbers to compare the size of irrational numbers, locate them approximately on a number line diagram, and estimate the value of expressions.

8.EE.2 Use square root and cube root symbols to represent solutions to equations of the form x 2 = p and x 3 = p, where p is a positive rational number. Evaluate square roots of small perfect squares and cube roots of small perfect cubes. Know that $\sqrt{2}$ is irrational.

8.G.6 Explain a proof of the Pythagorean Theorem and its converse.

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.

Name:_____ **Date:** _____ **Period:**_____

Lesson #88 Square Roots

To _____ a number find the product of the number multiplied by itself.

To find the _____of a number (example – 16) you must find the number that is multiplied by itself to get that number (square root of 16 is 4, because 4 x 4 is 16).

A _____ is any number whose square root is a whole number.

List the perfect squares you know from least to greatest.

All the numbers in between those listed above, are _____.
We can use the list to help estimate the square roots of non-perfect squares.

The square roots of non – perfect squares are _____ numbers.

Examples:

A. $\sqrt{40}$ is between 6 and 7 because it falls between the numbers 36 and 49.

B. $\sqrt{152}$ is between 12 and 13 because it falls between the numbers 144 and 169.

Estimate the square root of each of the following, then use a calculator to check your work.

1. $\sqrt{54}$

2. $-\sqrt{13}$

3. $\sqrt{132}$

4. $-\sqrt{89}$

5. $\sqrt{38}$

6. $\sqrt{-98}$

Try the following on your own:

7. $\sqrt{118}$

8. $-\sqrt{20}$

9. $\sqrt{67}$

10. $\sqrt{-75}$

Word Problems:

11. Mrs. Cotton is sewing a square table cloth that measures 16 ft^2. What is the length of each side of the tablecloth?

12. A gymnasium that has the same length and width will cover an area of 900 ft^2. What is the length of each side of the gymnasium?

13. Can the $\sqrt{25}$ be -5? Prove yes or no.

HW #88 Square Roots

1. List the perfect squares from 0 to 400.

2. If a number is not in the list above, its square root is what type of number?

Determine what two integers each of the following is between.

3. $\sqrt{18}$

4. $\sqrt{127}$

5. $\sqrt{199}$

6. $-\sqrt{300}$

7. $\sqrt{241}$

8. $\sqrt{-372}$

9. Janet is sewing a quilt that is a square. She needs 64 square feet of fabric. What are the dimensions of the square?

Lesson #89 Cube Roots

To _____ a number find the product of the number multiplied by itself three times.

To find the _____of a number (example – 8) you must find the number that is multiplied by itself three times to get that number (cube root of 8 is 2, because 2 x 2 x 2 is 8).

A _____ is any number whose cube root is a whole number.

Evaluate the following cubes.

2^3	3^3	4^3	5^3	6^3	7^3	8^3	9^3	10^3

All the numbers in between those listed above, are _____.
We can use the list to help estimate the cube roots of non-perfect cubes.

The cube root of non – perfect cubes are _____ numbers.

Examples:

A. $\sqrt[3]{40}$ is between 3 and 4 because it falls between the numbers 27 and 64.

B. $\sqrt[3]{300}$ is between 6 and 7 because it falls between the numbers 216 and 343.

Estimate the cube root of each of the following, than use a calculator to check your work.

1. $\sqrt[3]{124}$

2. $-\sqrt[3]{6}$

3. $\sqrt[3]{250}$

4. $-\sqrt[3]{400}$

5. $\sqrt[3]{178}$

6. $-\sqrt[3]{399}$

Try the following on your own:

7. $\sqrt[3]{999}$

8. $-\sqrt[3]{1244}$

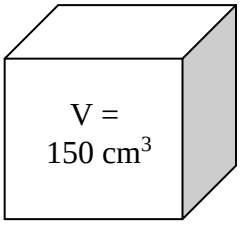
9. $\sqrt[3]{28}$

10. $-\sqrt[3]{832}$

Word Problems:

11. A cube has a volume of 512 in^3. Find the dimensions of the cube.

12. Estimate the length of one side of the cube below.



HW #89 Cube Roots

Evaluate:

11^3	12^3	13^3	14^3	15^3	16^3	17^3	18^3	19^3	20^3

Determine the cube root of the number given. If the number is not a perfect cube, determine what two integers the cube root will fall between.

1. $\sqrt[3]{343}$

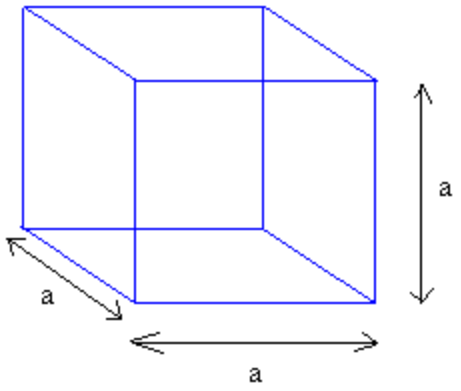
2. $\sqrt[3]{425}$

3. $\sqrt[3]{1000}$

4. $\sqrt[3]{1500}$

5. A cube has a volume of 729 cm^3. What are the dimensions of the cube?

6. If the volume of the cube is 1331 $inches^3$ what are its dimensions?



Lesson #90 Solving Equations Involving Squares and Cubes

Solve and check each of the following:

SOLVE:	**CHECK:**
1 . $x^3 + 9x = \frac{1}{2}(18x + 54)$	
2. $x(x-3) - 51 = -3x + 13$	
3. $x^2 - 14 = 5x + 67 - 5x$	

4. $216 + x = x(x^2 - 5) + 6x$	
5. $4x^2(x - 3) + 5x^2 = \frac{1}{2}x(2x^2 - 14x) + 24$	
6. $\frac{1}{3}x(3x^2 - 15x) - 32 = 4(x^2 + 8) - 9x^2$	

HW #90 Solving Radical Equations

Solve and check each of the following:

1. $-3x^3 + 14 = -67$

2. $x(x-1) = 121 - x.$

3. $x(x+4) - 3 = 4(x+19.5)$

Lesson #91 Solving Equations Involving Squares and Cubes

Solve and check each of the following:

SOLVE:	**CHECK:**
1 . $\left(\frac{1}{2}x\right)^2 - 3x = 7x + 16 - 10x$	
2. $12x + x(x - 4) = 4(2x + 25)$	
3. $2x^2(x - 8) + 18x = -3x(5x - 6) - x^2 + 250$	

4. $\frac{1}{4}x(32x-20)+49=\frac{3}{4}x(12x-20)+10x$	
5. $\frac{3}{2}x(x^2+16)-212=436-\frac{1}{2}x(3x^2-48)$	
6. $(3x)^2+6(x-4)=\frac{3}{2}(4x+80)$	

HW #91 Solving Radical Equations

Solve and check each of the following:

1. $x^2(x+7) = \frac{1}{2}(14x^2 + 16)$

2. $\frac{2}{5}x(x - 30) - 108 = 88 - \frac{3}{5}x(x + 20)$

3. $\left(\frac{3}{2}x\right)^2 - 5(x + 80) = \frac{1}{4}x(x - 20) - 8$

Lesson #92 Simplifying Non Perfect Square Roots

To simplify a non-perfect square root:

1. Create a _____ of the number under the radical.
2. Express the number as a _____ under the radical.
3. Any prime that occurs an _____ is a perfect square.

4. Take the _____ of the numbers from step three.

5. Rewrite the _____ as the product of the _____ found in step 4 and the _____ square root.

Examples:

1. What is another way to write $\sqrt{20}$?

2. What is another way to write $\sqrt{28}$?

Simplify the square root as much as possible.

3. $\sqrt{50} =$

4. $\sqrt{98} =$

5. $\sqrt{18} =$

6. $\sqrt{44} =$

7. $\sqrt{243} =$

8. $\sqrt{75} =$

9. $\sqrt{128} =$

10. $\sqrt{288} =$

11. $\sqrt{108} =$

12. $\sqrt{250} =$

HW #92 Simplifying Non Perfect Square Roots

Simplify each of the square roots.

1. $\sqrt{48}$

2. $\sqrt{54}$

3. $\sqrt{384}$

4. $\sqrt{675}$

Lesson #93 Simplifying Square Roots Practice

1. $\sqrt{40}$

2. $\sqrt{45}$

3. $\sqrt{125}$

4. $\sqrt{192}$

5. $\sqrt{147}$

6. $\sqrt{300}$

7. $\sqrt{162}$

8. $\sqrt{512}$

9. $\sqrt{1134}$

10. $\sqrt{540}$

11. $\sqrt{756}$

12. $\sqrt{1575}$

HW #93 Simplifying Square Roots Practice

1. $\sqrt{468}$

2. $\sqrt{702}$

3. $\sqrt{735}$

4. $\sqrt{1372}$

Lesson #94 Simplify Radical Solutions to Equations

Solve:	**Simplify:**
1. $x(x+4)-20=\frac{1}{2}(8x+24)$	
2. $x(x-3)-15=3(-x+25)$	
3. $3x(x+12)-28=2(18x+64)$	

4. $\left(\frac{1}{2}x\right)^2 - 3(2x - 8) = -6(x - 7)$	
5. $(2x)^2 - 9(4x + 12) = -6(6x - 18)$	
6. $\left(\frac{3}{4}x\right)^2 + \frac{1}{3}(12x - 21) = 4(x + 5)$	

HW #94 Simplify Radical Solutions to Equations

Solve each of the following and make sure your answer is in simplest radical form.

1. $2x(x - 5) = 90 - 10x$

2. $\frac{1}{2}x(-6x + 18) = 3(3x - 48)$

3. $x(5x + 12) - 39 = \frac{3}{2}(8x + 54)$