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Irrational Numbers Study Guide

Square Roots and Cube Roots

Positive Square Roots
A positive number whose square is equal to a positive number b is denoted by the symbol $\sqrt{b}$. The symbol $\sqrt{b}$ is automatically denotes a positive number. The number $\sqrt{b}$ is called the positive square root of b.

Cube Roots: The cube root of a number, x, is the number, y which satisfy the equation $x = y^3$. The notation we use is as follows: $\sqrt[3]{x} = y$
Example: $8 = 2^3$ and $\sqrt[3]{8} = 2$

Simplifying Square Roots
You can simplify square roots by rewriting the radicand (number inside the radical symbol) as a product containing perfect squares (such as 4, 9, 16, 25, etc). The square root of perfect squares are integers.
Example: $\sqrt{48} = \sqrt{16} \cdot \sqrt{3} = 4\sqrt{3}$

Solving Equations with Square and Cube Roots
We can simplify the expressions until we have the form of $x^2 = p$ or $x^3 = p$ and then take the square root or cube root of both sides of the equation to solve for x.

Example:	$3x^2 = 48$ →
(divide by 3)	$x^2 = 16$ →
(take square root of each side)	$x = 4$

For more refreshers, go to www.khanacademy.com. Work on the following exercises and watch associated videos:

- Square roots of perfect squares
- Equations with square roots and cube roots
- Square and Cube Challenge
- Simplify square-root expressions: no variables
- Cube roots
- Roots of Decimals and Fractions
- Simplify Square Roots
- Approximating Square Roots

For more information, check out Lessons 1-5 from Module 7 on http://mrrogove.weebly.com

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Rational and Irrational Numbers

Rational Numbers: Any number that can be expressed as a fraction $\frac{p}{q}$ where p and q are both integers and $q \neq 0$.

Example: 41.13, $\frac{5}{2}$, $-\frac{111}{135}$, $64.\overline{9}$

Finite Decimals: A subset of rational numbers which have terminating decimals. Written as fractions, **the denominators are products of only 2's and 5's**.

Example: $\frac{3}{32}$, 1.05, 4.253

Repeating Decimals: A subset of rational numbers that have infinite decimals that repeat. Written as fractions, **the denominators are products of numbers other than 2 and 5.**

Example: $\frac{8}{9}$, $\frac{72}{93}$, 0.4545454545 ….

Irrational Numbers: The set of numbers that have infinite decimals that **DO NOT** repeat.

Example: $e, \pi, \sqrt{8}, \sqrt[3]{25}$

For more refreshers, go to www.khanacademy.com. Work on the following exercises and watch associated videos:

- Writing fractions as repeating decimals
- Converting 1-digit repeating decimals to fractions
- Converting multi-digit repeating decimals to fractions
- Classify numbers: rational & irrational
- Classify numbers
- Comparing irrational numbers
- Comparing irrational numbers with a calculator (try not to use a calc)

For more information, check out Lessons 6-8 from Module 7 on http://mrrogove.weebly.com

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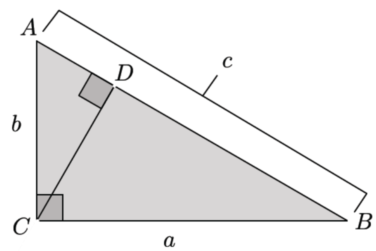
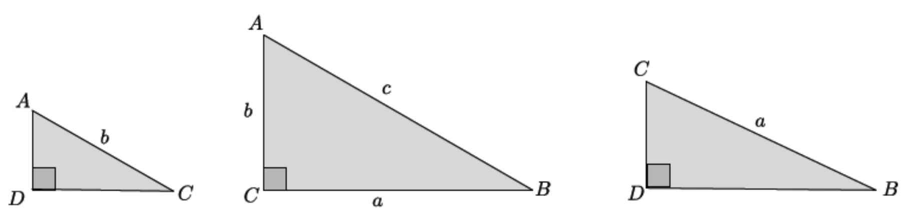
Pythagorean Theorem

Pythagorean theorem is $a^2 + b^2 = c^2$

We can prove this using squares, similar triangles, and area. Refer to lesson 75 for specific information on the proofs.





Distance on a coordinate plane: We can use the Pythagorean Theorem to find the distance of diagonals on a coordinate plane.

Formula: $c = \sqrt{(x_1 - x_2)^2 + (y_1 - y_2)^2}$

For more refreshers, go to www.khanacademy.com. Work on the following exercises and watch associated videos:

- Pythagorean Theorem
- Distance between two points
- Pythagorean Theorem in 3D
- Pythagorean Theorem Proofs
- Pythagorean Theorem word problems (videos)

For more information, check out Lessons 9-12 from Module 7 on http://mrrogove.weebly.com

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PROBLEM SET

I strongly suggest you solve these problems by hand. You will NOT be allowed to use a calculator on the assessment. In order to get ANY credit, you MUST SHOW YOUR WORK!!!

Please initial here to indicate that you read this paragraph. _________

Simplify: $\sqrt{576}$	Simplify: $\sqrt{128}$
Simplify: $3\sqrt{80}$	Simplify: $\sqrt{512}$
Simplify: $\sqrt[3]{729}$	Simplify: $\sqrt[3]{1024}$

Solve for *x*. $$x(2x^2 - 12x) = -6(2x^2 - 9)$$	Solve for *x*. $$3x^2 - 4x + 13 = 2x(x - 2) + 29$$
Solve for *x*. $$\frac{2x^9}{x^6} + 2x^2 = -4x\left(x - \frac{x^2}{2}\right) + 216$$	Solve for *x*. $$\left(3\sqrt{x}\right)^4 = 1$$
Convert to a decimal. Classify as a repeating or finite decimal. $$\frac{7}{12}$$	Convert to a decimal. Classify as a repeating or finite decimal. $$\frac{42}{48}$$

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Convert to a decimal. Classify as a repeating or finite decimal. $\frac{13}{15}$	Convert to a decimal. Classify as a repeating or finite decimal. $\frac{13}{125}$
Convert to a fraction. $0.\overline{72}$	Convert to a fraction. $0.07\overline{2}$
Convert to a fraction. $0.\overline{234}$	Convert to a fraction. $4.1\overline{2}$

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Approximate to the nearest hundredth $\sqrt{80}$	Approximate to the nearest hundredth $\sqrt{90}$
Approximate to the nearest hundredth $\sqrt{20}$	Approximate to the nearest hundredth $\sqrt{30}$
Which is greater: $\sqrt{21}$ *or* 4.4?	Which is greater: $\sqrt{47}$ *or* 6.8

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Label these numbers on a number line in their approximate place. $\sqrt[3]{29}$, $\sqrt{9}$, $\frac{10}{3}$, $3.\overline{2}$, $\sqrt{13}$	
Prove the Pythagorean Theorem for a triangle that has sides of 12, 16, and 20 using the similar triangles proof.	
Find the distance between $(1, -2)$ and $(8, -6)$ on the coordinate plane	Find the distance between $(6, 10)$ and $(15, -2)$ on the coordinate plane