**KHAN LESSONS AND KEY FISHTREE LESSON CONCEPTS**

**Anything here would be great practice for you:**

<https://www.khanacademy.org/mission/cc-eighth-grade-math>

These match Semester B Unit 1 Lessons 11-14 in Fishtree:

11: Students will evaluate a function defined by a rule, table, or equation.

Key concept(s): To evaluate a function, simply replace (substitute) the function's variable with the indicated number or expression. A function is represented by f (x) = 2x + 5. Find f (3). To find f (3), replace the x-value with 3.

Learn: <https://www.khanacademy.org/math/cc-eighth-grade-math/cc-8th-linear-equations-functions/8th-functions-and-function-notation/v/understanding-function-notation-example-1>

And

<https://www.khanacademy.org/math/cc-eighth-grade-math/cc-8th-linear-equations-functions/8th-functions-and-function-notation/v/understanding-function-notation-example-2>

Practice: <https://www.khanacademy.org/math/cc-eighth-grade-math/cc-8th-linear-equations-functions/8th-functions-and-function-notation/e/functions_1>

And

<https://www.khanacademy.org/math/algebra/algebra-functions/evaluating-functions/e/evaluate-functions-from-their-graph>

12: Students will sketch the graph of a function that is defined verbally.

Key concept(s): Describing a function verbally is another way (in addition to equations, maps, and tables) to describe a function.

Learn: <https://www.khanacademy.org/math/algebra/linear-word-problems/constructing-linear-models/v/constructing-linear-functions-1>

Practice: <https://www.khanacademy.org/math/cc-eighth-grade-math/cc-8th-linear-equations-functions/8th-linear-functions-modeling/e/constructing-linear-functions-word-problems>

13: Students will define functions that apply to real world applications.

Key concept(s): A function includes an input/domain (x), and equation, and an output/result/range (y).

Learn: <https://www.khanacademy.org/math/algebra/linear-word-problems/constructing-linear-models/v/graphing-linear-functions-1>

Practice: <https://www.khanacademy.org/math/cc-eighth-grade-math/cc-8th-linear-equations-functions/8th-linear-functions-modeling/e/graphing-linear-functions-word-problems>

14: Students will utilize functions to solve real world applications.

Key concept(s): Functions are mathematical building blocks for designing machines, predicting natural disasters, curing diseases, understanding world economies and for keeping airplanes in the air. Functions can take input from many variables, but always give the same output, unique to that function.

Functions also allow us to visualize relationships in terms of graphs, which are much easier to read and interpret than lists of numbers.

Some examples of functions include money as a function of time, temperature as a function of various factors, location as a function of time, etc

Learn: <https://www.khanacademy.org/math/algebra/linear-word-problems/constructing-linear-models/v/constructing-linear-functions-2>

Practice: <https://www.khanacademy.org/math/algebra/linear-word-problems/constructing-linear-models/e/constructing-linear-functions-word-problems>

These match Semester B Unit 1 Lessons 6-9 in Fishtree:

6: Students will solve real world problems involving two linear equations

using a variety of techniques.

Key concept(s): Systems of equations can be amazingly useful. How else would you figure out how many ounces of 70% dark chocolate and 20% milk chocolate you need to mix to get one pound (16 oz) of 40% chocolate? We forgot to mention: the meaning of life involves mixing chocolate. There. Now you know.

Learn: <https://www.khanacademy.org/math/cc-eighth-grade-math/cc-8th-systems-topic/cc-8th-systems-overview/v/trolls-tolls-and-systems-of-equations>

And

<https://www.khanacademy.org/math/cc-eighth-grade-math/cc-8th-systems-topic/cc-8th-systems-overview/v/solving-the-troll-riddle-visually>

Practice: <https://www.khanacademy.org/math/cc-eighth-grade-math/cc-8th-systems-topic/cc-8th-systems-overview/e/systems_of_equations>

7: Students will determine if a given relationship is a function.

Key concept(s): A function is a relationship in which each x value is mapped to one (and only one) y value.

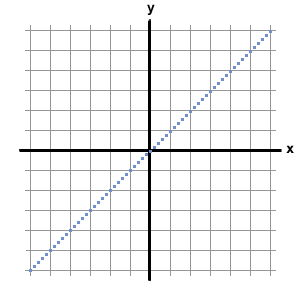
Learn: <https://www.khanacademy.org/math/cc-eighth-grade-math/cc-8th-linear-equations-functions/8th-functions-and-function-notation/v/what-is-a-function>

Practice: <https://www.khanacademy.org/math/cc-eighth-grade-math/cc-8th-linear-equations-functions/8th-functions-and-function-notation/e/functions_1>

8: Students will express functions using maps, tables, and equations.

Key concept(s): Functions can be expressed in a variety of ways, including maps, tables, and equations:

|  |  |  |  |
| --- | --- | --- | --- |
| x | 0 | 1 | 2 |
| y | 0 | 1 | 2 |

y = x is the same asand

Learn: <https://www.khanacademy.org/math/cc-eighth-grade-math/cc-8th-linear-equations-functions/8th-functions-and-function-notation/v/comparing-features-of-functions-3>

Practice: <https://www.khanacademy.org/math/cc-eighth-grade-math/cc-8th-linear-equations-functions/8th-functions-and-function-notation/e/views_of_a_function>

9: Students will identify functions that are not linear.

Key concept(s): **A function is linear if the change in y over the change in x is always constant.**

Learn: <https://www.khanacademy.org/math/cc-eighth-grade-math/cc-8th-linear-equations-functions/linear-nonlinear-functions-tut/v/recognizing-linear-functions>

Practice: <https://www.khanacademy.org/math/cc-eighth-grade-math/cc-8th-linear-equations-functions/linear-nonlinear-functions-tut/e/linear-non-linear-functions>

These match Semester B Unit 1 Lessons 1-4 in Fishtree:

1: Students will identify systems of two linear equations with 0, 1, and

infinitely many solutions graphically.

Key concept(s): When graphed, a “0 solutions” system will show parallel lines. A “1 solution” system will show intersecting lines, and an “infinitely many solutions” system will show coincident lines (the lines are on top of each other).

Learn: <https://www.khanacademy.org/math/cc-eighth-grade-math/cc-8th-systems-topic/cc-8th-systems-overview/v/solving-systems-graphically>

Practice: <https://www.khanacademy.org/math/cc-eighth-grade-math/cc-8th-systems-topic/cc-8th-systems-overview/e/graphing_systems_of_equations>

2: Students will solve a system of two linear equations using the

substitution method.

Key concept(s): The method of solving "by substitution" works by solving one of the equations (you choose which one) for one of the variables (you choose which one), and then plugging this back into the other equation, "substituting" for the chosen variable and solving for the other. Then you back-solve for the first variable.

Learn: <https://www.khanacademy.org/math/cc-eighth-grade-math/cc-8th-systems-topic/cc-8th-systems-overview/v/solving-systems-with-substitution>

Practice: <https://www.khanacademy.org/math/cc-eighth-grade-math/cc-8th-systems-topic/cc-8th-systems-overview/e/systems_of_equations_with_substitution>

3: Students will solve a system of two linear equations using the

elimination method.

Key concept(s): Solving a system of equations using elimination relies on one of the basic things you already know about algebra—you can add or subtract anything to one side of an equation, as long as you do the same to the other side.

Learn: <https://www.khanacademy.org/math/cc-eighth-grade-math/cc-8th-systems-topic/cc-8th-systems-overview/v/king-s-cupcakes-solving-systems-by-elimination>

Practice: <https://www.khanacademy.org/math/cc-eighth-grade-math/cc-8th-systems-topic/cc-8th-systems-overview/e/systems_of_equations_with_elimination_0.5>

4: Students will solve a system of two linear equations by choosing the

best method.

Key concept(s): Graphing is the best method to use when you’re using a graphing calculator or both equations are in slope-intercept form or you need a visual representation of the equations for a practical purpose.

It’s much easier to use substitution when one of your equations is already solved for *x* or *y* (or it would be very easy to solve for x or y).

Elimination is the best method to use when there’s an obvious pair of *x* or *y* values that cancel out across the two equations or it would be easy to manipulate one of the equations to make a pair of values cancel out.

Learn: See above

Practice: <https://www.khanacademy.org/math/cc-eighth-grade-math/cc-8th-systems-topic/cc-8th-systems-overview/e/systems_of_equations>

**These match Unit 6 lessons 11-14 in Fishtree:**

11: Students will determine the slope-intercept form of a line given two

points.

Key concepts(s): We can find the slope (m) by finding the ratio of the change in y to the change in x. This is also called “rise over run” and (y2 – y1)/(x2 – x1).

Learn: <https://www.khanacademy.org/math/cc-eighth-grade-math/cc-8th-linear-equations-functions/8th-slope/v/slope-of-a-line-2>

Practice: <https://www.khanacademy.org/math/cc-eighth-grade-math/cc-8th-linear-equations-functions/8th-slope/e/slope-from-two-points>

12: Students will solve application problems using the slope-intercept form

of a line.

Key concepts(s): When something changes at a constant rate, it can be represented with a graph of a line, and a linear equation can also be used to describe it. The slope intercept form of a line (y = mx + b) can be used to represent and solve a variety of problems.

Learn: <https://www.khanacademy.org/math/cc-eighth-grade-math/cc-8th-linear-equations-functions/8th-slope-intercept-form/v/slope-intercept-form-from-table>

Practice: <https://www.khanacademy.org/math/cc-eighth-grade-math/cc-8th-linear-equations-functions/8th-slope-intercept-form/e/slope-intercept-equation-from-two-points>

13: Students will confirm the solution to a linear system given its graph.

Key concepts(s): A linear system is a pair of lines that share a common solution. Linear systems can be used to solve problems involving related situations, such as two different payment plans, or two individuals traveling at different speeds and starting at different locations. In this lesson, we will learn how to find the solution to a linear system when we are given its graph.

Learn: <https://www.khanacademy.org/math/algebra/systems-of-linear-equations/analyzing-the-solutions-to-systems-of-equations/v/solving-systems-by-graphing-2>

Practice: <https://www.khanacademy.org/math/algebra/systems-of-linear-equations/analyzing-the-solutions-to-systems-of-equations/e/graphical-solutions-to-systems>

14: Students will solve a system of two linear equations in two variables by

graphing.

Key concepts(s): When we graph a line, we get a visual picture of the solutions to a linear equation. By graphing two lines, we can easily see the relationship between two linear equations and can quickly identify a shared solution.

Learn: <https://www.khanacademy.org/math/algebra-basics/core-algebra-systems/core-algebra-systems-tutorial/v/solving-linear-systems-by-graphing>

Practice: <https://www.khanacademy.org/math/algebra-basics/core-algebra-systems/core-algebra-systems-tutorial/e/graphing_systems_of_equations>

**These match Unit 6 lessons 6-9 in Fishtree:**

6: Students will use similar triangles to demonstrate the slope of a line

graphed on the coordinate plane.

Key concept(s): The slopes of the hypotenuse of similar triangles are equal.

Learn: <https://www.khanacademy.org/math/cc-eighth-grade-math/cc-8th-linear-equations-functions/8th-slope/v/similar-triangles-to-prove-that-the-slope-is-constant-for-a-line>

Practice: <https://www.khanacademy.org/math/cc-eighth-grade-math/cc-8th-linear-equations-functions/8th-slope/e/slope-from-a-graph>

7: Students will identify the slope and y-intercept of the graph of a line

given in slope-intercept form.

Key concept(s): When in the form y = mx + b, the equation of a line tells us two important pieces of information about the line: the **slope**, which is the ratio of the change in the y-value to the change in the x-value for any point on the line, and the **y-intercept** which is the place where the line crosses the y-axis. For this reason, this form of the equation is also called slope-intercept form.

Learn: <https://www.khanacademy.org/math/algebra/two-var-linear-equations/slope-intercept-form/v/slope-intercept-form>

Practice: <https://www.khanacademy.org/math/algebra/two-var-linear-equations/slope-intercept-form/e/slope-from-an-equation-in-slope-intercept-form>

8: Students will graph a linear equation in slope-intercept form.

Key concept(s): When the equation of a line is in the form y = mx + b, known as slope-intercept form, it provides us with two important pieces of information: the slope (m), and the y-intercept (b). With these two pieces of information, we can make a graph of a line.

Learn: <https://www.khanacademy.org/math/cc-eighth-grade-math/cc-8th-linear-equations-functions/8th-slope-intercept-form/v/graphing-a-line-in-slope-intercept-form>

Practice: <https://www.khanacademy.org/math/cc-eighth-grade-math/cc-8th-linear-equations-functions/8th-slope-intercept-form/e/graph-from-slope-intercept-equation>

9: Students will determine the slope of a line given two points.

Key concept(s): In order to find the slope of a line, we only need to know the location of two points from that line. To find the slope, find the ratio of the change in y to the change in x.

Learn: <https://www.khanacademy.org/math/cc-eighth-grade-math/cc-8th-linear-equations-functions/8th-slope/v/slope-of-a-line-2>

Practice: <https://www.khanacademy.org/math/cc-eighth-grade-math/cc-8th-linear-equations-functions/8th-slope/e/slope-from-two-points>

**These match Unit 6 lessons 1-4 in Fishtree:**

1: Students will graph an equation using the point-plotting method.

Key concept(s): Only two points are required to graph a line; these points can be determined by substituting x (or y) into a linear equation.

Learn: <https://www.khanacademy.org/math/cc-eighth-grade-math/cc-8th-linear-equations-functions/8th-solutions-to-two-var-linear-equations/v/graphs-of-linear-equations>

Practice: <https://www.khanacademy.org/math/cc-eighth-grade-math/cc-8th-linear-equations-functions/8th-solutions-to-two-var-linear-equations/e/graphing-solutions-to-two-variable-linear-equations>

2: Students will determine if a graph represents a function.

Key concept(s): In the last lesson we graphed equations by using the equations to find pairs of *x* and *y* coordinates. Each time we entered a value for *x* we got only one value for *y.* When this relationship exists, it is called a function.

Learn: <https://www.khanacademy.org/math/algebra/algebra-functions/recognizing_functions/v/graphical-relations-and-functions>

Practice: <https://www.khanacademy.org/math/algebra/algebra-functions/recognizing_functions/e/recog-func-2>

3: Students will determine if a table of values represents a function.

Key concept(s): A function defines the relationship between *x* and *y* in such a way that each *x* value yields only one distinct *y* value.

Learn: <https://www.khanacademy.org/math/algebra/algebra-functions/recognizing_functions/v/functional-relationships-1>

Practice: <https://www.khanacademy.org/math/algebra/algebra-functions/recognizing_functions/e/recognizing_functions>

4: Students will identify linear functions in equations, tables, and graphs.

Key concept(s): A function defines the relationship between x and y in such a way that each x value yields only one distinct y value. The equation of a linear function is an equation where the highest exponent is 1 and can be written in the form y = mx + b.

Learn: <https://www.khanacademy.org/math/cc-eighth-grade-math/cc-8th-linear-equations-functions/linear-nonlinear-functions-tut/v/recognizing-linear-functions>

Practice: <https://www.khanacademy.org/math/cc-eighth-grade-math/cc-8th-linear-equations-functions/linear-nonlinear-functions-tut/e/linear-non-linear-functions>

**These match Unit 5 lessons 11-14 in Fishtree:**

11: Students will solve linear equations involving rational coefficients.

Key concept(s): To “distribute” a coefficient “over” the numbers inside the parentheses, like a(b + c), do the following: ab + ac.

Learn: <https://www.khanacademy.org/math/algebra-basics/core-algebra-expressions/core-algebra-manipulating-expressions/v/combining-like-terms-and-the-distributive-property>

Practice:<https://www.khanacademy.org/math/algebra-basics/core-algebra-expressions/core-algebra-manipulating-expressions/e/combining_like_terms_2>

12: Students will solve linear equations with the variable on both sides.

Key concept(s): No matter how complicated equations with variables on both sides can get, the goal is always the same: gather all the *x* terms on one side of the equation and all the *constants* on the other side.

Learn: <https://www.khanacademy.org/math/algebra-basics/core-algebra-linear-equations-inequalities/solving-fancier-linear-equations/v/equations-3>

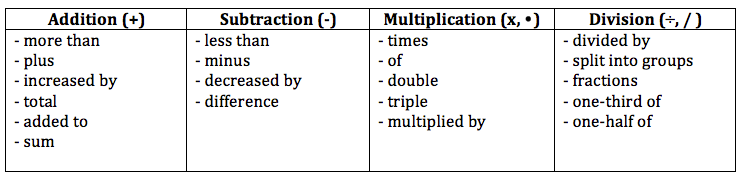
And

<https://www.khanacademy.org/math/algebra-basics/core-algebra-linear-equations-inequalities/solving-fancier-linear-equations/v/multi-step-equations-1>

Practice:<https://www.khanacademy.org/math/algebra-basics/core-algebra-linear-equations-inequalities/solving-fancier-linear-equations/e/linear_equations_3>

13: Students will write and solve linear equations from a given verbal model.

Key concept(s):



Learn: <https://www.khanacademy.org/math/algebra-basics/core-algebra-linear-equations-inequalities/core-algebra-linear-equation-word-problems/v/linear-equation-word-problem-example>

Practice: <https://www.khanacademy.org/math/algebra-basics/core-algebra-linear-equations-inequalities/core-algebra-linear-equation-word-problems/e/linear-equation-world-problems-2>

14: Students will give examples of linear equations with 0, 1, and infinitely many solutions.

Key concept(s): Some equations have one solution, some have no (0) solutions, and some have infinitely many solutions.

Learn: <https://www.khanacademy.org/math/cc-eighth-grade-math/cc-8th-solving-equations/number-of-solutions-to-linear-equations/v/number-of-solutions-to-linear-equations>

Practice: <https://www.khanacademy.org/math/cc-eighth-grade-math/cc-8th-solving-equations/number-of-solutions-to-linear-equations/e/solutions-to-linear-equations>

**These match Unit 5 lessons 6-9 in Fishtree:**

6: Students will identify if a table or graph represents a proportional relationship.

Key concept(s): The easiest way to figure this out is to simply express each *x/y* pairing as a ratio, then reduce them to simplest terms, or convert them into unit rates.

Learn: <https://www.khanacademy.org/math/in-sixth-grade-math/ratio-and-proportion/proportion-ratio-proportion/v/understanding-proportions>

And

<https://www.khanacademy.org/math/in-sixth-grade-math/ratio-and-proportion/proportion-ratio-proportion/v/introduction-to-proportional-relationships>

Practice:

<https://www.khanacademy.org/math/in-sixth-grade-math/ratio-and-proportion/proportion-ratio-proportion/e/analyzing-and-identifying-proportional-relationships>

7: Students will compare two different proportional relationships represented in different ways.

Key concept(s): Proportions represented in different ways (equations, graphs, and tables) can be compared using the unit rate of the proportions.

Learn: <https://www.khanacademy.org/math/cc-seventh-grade-math/cc-7th-ratio-proportion/cc-7th-proportional-rel/v/analyzing-and-identifying-proportional-relationships-ex3>

Practice: <https://www.khanacademy.org/math/cc-seventh-grade-math/cc-7th-ratio-proportion/cc-7th-proportional-rel/e/analyzing-and-identifying-proportional-relationships>

8: Students will solve one-step linear equations.

Key concept(s): Isolate the variable by using inverse operations and by doing the same thing to both sides of the equation.

Learn: <https://www.khanacademy.org/math/algebra-basics/core-algebra-linear-equations-inequalities/core-algebra-solving-basic-equations/v/solving-one-step-equations>

And

<https://www.khanacademy.org/math/algebra-basics/core-algebra-linear-equations-inequalities/core-algebra-solving-basic-equations/v/one-step-equations>

Practice: <https://www.khanacademy.org/math/algebra-basics/core-algebra-linear-equations-inequalities/core-algebra-solving-basic-equations/e/linear_equations_1>

And

<https://www.khanacademy.org/math/algebra-basics/core-algebra-linear-equations-inequalities/core-algebra-solving-basic-equations/e/one_step_equations>

9: Students will solve two-step linear equations.

Key concept(s): The first goal in solving a two-step linear equation is to remove any terms that do not have a variable. Then, isolate the variable by using inverse operations and by doing the same thing to both sides of the equation.

Learn: <https://www.khanacademy.org/math/algebra-basics/core-algebra-linear-equations-inequalities/core-algebra-solving-basic-equations/v/two-step-equations>

And

<https://www.khanacademy.org/math/algebra-basics/core-algebra-linear-equations-inequalities/core-algebra-solving-basic-equations/v/solving-equations-1>

Practice: <https://www.khanacademy.org/math/algebra-basics/core-algebra-linear-equations-inequalities/core-algebra-solving-basic-equations/e/linear_equations_2>

**These match Unit 5 lessons 1-4 in Fishtree:**

**1:** Students will reduce a ratio to lowest terms.

Key concept(s): A ratio is a relationship between two numbers. it is always important to reduce a ratio to its lowest terms. In order to do this, we must first identify the greatest common factor between the two numbers of the ratio. Remember that factors are numbers that you can multiply together to get another number.

Learn: <https://www.khanacademy.org/math/pre-algebra/rates-and-ratios/ratios_and_proportions/v/introduction-to-ratios-new-hd-version>

Practice: <https://www.khanacademy.org/math/ab-sixth-grade-math/ab-number/ratios-percentages/e/representing-ratios>

**2:** Students will reduce a rate to a unit rate.

Key concept(s): A unit rate is a ratio that compares two numbers and has a 1 as its second value, making it valuable for real world applications like miles per (one) hour and miles per (one) gallon.

Learn: <https://www.khanacademy.org/math/pre-algebra/rates-and-ratios/rates_tutorial/v/usain-bolt-s-average-speed>

And

<https://www.khanacademy.org/math/pre-algebra/rates-and-ratios/rates_tutorial/v/finding-unit-rates>

And

<https://www.khanacademy.org/math/pre-algebra/rates-and-ratios/rates_tutorial/v/finding-unit-prices>

Practice: <https://www.khanacademy.org/math/pre-algebra/rates-and-ratios/rates_tutorial/e/rate_problems_0.5>

**3:** Students will solve applications involving unit rates.

Key concept(s): A unit rate is a ratio that has a 1 as its second value, meaning it is expressed as a quantity of 1. It is *much* more useful than any other ratio, as it can be used for other calculations involving the same scenario.

Learn: <https://www.khanacademy.org/math/pre-algebra/rates-and-ratios/rates_tutorial/v/multiple-rates-word-problem>

Practice: <https://www.khanacademy.org/math/pre-algebra/rates-and-ratios/rates_tutorial/e/rate_problems_2>

**4:** Students will identify if an equation represents a proportional relationship.

Key concept(s): A proportion is a comparison of two equal ratios. One way to think about this is to say that a proportion is two ratios that have the same unit rate.

All equations that represent proportional relationships can be expressed in the form y = kx, where k is a rational number.

Learn: <https://www.khanacademy.org/math/algebra-basics/core-algebra-linear-equations-inequalities/ratios-core-algebra/v/writing-proportions>

And

<https://www.khanacademy.org/math/algebra-basics/core-algebra-linear-equations-inequalities/ratios-core-algebra/v/find-an-unknown-in-a-proportion>

Practice: <https://www.khanacademy.org/math/algebra-basics/core-algebra-linear-equations-inequalities/ratios-core-algebra/e/writing_proportions>

And

<https://www.khanacademy.org/math/algebra-basics/core-algebra-linear-equations-inequalities/ratios-core-algebra/e/proportions_1>

**These match Unit 4 lessons 11-14 in Fishtree:**

**11:** Students will solve a simple equation by taking square roots.

Key concept(s): When solving an equation, you’re trying to get the variable, or unknown value, all by itself. Remember that whatever you do to one side of the equation, you must do to the other side to keep the equation balanced.

When solving an equation involving a square root, the goal is to get the variable by itself. We perform the inverse operation of squaring a number, which is to take the *square root* of the number. This will isolate the variable since it is the inverse operation. Remember that we must do this to both sides of the equation.

Learn: <https://www.khanacademy.org/math/algebra/one-variable-linear-equations/why-of-algebra/v/why-we-do-the-same-thing-to-both-sides-two-step-equations>

And

<https://www.khanacademy.org/math/in-eighth-grade-math/squares-square-roots/square-roots/v/introduction-to-square-roots>

Practice: <https://www.khanacademy.org/math/algebra-basics/core-algebra-linear-equations-inequalities/core-algebra-solving-basic-equations/e/linear_equations_2>

And

<https://www.khanacademy.org/math/cc-eighth-grade-math/cc-8th-numbers-operations/cc-8th-roots/e/equations-w-square-and-cube-roots>

**12:** Students will solve a simple square root equation.

Key concept(s): A *square root equation* is any equation that has a variable, an unknown like *x*, *y*, or *a*, in the radicand of a square root. Remember that *radicand*is the name for anything underneath the radical symbol.

The most basic type of square root equation is one in which the square root term is isolated on one side of the equation. When you see an equation like this, you simply need to perform the inverse operation of taking a square root, on both sides of the equation. Specifically, you need to *square*, or raise to the second power, both sides.

If everything on one side of the equation is under a square root, then you need to square both sides before adding or subtracting. However, if you have a square root term added or subtracted to a rational number (not under a square root), then you must add or subtract *before* squaring both sides.

If there is a coefficient in front of the square root, remember that coefficients represent multiplication. This means that we will need to perform the inverse operation of multiplication, which is division.

Learn: See U4L11

Practice: See U4L11

**13:** Students will solve a simple equation by taking cube roots.

Key concept(s): To solve for a variable in a cube root equation, we need to make sure that the variable is by itself on one side of the equation. If the variable is  *x*3 , and we need it to simply be *x*. To get rid of that power of 3, we perform the inverse operation of cubing, which is to take the cube root. Since the cube root is the inverse operation of cubing, this will leave us with just *x* on the left side.

Learn: <https://www.khanacademy.org/math/in-eighth-grade-math/squares-square-roots/square-roots/v/introduction-to-square-roots>

Practice: <https://www.khanacademy.org/math/cc-eighth-grade-math/cc-8th-numbers-operations/cc-8th-roots/e/equations-w-square-and-cube-roots>

**14:** Students will solve a simple cube root equation.

Key concept(s): A “cube root equation” is any equation that has a variable in the radicand of a cube root. Remember that when you are solving an equation you are trying to isolate the variable by performing inverse operations. With cube roots, the inverse operation is to cube both sides of the equation.

Note that the cube root term may not be isolated to begin with. In cases like these, you will have to perform an additional operation before cubing both sides.

Learn: <https://www.khanacademy.org/math/in-eighth-grade-math/squares-square-roots/square-roots/v/introduction-to-square-roots>

Practice: <https://www.khanacademy.org/math/cc-eighth-grade-math/cc-8th-numbers-operations/cc-8th-roots/e/equations-w-square-and-cube-roots>

**These match Unit 4 lessons 6-9 in Fishtree:**

**6:** Students will simplify radicals into simplest radical form.

Key concept: to simplify radicals, do the process of “prime factorization” – breaking a number into the product of ONLY its prime numbers.

Learn: <https://www.khanacademy.org/math/pre-algebra/factors-multiples/prime_factorization/v/prime-factorization>

And

<https://www.khanacademy.org/math/pre-algebra/exponents-radicals/radical-radicals/v/simplifying-radicals>

And

<https://www.khanacademy.org/math/pre-algebra/exponents-radicals/radical-radicals/v/square-roots-and-real-numbers>

Practice: <https://www.khanacademy.org/math/pre-algebra/exponents-radicals/radical-radicals/e/simplifying_radicals>

**7:** Students will multiply and divide radicals in an expression.

Key concepts:

To multiply/divide radicals

1. Separately multiply/divide the **coefficients** of each term and the **radicands** of each term.
2. Simplify the radical that you are left with, using prime factorization.
3. Multiply/divide any coefficient from Step 1 with anything that you pulled out front in Step 2.
4. Rewrite your radical with the new coefficient and whatever remains under the radical.

Learn: Fishtree (No Khan)

Practice: Fishtree (no Khan)

**8:** Students will add or subtract radicals in an expression.

Key concept: When adding and subtracting radicals in an expression, you **cannot** add or subtract radicals unless they have the **same radicand**. Remember that “radicand” is just a term for the number under the radical sign. Once you have radicals with the same radicand, you simply add or subtract their coefficients together but **not their radicands**. The only elements that are added or subtracted are the coefficients.

Learn: <https://www.khanacademy.org/math/algebra/rational-exponents-and-radicals/simplifying-radical-expressions/v/adding-and-simplifying-radicals>

And

<https://www.khanacademy.org/math/algebra/rational-exponents-and-radicals/simplifying-radical-expressions/v/subtracting-and-simplifying-radicals>

Practice: <https://www.khanacademy.org/math/algebra/rational-exponents-and-radicals/simplifying-radical-expressions/e/multiplying_radicals>

**9:** Students will rationalize the denominator of an expression.

Key concept: A fraction is not completely simplified until it has **no radicals** in the denominator. Sometimes you can get rid of radicals in the denominator by just simplifying them if their radicands are perfect squares. However, when the radicands are not perfect squares, you are left with an irrational number in the denominator, and you will need to get rid of it by rationalizing the denominator. This process is described in the Fishtree lesson and in Khan, below:

Learn: <https://www.khanacademy.org/math/algebra/rational-exponents-and-radicals/simplifying-radical-expressions/v/how-to-rationalize-a-denominator>

And

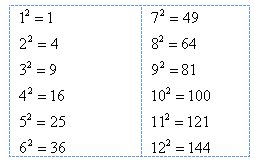
<https://www.khanacademy.org/math/algebra/rational-exponents-and-radicals/simplifying-radical-expressions/v/rationalizing-denominators-of-expressions>

Practice: <https://www.khanacademy.org/math/pre-algebra/exponents-radicals/radical-radicals/e/adding_and_subtracting_radicals>

**These match Unit 4 lessons 1-4 in Fishtree:**

**1:** Students will identify the first 12 perfect squares.

Key concept:



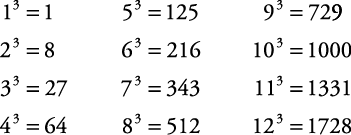
Squares are used when discussing area (2 dimensions); cubes are used when discussing volume (3 dimensions).

**Learn:** <https://www.khanacademy.org/math/pre-algebra/exponents-radicals/radical-radicals/v/understanding-square-roots>

**Practice:** <https://www.khanacademy.org/math/pre-algebra/exponents-radicals/radical-radicals/e/square_roots>

**2:** Students will identify the first 6 perfect cubes.

Key concept:



Squares are used when discussing area (2 dimensions); cubes are used when discussing volume 93 dimensions).

**Learn:** <https://www.khanacademy.org/math/pre-algebra/exponents-radicals/cube-root-tutorial/v/finding-cube-roots>

**Practice:** <https://www.khanacademy.org/math/pre-algebra/exponents-radicals/cube-root-tutorial/e/cube_roots>

**3:** Students will simplify radicals into rational numbers.

Key concept: Square roots will have two solutions: the positive and the negative version of the number. Cube roots, however, will only have one. Examples:

https://s3-eu-west-1.amazonaws.com/teacher-uploads.fishtree.com/SpiderLearning/1444832587dok1-3.png

https://s3-eu-west-1.amazonaws.com/teacher-uploads.fishtree.com/SpiderLearning/1444832924dok2-2.png

When evaluating and ordering roots, simplify the radicals and then put in order. Example:

Simplify

https://s3-eu-west-1.amazonaws.com/teacher-uploads.fishtree.com/SpiderLearning/1444833898dok3-6.png

https://s3-eu-west-1.amazonaws.com/teacher-uploads.fishtree.com/SpiderLearning/1444833907dok3-7.png

https://s3-eu-west-1.amazonaws.com/teacher-uploads.fishtree.com/SpiderLearning/1444833916dok3-8.png

https://s3-eu-west-1.amazonaws.com/teacher-uploads.fishtree.com/SpiderLearning/1444833928dok3-9.png

Put in order

https://s3-eu-west-1.amazonaws.com/teacher-uploads.fishtree.com/SpiderLearning/1444833975dok3-10.png

https://s3-eu-west-1.amazonaws.com/teacher-uploads.fishtree.com/SpiderLearning/1444833984dok3-11.png

https://s3-eu-west-1.amazonaws.com/teacher-uploads.fishtree.com/SpiderLearning/1444833990dok3-12.png

https://s3-eu-west-1.amazonaws.com/teacher-uploads.fishtree.com/SpiderLearning/1444833997dok3-13.png

**Learn:** <https://www.khanacademy.org/math/pre-algebra/exponents-radicals/cube-root-tutorial/v/simplifying-radical-expressions1>

**Practice:** <https://www.khanacademy.org/math/pre-algebra/exponents-radicals/radical-radicals/e/square_roots_2>

**4:** Students will identify irrational numbers.

Key concepts: A rational number is any number that can be expressed as a ratio (or fraction) of two integers.

An irrational number is any number that cannot be expressed as a ratio (or fraction) of two integers.

Any time a rational number is added, subtracted, multiplied, or divided with another rational number, the result is another rational number.

Any time an irrational number is added, subtracted, multiplied, or divided with a rational number, the result is an irrational number.

**Learn:** <https://www.khanacademy.org/math/pre-algebra/order-of-operations/rational-irrational-numbers/v/recognizing-irrational-numbers>

**Practice:** <https://www.khanacademy.org/math/pre-algebra/order-of-operations/rational-irrational-numbers/v/approximating-irrational-number-exercise-example>

**These match Unit 3 lessons 11-14 in Fishtree**

**11: Distinguish between rational and irrational numbers**

**Learn:** <https://www.khanacademy.org/math/pre-algebra/order-of-operations/rational-irrational-numbers/v/recognizing-irrational-numbers>

**Practice:** <https://www.khanacademy.org/math/pre-algebra/order-of-operations/rational-irrational-numbers/e/recognizing-rational-and-irrational-numbers>

**12: Approximate the value of an irrational number**

**Learn:** <https://www.khanacademy.org/math/pre-algebra/order-of-operations/rational-irrational-numbers/v/approximating-irrational-number-exercise-example>

and

<https://www.khanacademy.org/math/algebra/rational-and-irrational-numbers/rational-and-irrational-expressions/v/recognizing-rational-and-irrational-expressions-example>

**Practice:** <https://www.khanacademy.org/math/pre-algebra/order-of-operations/rational-irrational-numbers/e/approximating-irrational-numbers>

and

<https://www.khanacademy.org/math/algebra/rational-and-irrational-numbers/rational-and-irrational-expressions/e/recognizing-rational-and-irrational-expressions>

**13: Plot the approximate location of rational and irrational numbers on the number line**

**Learn:** <https://www.khanacademy.org/math/pre-algebra/decimals-pre-alg/decimals-on-number-line-pre-alg/v/points-on-a-number-line>

**and**

<https://www.khanacademy.org/math/pre-algebra/order-of-operations/rational-irrational-numbers/v/approximating-irrational-number-exercise-example>

**Practice:** <https://www.khanacademy.org/math/pre-algebra/decimals-pre-alg/decimals-on-number-line-pre-alg/e/decimals_on_the_number_line_2>

**14: Order a list of real numbers including both rational and irrational numbers**

**Learn:** <https://www.khanacademy.org/math/pre-algebra/order-of-operations/rational-irrational-numbers/v/introduction-to-rational-and-irrational-numbers>

**Practice:**

<https://www.khanacademy.org/math/cc-eighth-grade-math/cc-8th-numbers-operations/cc-8th-approximating-irrational-numbers/e/approximating-irrational-numbers-without-a-calculator>

**These match Unit 3 lessons 6-9 in Fishtree**

**6: Write mixed numbers as improper fractions**

Learn: <https://www.khanacademy.org/math/arithmetic/fractions/mixed_numbers/v/converting-mixed-numbers-to-improper-fractions>

Practice: <https://www.khanacademy.org/math/arithmetic/fractions/mixed_numbers/e/converting_mixed_numbers_and_improper_fractions>

**7: Write mixed numbers as decimal values and vice versa**

Learn: <https://www.khanacademy.org/math/pre-algebra/fractions-pre-alg/decimals-fractions-pre-alg/v/decimals-and-fractions>

Practice: <https://www.khanacademy.org/math/arithmetic/fractions/mixed_numbers/e/comparing_improper_fractions_and_mixed_numbers>

and

<https://www.khanacademy.org/math/pre-algebra/fractions-pre-alg/decimals-fractions-pre-alg/e/converting_fractions_to_decimals>

**8: Write a rational number as a fraction, decimal, or percent**

Learn: <https://www.khanacademy.org/math/pre-algebra/decimals-pre-alg/percent-intro-pre-alg/v/converting-decimals-to-percents-ex-1>

Practice: <https://www.khanacademy.org/math/pre-algebra/decimals-pre-alg/percent-intro-pre-alg/e/converting_decimals_to_percents>

**9: Define and describe an “irrational number”.**

Learn: <https://www.khanacademy.org/math/pre-algebra/order-of-operations/rational-irrational-numbers/v/recognizing-irrational-numbers>

Practice: <https://www.khanacademy.org/math/pre-algebra/order-of-operations/rational-irrational-numbers/e/recognizing-rational-and-irrational-numbers>

**These match Unit 3 lessons 1-4 in Fishtree**

**1: Demonstrate how some fractions may be written as terminating decimals and 2: Demonstrate how some fractions may be written as repeating decimals**

Learn: <https://www.khanacademy.org/math/pre-algebra/fractions-pre-alg/decimals-fractions-pre-alg/v/converting-decimals-to-fractions-2-ex-1>

and

<https://www.khanacademy.org/math/pre-algebra/fractions-pre-alg/decimals-fractions-pre-alg/v/converting-a-fraction-to-a-repeating-decimal>

Practice: <https://www.khanacademy.org/math/pre-algebra/fractions-pre-alg/decimals-fractions-pre-alg/e/converting_decimals_to_fractions_2>

and

<https://www.khanacademy.org/math/pre-algebra/fractions-pre-alg/decimals-fractions-pre-alg/e/writing-fractions-as-repeating-decimals>

**3: Convert a terminating decimal into a rational number**

Learn: <https://www.khanacademy.org/math/pre-algebra/fractions-pre-alg/decimals-fractions-pre-alg/v/converting-decimals-to-fractions-1-ex-1>

Practice: <https://www.khanacademy.org/math/pre-algebra/fractions-pre-alg/decimals-fractions-pre-alg/e/converting_decimals_to_fractions_1>

**4: Convert a repeating decimal into a rational number**

Learn: <https://www.khanacademy.org/math/algebra/solving-linear-equations-and-inequalities/conv_rep_decimals/v/coverting-repeating-decimals-to-fractions-1>

and

<https://www.khanacademy.org/math/algebra/solving-linear-equations-and-inequalities/conv_rep_decimals/v/coverting-repeating-decimals-to-fractions-2>

Practice: <https://www.khanacademy.org/math/algebra/solving-linear-equations-and-inequalities/conv_rep_decimals/e/converting_repeating_decimals_to_fractions_1>

and

<https://www.khanacademy.org/math/algebra/solving-linear-equations-and-inequalities/conv_rep_decimals/e/converting_repeating_decimals_to_fractions_2>

**These match Unit 2 lessons 11-14 in Fishtree**

**11: Add or subtract two numbers written in scientific notation**

Learn: <https://www.khanacademy.org/math/cc-eighth-grade-math/cc-8th-numbers-operations/cc-8th-scientific-notation-compu/v/subtracting-in-scientific-notation>

Practice: <https://www.khanacademy.org/math/cc-eighth-grade-math/cc-8th-numbers-operations/cc-8th-scientific-notation-compu/e/adding-and-subtracting-in-scientific-notation>

**12: Multiply two numbers written in scientific notation and 13: Divide two numbers written in scientific notation**

Learn: <https://www.khanacademy.org/math/pre-algebra/exponents-radicals/scientific-notation/v/scientific-notation-example-2>

and

<https://www.khanacademy.org/math/pre-algebra/exponents-radicals/computing-scientific-notation/v/multiplying-and-dividing-in-scientific-notation>

Practice: <https://www.khanacademy.org/math/pre-algebra/exponents-radicals/computing-scientific-notation/e/multiplying_and_dividing_scientific_notation>

**14: Solve a variety of real-world problems involving numbers in scientific notation**

Learn: <https://www.khanacademy.org/math/pre-algebra/exponents-radicals/computing-scientific-notation/v/simplifying-a-complicated-expression-into-scientific-notation>

and

<https://www.khanacademy.org/math/pre-algebra/exponents-radicals/computing-scientific-notation/v/calculating-red-blood-cells-in-the-body-using-scientific-notation>

Practice: <https://www.khanacademy.org/math/pre-algebra/exponents-radicals/computing-scientific-notation/e/computing-in-scientific-notation>

**These match Unit 2 lessons 6-9 in Fishtree**

**6: Evaluate arithmetic expressions using properties of exponents and 7: Use basic exponent properties to generate equivalent forms of expressions involving exponents**

Intro videos: <https://www.khanacademy.org/math/algebra-basics/core-algebra-exponent-expressions/core-algebra-exponent-properties/v/exponent-properties-involving-products>

and

<https://www.khanacademy.org/math/algebra-basics/core-algebra-exponent-expressions/core-algebra-exponent-properties/v/exponent-properties-involving-quotients>

Practice: <https://www.khanacademy.org/math/cc-eighth-grade-math/cc-8th-numbers-operations/cc-8th-exponent-properties/e/exponent_rules>

and

<https://www.khanacademy.org/math/cc-eighth-grade-math/cc-8th-numbers-operations/cc-8th-exponent-properties/e/properties-of-integer-exponents>

**8: Express very large numbers using scientific notation and 9 : Express very small numbers using scientific notation**

Intro videos: <https://www.khanacademy.org/math/pre-algebra/exponents-radicals/scientific-notation/v/scientific-notation>

and

<https://www.khanacademy.org/math/cc-eighth-grade-math/cc-8th-numbers-operations/cc-8th-scientific-notation/v/scientific-notation-i>

Practice: <https://www.khanacademy.org/math/pre-algebra/exponents-radicals/scientific-notation/e/scientific_notation>

and

<https://www.khanacademy.org/math/pre-algebra/exponents-radicals/scientific-notation/e/scientific_notation_intuition>

**These match Unit 2 lessons 1-4 in Fishtree**

**1: Positive exponents expressed in expanded form and 2: Evaluate expressions with positive exponents**

Intro video: <https://www.khanacademy.org/math/pre-algebra/exponents-radicals/World-of-exponents/v/introduction-to-exponents>

Practice: <https://www.khanacademy.org/math/pre-algebra/exponents-radicals/World-of-exponents/e/positive_and_zero_exponents>

and

**Powers of 0 and 1**

Intro: <https://www.khanacademy.org/math/pre-algebra/exponents-radicals/World-of-exponents/v/raising-a-number-to-the-0th-and-1st-power>

Practice: <https://www.khanacademy.org/math/pre-algebra/exponents-radicals/World-of-exponents/e/exponents_1>

**3: Define negative exponents and write them using positive exponents and 4: Evaluate expression with negative exponents**

Intro: <https://www.khanacademy.org/math/algebra-basics/core-algebra-exponent-expressions/core-alg-negative-exponents/v/introduction-to-negative-exponents>

Practice: <https://www.khanacademy.org/math/algebra-basics/core-algebra-exponent-expressions/core-alg-negative-exponents/e/exponents_2>

**These match Unit 1 lessons 11-14 in Fishtree**

**11: Convert between fractions and percents**

<https://www.khanacademy.org/math/cc-sixth-grade-math/cc-6th-ratios-prop-topic/cc-6th-percentages/e/converting-between-fractions-and-percents>

**12: Determine the part of a whole using percents**

<https://www.khanacademy.org/math/cc-sixth-grade-math/cc-6th-ratios-prop-topic/cc-6th-percent-problems/e/finding_percents>

**13: Determine the whole given a part and its percent**

<https://www.khanacademy.org/math/algebra-basics/core-algebra-foundations/algebra-foundations-decimal-operations/e/finding_percents>

**14: Solve application problems involving percents**

<https://www.khanacademy.org/math/cc-sixth-grade-math/cc-6th-ratios-prop-topic/cc-6th-percent-word-problems/e/percentage_word_problems_1>

**These match Unit 1 Lessons 6-9 in Fishtree**

**6. Convert between improper fractions and mixed numbers**

<https://www.khanacademy.org/math/arithmetic/fractions/visualizing-equivalent-fractions/e/visualizing-equivalent-fractions>

and

<https://www.khanacademy.org/math/arithmetic/fractions/mixed_numbers/e/comparing_improper_fractions_and_mixed_numbers>

**7: Add and subtract mixed numbers**

<https://www.khanacademy.org/math/arithmetic/fractions/Mixed_number_add_sub/e/adding_subtracting_mixed_numbers_0.5>

and

<https://www.khanacademy.org/math/arithmetic/fractions/Mixed_number_add_sub/e/adding_subtracting_mixed_numbers_1>

**8: Multiply mixed numbers**

<https://www.khanacademy.org/math/arithmetic/fractions/mixed_number_mult_div/e/multiplying_mixed_numbers_1>

**9: Divide mixed numbers**

<https://www.khanacademy.org/math/cc-seventh-grade-math/cc-7th-negative-numbers-multiply-and-divide/cc-7th-mult-div-fractions-2/e/dividing-mixed-numbers>

**These match Unit 1 Lessons 1-4 in Fishtree**

**1. Reduce Fractions:**

<https://www.khanacademy.org/math/cc-seventh-grade-math/cc-7th-fractions-decimals/cc-7th-fracs-to-decimals/e/converting_decimals_to_fractions_1>

**2. Add and subtract fractions:**

<https://www.khanacademy.org/math/cc-fifth-grade-math/cc-5th-fractions-topic/cc-5th-add-sub-fractions/e/adding_fractions>

and

<https://www.khanacademy.org/math/cc-fifth-grade-math/cc-5th-fractions-topic/cc-5th-add-sub-fractions/e/subtracting_fractions>

**3. Multiply fractions:**

<https://www.khanacademy.org/math/cc-fifth-grade-math/cc-5th-fractions-topic/cc-5th-multiplying-fractions/e/multiplying_fractions_0.5>

**4. Divide fractions:**

<https://www.khanacademy.org/math/cc-fifth-grade-math/cc-5th-fractions-topic/cc-5th-fractions-as-division/e/understanding-fractions-as-division>

and

<https://www.khanacademy.org/math/cc-seventh-grade-math/cc-7th-negative-numbers-multiply-and-divide/cc-7th-mult-div-neg-fractions/e/dividing_fractions_2>

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