

Know-Understand-Do (KUD)

Grade: 8

Unit: Graphing Equations

Critical Area of Focus and/or Parts of Narrative:

In Grade 8, instructional time should focus on this critical area: (1) formulating and reasoning about expressions and equations, including modeling an association in bivariate data with a linear equation, and solving linear equations and systems of linear equations; Students solve systems of two linear equations in two variables and relate the systems to pairs of lines in the plane; these intersect, are parallel, or are the same line. Students use linear equations, systems of linear equations, linear functions, and their understanding of slope of a line to analyze situations and solve problems.

Standards for Mathematical Practice:

1. Make sense of problems & persevere in solving them.
2. Reason abstractly & quantitatively.
3. Construct viable arguments and critique the reasoning of others.
4. Model with mathematics
5. Use appropriate tools strategically.
6. Attend to precision.
7. Look for and make use of structure.
8. Look for and express regularity in repeated reasoning.

By the end of this unit, students will...

UNDERSTAND:

- An object's location on a plane or in space can be described quantitatively (considering the restriction of movements)
- Movement in a plane can be mathematically modeled and represented by equations,

KNOW:

Extension/Building:

- Cardinal directions and degrees to find location, movement, intersection in polar grids and rectangular grids
- Coordinate pairs can be located according to direction on a coordinate plane.
- Shapes on coordinate grid- manipulated using operations with integers to move shapes
- Inequalities to identify boundaries
- usually represented in Quadrant 1 are extended into 4 quadrants
- X axis- horizontal, Y axis- vertical
- Prior understandings of attention to scale are revisited in the context of identifying directional pairs and tangent ratios

New:

- Directional pairs with the ratio of the two numbers always being the same in the same direction
- Slope convention defined as a y-component compared to an x-component, with a relation to direction of a line
- Equations with x and y to define a point on a line and the direction it moves-
- Utilize 4 quadrants of the coordinate system for graphing lines (not restricted to just quadrant I)
- The point where the x-axis and y-axis intersect is known as the origin, which is (0,0)
- Equations of vertical and horizontal lines
- The point where a line crosses an axis is known as that axis' intercept
- Finding intersection of lines by solving equations using models such as frogs, pictures, number lines, and same operation on

DO:

Expressions and Equations 8.EE

Understand the connections between proportional relationships, lines, and linear equations.

5. Graph proportional relationships, interpreting the unit rate as the slope of the graph. Compare two different proportional relationships represented in different ways. *For example, compare a distance-time graph to a distance-time equation to determine which of two moving objects has greater speed.*
CC.8.EE.5

***students learn more formal methods of graphing systems of equations with attention to the y intercept and slope.**

- Determine the relationship between slope and tangent ratio of a line

Analyze and solve linear equations and pairs of simultaneous linear equations.

7. Solve linear equations in one variable. **CC.8.EE.7**
 - a. Give examples of linear equations in one variable with one solution, infinitely many solutions, or no solutions. Show which of these possibilities is the case by successively transforming the given equation into simpler forms, until an equivalent equation of the form $x = a$, $a = a$, or $a = b$ results (where a and b are different numbers). **CC.8.EE.7a**
***Pre-formal introduction for this**
8. Analyze and solve pairs of simultaneous linear equations. **CC.8.EE.8**
 - a. Understand that solutions to a system of two linear equations in two variables correspond to points of intersection of their graphs, because points of intersection satisfy both equations simultaneously. **CC.8.EE.8a**

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each side (solving systems)

- b. Solve systems of two linear equations in two variables algebraically, and estimate solutions by graphing the equations. Solve simple cases by inspection. *For example, $3x + 2y = 5$ and $3x + 2y = 6$ have no solution because $3x + 2y$ cannot simultaneously be 5 and 6.* **CC.8.EE.8b**
- c. Solve real-world and mathematical problems leading to two linear equations in two variables. *For example, given coordinates for two pairs of points, determine whether the line through the first pair of points intersects the line through the second pair.* **CC.8.EE.8c**

Functions 8.F

Define, evaluate, and compare functions.

1. Understand that a function is a rule that assigns to each input exactly one output. The graph of a function is the set of ordered pairs consisting of an input and the corresponding output.¹ **CC.8.F.1**
 - Describe directions using ordered pairs (direction pairs)
 - Use slope in a more formal level
 - Graph points and lines in a coordinate system
 - Find the y intercept using the equation of a line or a graph and understanding its meaning
 - Solve linear systems using graphing and by solving a linear equation algebraically
 - Write and solve linear equations
- Use cardinal directions and degrees to find location and give direction
- Use inequalities to describe a region

Vocabulary:

Mathematically proficient students acquire precision in the use of mathematical language by engaging in discussion with others and by giving voice to their own reasoning. By the time they reach high school they have learned to examine claims, formulate definitions, and make explicit use of those definitions. The terms students should learn to use with increasing precision in this unit are:

Degree measurements, horizontal coordinate, vertical coordinate, x-coordinate, y-coordinate, origin, x-axis, y-axis, quadrants, Cardinal direction, directional pair, slope, compass, vertical component, horizontal component, coordinate grid/plane/system, equation of vertical line, equation of horizontal line, y-intercept, slope, equation of a line, unknown, Variable, equation, unknown, expression, Intersecting, parallel, perpendicular

Connections:

¹ Function notation is not required in Grade 8.