

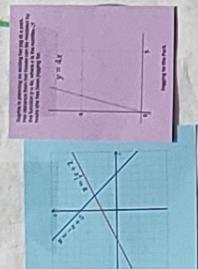
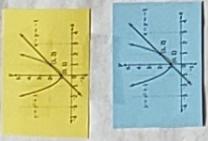
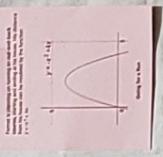
Linear Equations

Non-linear equations

- straight lines
- exponents x^2, x^4
- \sqrt{x} square roots
- $x^{1/3}$ cube roots

Linear Equations for a straight line $y = mx + b$

Coefficient Variable Constant
 $3x - 1$ term



Forms of Linear Equations

Slope: $\frac{\text{rise}}{\text{run}}$ ↑

$y = mx + b$

Slope-intercept form

$y = 2x + 5$

Comparing Proportional Relationships

Maria and Ashley are each going on a car trip with their family. Compare the two scenarios to determine which represents a greater speed.

#1 graph

#2 equation

$y = 55x$

X is time in hours
 y is distance in miles

hours	miles
1	55
2	110
3	165
4	?

60 miles per hour

Solutions

One Solution

$7x - 3 = 7x + 5$

$7x - 3 - 7x = 7x + 5 - 7x$

$-3 = 5$

No Solution

$7x - 3 = 7x + 5 + 3$

$7x - 3 + 3 = 7x + 5 + 3$

$7x = 7x + 8$

$7x - 7x = 7x + 8 - 7x$

$0 = 8$

$x = 4$

Infinitely many solutions

$\frac{1}{3}(8x + 26) = 13 + 4x$

$8x + \frac{26}{3} = 13 + 4x$

$14x + 13 = 13 + 4x$

Same what

Mathematical Standards and Practices

The practice of mathematics involves creating viable arguments and critiquing the reasoning of others.

1) We will solve linear equations and justify our solutions by ratios equal to each other to others.

2) We will compare proportional relationships using tables, equations and graphs.

3) We will determine the equation of a line given in the coordinate plane by looking for and making use of structure. $y = mx + b$

Inquiry What we want to learn about... linear equations

We know x is a number. Other letters can be variables too. (x, y, z)

We are trying to see what is.

What we want to learn about... linear equations

Do for me in general? Linear equations help us understand things.

What is the biggest linear equation? How big can they get?

How do you use DGI when solving linear equations?

Title/ Focus:

Linear Equations

not a line
non-linear equations
(equation for a straight line)

Simple variables
 x y

\sqrt{x} x^2
exponents
 $\sqrt[3]{x}$
cubed roots...



(attach examples from surf)

Solutions

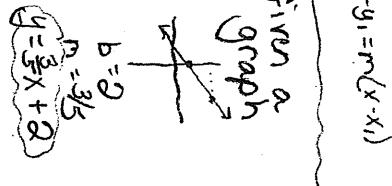
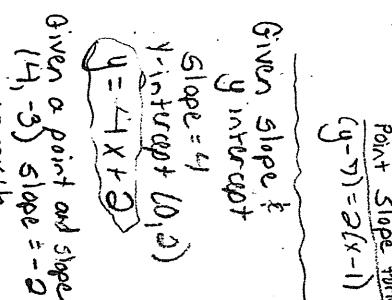
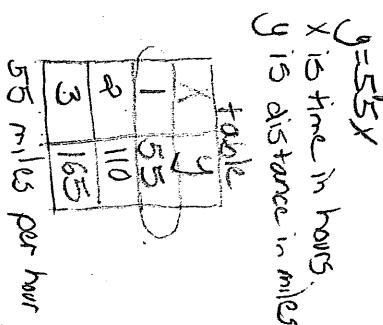
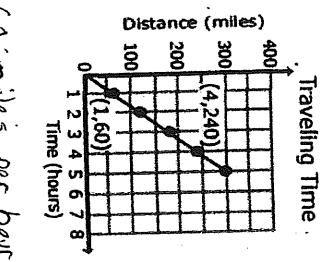
unique
one solution

$$\begin{aligned} 7x - 3 &= 7x + 5 \\ 7x - 7x &= 5 + 3 \\ -3 &\neq 5 \end{aligned}$$

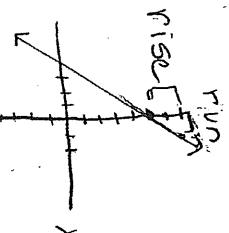
$$\begin{aligned} 7x - 3 &= 5x + 5 \\ 7x - 5x &= 5 + 3 \\ 2x &= 8 \\ x &= 4 \end{aligned}$$

$$\begin{aligned} 7x - 3 &= 5x + 5 \\ 7x - 5x &= 5 + 3 \\ 2x &= 8 \\ x &= 4 \end{aligned}$$

infinitely many solutions



coefficient variable \downarrow constant
 $3x - 1y = 7$
variable term \downarrow term



Forms of Linear Equations

$$\text{slope} = \frac{\text{rise}}{\text{run}}$$

$$\begin{aligned} \text{Slope-intercept form} \\ y = mx + b \\ y - y_1 = m(x - x_1) \\ (y - y_1) = m(x - x_1) \end{aligned}$$

$$y = Ax + B$$

$$Ax + By = C$$

$$\begin{aligned} \text{Point-Slope form} \\ y - y_1 = m(x - x_1) \end{aligned}$$

$$\begin{aligned} \text{Given slope } \frac{1}{2} \\ \text{y-intercept } (0, 0) \\ y = \frac{1}{2}x + 0 \end{aligned}$$

$$\begin{aligned} \text{Given a graph} \\ \text{y-intercept } (0, 3) \\ \text{slope } -2 \\ y = -2x + 3 \end{aligned}$$

Mathematical Standards and Practices

1) We will solve linear equations and justify our solutions to others.

What we know about _____?

Inquiry Chart

What we want to learn about _____?

2) We will compare proportional relationships using tables, equations and graphs.

linear equations

3) We will determine the equation of a line given in the coordinate plane by looking for and making use of structure.

UNIT PLANNING TOOL

Planning Focus: Linear Equations 8th grade

CCSSM: 8.EE.5 Graph proportional relationships, interpreting the unit rate as the slope of the graph. Compare two different proportional relationships represented in different ways.

8.EE.6 Use similar triangles to explain why the slope m is the same between any two distinct points on a non-vertical line in the coordinate plane; derive the equation $y = mx$ for a line through the origin and the equation $y = mx + b$ for a line intercepting the vertical axis at b .

8.EE.7 Solve linear equations in one variable.

1. 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).
2. Solve linear equations with rational number coefficients, including equations whose solutions require expanding expressions using the distributive property and collecting like terms.

Mathematical Practices being emphasized:

MP. 3 Construct viable arguments and critique the reasoning of others.

MP. 4 Model with mathematics

MP. 7 Look for and make use of structure

Essential Questions

What careers use linear equations?

How can patterns, relationships and functions be used as tools to explain real-life relationships?

How can the same mathematical idea be represented in a different way? Why would that be useful?

Key Concepts

Determining unit rate

Solving linear equations

Plotting points on a coordinate plane

Attributes of similar figures

Ratios and proportions

Pre and Post Assessments

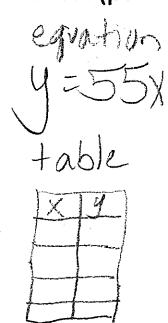
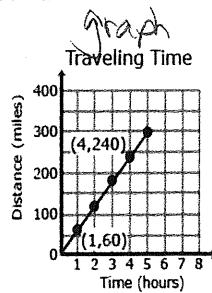
Pre-assessment teacher made (see attached)

Exit slips with lessons

Mid and post assessment from unit

Visual Models/ Algorithms/ Diagrams for Compendium

Linear and non-linear equation sort (put some of the graphs on the Compendium)



Coefficient Variable Constant
 $3x - 1y = 7$

Variable term Term

Forms Slope-Intercept
Standard
Point Slope (Algebra I)
 $\text{Slope} = \frac{\text{rise}}{\text{run}}$

Connections (Real World Applications)

Careers that use linear equations - <https://sciencing.com/careers-use-linear-equations-6060294.html>

Real-life application of linear equations – examples - <https://sciencing.com/linear-equations-used-everyday-life-6022370.html>

Make sure to emphasize examples from daily problems that are set in a real-life context.

Language Functions/Structures

Compare and contrast *Both the linear and the non-linear equations have However, the non-linear equations only have ...*

Describe *A linear equation has (no solution/ one solution/ infinitely many solutions) when ...*
 Explain *To find the slope, I*
I used a (table/graph) because...

Cooperate *Our team worked together by...*
Our team supported each other when...

Vocabulary

Slope	horizontal	vertical	
x-axis	x-intercept	y-axis	y-intercept
coefficient	like terms	variable	
unit rate	solution		
linear equation		linear expression	
proportional relationships		similar triangles	

Focus and Motivation

Careers that use linear equations – see above

Youtube songs – Graph a Linear Equation <https://www.youtube.com/watch?v=dqQb8iZtS4>

Linear equations rap - <https://www.youtube.com/watch?v=tvqPmh6zv3Q>

Comics about solving for X

Visual Thinking Strategy – post pictures of graphs with real-life data, people using linear equations

Equation Riddles - <https://www.quora.com/Think-of-a-number-double-it-add-six-divide-it-in-half-and-subtract-the-number-you-started-with-The-answer-is-three-Why>, <https://www.georgiastandards.org/Georgia-Standards/Frameworks/6th-Math-Unit-3.pdf> (pg. 48)