DHS Algebra 1

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Welcome to Algebra 1

Welcome to Algebra 1 at Frederick Douglass High School!

This book will guide you through the most important math skills you'll need to succeed in high school and beyond. Algebra is more than just solving equations — it's a powerful way to understand patterns, solve problems, and think logically.

Whether you're reviewing old ideas or learning something brand new, this book is here to help you every step of the way.

What You'll Find in This Book

Each unit includes:

- Clear goals to help you focus
- Examples and explanations
- Practice problems
- Activities to explore and talk through ideas

We'll start with the basics — like working with numbers and fractions — and build up to more complex ideas like equations, graphs, and even quadratics.

You don't have to be a "math person" to do well here. Just bring your curiosity, a little patience, and the willingness to try.

Let's get started!

Part I

Unit 1: Foundations

Introduction

Welcome to Unit 1! In this unit, we'll build the foundation you need to succeed in Algebra. Think of this as preparing your math toolkit.

You'll explore integers, factors, fractions, and how to evaluate expressions. These skills are the building blocks that will help you solve more complex problems with confidence.

What You'll Learn

By the end of this unit, you'll be able to:

- Work with positive and negative numbers on a number line
- Use factor trees to find prime factorizations
- Identify and use the greatest common factor (GCF)
- Simplify and convert fractions and mixed numbers
- Follow the correct order of operations
- Evaluate expressions by substituting values
- Understand input-output tables and basic functions

Topics in This Unit

Integers & Number Lines
Understand and use positive and negative numbers, and how to place them on a number line.

Factor Trees & Prime Factorization
Break numbers into prime factors and draw factor trees to visualize.

Greatest Common Factor (GCF)
Use GCF to simplify expressions and understand relationships between numbers.

Multiplication & Division Fluency
Practice and strengthen multiplication and division skills.

Fractions: Meaning & Models
Visualize and interpret fractions as parts of a whole or group.

Simplifying Fractions Using GCF
Reduce fractions to simplest form using the GCF.

Mixed Numbers & Improper Fractions
Convert and understand the relationship between mixed and improper fractions.

Order of Operations
Use PEMDAS to simplify expressions accurately.

Evaluating Expressions
Substitute values into algebraic expressions and simplify.

Input-Output Machines
Explore how functions assign outputs to inputs and recognize simple rules.

Let's build those Algebra muscles — you'll need them for everything that follows!

1.1 - Integers & Number Lines

Did you know that all of mathematics is actually built up from simple things like counting? Even advanced topics like algebra and calculus are just clever ways of organizing and extending basic ideas — like moving forward and backward on a number line.

In this lesson, we'll use the number line not just to count, but to add, subtract, and compare positive and negative numbers. That might sound basic, but it's the foundation of nearly everything else you'll do in Algebra.

Negative numbers can be tricky, especially when the rules don't always match what your gut tells you. But if you can master the way they work on the number line — including things like opposites, absolute value, and comparison — you'll be setting yourself up for success in the rest of the course.

Objectives

- ☐ Know what a number line represents
- ☐ Understand and identify opposite numbers
- ☐ Compare integers using greater than and less than
- ☐ Use a number line to perform addition and subtraction

Vocabulary

absolute value, greater than, integer, less than, number line, negative, opposite, positive

Warm-Up

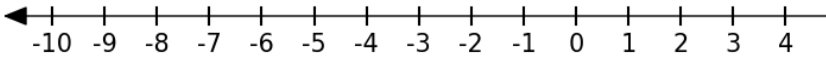
Answer as best you can – even if you aren't sure!

1. What is the opposite of 6?
2. Which is greater -4 or -9?
3. Which is farther from 0: -7 or 5?

Learn Together

1.1.1 - The Number Line Is More Than Just Counting

You already know how to count — 0, 1, 2, 3, and so on. The **number line** extends that idea in both directions.



Let's draw a number line from -10 to 10

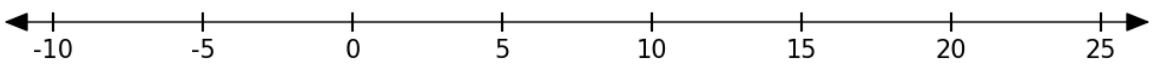
Here, every tick mark is an integer — a whole number.

- Numbers to the **right** of zero are positive
- Numbers to the **left** of zero are negative

We can use this number line to *see* what happens when we add, subtract, or compare numbers.

Are there other ways to draw a number line?

Yes! Number lines can be drawn over different ranges and scales. For example, here is a number line that counts form -10 to 25 in steps of 5.



In fact, number lines don't even have to be horizontal. Here is a vertical number line that goes from 0 to 100 in steps of 10.

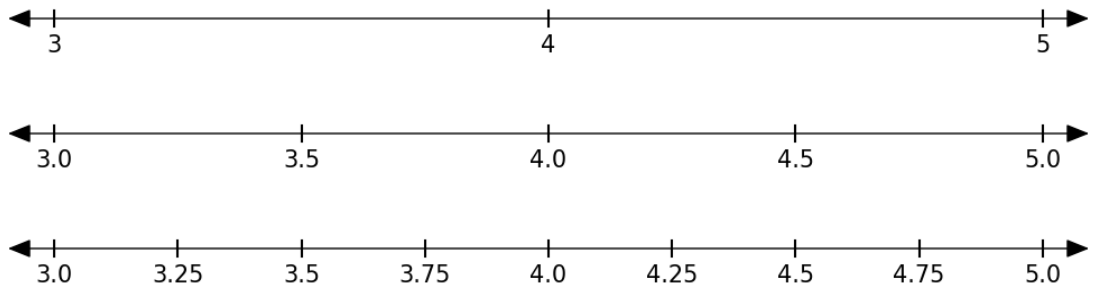
Can you think of any real world examples of number lines?

Here are a few examples:

- thermometer
- ruler
- timeline
- American football field
- volume slider on a phone

How many numbers are between 3 and 5?

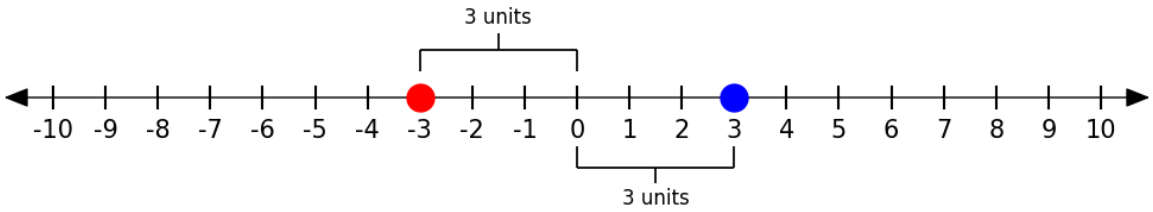
Though there are 2 integers between 3 and 5, the answer is not 2! There are infinitely many numbers between 3 and 5. Here are some number lines that might help convince you.



1.1.2 - Understanding Opposites

Let's look at a pair of numbers, 3 and -3.

These are called opposite numbers. They are the **same distance** from zero but on **opposite sides** of it.



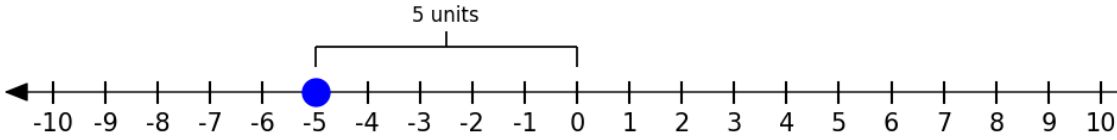
What is the opposite of zero?

The opposite of zero is zero. Zero is the only number that is its own opposite!

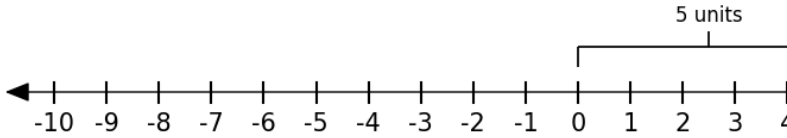
1.1.3 - What Is Absolute Value?

Absolute value ($|number|$) measures the **distance from zero**, no matter the direction.

Take a look at the number -5. The number line shows that it's absolute value is 5 because it is 5



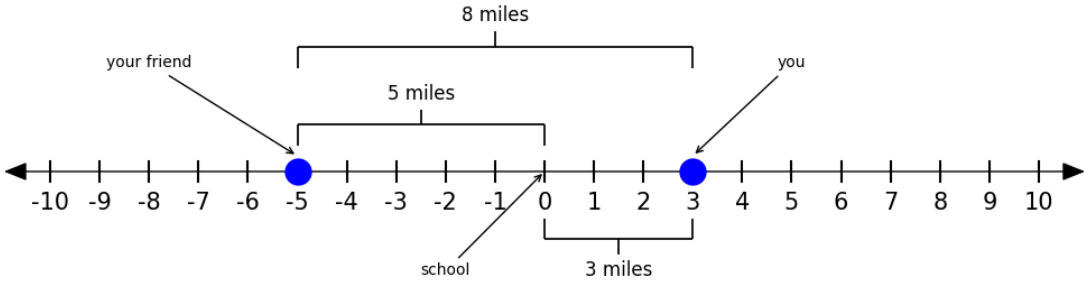
units away from zero.



You can see that |5| is also 5 for the same reason!

In the Real World

Absolute value is often used for describing the distance between two points. Suppose you live 3 miles to the east of the school and your best friend lives 5 miles to the west. How far apart are your houses? This is easy to see with a number line.



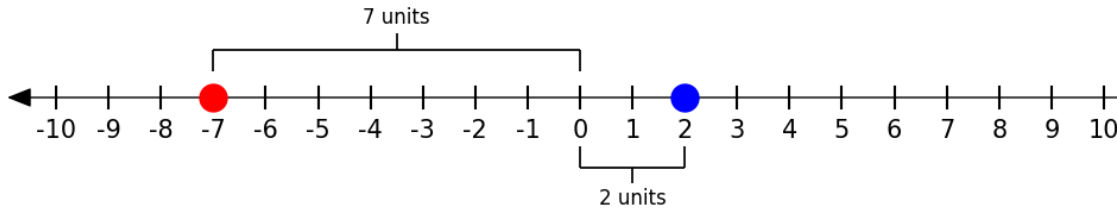
You can compute your distances by adding |-5| + |3|, by |-5 - 3|, or by |3 - (-5)|. All three of these give the same answer, 8 miles. What would change if we did not use absolute value?

Can the absolute value ever be negative?

Absolute value is **never** negative, because distance is never negative.

1.1.4 - Comparing Integers

We can also use the number line to compare values.



Let's compare 2 to -7.

You can see from the number line that 2 is greater than (>) -7 because 2 is to the right of -7.

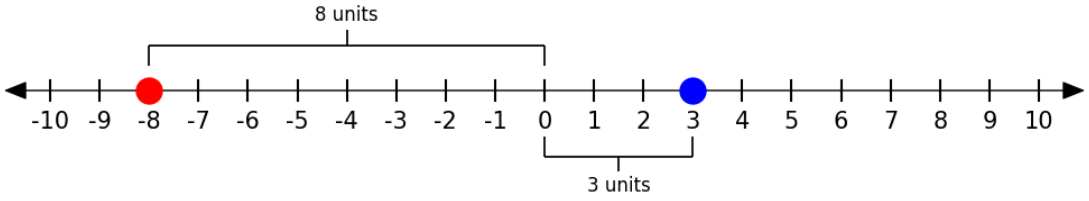
You can also see that -7 is further from zero than 2 and so |-7| > |2|.

Which is **bigger**?

It is easy to get confused here. When we say which is "bigger" we are asking which number is further to the right on the number line, **not** which one is furthest from zero.

Try comparing 3 to -8 using a number line.

3 > -8 because it is farther to the right but |-8| > |3| because -8 is further from zero.

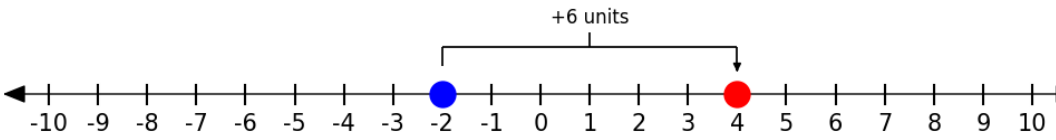


1.1.5 - Number Lines and Arithmetic

We can also use the number line to model **adding and subtracting** integers.

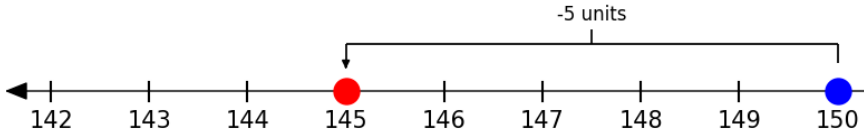
- To add a positive number, move **right**
- To add a negative number, move **left**

Examples:



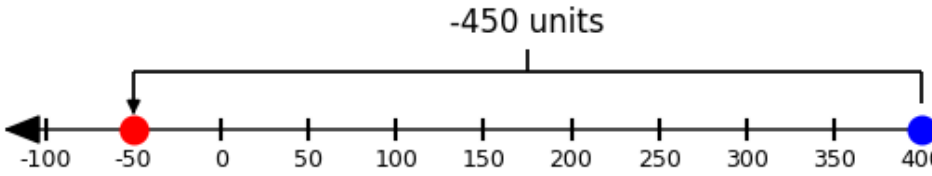
1. Addition: $-2+6=4$

> In the Real World
>
> Imagine that you are \$2 in debt. If someone pays you \$6 you can pay off the debt and have \$4 left over.



2. Adding a negative: $150+(-5)=145$

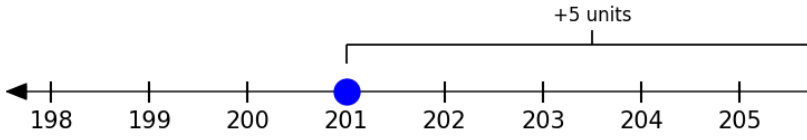
> In the Real World
>
> You have \$150 in the bank. The bank ads a fee for being under their \$200 minimum balance. You now have \$145.



3. Subtraction: $400-450=-50$

In the Real World

If you only have $400 but spend $450 on a credit card. You are now $50 in debt.



4. Subtracting a negative: $201-(-5) = 206$

Can You think of a real-world example for the previous example?

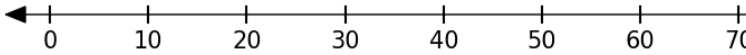
Example: The bank made a mistake, you had $201 in your account so they took off the $5 fee. Now you have $206.

Practice On Your Own

Working With Number Lines

1. Draw a number line that shows:
   a. -4, 0, and 3.
   b. Your age
   c. The number halfway between 5 and 9.

2. What question could match this number line?



Opposites

3. What is the opposite of 42?
4. What is the opposite of -3?

5. Draw a number line with two numbers that are opposites.
6. Does 3.5 have an opposite? If yes, what is it?

Comparing Numbers

7. Which number is **greater**, 5 or -10?
8. Which number has the greater absolute value, 5 or -10?
9. Is 28 bigger than -30?
10. Use ($>$) or ($<$) to compare:
    a. -11 _____ -13
    b. 7 _____ -2
    c. |-3| _____ |5|
11. Which is bigger?
    a. -4 or -5
    b. 3 or the opposite of 7
    c. |-5| or |4|
12. Use a number line to compare:
    a. -7 to 2.
    b. The year you were born and the current year

Addition and Subtraction

13. Show these on a number line:
    a. $-3 + 5$
    b. $3 - 5$
    c. $-3 + (-3)$
    d. $3 - (-3)$

Word Problems

14. Solve using a number line

    a. The temperature was -12°F. It warms up by 20°. What is the new temperature?

    b. A diver is 45 feet below sea level. She dives 30 feet deeper. How far down is she?

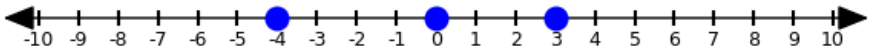
    c. Your bank account is at -$8. You deposit $5. What is your new balance?

Answer key

Working With Number Lines

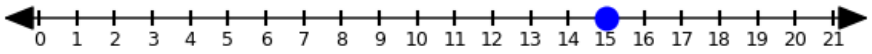
1. Draw a number line that shows:

    a. -4, 0, and 3.



    b. Your age

    Answers vary. Here is what a 15 year old would show

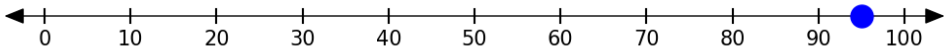


    c. The number halfway between 5 and 9.

    The answer is 7

2. What question could match this number line?

Answers vary. We could say "Plot the temperature on July 4th"



Opposites

3. What is the opposite of 42?

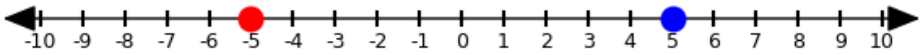
   -42

4. What is the opposite of -3?

   3

5. Draw a number line with two numbers that are opposites.

   Answers vary. Here is an example:



6. Does 3.5 have an opposite? If yes, what is it?

   Yes! The opposite is -3.5.

Comparing Numbers

7. Which number is **greater**, 5 or -10?

   5 is greater

8. Which number has the greater absolute value, 5 or -10?

   -10 has a greater absolute value

9. Is 28 bigger than -30?

   Yes, because it is further from zero

10. Use ($>$) or ($<$) to compare:

    a. -11 _____ -13

    -11 $>$ -13

    b. 7 _____ -2

    7 $>$ -2

    c. |-3| _____ |5|

    |-3| $<$ |5|

11. Which is bigger?

    a. -4 or -5

    -4 is bigger because it is further to the right

    b. 3 or the opposite of 7

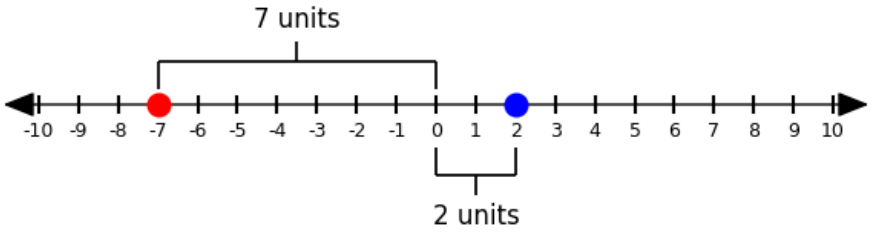
    3 is bigger. The opposite of 7 is -7 and 3 is further to the right.

    c. |-5| or |4|

    |-5| is bigger. |-5| is 5 which is further to the right than |4| which is 4.

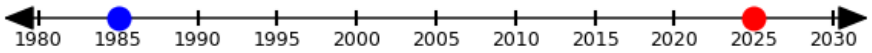
12. Use a number line to compare:

    a. -7 to 2.



    b. The year you were born and the current year

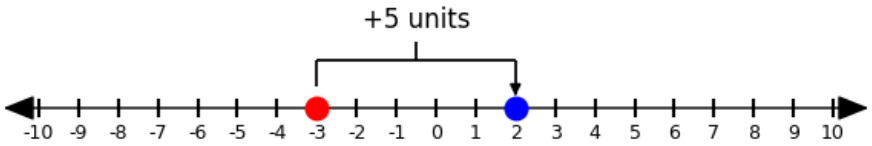
Answers vary. I was born in 1982. The current year is 2025.



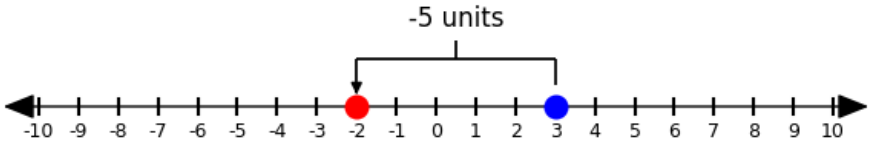
Addition and Subtraction

13. Show these on a number line:

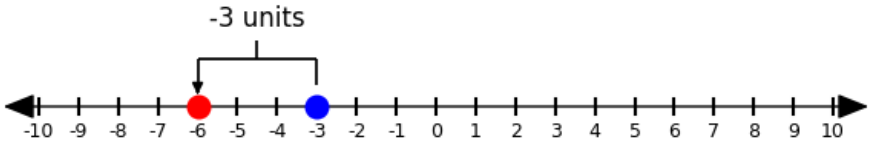
    a. $-3+5$



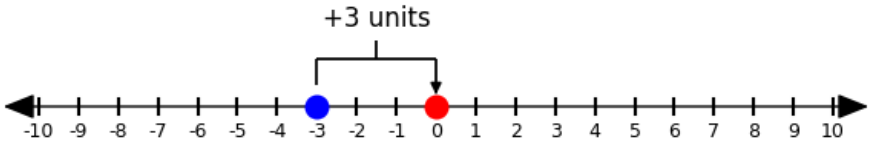
    b. $3-5$



    c. $-3+(-3)$



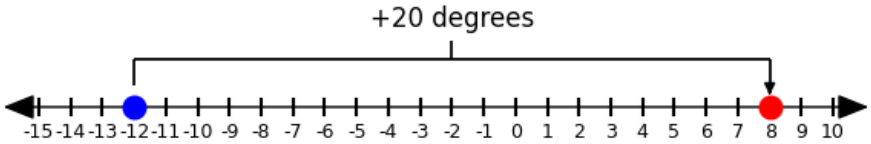
d. $3 - (-3)$



Word Problems

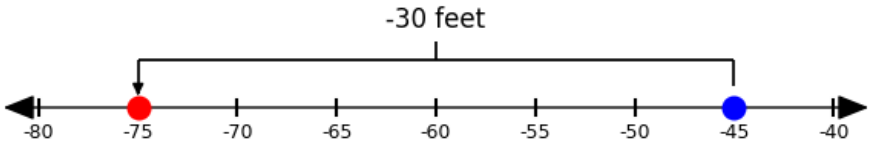
14. Solve using a number line

    a. The temperature was -12°F. It warms up by 20°. What is the new temperature?



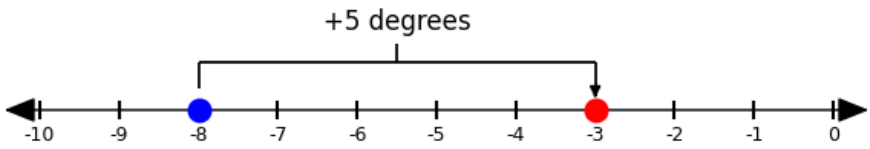
    It is now 8 degrees

    b. A diver is 45 feet below sea level. She dives 30 feet deeper. How far down is she?



    She is now 75 feet down.

    c. Your bank account is at -$8. You deposit $5. What is your new balance?



You now have -$3.

1.2 Factor Trees & Prime Factorization

This lesson explores how to break numbers down into their prime components using factor trees. Understanding prime factorization is key for simplifying fractions and finding common factors.

Objectives

- ☐ Identify prime numbers
- ☐ Use factor trees to find the prime factorization of a number
- ☐ Apply prime factorization in other math problems

Vocabulary

prime, factor, factor tree, prime factorization

Warm-Up

Coming soon.

Learn Together

Coming soon.

Practice On Your Own

Coming soon.

1.3 Greatest Common Factor (GCF)

You'll learn how to find the GCF of two or more numbers using prime factorization. GCF is important for simplifying fractions and solving real-world problems involving multiples.

Objectives

- ☐ Find the GCF using prime factorization
- ☐ Apply GCF to simplify fractions
- ☐ Solve problems involving shared quantities

i Vocabulary

GCF, common factor, prime factor, simplify

Warm-Up

Coming soon.

Learn Together

Coming soon.

Practice On Your Own

Coming soon.

1.4 Multiplication & Division Fluency

This lesson builds speed and accuracy with multiplication and division. Being fluent in these operations will help with algebraic expressions later.

Objectives

- ☐ Practice multiplication facts
- ☐ Practice division facts
- ☐ Apply fluency to solve real problems

Vocabulary

multiply, divide, fact family, quotient

Warm-Up

Coming soon.

Learn Together

Coming soon.

Practice On Your Own

Coming soon.

1.5 Fractions: Meaning & Models

Learn what fractions represent and how to model them visually. This lesson builds the foundational understanding needed for fraction operations.

Objectives

- ☐ Understand fractions as parts of a whole
- ☐ Model fractions with shapes and number lines
- ☐ Recognize proper and improper fractions

Vocabulary

fraction, numerator, denominator, proper fraction, improper fraction

Warm-Up

Coming soon.

Learn Together

Coming soon.

Practice On Your Own

Coming soon.

1.6 Simplifying Fractions Using GCF

This lesson teaches how to simplify fractions by dividing the numerator and denominator by their GCF.

Objectives

- ☐ Simplify fractions using GCF
- ☐ Recognize equivalent fractions
- ☐ Use visual models to support simplification

Vocabulary

simplify, equivalent, GCF, fraction

Warm-Up

Coming soon.

Learn Together

Coming soon.

Practice On Your Own

Coming soon.

1.7 Mixed Numbers & Improper Fractions

You'll learn how to convert between mixed numbers and improper fractions, and why both forms are useful.

Objectives

- ☐ Convert between mixed numbers and improper fractions
- ☐ Visualize mixed numbers on number lines
- ☐ Use both forms in real-world situations

Vocabulary

mixed number, improper fraction, convert

Warm-Up

Coming soon.

Learn Together

Coming soon.

Practice On Your Own

Coming soon.

1.8 Order of Operations

In this lesson, we'll explore how to simplify expressions using the correct order of operations (PEMDAS).

Objectives

- ☐ Apply the order of operations to simplify expressions
- ☐ Use grouping symbols correctly
- ☐ Solve multi-step expressions

Vocabulary

order of operations, PEMDAS, grouping symbols

Warm-Up

Coming soon.

Learn Together

Coming soon.

Practice On Your Own

Coming soon.

Part II

Unit 2: Algebraic Expressions

Introduction

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2.1 Evaluating Expressions

You'll learn how to evaluate algebraic expressions by substituting values for variables.

Objectives

- ☐ Evaluate expressions with one or more variables
- ☐ Use correct substitution and order
- ☐ Check your work for accuracy

Vocabulary

expression, evaluate, substitute, variable

Warm-Up

Coming soon.

Learn Together

Coming soon.

Practice On Your Own

Coming soon.

2.2 Inputs, Outputs & Function Machines (Intro)

This introductory lesson explains how functions work using simple input-output models. This is the foundation for understanding functions throughout the course.

Objectives

- ☐ Understand the concept of a function
- ☐ Match inputs with outputs
- ☐ Identify function rules from patterns

Vocabulary

input, output, function, function rule

Warm-Up

Coming soon.

Learn Together

Coming soon.

Practice On Your Own

Coming soon.

Part III

Unit 3: Solving Equations

Introduction

This unit is where Algebra really begins to feel like solving puzzles. You'll learn how to isolate variables, understand balance, and make sense of problems that come up in everyday life.

What You'll Learn

By the end of this unit, you'll be able to:

- Solve one- and two-step equations using inverse operations
- Distribute and combine like terms in multi-step equations
- Move variables to one side of the equation
- Identify when equations have no or infinite solutions
- Write and solve equations from word problems and contexts

Topics in This Unit

3. Solving One- and Two-Step Equations

Use inverse operations to find solutions.

3. Multi-Step Equations with Distribution

Distribute, simplify, and solve more complex equations.

3. Equations with Variables on Both Sides

Move all variable terms to one side, then solve.

3. No Solution vs. Infinite Solutions

Learn to recognize when an equation has no solution or all numbers work.

3. Writing Equations from Contexts

Translate real-world problems into equations.

3. Solving with Tables, Graphs & Rules

Connect functions to equations and problem-solving.

How to Use This Unit

You'll find plenty of examples, visuals, and practice to help you develop confidence in solving equations from both numbers and words!

3.1 Solving One-Step & Two-Step Equations

In this lesson, students will learn how to solve one-step and two-step equations using inverse operations. This foundational skill sets the stage for solving more complex equations in future lessons.

Objectives

- ☐ Use inverse operations to isolate the variable
- ☐ Solve one-step and two-step equations involving addition, subtraction, multiplication, or division
- ☐ Check solutions by substitution

Vocabulary

equation, inverse operations, solution, variable

Warm-Up

Coming soon.

Learn Together

Coming soon.

Practice On Your Own

Coming soon.

3.2 Multi-Step Equations with Distribution

This lesson extends equation solving to multi-step problems, including those that require the distributive property and combining like terms.

Objectives

- ☐ Apply the distributive property to simplify equations
- ☐ Combine like terms before solving
- ☐ Solve multi-step equations with multiple operations

Vocabulary

distributive property, like terms, combine, simplify

Warm-Up

Coming soon.

Learn Together

Coming soon.

Practice On Your Own

Coming soon.

3.3 Equations with Variables on Both Sides

Students will learn how to solve equations where variables appear on both sides of the equals sign, reinforcing the concept of balancing and simplifying equations.

Objectives

- ☐ Move variable terms to one side of the equation
- ☐ Simplify both sides before solving
- ☐ Identify equations with no or infinite solutions

Vocabulary

combine like terms, variable, no solution, infinite solutions

Warm-Up

Coming soon.

Learn Together

Coming soon.

Practice On Your Own

Coming soon.

3.4 No Solution vs. Infinite Solutions

This lesson focuses on identifying when equations have no solution or infinitely many solutions and how to justify those conclusions.

Objectives

- ☐ Recognize inconsistent equations with no solution
- ☐ Identify dependent equations with infinite solutions
- ☐ Justify solutions using substitution or reasoning

Vocabulary

identity, contradiction, solution set, consistent, inconsistent

Warm-Up

Coming soon.

Learn Together

Coming soon.

Practice On Your Own

Coming soon.

3.5 Writing Equations from Real-Life Contexts

Students will translate real-world scenarios into algebraic equations, helping them understand the connection between math and everyday problem solving.

Objectives

- ☐ Identify quantities and relationships in word problems
- ☐ Write algebraic equations to represent situations
- ☐ Solve and interpret solutions in context

Vocabulary

context, representation, translate, real-world

Warm-Up

Coming soon.

Learn Together

Coming soon.

Practice On Your Own

Coming soon.

3.6 Solving with Tables, Graphs & Rules (Function Tie-In)

This lesson introduces multiple representations of relationships — including tables, graphs, and rules — to show how equations can be connected to functions.

Objectives

- ☐ Solve equations by analyzing input-output tables
- ☐ Interpret relationships from graphs and equations
- ☐ Connect equations to real-world patterns

Vocabulary

input, output, table, function, rule, graph

Warm-Up

Coming soon.

Learn Together

Coming soon.

Practice On Your Own

Coming soon.

Part IV

Unit 4: Graphs and Patterns

Introduction

In this unit, we'll use visual and numerical patterns to understand how algebraic relationships behave. This helps us prepare for graphing and working with functions in more depth.

What You'll Learn

- Recognize and extend arithmetic and geometric patterns
- Build and interpret tables
- Graph expressions and equations
- Compare linear models using graphs

Topics in This Unit

4. Graphing Expressions with Tables

Use input-output tables to generate points.

4. Interpreting Graphs in Context

Make sense of graphs in stories and real-life settings.

4. Arithmetic vs. Geometric Patterns

Identify whether change is constant or multiplicative.

4. Linear Modeling & Rate of Change

Build linear functions and interpret slope in context.

4. Estimating and Checking with Graphs

Use visuals to verify solutions.

How to Use This Unit

Graphing builds a strong link between abstract algebra and concrete understanding. Let's get visual!

4.1 Graphing Expressions with Tables

In this lesson, students will learn how to create tables of values for algebraic expressions and plot them on a coordinate plane. This builds foundational understanding of how algebraic rules connect to visual patterns.

Objectives

- ☐ Generate tables of values from algebraic expressions
- ☐ Graph ordered pairs on the coordinate plane
- ☐ Recognize linear patterns in tables and graphs

Vocabulary

expression, table, ordered pair, coordinate plane, input, output

Warm-Up

Coming soon.

Learn Together

Coming soon.

Practice On Your Own

Coming soon.

4.2 Interpreting Graphs in Context

Students will examine graphs that represent real-world scenarios and learn how to describe the relationships shown. Emphasis is placed on labeling axes, identifying trends, and understanding what changes in slope mean.

Objectives

- ☐ Identify variables and units from graph labels
- ☐ Describe trends in linear graphs
- ☐ Interpret slope and intercepts in context

i Vocabulary

x-axis, y-axis, slope, intercept, context, trend

Warm-Up

Coming soon.

Learn Together

Coming soon.

Practice On Your Own

Coming soon.

4.3 Arithmetic vs. Geometric Patterns

Students will compare arithmetic and geometric patterns and recognize how they grow. This helps build pattern recognition and introduces exponential growth.

Objectives

- ☐ Identify arithmetic patterns using constant differences
- ☐ Identify geometric patterns using constant ratios
- ☐ Generate sequences and compare their growth

Vocabulary

arithmetic, geometric, sequence, common difference, common ratio, pattern

Warm-Up

Coming soon.

Learn Together

Coming soon.

Practice On Your Own

Coming soon.

4.4 Linear Modeling & Rate of Change

This lesson focuses on creating linear models from real-life data. Students will identify constant rates of change and use equations to model situations.

Objectives

- ☐ Recognize and describe constant rate of change
- ☐ Write linear equations to represent situations
- ☐ Interpret slope and intercepts from data

Vocabulary

linear model, rate of change, slope, intercept, data

Warm-Up

Coming soon.

Learn Together

Coming soon.

Practice On Your Own

Coming soon.

4.5 Estimating and Checking with Graphs

Students will use graphs to estimate values and verify solutions to equations. This lesson ties visual reasoning to algebraic work.

Objectives

- ☐ Estimate input or output values from a graph
- ☐ Use a graph to verify equation solutions
- ☐ Analyze how accurate a graph-based solution is

Vocabulary

estimate, graph, solution, verify, input, output

Warm-Up

Coming soon.

Learn Together

Coming soon.

Practice On Your Own

Coming soon.

Part V

Unit 5: Inequalities

Introduction

Sometimes in life, it's not about finding the exact number — it's about knowing what's greater or less. In this unit, you'll explore how to express and graph inequalities.

What You'll Learn

- Solve and graph inequalities on number lines
- Write inequalities from real-world contexts
- Understand "greater than" and "less than" symbols
- Explore compound inequalities (optional)

Topics in This Unit

5. One- and Two-Step Inequalities

Use similar steps as equations to isolate variables.

5. Graphing on a Number Line

Use open and closed circles to represent solutions.

5. Writing Inequalities from Situations

Turn words into math using inequality symbols.

5. Interpreting Graphs with Constraints

Match real-world limits to graphs.

5. Compound Inequalities (Optional)

Handle ranges like “between 2 and 5”.

How to Use This Unit

Use drawings and comparisons to make inequality concepts more concrete and real-world focused.

5.1 One- and Two-Step Inequalities

In this lesson, students will learn how to solve one-step and two-step inequalities and graph the solutions on a number line.

Objectives

- ☐ Solve one-step inequalities using addition, subtraction, multiplication, and division
- ☐ Solve two-step inequalities
- ☐ Graph the solution sets on a number line

Vocabulary

inequality, solution, greater than, less than, number line

Warm-Up

Coming soon.

Learn Together

Coming soon.

Practice On Your Own

Coming soon.

5.2 Graphing on a Number Line

Students will practice representing solutions to inequalities by graphing them on a number line, including open and closed circles.

Objectives

- ☐ Understand the use of open and closed circles on a number line
- ☐ Graph simple inequalities
- ☐ Interpret solution sets visually

Vocabulary

number line, open circle, closed circle, graph, solution set

Warm-Up

Coming soon.

Learn Together

Coming soon.

Practice On Your Own

Coming soon.

5.3 Writing Inequalities from Situations

This lesson teaches students to write inequalities based on verbal descriptions and real-world contexts.

Objectives

- ☐ Translate real-world problems into inequalities
- ☐ Identify keywords that signal inequality relationships
- ☐ Solve and interpret contextual inequalities

Vocabulary

verbal model, inequality, context, translate, interpret

Warm-Up

Coming soon.

Learn Together

Coming soon.

Practice On Your Own

Coming soon.

5.4 Interpreting Graphs with Constraints

Students will explore how to read and make sense of graphs that include constraints or limited domains and ranges.

Objectives

- ☐ Analyze graphs that include limited domains or ranges
- ☐ Interpret constraints in real-world situations
- ☐ Relate inequalities to graphical representations

Vocabulary

constraint, domain, range, graph, inequality

Warm-Up

Coming soon.

Learn Together

Coming soon.

Practice On Your Own

Coming soon.

5.5 Compound Inequalities (Optional)

Students will be introduced to compound inequalities, learning how to solve and graph problems with two connected inequalities.

Objectives

- ☐ Understand compound inequalities using 'and' and 'or'
- ☐ Solve compound inequalities
- ☐ Graph compound inequalities on a number line

Vocabulary

compound inequality, and, or, solution set, number line

Warm-Up

Coming soon.

Learn Together

Coming soon.

Practice On Your Own

Coming soon.

Part VI

Unit 6: Linear Relationships

Introduction

Linear equations are a powerful way to describe change. Whether it's cost, speed, or growth, this unit shows how lines help us understand the world.

What You'll Learn

- Graph lines using slope and intercepts
- Interpret slope as a rate of change
- Write equations from tables, graphs, or situations
- Compare different linear situations

Topics in This Unit

6. Coordinate Plane & Graphing

Plot ordered pairs and recognize axes.

6. Understanding Slope

Learn how steepness shows change.

6. Slope-Intercept Form

Graph and write lines using $y = mx + b$.

6. Writing Equations from Graphs or Words

Use information to build your own equations.

6. Comparing Models

See how different lines behave and what they represent.

6. Applications

Use linear models for real-world math.

How to Use This Unit

This unit brings it all together — tables, equations, and graphs help us tell a full story.

6.1 The Coordinate Plane and Graphing from Tables

This lesson introduces the coordinate plane and helps students practice plotting points and graphing from tables.

Objectives

- ☐ Identify and label the x- and y-axes
- ☐ Plot ordered pairs on the coordinate plane
- ☐ Graph data from tables

Vocabulary

coordinate plane, x-axis, y-axis, origin, ordered pair

Warm-Up

Coming soon.

Learn Together

Coming soon.

Practice On Your Own

Coming soon.

6.2 Understanding Slope as Rate of Change

Students will explore slope as a measure of how one quantity changes in relation to another, using graphs and real-world contexts.

Objectives

- ☐ Define slope as a rate of change
- ☐ Interpret slope from a graph or context
- ☐ Calculate slope using tables or graphs

Vocabulary

slope, rate of change, rise, run, linear relationship

Warm-Up

Coming soon.

Learn Together

Coming soon.

Practice On Your Own

Coming soon.

6.3 Slope-Intercept Form

This lesson introduces the slope-intercept form of a linear equation and how to use it to graph lines.

Objectives

- ☐ Understand the form $y = mx + b$
- ☐ Identify slope and y-intercept
- ☐ Graph a line using slope and intercept

Vocabulary

slope-intercept form, slope, y-intercept, linear equation

Warm-Up

Coming soon.

Learn Together

Coming soon.

Practice On Your Own

Coming soon.

6.4 Writing Equations from Graphs or Words

Students learn to write linear equations from graphs, tables, or written descriptions of relationships.

Objectives

- ☐ Write linear equations from graphs or data
- ☐ Translate real-world relationships into equations
- ☐ Use slope and intercept in context

Vocabulary

linear equation, slope, y-intercept, context, model

Warm-Up

Coming soon.

Learn Together

Coming soon.

Practice On Your Own

Coming soon.

6.5 Comparing Linear Models from Graphs or Data

Students compare multiple linear models by analyzing graphs and data sets.

Objectives

- ☐ Compare different linear relationships
- ☐ Analyze graphs and tables for patterns
- ☐ Interpret slope and intercept in context

Vocabulary

linear model, compare, rate of change, initial value

Warm-Up

Coming soon.

Learn Together

Coming soon.

Practice On Your Own

Coming soon.

6.6 Applications: Cost, Speed, Growth

This lesson applies linear modeling to real-life contexts like cost, speed, and growth.

Objectives

- ☐ Apply linear equations to real-life situations
- ☐ Create and interpret graphs in context
- ☐ Understand the meaning of slope and intercept in real-life problems

Vocabulary

cost, speed, growth, context, linear relationship

Warm-Up

Coming soon.

Learn Together

Coming soon.

Practice On Your Own

Coming soon.

Part VII

Unit 7: Exponents and Powers

Introduction

Exponents let us write repeated multiplication more easily. In this unit, you'll learn the rules for working with exponents to simplify expressions.

What You'll Learn

- Multiply and divide expressions with exponents
- Apply exponent rules (no scientific notation)
- Understand zero and negative exponents

Topics in This Unit

7. Multiplying with Exponents

Use the product rule.

7. Dividing with Exponents

Use the quotient rule.

7. Power of a Power

Apply powers to powers.

7. Zero & Negative Exponents

Learn their meaning and use them simply.

How to Use This Unit

Use guided examples and repetition to get comfortable with patterns in exponent rules.

7.1 Multiplying with Exponents

In this lesson, you'll learn how to multiply expressions that contain exponents. This is a key part of working with powers and simplifying expressions efficiently.

Objectives

- ☐ Multiply powers with the same base
- ☐ Understand and apply the product of powers rule
- ☐ Simplify expressions with exponents

Vocabulary

exponent, base, product of powers rule

Warm-Up

Coming soon.

Learn Together

Coming soon.

Practice On Your Own

Coming soon.

7.2 Dividing with Exponents

This lesson focuses on how to divide expressions with the same base using exponents. You'll build on what you know about multiplication and simplify complex expressions.

Objectives

- ☐ Divide powers with the same base
- ☐ Apply the quotient of powers rule
- ☐ Simplify expressions involving division and exponents

Vocabulary

quotient, base, exponent

Warm-Up

Coming soon.

Learn Together

Coming soon.

Practice On Your Own

Coming soon.

7.3 Power of a Power

You'll learn how to raise an exponent to another exponent. This is useful for simplifying more complex expressions and working with formulas.

Objectives

- ☐ Use the power of a power rule
- ☐ Simplify nested exponents
- ☐ Combine exponent rules to simplify expressions

Vocabulary

exponent, power of a power, simplify

Warm-Up

Coming soon.

Learn Together

Coming soon.

Practice On Your Own

Coming soon.

7.4 Zero and Negative Exponents (Intro only)

This lesson introduces zero and negative exponents. You'll explore what these mean and how they behave in expressions.

Objectives

- ☐ Understand and apply the zero exponent rule
- ☐ Explore the meaning of negative exponents
- ☐ Simplify expressions with zero and negative exponents

Vocabulary

zero exponent, negative exponent, reciprocal

Warm-Up

Coming soon.

Learn Together

Coming soon.

Practice On Your Own

Coming soon.

Part VIII

Unit 8: Quadratic Thinking

Introduction

Quadratic equations make parabolas, not lines! This unit introduces key forms and solution methods, especially factoring and the quadratic formula.

What You'll Learn

- Identify quadratic forms
- Factor simple trinomials
- Solve quadratics by factoring and formula
- Compare graphs of quadratics and lines

Topics in This Unit

8. Recognizing Quadratics

Understand what makes an equation quadratic.

8. Factoring

Break expressions into binomials.

8. Solving by Factoring

Set equal to zero and find solutions.

8. Quadratic Formula (Intro)

Use the formula to solve when factoring is hard.

8. Graphing Parabolas

See how the shape differs from linear graphs.

How to Use This Unit

This unit prepares students for what's tested and what's useful long-term.

8.1 Recognizing Quadratic Equations

In this lesson, students will learn to identify quadratic equations by their standard form and understand what makes them different from linear equations.

Objectives

- ☐ Recognize quadratic equations in standard form: $ax^2 + bx + c$
- ☐ Identify the key features that make an equation quadratic
- ☐ Distinguish between linear and quadratic relationships

Vocabulary

quadratic, parabola, standard form, coefficient

Warm-Up

Coming soon.

Learn Together

Coming soon.

Practice On Your Own

Coming soon.

8.2 Factoring Simple Quadratics

This lesson introduces the process of factoring quadratic expressions where the leading coefficient is 1.

Objectives

- ☐ Factor simple quadratic expressions of the form $x^2 + bx + c$
- ☐ Use factoring to find the roots of a quadratic equation
- ☐ Check factored expressions by expanding

Vocabulary

factor, root, binomial, quadratic expression

Warm-Up

Coming soon.

Learn Together

Coming soon.

Practice On Your Own

Coming soon.

8.3 Solving by Factoring

Students will learn how to solve quadratic equations by factoring and setting each factor equal to zero.

Objectives

- ☐ Solve quadratic equations using factoring
- ☐ Apply the zero product property
- ☐ Interpret solutions in context

Vocabulary

zero product property, solution, quadratic equation

Warm-Up

Coming soon.

Learn Together

Coming soon.

Practice On Your Own

Coming soon.

8.4 The Quadratic Formula (Intro)

This lesson introduces the quadratic formula as a method for solving any quadratic equation, especially when factoring is not straightforward.

Objectives

- ☐ Identify the components of the quadratic formula
- ☐ Use the quadratic formula to solve quadratic equations
- ☐ Understand when the formula is useful compared to factoring

Vocabulary

quadratic formula, discriminant, solution, standard form

Warm-Up

Coming soon.

Learn Together

Coming soon.

Practice On Your Own

Coming soon.

8.5 Graphing Parabolas by Table & Comparing with Linear

Students will use tables to graph quadratic functions and compare their shapes and behaviors with linear functions.

Objectives

- ☐ Graph quadratic functions using input-output tables
- ☐ Identify the vertex and axis of symmetry from a graph
- ☐ Compare quadratic and linear graphs

Vocabulary

vertex, axis of symmetry, parabola, table of values

Warm-Up

Coming soon.

Learn Together

Coming soon.

Practice On Your Own

Coming soon.

Part IX

Unit 9: Systems of Equations

Introduction

Sometimes two equations work together. A system shows how two relationships interact. This unit is optional but powerful.

What You'll Learn

- Understand what a system is
- Solve systems by graphing or substitution
- Apply systems to real-life problems

Topics in This Unit

9. What Is a System?

Understand the idea of two equations and one solution.

9. Solving by Graphing

Find where lines intersect.

9. Substitution (Optional)

Plug one equation into another to find solutions.

9. Word Problems with Systems

Use systems to model stories or scenarios.

How to Use This Unit

Best taught after mastery of equations and graphing — use visuals and pair work!

9.1 What Is a System?

This lesson introduces the concept of a system of equations—two or more equations that share variables. Students learn how solutions to systems represent points that satisfy all equations involved.

Objectives

- ☐ Define what a system of equations is
- ☐ Identify solutions to systems from graphs and tables
- ☐ Understand consistent vs. inconsistent systems

Vocabulary

system of equations, solution, consistent, inconsistent

Warm-Up

Coming soon.

Learn Together

Coming soon.

Practice On Your Own

Coming soon.

9.2 Solving by Graphing

Students learn to solve systems of equations by graphing each equation and identifying the intersection point. This visual approach builds on prior graphing skills and deepens conceptual understanding.

Objectives

- ☐ Graph linear equations
- ☐ Determine the solution to a system by finding where two lines intersect
- ☐ Interpret real-world meaning from the graph

Vocabulary

graphing, intersection, solution, coordinate

Warm-Up

Coming soon.

Learn Together

Coming soon.

Practice On Your Own

Coming soon.

9.3 Substitution Method (Optional)

This lesson introduces substitution as an algebraic method to solve systems of equations. Students practice solving one equation for a variable and substituting into the other.

Objectives

- ☐ Solve one equation for one variable
- ☐ Substitute expressions to solve systems algebraically
- ☐ Check solutions for accuracy

Vocabulary

substitution, isolate, expression, solution

Warm-Up

Coming soon.

Learn Together

Coming soon.

Practice On Your Own

Coming soon.

9.4 Word Problems with Systems

Students apply their knowledge of systems of equations to solve word problems. They learn to represent real-life situations with systems and interpret their solutions in context.

Objectives

- ☐ Translate real-world scenarios into systems of equations
- ☐ Solve using graphing or substitution
- ☐ Interpret solutions in context

Vocabulary

system, context, real-world, model

Warm-Up

Coming soon.

Learn Together

Coming soon.

Practice On Your Own

Coming soon.

Part X

Unit 10: Cumulative Review and Projects

Introduction

The final unit ties everything together. Reflect, review, and show what you know through projects and EOC practice.

What You'll Learn

- Use vocabulary and concepts from the whole course
- Create graphs, tables, and equations for real-world data
- Review core topics for the final exam or state test

Topics in This Unit

10. Vocabulary Review

Define and use terms from the course.

10. Real-World Projects

Apply math to something meaningful.

10. Presentations

Explain your thinking visually and clearly.

10. Final Review or EOC Practice

Practice key problems to prepare for success.

How to Use This Unit

Encourage creativity and depth of understanding. Show off what you've learned!

10.1 Vocabulary Review

In this lesson, we'll review the key vocabulary from this course and reinforce understanding through matching, definitions, and real-world examples.

Objectives

- ☐ Review and define key algebra vocabulary terms
- ☐ Apply vocabulary in math contexts and explanations
- ☐ Recognize terms in problems and relate them to math operations

Vocabulary

term, coefficient, constant, expression, equation, solution, function

Warm-Up

Coming soon.

Learn Together

Coming soon.

Practice On Your Own

Coming soon.

10.2 Real-World Projects (Graphs + Tables + Equations)

This lesson applies everything we've learned to real-world situations using data, graphs, tables, and equations to make connections and solve problems.

Objectives

- ☐ Interpret and analyze real-world data
- ☐ Represent situations with tables, graphs, and equations
- ☐ Explain connections between different representations

Vocabulary

data, table, graph, equation, relationship, pattern

Warm-Up

Coming soon.

Learn Together

Coming soon.

Practice On Your Own

Coming soon.

10.3 Group Presentations or Visual Reports

Students will collaborate on a final presentation or report to demonstrate their learning, using mathematical vocabulary, visuals, and examples.

Objectives

- ☐ Create a visual or oral presentation using math content
- ☐ Work collaboratively to explain mathematical ideas
- ☐ Use accurate vocabulary and representations in communication

Vocabulary

presentation, visual, explanation, evidence, support

Warm-Up

Coming soon.

Learn Together

Coming soon.

Practice On Your Own

Coming soon.

10.4 Final Assessment or EOC Practice

This lesson offers a chance to show mastery of key Algebra concepts through a final assessment or EOC-style practice problems.

Objectives

- ☐ Demonstrate understanding of major Algebra concepts
- ☐ Solve a variety of equations and interpret representations
- ☐ Apply skills learned to novel and test-like problems

Vocabulary

equation, function, graph, solution, expression

Warm-Up

Coming soon.

Learn Together

Coming soon.

Practice On Your Own

Coming soon.

Part XI

Supplemental

Supplemental Materials

Welcome to the **Supplemental Materials** section of this course! This is where you'll find all the fun, extra, and just plain interesting math content that doesn't quite fit into the main units — but still helps build understanding, spark curiosity, or offer a little challenge.

Use these resources to: - Practice your skills in new and creative ways - Explore math puzzles and logic games - Reinforce key concepts from class - Take a brain break with something still mathy (but fun!)

Math Games & Puzzles

Number grids, logic puzzles, equation word searches, and more.

Extra Practice Worksheets

Targeted drills and alternative problem sets.

Challenge Problems

For students who want to push their thinking further.

Math Activities

Open-ended or interactive things to try out

Happy exploring!

Math Games and Puzzles

Explore these fun and challenging math activities! Click on any worksheet to open the PDF.

Hidden Math Problems

Practice: Arithmetic operations, pattern recognition
How it works: Find groups of 3 numbers in the grid. Add, subtract, multiply, or divide the first two to get the third. Problems may be horizontal, vertical, or diagonal.

Download Worksheet

Want to suggest an activity or submit your own? Let me know!

Glossary

absolute value

The distance a number is from zero on a number line, always expressed as a positive number or zero.

Example: The **absolute value** of `-7` is `7`.

Algebra

Algebra is a branch of math that uses letters and symbols to represent numbers and relationships.

Instead of just solving problems with numbers, algebra lets us write rules, patterns, and equations that work for many situations.

Calculus

Calculus is a branch of math that helps us understand change and motion.

It's used to study things like how fast something is moving, how things are growing or shrinking, or how to find the exact area under a curve.

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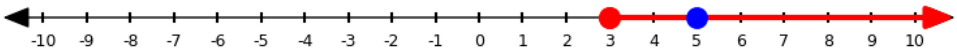
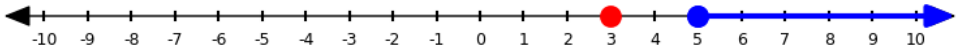
greater than

A number is greater than ($>$) another number if it is further to the right on the number line.



Example $5 > 3$ is true



but $3 > 5$ is false

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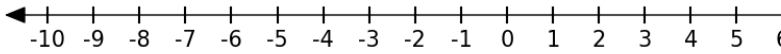
horizontal

Side to side, like the horizon. Level ground is horizontal.

Example: This is a horizontal number line.



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integer

In mathematics, an integer is a whole number (not a fraction or decimal) that can be positive, negative, or zero. Examples include -3, 0, 5, and 100.

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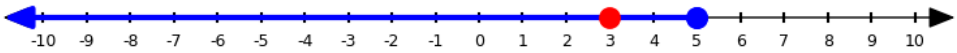
less than

A number is less than ($<$) another number if it is further to the left on the number line.



Example $3 < 5$ is true

but $5 < 3$ is false

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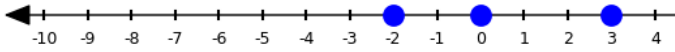
number line

A straight line used to represent numbers in order. It usually has zero in the middle, with positive numbers to the right and negative numbers to the left. Number lines help visualize operations and compare values.



Example: -2, 0, and 3 are all on the number line.

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negative

A number is negative if it is less than zero. On a number line, negative numbers are to the left of zero.

Example: `-4` is a **negative** number.

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opposite

Two numbers that are the same distance from zero on a number line, but on opposite sides. Their sum is always zero.

Example: `-3` and `3` are **opposite** numbers.

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positive

A number is positive if it is greater than zero. On a number line, positive numbers are to the right of zero.

Example: `5` is a **positive** number.

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vertical

Up and down like a flag pole.

Example: This is a vertical number line.


100
90
80
70
60
50
40
30
20
10
0