How to support your student as they learn about
Moving Beyond Positive Quantities

Mathematics is a connected set of ideas, and your student knows a lot. Encourage them to use the mathematics they already know when seeing new concepts in this module.

Module Introduction

In this module your student will learn more about positive and negative numbers. There are 2 topics in this module: *Signed Numbers and the Four Quadrants* and *Operating with Integers*. Your student will use what they already know about adding, subtracting, multiplying, and dividing whole numbers in this module.

Academic Glossary

Each module will highlight an important term. Knowing and using these terms will help your student think, reason, and communicate their math ideas.

Term	Represent
Definition	• To display information in different ways. • Representing mathematics can be done using words, tables, graphs, or symbols.
Questions to Ask Your Student	• How can you organize your thoughts? • How can you use a model to show an idea? • What does this representation mean to you? • Is your representation correct?
Related Phrases	• Show • Sketch • Draw • Create • Plot • Graph • Write an equation • Complete the table

Write a numeric expression using absolute values that would **represent** the situation.

Caleb parks his car on the 2nd floor below ground and works on the 7th floor. How many floors must he go up from his car to reach his office?

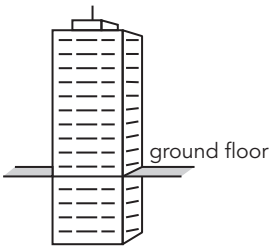

TABLE OF CONTENTS

Page 1
Module Introduction
Academic Glossary

Page 2
Math Process Standards

Page 3
CL Way

Page 4
Module Overview

Pages 5–12
Topic Summaries

Page 13
Dates
Links

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Math Process Standards

Each module will focus on a process (or a pair of processes) that will help your student become a mathematical thinker. The "I can" statements listed below help your student to develop their mathematical learning and understanding.

Select tools, including real objects, manipulatives, paper and pencil, and technology as appropriate; and techniques including mental math, estimation, and number sense as appropriate, to solve problems.

I can:

- use a variety of different tools that I have to solve problems.
- recognize when a tool that I have to solve problems might be helpful and when it has limitations.
- look for efficient methods to solve problems.
- estimate before I begin calculations to inform my reasoning.

Create and use representations to organize, record, and communicate mathematical ideas.

I can:

- consider the units of measure involved in a problem.
- label diagrams and figures appropriately to clarify the meaning of different representations.
- create an understandable representation of a problem situation.

Look for examples of these processes in the Topic Summaries.

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The Carnegie Learning Way

Problem Types You Will See: ***Worked Examples***

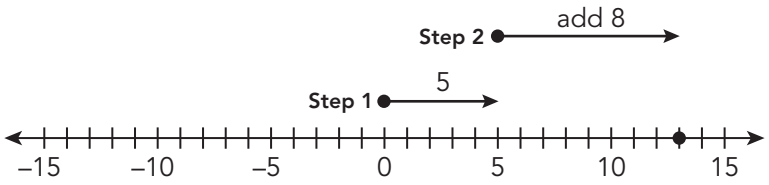
When you see a Worked Example:

- Take your time to read through it.
- Question your own understanding.
- Think about the connection between steps.

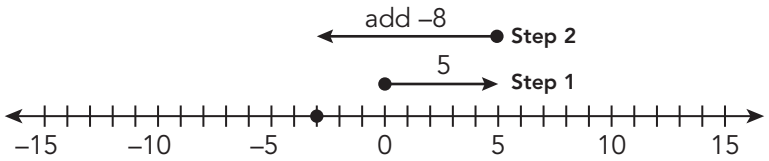
WORKED EXAMPLE

A number line can be used to model integer addition. When adding a positive integer, move to the right on a number line. When adding a negative integer, move to the left on a number line.

Example 1: The number line shows how to determine 5 + 8.



Example 2: The number line shows how to determine 5 + (–8).



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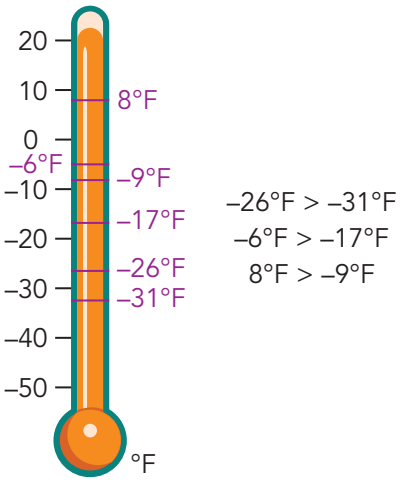
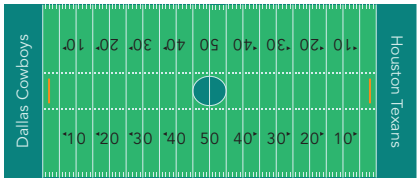
Module Overview

TOPIC 1	TOPIC 2
Signed Numbers and the Four Quadrants	**Operating with Integers**
13 Days	12 Days
Your student will use a number line to reason about negative numbers and absolute value. Students explore the four-quadrant coordinate plane.	**Your student will use physical motion, number lines, and two-color counters to understand adding and subtracting integers.** **Students model the product of signed numbers using number lines and two-color counters.**
Did you know that? You can use the thermometer to compare signed numbers.  –26°F > –31°F –6°F > –17°F 8°F > –9°F	Did you know that? Each time you watch a game of American football you are watching *Operating with Integers* in action. The field is a number line and the players are modeling integer addition and subtraction when they run up and down the field.  Picture this: A Texan has the ball at his own 30 yardline. How far does he have to go to reach the Cowboys' end zone? Write an equation that represents the situation. [|–20 yards| + 50 yards = 70 yards]

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Topic 1: Signed Numbers and the Four Quadrants

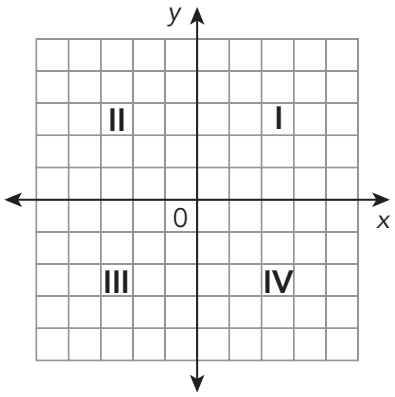
Key Terms	
• negative numbers • infinity • absolute value • integers	• ellipsis • rational numbers • Density Property • quadrants

The **absolute value**, or magnitude, of a number is its distance from zero on a number line.

The absolute value of −3 is the same as the absolute value of 3 because they are both a distance of 3 from zero on a number line.

$|-3| = |3|$

The *x*- and *y*-axes divide the coordinate plane into four regions called **quadrants**. These quadrants are numbered with Roman numerals from one (I) to four (IV), starting in the upper right-hand quadrant and moving counterclockwise.



Follow the link to access the Mathematics Glossary:
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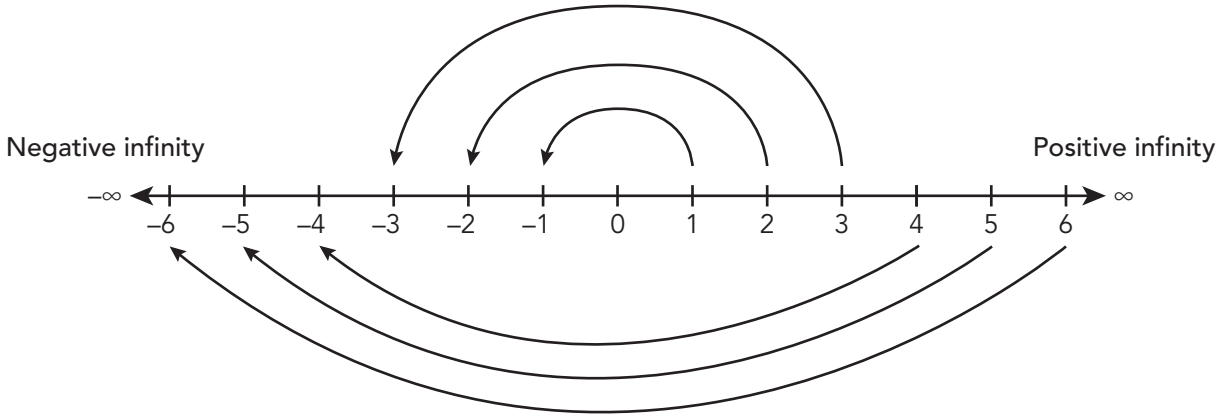
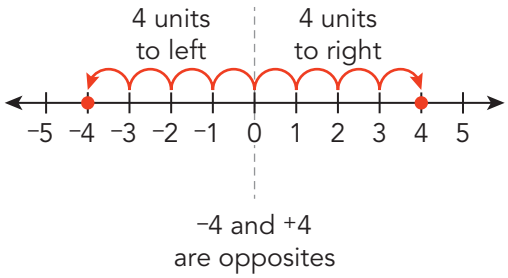
Negative Numbers

In this topic, students are introduced to **negative numbers**. Students begin by reflecting the positive numbers across zero to build the rational number line. The values to the left of zero on the number line are called negative numbers.



Opposites and Absolute Value

Students learn that opposite numbers are reflections of each other across 0 on the number line. The opposite of a positive number is a corresponding negative number. The opposite of a negative number is a corresponding positive number. The **absolute value**, or magnitude, of a number is its distance from zero on a number line. A number and its opposite have the same absolute value.



The absolute value of 4 is 4.

The absolute value of −4 is 4.

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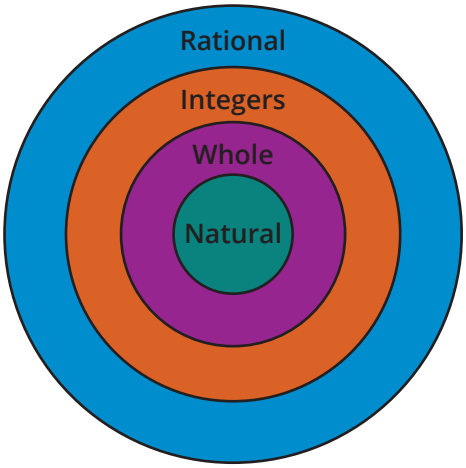
Classifying Numbers

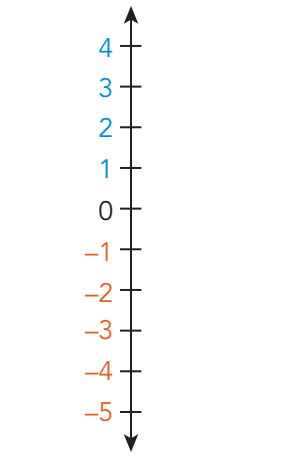
Your student will study the number system to learn more about the relationships among sets of numbers.



	Natural Numbers	Whole Numbers	Integers	Rational Numbers
Examples	{1, 2, 3, …}	{0, 1, 2, 3, …}	{…, −3, −2, −1, 0, 1, 2, 3, …}	$\left\{\frac{1}{2}, 0.35, 5\right\}$
Description	Counting numbers	Natural numbers and 0	Whole numbers with their opposites	Numbers that you can write as $\frac{a}{b}$, where a and b are integers and $b \neq 0$

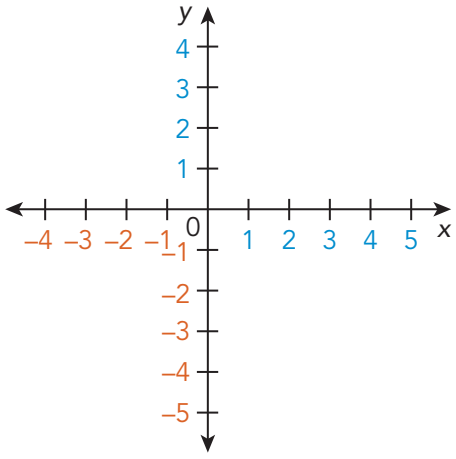
The Coordinate Plane

Students use reflections of the first quadrant and their knowledge of the rational number line to build their own four-quadrant coordinate plane. A coordinate plane is made up of two number lines, a horizontal number line and a vertical number line, that meet at the zeros.



Vertical Number Line

Horizontal Number Line



The Coordinate Plane

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Topic 2: Operating with Integers

Key Terms	
• additive inverses	• zero pair
Two numbers with the sum of zero are called **additive inverses**. $-19 + 19 = 0$ $a + -a = 0$	A positive counter and a negative counter together make a **zero pair**, since the total value of the pair is zero. $\oplus + \ominus = 0$
Follow the link to access the Mathematics Glossary: https://www.carnegielearning.com/texas-help/students-caregivers/	

In this topic, students use number lines and two-color counters to model addition, subtraction, and multiplication of integers before developing rules for determining the sum, difference, and product of positive and negative numbers.

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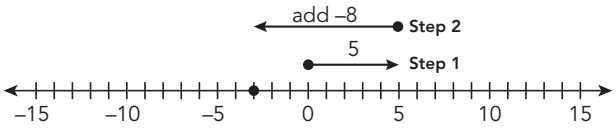
Number Lines

Using Number Lines to Add

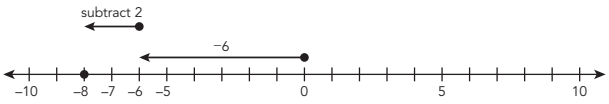
The number line shows how to determine 5 + (−8).



The absolute value of 5 is 5, and the absolute value of −8 is 8. The −8 has a greater absolute value, or distance from zero. Therefore, the sign of the sum is negative.

Using Number Lines to Subtract

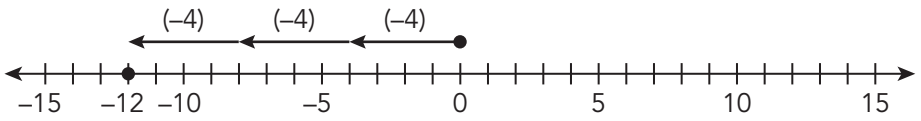
Consider the expression −6 − (+2).



First, move to −6. Then move in the opposite direction of adding (+2).

Using Number Lines to Multiply

Consider the expression 3(−4). You can think of 3(−4) as three groups of (−4).



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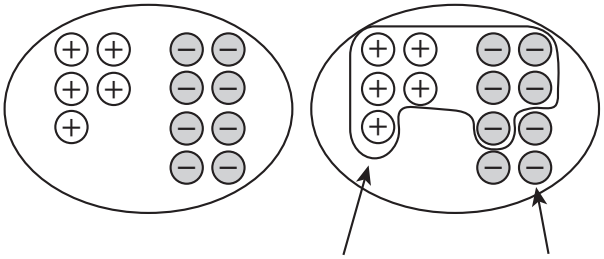
Two-Color Counters

Using Two-Color Counters to Add

Consider the expression 5 + (−8).



There are five ⊕ ⊖ pairs.

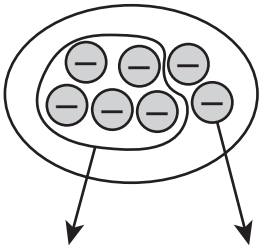
The value of those pairs is 0.

There are 3 ⊖, or negative counters, remaining.

There are 3 negative counters remaining. The sum of 5 + (−8) is −3.

Using Two-Color Counters to Subtract

Consider the expression −7 − (−5).
First, start with seven negative counters.



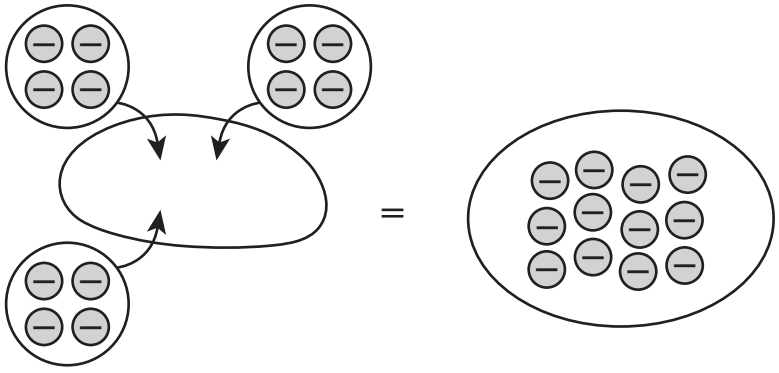
Then, take away five negative counters. Two negative counters remain.

$$-7 - (-5) = -2$$

You can change any subtraction problem to an addition problem without changing the answer. Subtracting two integers is the same as adding the opposite of the subtrahend, which is the number you are subtracting.

Using Two-Color Counters to Multiply

Consider the expression 3(−4). As repeated addition, it is represented as (−4) + (−4) + (−4).



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MATH PROCESS STANDARDS

How do the activities in *Operating with Integers* promote student expertise in the math process standards?

NOTE: This is an example of the math process standard:

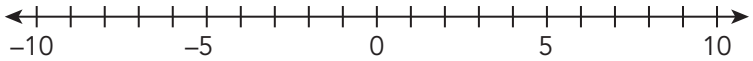
Select tools, including real objects, manipulatives, paper and pencil, and technology as appropriate; and techniques including mental math, estimation, and number sense as appropriate, to solve problems.

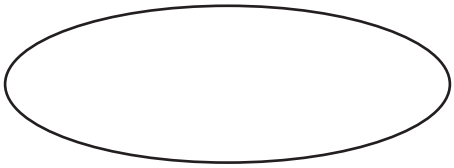
- I can use a variety of different tools that I have to solve problems.

Have your student refer to page 2 for more "I can" statements.

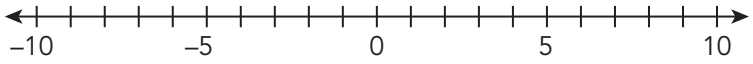
Use the number line to complete each number sentence. Then, draw a representation for each subtraction problem. Calculate the difference.

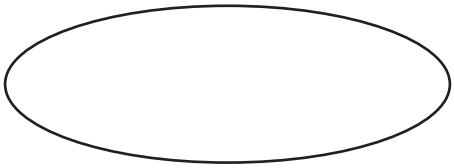
1. −4 − 3 = ____





2. −4 − (−3) = ____





Students are expected to make connections between the representations used and the rules for operating with integers.

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Integer Rules

Adding Integers

When two integers have the **same sign** and are added together, the sign of the sum is the sign of both integers.

$$6 + 3 = 9$$
$$-6 + (-3) = -9$$

When two integers have **opposite signs** and are added together, the absolute values of the integers are subtracted and the sign of the sum is the sign of the integer with the greater absolute value.

$$-6 + 3 = -3$$
$$6 + (-3) = 3$$

Subtracting Integers

You can change any subtraction problem to an addition problem without changing the answer. Subtracting two integers is the same as adding the opposite of the subtrahend, which is the number you are subtracting.

$$-6 - (\mathbf{-3}) = -6 + \mathbf{3} = -3$$

Multiplying and Dividing Integers

To multiply and divide integers, perform the usual multiplication and division algorithms or steps, and then use the correct sign for the product or quotient. An odd number of negative signs in the expression gives a negative product or quotient. An even number of negative signs in the expression gives a positive product or quotient.

$$-6 \cdot 3 = -18$$
$$3(-6) = -18$$
$$-18 \div (-6) = 3$$
$$-18 \div 3 = -6$$

$$-6 \cdot -3 = 18$$
$$-3(-6) = 18$$
$$18 \div (-6) = -3$$
$$18 \div -3 = -6$$

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Discuss important dates throughout this module such as assessments, assignments, or class events with your student. Use the table to record these dates and reference them as your student progresses through the module.

Important Dates	
Date	Reason

Using the link below, visit the Texas Math Solution Support Center for students and caregivers to access additional resources such as:

- Mathematics Glossaries
- Videos
- Topic Materials
- A Letter to Families and Caregivers

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