MODULE 3 OVERVIEW

TEKS* Addressed:
6.2A, 6.2B, 6.2C, **6.2D**, 6.3C, **6.3D**, **6.11A**
*Bold TEKS = Readiness Standard

Moving Beyond Positive Quantities

Sts think about ordering absolute values of rational #s

Key Goal: make sts robust problem solvers that are flexible and can think abstractly

Sessions: **25**

Why is this module named *Moving Beyond Positive Quantities*?

Moving Beyond Positive Quantities extends students' understanding of number to negative rational numbers. Students reason about the order and absolute value of rational numbers and about the locations of ordered pairs in all four quadrants of the coordinate plane. They develop the conceptual understanding and procedural fluency of operating on (adding, subtracting, multiplying, and dividing) signed numbers. Analyzing the entire system of rational numbers allows students to approach problem-solving with more robust, flexible, abstract, and generalizable mental representations of mathematical situations.

The activities within the module make use of movement to provide students with opportunities to physically model negative and positive integers on a number line and in the four quadrants. Students use physical motion, number line models, and two-color counters to develop an understanding of the rules for operating with positive and negative integers. Only then do they generalize their rules to all positive and negative integers.

keypoint

The Research Shows . . .

"In the past, students often learned the 'rules of signs' . . . without much understanding. [This may be why] some secondary and college students still have difficulty working with negative numbers . . . Students generally perform better on problems posed in the context of a story (debts and assets, scores and forfeits) or through movement on a number line than on the same problems presented solely as formal equations."

(*Adding It Up*, pp. 245–246)

Lessons include use of number lines & color counters to understand rules of integers & operations.

What is the mathematics of *Moving Beyond Positive Quantities*?

Moving Beyond Positive Quantities contains two topics: *Signed Numbers and the Four Quadrants* and *Operating with Integers*. Students use a number line to reason about negative numbers and absolute value. Students use physical representations to model addition, subtraction, multiplication, and division of integers.

Topic 1 : signed numbers & the four quadrants.
Topic 2 : operating with integers.

1 DAY PACING = 45-MINUTE SESSION

Possible Daily Learning Obj

11 SESSIONS
10 LEARNING • 1 ASSESSMENT

TOPIC 1 *Signed Numbers and the Four Quadrants*

Learning Together: 8 Sessions

TEKS: 6.2A, 6.2B, 6.2C, **6.2D**, **6.11A**

Students use a number line to reason about negative numbers and absolute value.

Readiness TEKS

- Students interpret the meanings of positive rational numbers, negative rational numbers, and zero in real-world situations.
- Students explore the relationship between opposites and distance on a number line and define absolute value.
- Students classify numbers into their respective number systems and explore the density of rational numbers. Diagrams, double number lines, tables, and graphs.
- Students explore the four-quadrant coordinate plane.

Learning Individually: 2 Sessions

Targeted Skills Practice for *Signed Numbers and the Four Quadrants*

- Students plot numbers and their opposites on number lines.
- Students use points plotted on number lines to compare numbers and answer questions.
- Students write absolute value statements and integers to represent situations.
- Students classify numbers by their number systems.
- Students plot ordered pairs on the coordinate plane.

14 SESSIONS
13 LEARNING • 1 ASSESSMENT

TOPIC 2 *Operating with Integers*

possible Daily Learn Obj

Learning Together: 10 Sessions

TEKS: 6.3C, **6.3D**

Readiness TEKS

Students make conjectures, explain connections between representations and algorithms, generalize, and practice algorithms.

- Students use physical representations to model addition, subtraction, multiplication, and division of integers.
- Students relate additive inverses and zero pairs and develop rules for adding and subtracting integers, then practice those rules with two or more integers to develop fluency.
- Students also use fact families to develop rules for the signs of products and quotients of integers.
- Students use their knowledge of all four operations to practice and develop fluency with two or more integers.

Learning Individually: 3 Sessions

Targeted Skills Practice for *Operating with Integers*

- Students add, subtract, multiply, and divide two or more integers.
- Students use operations with integers to solve real-world problems.

How is *Moving Beyond Positive Quantities* connected to prior learning?

Moving Beyond Positive Quantities builds on previous grade level skills of plotting and ordering positive rational numbers on a number line and of plotting and interpreting ordered pairs in the first quadrant of the coordinate plane. Students also use their knowledge of symmetry and reflection to construct the number line and coordinate plane. This module also draws on students' fluency with adding, subtracting, multiplying, and dividing whole numbers developed in elementary school to develop rules for operating with integers.

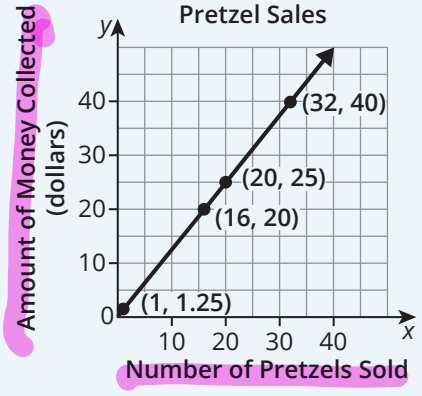
Prior Knowledge:
Plotting & ordering positive rational numbers on a number line

Math Representation

You can use a graph to represent the relationship between the number of pretzels Nic sells and the amount of money he collects in dollars.

In this graph, each ordered pair represents (number of pretzels, dollars collected).

Therefore, the graph shows that when Nic sells 16 pretzels, he earns $20.



When will students use knowledge from *Moving Beyond Positive Quantities* in future learning?

Moving Beyond Positive Quantities develops students' understanding of the numbers with which they will operate in the next few years of their mathematical journey. They are building a strong conceptual foundation for operating with integers in this module which they will continue to build off of as they operate with the full set of rational numbers in Grade 7. Students will continue to build fluency in operating with rational numbers throughout future courses.

Future learning
- rational numbers
- irrational numbers
- complex systems

In future courses, students will build onto the number system, adding the irrational, real, and complex systems.

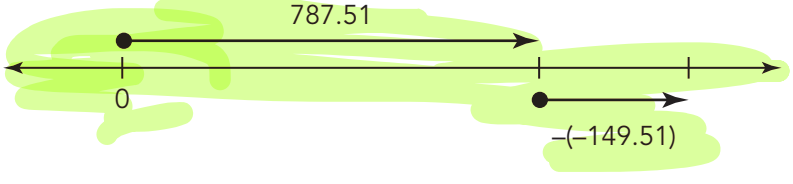
For example, the freezing point of chlorine is −149.51°F. The freezing point of zinc is 787.51°F. How many more degrees is the freezing point of zinc than the freezing point of chlorine?

Example of pos − (−neg).

A model can help you estimate that the answer will be greater than 787.51.

$$787.51 - (-149.51) = 937.02$$

The freezing point of zinc is 937.02°F more than the freezing point of chlorine.



3 Moving Beyond Positive Quantities

MODULE 3 Assessment Summary

Topic	Topic Title	Name	Administered	TEKS*
1	Signed Numbers and the Four Quadrants	End of Topic Assessment	After Topic 1	6.2A 6.2B 6.2C **6.2D** **6.11A**
2	Operating with Integers	End of Topic Assessment	After Topic 2	6.3C **6.3D**

Readiness TEKS

*Bold TEKS = Readiness Standard