InsightMath

Extending the Number System

Family Guide | Grade 6 | Unit 8

Your student is exploring how the number system can be extended to include negative numbers, which are reflections of their positive counterparts over the origin.

Key Math Ideas

In this unit, students learn about negative numbers, which changes how they see the number system. Instead of numbers only increasing from zero, they now understand that numbers go in both directions from zero, infinitely. Students discover mathematical symmetry, seeing how the number line mirrors across zero, with each positive number having a negative counterpart at the same distance from zero. This broader understanding helps students work with quantities that have opposite directions—like heights above and below sea level, temperatures above and below freezing, and financial situations involving credit and debt. Students plot and compare positive and negative numbers, both in mathematical and real world situations.

Later in the unit, students use this new understanding of how the number line includes negative numbers to extend their understanding of the coordinate plane. In grade 5, students worked with the coordinate plane in one quadrant showing only positive numbers. In this unit, students discover and use the coordinate plane with four quadrants, including positive and negative numbers.

→ In the beginning of the unit, your student will learn to

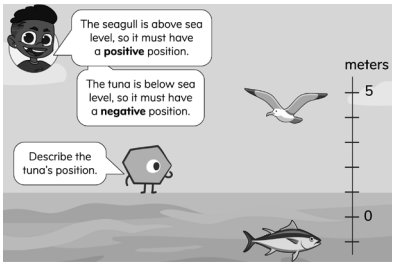
- use positive and negative numbers to describe real-world situations such as being above and below sea level;
- understand that number lines are symmetric around 0, therefore each negative number is the same distance away from 0 as its positive counterpart, meaning that -3 and 3 are both 3 away from 0 in opposite directions;
- locate and place positive and negative numbers on a number line and estimate the location of numbers between given points;
- find the opposite of a positive or negative number, such as finding the opposite of -2 as -(-2), which is 2.

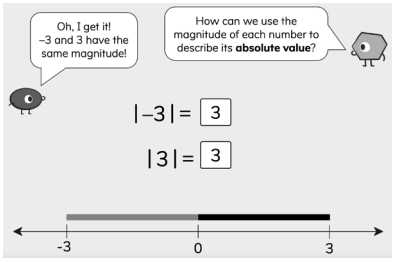
→ In the middle of the unit, your student will learn to

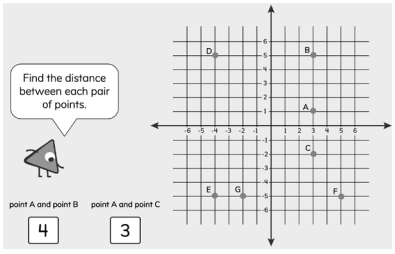
- compare positive and negative numbers, such as -1 > -2;
- describe real-world contexts where positive and negative numbers can be compared by magnitude (size) and by value, such as -$30 representing a greater debt than -$20 and -$30 < -$20;
- describe that absolute value refers to the size of a number or its distance from 0 on a number line;
- find the absolute value of positive and negative numbers.

→ By the end of the unit, your student will learn to

- plot in all four quadrants of the coordinate plane;
- find the distance between two points that share one coordinate, such as (2, 3) and (2, -1);
- model and solve word problems involving positive and negative numbers in real-world contexts.







Helpful Hint

Students have been comparing numbers for a long time using symbols to show greater than (<), less than (>) and equal to (=). In this unit students apply this understanding to compare with negative numbers and extend to compare using the symbols to show "greater than or equal to" (≥) and "less than or equal to" (≤). For example, $x > 3$ means that all numbers greater than 3 make the inequality true, except for 3. However, $x \geq 3$ means that 3 and all numbers greater than 3 make the inequality true. Support your student with understanding the difference in these comparisons by making connections to the real world and using comparison language.

Tips for Supporting Your Student at Home

Questions to Ask Your Student

→ In the beginning of the unit:

- How can you use numbers to describe where something is?
- How can a number be less than zero?
- How do you find the opposite of a number?

→ In the middle of the unit:

- How can you represent all the numbers that make an inequality true?
- What does it mean to find the absolute value of a number?
- What is the absolute value of the number ___? How do you know?

→Later in the unit:

- How do the *x*- and *y*-coordinates help us find the location of a point on a graph?
- How can you find the distance between two points on the coordinate grid?
- How can you use the coordinate system to read a map?

If...	Try...
your student incorrectly compares negative numbers, such as saying -4 is greater than -2 because 4 is greater than 2 . . .	asking them to compare the numbers in context, such as "Would you rather owe someone $4 (-4) or $2 (-2)?" You can also ask them to consider how far from zero each number is to help compare.

Student Strengths Spotlight

I value mistakes.	Exploring new ideas, such as negative numbers, can lead to mistakes, and students take this opportunity to recognize that every mistake is an opportunity to learn.
I seek out challenges as opportunities to grow.	Challenging problems help students expand their thinking and reasoning. Students recognize that challenges can help them learn!
I clarify my reasoning so others can make sense of it.	Students clarify their thinking to explain how to work with negative numbers, including comparing and finding absolute value.
I explain how my classmates' reasoning compares to my own.	Students make comparisons between their strategies for working with negative numbers, recognizing that that their classmates may think differently.

Try This Together!

- **Negative Number Scavenger Hunt.** Have your student find negative numbers in the real world, such as the temperature -8° F. Use them to try these activities:
  - » **Comparing:** Ask your student if it was warmer when the temperature was -8° F or -1° F. Support them to recognize that although 1 is less than 8, -1 is actually greater than -8 because of its distance from 0.
  - » **Find a Number Greater or Less:** Ask them to tell some numbers that are greater and/or less than the number they found. Ask them to tell how they know.
- **Absolute Value Hopscotch.** Create a large number line outside with chalk labeling numbers from -10 to 10. Call out numbers and have your student jump to the number, tell its absolute value, and say how they know. For example, if you call "-7," they jump to -7, saying "The absolute value of -7 is 7 because it has a distance of 7 from 0."
- **Coordinate Systems Around Us!** Support your student to find and explore maps and discuss how they relate to the coordinate system. Use actual city maps overlaid with coordinate grids for students to plan routes between landmarks, calculate distances, or create scavenger hunts for real locations using coordinates. Have them explore with a world map showing longitude and latitude and ask them to share similarities and differences between the map and a coordinate grid.