Khan Academy

# 6th Grade Math

## Unit 6: Adding and subtracting integers

6.3C, 6.3D

**Unlock the power of negative numbers to conquer real-world challenges! From understanding temperature drops to managing debts and even scoring in sports, mastering negative numbers will help students take on the unpredictable twists and turns of everyday life.**

- ☐ Use **integer chips** and **number lines** to perform addition and subtraction with positive and negative integers
- ☐ **Add** positive and **negative** numbers
- ☐ **Subtract** positive and **negative** numbers

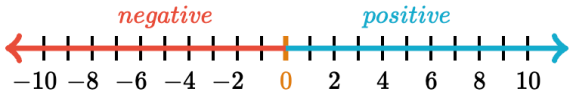

| TEKS standards | Common misconceptions |
|---|---|
| **6.3C:** Represent integer operations with concrete models and connect the actions with the models to standardized algorithms<br><br>**6.3D:** Add, subtract, multiply, and divide integers fluently | **"Negative numbers don't have practical applications" \|** Students might have difficulty connecting negative numbers to life outside of math class and may not see a purpose in learning how to perform operations with them.<br><br>**How to help:** Illustrate real-world scenarios such as temperature below zero, financial debts, elevation, and points on a coordinate plane to show the practical significance. Have students make up their own problems that involve negative numbers to get practice using them in practical situations and share their scenarios with their classmates.<br><br>**Misunderstanding zero pairs with integer chips \|** Students may struggle to understand the concept of zero pairs in relation to integer chips, leading to difficulties in visualizing the addition and subtraction of negative numbers. Integer chips are nickel-sized chips with a different color on each side - one color representing positive and one negative. They use chips to represent the values of integers and have a visual representation of operations.<br><br>**How to help:** Use manipulatives and visual aids to help students understand the concept of zero pairs and provide ample opportunities for practice to reinforce this foundational understanding. Relate the idea of zero pairs to situations they may be familiar with, like borrowing $1 and then paying back $1. For some students, having physical integer chips can be more helpful than simply drawing them. |

You can order integer chips online or make your own on cardstock.

**Misunderstanding that the left is negative on a number line |** When working with horizontal number lines, students may struggle to understand that when moving left, the value decreases and when moving right, the value increases.

**How to help:** Provide explicit demonstrations and practice exercises that reinforce the relationship between movement on the number line and the effect on the value of the number. When using vertical number lines, this may be more intuitive because "up" means the value increases and "down" means the value decreases.

Use colored pencils to denote the positive and negative sides of the number line and have students use their colors when solving problems with number lines and integer chips.




**"Just memorize rules" |** Students may struggle to understand negative numbers and may thus simply memorize rules. This will not help students in the long run because they will likely forget the rules and then have difficulty reasoning out how to solve the problems.

**How to help:** Give students time to explore negative numbers with integer chips and number lines. Have them develop their own "rules" based on their understanding and patterns they see. This may take longer, but you are building students' number sense, which is crucial for their future. Give students lots of practice working with negative numbers and allow them to use tools as they wish.

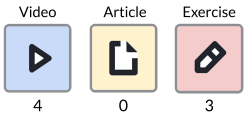
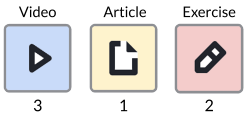
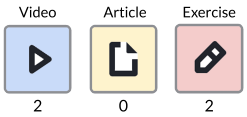
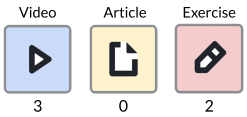
Create a large number line in your classroom across the front board/wall that can be referenced when solving problems. You (and students) can walk along the number line to show movement in either direction. This will give students concrete memories to connect with positive and negative numbers.

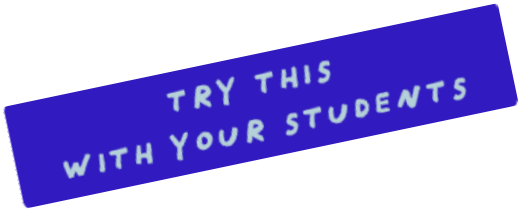
# Unit resources

- For Lesson 1 and beyond, students can use this Horizontal number line workspace, Vertical number line workspace, and this Integer chips workspace to help model problems. Copy them back-to-back and put in a plastic sleeve for students to reuse with dry erase markers.
- For Lesson 2, students can use this Blank number line workspace for when they approximate solutions.
- Print and cut out your own color integer chips or black and white integer chips.
- For the videos in this unit, use the Learning summary video notetaking guide.
- For the articles in this unit, use the Article notetaking guide.
- For the exercises in this unit, use the Blank workspace template.
- To record key terms and information, use the Vocabulary and notation notetaker.

# Lesson overview

| Lesson | Objective | Teaching tips |
|---|---|---|
| **Lesson 1: Intro to adding negative numbers**<br><br>TEKS standard: 6.3C<br><br>Video 3 · Article 0 · Exercise 3 | Students will be able to solve addition problems with negative numbers using integer chips and number lines. | • **Warm up activity**: Have students plot numbers on a number line. This will prepare them to work with number lines later in the lesson.<br>• This lesson is an introduction to working with integer chips and number lines when adding positive and negative integers. Some students will benefit from using physical integer chips (as opposed to drawing them), so it can be helpful to have some on hand. Spend time reinforcing that one positive and one negative chip makes a zero pair. |
| **Lesson 2: Adding negative numbers fluently**<br><br>TEKS standard: 6.3C, 6.3D<br><br>Video 1 · Article 1 · Exercise 2 | Students will be able to add positive and negative numbers on a number line. | • The first activities in this lesson are designed to help students develop an intuitive sense of adding positive and negative numbers. They are only asked to determine whether the answer will be positive or negative, not a numerical outcome. This is great practice for students as they develop an understanding of negative numbers. Allow students to explore and find patterns as opposed to giving them rules to follow. |
| **Lesson 3: Intro to subtracting negative numbers** | Students will be able to solve subtraction problems with positive and negative integers using integer chips | • This lesson uses integer chips and number lines to help students explore subtracting with positive and negative numbers. As in previous lessons, allow |

| | | |
|---|---|---|
| TEKS standard: 6.3C<br>  | and number lines. | students to explore these tools and discover their own patterns and shortcuts. The more sense they can make of this on their own, the better, as it will help with their fluency as they get more experience.<br>• Spend time explaining to students why subtracting means to do the opposite and also why two negatives make a positive, like 5 - (-2) = 5 + 2. The videos touch on this but students may need more of an explanation and additional practice. |
| **Lesson 4: Subtracting negative numbers fluently**<br><br>TEKS standard: 6.3C, 6.3D<br>  | Students will be able to subtract positive and negative numbers on a number line. | • This lesson provides additional ways for students to think about subtraction and increase their fluency and number sense. Students continue with subtraction as adding the opposite. For example, in -8 - 5 = -8 + (-5), you add the opposite of 5, which is -5, and in 9 - (-4) = 9 + 4, you add the opposite of -4, which is 4. Students can get in the habit of changing all subtraction they see to "adding a negative" if they prefer. |
| **Lesson 5: Adding & subtracting integers**<br><br>TEKS standard: 6.3D<br>  | Students will be able to add and subtract positive and negative integers. | • This lesson gives students practice with different types of problems involving positive and negative integers, combining multiple types of problems they've already seen. Students can continue to use integer chips and number lines as tools to solve the problems here.<br>• This is a good place to use teacher-led groups. Monitor student progress and group students as necessary to ensure they get the support they need. |
| **Lesson 6: Adding and subtracting integers word problems**<br><br>TEKS standard: 6.3D<br>  | Students will be able to add and subtract positive and negative numbers in word problems. | • Students will continue to develop their fluency with negative numbers, now working with word problems. Have students work slowly and carefully to make sure they are interpreting the problems correctly.<br>• Encourage students to write the problems out in words and then numbers and to use either vertical or horizontal number lines to model their thinking. |



# Best practices


**Tools: Integer chips and number lines**

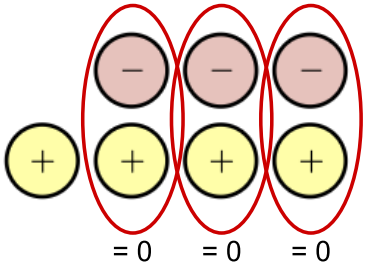
Using integer chips and number lines allow students to use concrete tools to solve abstract problems. When students understand how to use them, then can come back to them over and over again. Using number lines in particular is essential for students since they will continue to use number lines and coordinate planes (which are just two number lines!) for the rest of their time in math classes. Whenever students get stuck on a problem in the future, knowing they can come back and make a number line builds confidence and adds another tool to their math toolbox.

*Using integer chips*

Integer chips are a visual aid used to represent positive and negative numbers and can be either physical chips or sketches of chips. The chips are two colors, usually red for negative and yellow for positive, with each chip representing a value of 1. When circles are drawn to represent chips, students can use color to denote positive or negative values or they can simply write a "+" or "-" on the "chip."

When adding integers, you can simply add additional chips (+ or -) as needed. When subtracting integers, you can take away chips (+ or -) as needed. If you don't have enough chips to take away, use zero pairs. A zero pair is one positive and one negative chip that sum to zero.

For example, -3 + 4 can be represented like this with integer chips:




There are three negative chips to represent -3 and four positive chips to represent 4.

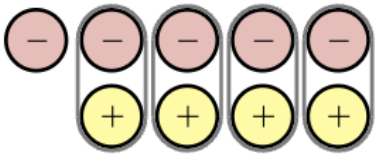
We have three zero pairs here, which all cancel out and we're left with one positive chip, so the answer is 1.

-3 + 4 = 1

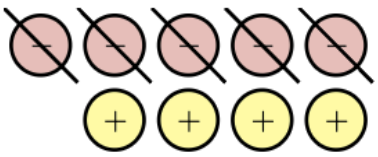
Sometimes we will need to add zero pairs when you are asked to subtract a quantity that isn't there. For example, -1 - (-5) can be solved like this:

We start with one (-1) chip. We need to remove five (-1) chips, but there aren't five to remove.

So, we will need to add zero pairs until we have enough (-1) chips to remove five of them.

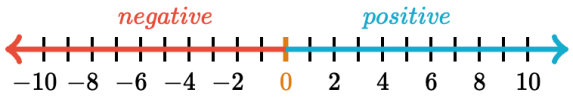


Now we have enough (-1) chips to remove five of them. The answer will be 4 because there are four (+1) chips left. So, -1 - (-5) = 4.



*Using number lines*

A number line is a visual representation of numbers in a linear format (horizontal or vertical). There are many applications of number lines, they will be used here to model addition and subtraction of positive and negative numbers.



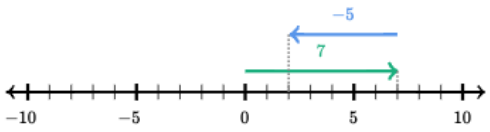

On a horizontal number line, positive numbers are on the right and negative numbers are on the left. When you add a positive number you move to the right, when you add a negative number you move to the left (since it's negative), when you subtract a positive number you move to the left (since you're taking away), and when you subtract a negative number, you move to the right (since you take away a negative, which is adding). See the examples below:

Example #1: $7 + (-5)$

$7 + (-5) =$

Go to $7$, then move $5$ back to the left.

Here's one way to visualize it:




$7 + (-5)$ takes us to $2$ on the number line.

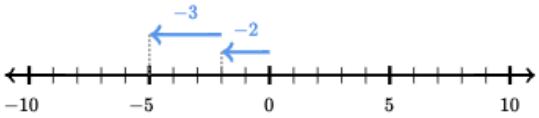
$7 + (-5) = 2$

Example #2: $-2 - 3$

$-2 - 3 =$

Go to $-2$, then move $3$ more to the left.

Here's one way to visualize it:




$-2 - 3$ takes us to $-5$ on the number line.

$-2 - 3 = -5$

Example #3: $-4 - (-2)$

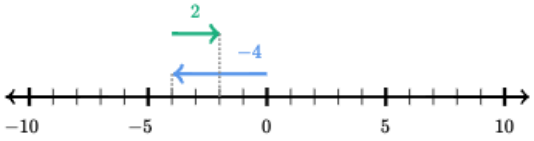
$-4 - (-2) =$

$- 4 - (-2)$

$= -4 + 2$

Go to $-4$, then move $2$ back to the right.

Here's one way to visualize it:




**GENERAL CLASSROOM IMPLEMENTATION RESOURCES:**

- Weekly Khan Academy quick planning guide: Use this template to plan your week using Khan Academy.
- Using Khan Academy in the classroom: Learn teaching techniques and strategies to support your students and save time with Khan Academy.
- Differentiation strategies for the classroom: Discover strategies to support the learning of all students.