

Adding Integers: Working with Positive and Negative Numbers



Student: Tilley

ID: PA-C582DAFB

Date: _____

Type: LESSON

Have you ever wondered how to work with numbers below zero, like negative temperatures or floors below ground level? Adding integers (positive and negative whole numbers) is a fundamental skill that helps us solve real-world problems involving gains and losses, heights and depths, and many other situations where we need to go in opposite directions.

Real-World Connection: Imagine you're playing a new video game where your character starts at ground level (0 points) and can either climb mountains for positive points or dive underwater for negative points. If you climb a mountain worth +15 points and then dive to an underwater cave worth -8 points, you need to add these integers to find your final score: $+15 + (-8) = +7$ points total!

Adding Integers with the Same Sign

When adding integers that have the same sign (both positive or both negative), we add their absolute values (the distance from zero) and keep the same sign. Think of it like walking in the same direction twice - you go further in that direction.

Example 1: $(+7) + (+4)$

Solution: Step 1: Notice both numbers are positive Step 2: Add the numbers: $7 + 4 = 11$ Step 3: Keep the positive sign: +11

Since we're adding two positive numbers, we're moving right on the number line twice, ending up at +11.

Example 2: $(-6) + (-9)$

Solution: Step 1: Notice both numbers are negative Step 2: Add their absolute values: $6 + 9 = 15$ Step 3: Keep the negative sign: -15

Since we're adding two negative numbers, we're moving left on the number line twice, ending up at -15.

Key Points:

- * Same signs: add the absolute values and keep the sign
- * Positive + Positive = Positive
- * Negative + Negative = Negative

Adding Integers with Different Signs

When adding integers with different signs (one positive, one negative), we subtract the smaller absolute value from the larger absolute value and use the sign of the number with the larger absolute value. Think of this like a tug-of-war - the stronger side wins!

Example 1: $(+8) + (-3)$

Solution: Step 1: Notice the signs are different Step 2: Find absolute values: $|8| = 8$, $|-3| = 3$
Step 3: Subtract: $8 - 3 = 5$ Step 4: Use the sign of the larger absolute value: $+5$

The positive 8 is 'stronger' than the negative 3, so we get a positive result.

Example 2: $(-12) + (+5)$

Solution: Step 1: Notice the signs are different Step 2: Find absolute values: $|-12| = 12$, $|5| = 5$
Step 3: Subtract: $12 - 5 = 7$ Step 4: Use the sign of the larger absolute value: -7

The negative 12 is 'stronger' than the positive 5, so we get a negative result.

Example 3: $(-4) + (+4)$

Solution: Step 1: Notice the signs are different Step 2: Find absolute values: $|-4| = 4$, $|4| = 4$
Step 3: Subtract: $4 - 4 = 0$ Step 4: The result is 0

When two numbers have the same absolute value but opposite signs, they cancel each other out completely.

Key Points:

- * Different signs: subtract absolute values, keep the sign of the number with larger absolute value
- * The result takes the sign of the 'stronger' number
- * Equal absolute values with opposite signs always equal zero

Understanding Additive Inverse

The additive inverse of a number is the number you add to it to get zero. Every integer has an additive inverse: for any number n , its additive inverse is $-n$. These pairs are like perfect opposites that cancel each other out completely.

Example 1: Find the additive inverse of $+7$

Solution: Step 1: The additive inverse of $+7$ is -7 Step 2: Check: $(+7) + (-7) = 0$ ✓

The additive inverse is always the same number with the opposite sign.

Example 2: Find the additive inverse of -15

Solution: Step 1: The additive inverse of -15 is $+15$ Step 2: Check: $(-15) + (+15) = 0$ ✓

Even negative numbers have additive inverses - they become positive!

Key Points:

- * Additive inverse: the number that, when added to the original, gives zero
- * Every integer has exactly one additive inverse
- * Adding a number and its additive inverse always equals zero

Vocabulary

Integer: Positive and negative whole numbers, including zero (... , -3, -2, -1, 0, 1, 2, 3, ...)

Absolute Value: The distance a number is from zero on the number line, always positive ($|-5| = 5$)

Additive Inverse: The opposite of a number that, when added to the original number, equals zero

Same Signs: When two integers are both positive or both negative

Different Signs: When one integer is positive and the other is negative

Summary:

Adding integers follows two main rules: when signs are the same, add the absolute values and keep the sign; when signs are different, subtract the absolute values and use the sign of the number with the larger absolute value. Understanding additive inverses helps us see that opposite numbers cancel each other out, which is useful in many real-world situations like temperature changes, money transactions, and elevation changes.

Try These:

1. A temperature starts at -8°F and rises 12°F . What is the final temperature?

Answer: _____

2. You have \$15 in your account and spend \$23. What is your account balance?

Answer: _____

3. An elevator starts at floor 3, goes down 7 floors, then up 2 floors. What floor is it on?

Answer: _____

4. $(-9) + (-6)$

Answer: _____

5. $(+13) + (-8)$

Answer: _____