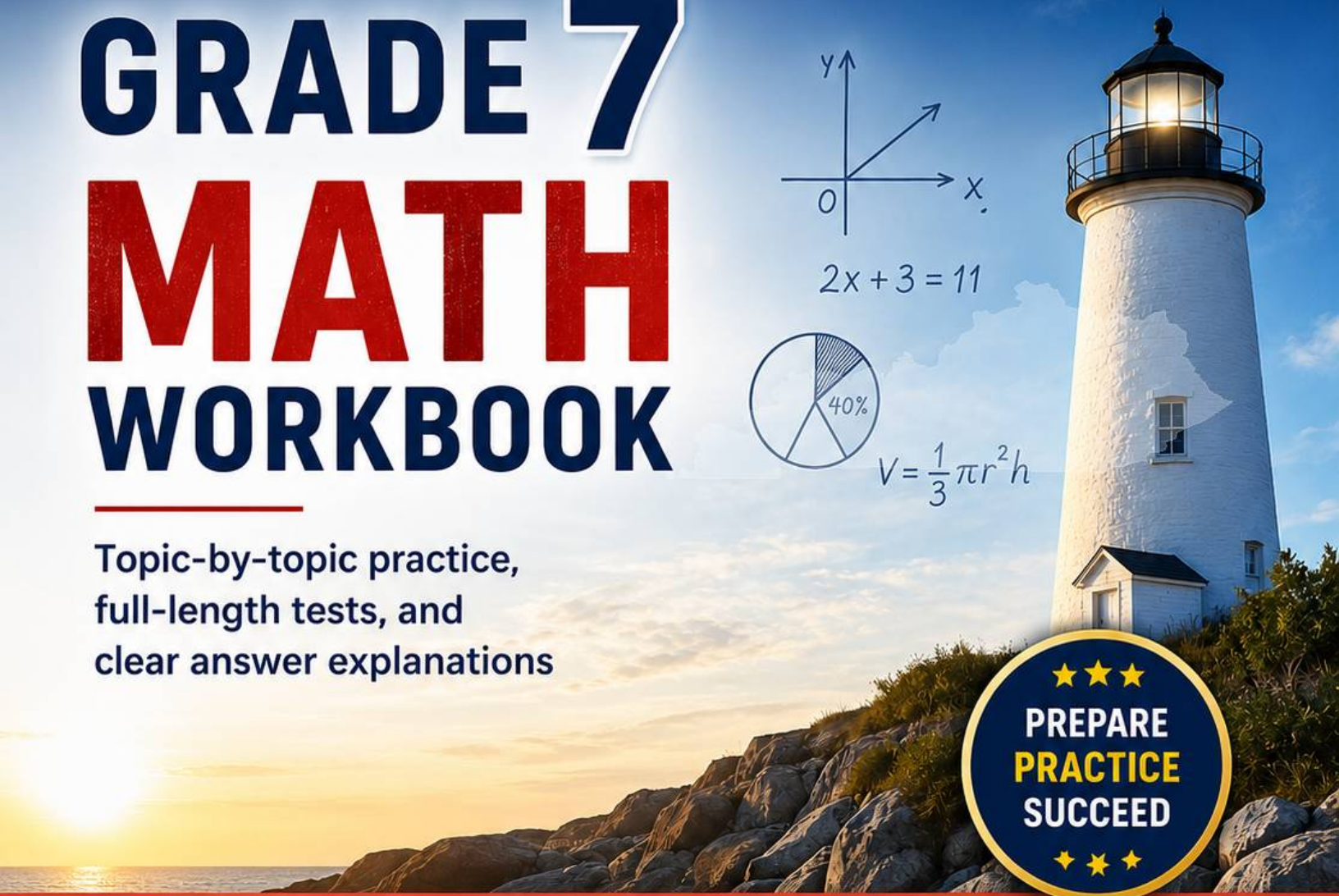
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CHAPTER

1

Integers and Absolute Value

1. Understanding Integers and the Number Line — KY.7.NS.1
2. Absolute Value — KY.7.NS.1
3. Comparing and Ordering Integers — KY.7.NS.1
4. Adding Integers — KY.7.NS.1
5. Subtracting Integers — KY.7.NS.1
6. Multiplying Integers — KY.7.NS.2
7. Dividing Integers — KY.7.NS.2

1.1 Understanding Integers and the Number Line

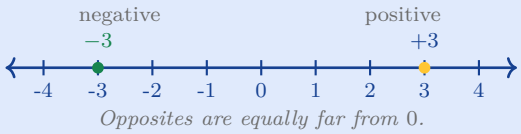
KY.7.NS.1

Welcome to integer world! An **integer** is any whole number—positive, negative, or zero—and it tells you both an amount and a direction. Think of temperatures above or below zero, elevations above or below sea level, or money gained versus money lost—integers are everywhere. On a number line, positives sit to the **right** of zero and negatives sit to the **left**, and every integer has an opposite that is the same distance from zero in the other direction. Once you can picture this, comparing integers and working with them in addition, subtraction, and beyond gets much, much easier.

Key Concepts & Quick Review

Integers: $\{\ldots, -3, -2, -1, 0, 1, 2, 3, \ldots\}$ **Positive** integers are to the right of 0; **Negative** integers are to the left of 0.

Opposite of n: $-n$ **Opposite of $-n$:** $-(-n) = n$ **Zero:** neither positive nor negative



Opposites are equally far from 0.

Examples

① Write an integer for: "A submarine descends **300 feet below** sea level."

Think It Through: The key phrase here is *below sea level*. Sea level is our zero point, so anything below zero is negative. The number 300 tells us how far down the submarine is, and the negative sign tells us the direction. So 300 feet below sea level is written as -300.

Answer: -300

② Point A is located at -8 on the number line. Point B is the opposite of point A. What is the distance between points A and B?

Think It Through: Start by finding the opposite of -8. The opposite is 8, so point B is at 8. On the number line, point A is 8 units to the left of zero and point B is 8 units to the right of zero. Since the points are on opposite sides of zero, add those distances: $8 + 8 = 16$ units.

Answer: 16 *units*

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the sign of the larger absolute value, which is negative, so the result is -140. Then add 95: $-140 + 95 = -45$. The final elevation is -45 feet, which means 45 feet below sea level.

Answer: -45 *feet*

✎ Practice Problems

Find each sum.

1. $5 + (-8) =$ _____

2. $(-6) + (-9) =$ _____

3. $(-12) + 7 =$ _____

4. $(-3) + 15 =$ _____

5. $(-14) + (-6) =$ _____

6. $8 + (-8) =$ _____

7. $(-25) + 13 =$ _____

8. $(-9) + (-11) =$ _____

9. $17 + (-24) =$ _____

10. $(-30) + 45 =$ _____

11. $(-7) + (-7) + 4 =$ _____

12. $12 + (-5) + (-9) =$ _____

13. $(-20) + (-15) + 30 =$ _____

14. $(-6) + 13 + (-4) =$ _____

15. $36 + (-49) =$ _____

Study Tips

- ☞ When adding a long list of integers, group positives together and negatives together first; then combine the two totals.
- ☞ Opposite integers cancel: $(-7) + 7 = 0$. Look for zero pairs to simplify quickly.
- ☞ The sign of the answer matches the sign of the integer with the **larger** absolute value.

✍ Word Problems

16. During a single football drive, a team gains 14 yards on the first play, loses 19 yards on the second play, gains 8 yards on the third play, and loses 6 yards on the fourth play. Write an addition expression using integers to represent the total yardage change, and then find the result. Is the team ahead of or behind their starting position, and by how many yards?

_____

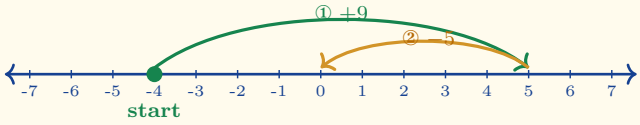
17. Kenji starts the week with \$15 in his account. He deposits \$30 on Monday, withdraws \$48 on Tuesday, deposits \$12 on Wednesday, and withdraws \$22 on Thursday. Write his balance after each transaction as an addition expression, and determine whether his

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account is positive or negative at the end of Thursday. If negative, how much does he owe?

_____

18. This number line shows two "jumps." The bug starts at -4, hops $+9$ along arrow ①, and then hops -5 along arrow ②. Write the addition expression for the bug's final position and find where the bug lands.



_____

1.5 Subtracting Integers

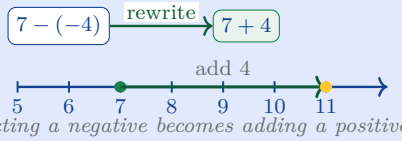
KY.7.NS.1

Here is the secret to subtracting integers: don't treat it as something new! Every subtraction can be rewritten as **adding the opposite**: $a - b = a + (-b)$. After that one rewrite, you already know what to do—just use the integer-addition rules from the last section. Try it with $-6 - (-9)$: rewrite as $-6 + 9$, and the answer is 3. The more you practice this "add-the-opposite" move, the faster and more confident you will become with any integer subtraction problem.

Key Concepts & Quick Review

Subtraction Rule: $a - b = a + (-b)$ **Keep · Change · Change (KCC):** keep the first number, change subtraction to addition, change the sign of the second number.

Examples: $7 - (-4) = 7 + 4 = 11$ $\qquad (-5) - 9 = (-5) + (-9) = -14$
$(-3) - (-10) = (-3) + 10 = 7$



Subtracting a negative becomes adding a positive.

Examples

① Evaluate $(-8) - (-11)$.

Think It Through: Rewrite subtraction as addition of the opposite. So $(-8) - (-11)$ becomes $(-8) + 11$. Now the signs are different, so subtract the absolute values: $11 - 8 = 3$. Since 11 has the larger absolute value, the answer is positive. Therefore the result is 3.

Answer: 3

② At sunrise the temperature was $-9°$F. By noon it had risen to $18°$F. By how many degrees did the temperature change from sunrise to noon?

Think It Through: Change means final minus initial, so write $18 - (-9)$. Use Keep-Change-Change: keep the 18, change subtraction to addition, and change -9 to $+9$. That gives $18 + 9 = 27$. So the temperature rose $27°$F.

Answer: $27° F$ *increase*

Practice Problems

Find each difference.

1. $8 - 13 =$ _____

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

3. $(-9) - (-3) =$ _____

4. $4 - (-11) =$ _____

5. $(-12) - (-8) =$ _____

6. $0 - (-6) =$ _____

7. $(-15) - 9 =$ _____

8. $7 - (-7) =$ _____

9. $(-20) - (-20) =$ _____

10. $(-3) - 14 =$ _____

11. $25 - (-13) =$ _____

12. $(-8) - (-15) =$ _____

13. $(-40) - (-25) =$ _____

14. $6 - (-6) - 3 =$ _____

15. $(-11) - (-5) - 9 =$ _____

Study Tips

- Always apply **Keep** · **Change** · **Change** before simplifying: never skip the rewrite step.
- Subtracting a **negative** always increases the value: $5 - (-3) = 5 + 3 = 8 > 5$.

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