Subtracting Integers

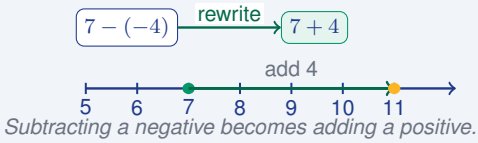
Name: _____	Date: _____	Score: _____ / 18

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



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: $5 - (-3) = 5 + 3 = 8 > 5$.
- For multi-step problems, rewrite *every* subtraction as addition first, then work left to right.

Word Problems

16. At 6:00 AM the temperature in a mountain town was $-14°$F. By 3:00 PM the temperature had climbed to $23°$F. Write a subtraction expression to find the total change in temperature, then evaluate it. By how many degrees did the temperature rise, and does the rise represent a gain or a loss?

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17. A submarine began a mission at a depth of -520 feet. It then descended further to -785 feet. How many feet did the submarine descend during this maneuver? After reaching -785 feet, the submarine ascended 310 feet. Write and evaluate a subtraction expression to find the submarine's new depth after ascending.

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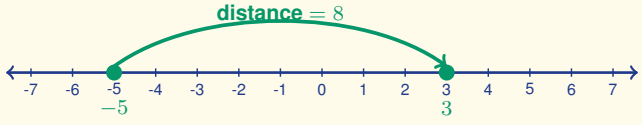
18. This number line shows the difference $3 - (-5)$ as a single arrow. Use the picture to (a) explain why $3 - (-5)$ is the same as $3 + 5$, (b) give the value of the expression, and (c) determine the *distance* between the two endpoints.



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Answer Keys

1) -5
2) -12
3) -6
4) 15
5) -4
6) 6
7) -24
8) 14
9) 0
10) -17
11) 38
12) 7
13) -15
14) 9
15) -15
16) $37°$F gain
17) Descended $265\,ft$; new depth $-475\,ft$
18) (a) $3 + 5$; (b) 8; (c) 8

Step-by-Step Explanations

Strategy: For Subtracting Integers, rewrite subtraction as adding the opposite whenever signs get crowded, then combine the positive and negative parts carefully. For integer-subtraction, have students say the rule in words before they start calculating.

Practice 1: $8 - 13 =$ **Answer:** -5
For the first sample, rewrite $a - b$ as $a + (-b)$; the second number changes sign before the integers are combined.

Practice 15: $(-11) - (-5) - 9 =$ **Answer:** -15
Late in the set, check the sign of the number being subtracted first; taking the opposite is what keeps a double negative from slipping by.

Word-problem notes:

16. Answer: $23 - (-14) = 37°$F; a gain of $37°$.
Use final minus initial: $23 - (-14)$. Subtracting a negative is the same as adding the opposite, so this becomes $23 + 14 = 37$. Because the temperature increased, the change is a gain of $37°$F.

17. Answer: Descended $265\,ft$; new depth $= -785 - (-310) = -475\,ft$.
To find how much farther down the submarine went, subtract the starting depth from the new depth: $-785 - (-520) = -785 + 520 = -265$. The negative result tells you the movement was downward, so the submarine descended 265 feet. Then it ascends 310 feet, which means add 310: $-785 + 310 = -475$. So the new depth is -475 feet.

18. Answer: (a) Keep–Change–Change rewrites $3 - (-5)$ as $3 + 5$; (b) value $= 8$; (c) distance $= 8$.
Subtraction is the same as adding the opposite, so $3 - (-5) = 3 + (+5) = 3 + 5 = 8$. On the number line, the arrow shows that 3 is 8 units to the right of -5, which is exactly the distance between the two endpoints. The value of the expression equals the distance between the points.

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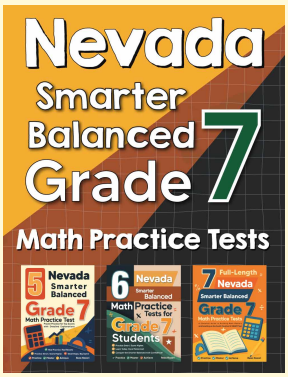

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