Please solve in your spiral

ZERO PAIR

$4 + (-7) = -3$

$-5 + 9 = +4$

$-3 + (-10) = -13$

$4 + {}^-7 = -3$

-3

$-5 - 3 = -8$

$-5 + \boxed{-3} = -8$

$4 - 9 = -5$

$4 + \boxed{-9} = -5$

$-6 - (-8) = +2$

$-6 + \boxed{8} = +2$

$-4 - (-3) = -1$

$-4 + \boxed{3} = -1$

$7 - (-5) = +12$

$7 + \boxed{5} = +12$

$-17 - (-30) =$

$-17 + 30 = +13$

Page 1

Lesson 2-2

Adding Integers

Essential Question

What happens when you add, subtract, multiply, and divide integers?

CCSS Common Core State Standards

Content Standards
7.NS.1, 7.NS.1a,
7.NS.1b, 7.NS.1d,
7.NS.3, 7.EE.3

Mathematical Practices
1, 2, 3, 4

Vocabulary

additive inverse

What You'll Learn
• Add two integers.
• Add more than two integers.

Real-World Link

Financial Literacy The money you earn can be represented by a positive integer while the money you spend or borrow can be represented by a negative integer. Every time you find the total amount of money you have after earning or spending it, you are adding integers.

Add Integers

The equation $-2 + (-3) = -5$ is an example of adding two integers with the same sign. Notice the sign of the sum is the same as the sign of the addends.
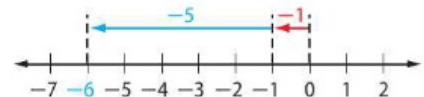
Key Concept ▶ Add Integers with the Same Sign

Words	To add integers with the same sign, add their absolute values. The sum is:
	• positive if both integers are positive.
	• negative if both integers are negative.
Examples	$-2 + (-4) = -6$ $8 + 1 = 9$

Example 1

Find $-1 + (-5)$.

Use a number line.

Step 1 Start at zero.

Step 2 Move 1 unit to the left.

Step 3 From there, move 5 more units to the left.

So, $-1 + (-5) = -6$.

Got It? Do these problems to find out.

Find each sum.

1a. $-3 + (-4)$ **1b.** $-6 + (-14)$ **1c.** $-7 + (-2)$

Example 2

Tools **Tutor**

Find $-3 + (-6)$.

$-3 + (-6) = -9$ Add $|-3|$ and $|-6|$. Both numbers are negative, so the sum is negative.

Got It? Do these problems to find out.

Find each sum.

2a. $-8 + (-2)$ **2b.** $-1 + (-12)$

Key Concept — Add Integers with Different Signs

Words	To add integers with different signs, subtract their absolute values. The sum is: • positive if the positive integer's absolute value is greater. • negative if the negative integer's absolute value is greater.
Examples	$9 + (-4) = 5$ $-9 + 4 = -5$

Adding Integers on a Number Line

The sum of p and q is located a distance $|q|$ from p on a number line. The sum is left of p if q is negative and right of p if q is positive.

To add integers with different signs you can also use a number line. Start at zero. Move right to model a positive integer. Move left to model a negative integer.

Example 3

Tools **Tutor**

Find each sum.
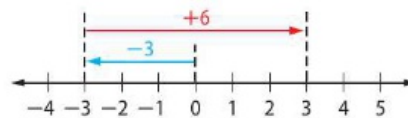
a. $-3 + 6$

     Use a number line.

     Step 1   Start at zero.

     Step 2   Move 3 units to the left.

     Step 3   From there, move 6 units to the right. The sum, 3, is 6 units to the right of -3.

     So, $-3 + 6 = 3$.

Parentheses

Use parentheses around negative numbers that come after operation symbols. So, write $1 + (-4)$, *not* $1 + -4$.
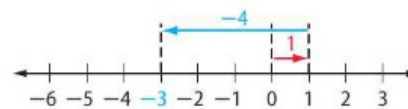
b. $1 + (-4)$

     Use a number line.

     Step 1   Start at zero.

     Step 2   Move 1 unit to the right.

     Step 3   From there, move 4 units to the left. The sum, -3, is 4 units to the left of 1.

     So, $1 + (-4) = -3$.

Got It? Do these problems to find out.

3a. $5 + (-2)$ **3b.** $4 + (-8)$

Example 4

Tutor

Find each sum.

a. $12 + (-6)$

$12 + (-6) = 6$

To find $12 + (-6)$, subtract $|-6|$ from $|12|$.
The sum is positive because $|12| > |-6|$.

b. $-7 + 5$

$-7 + 5 = -2$

To find $-7 + 5$, subtract $|5|$ from $|-7|$.
The sum is negative because $|-7| > |5|$.

Watch Out!

Check the sign of the sum. The sign should be the same as the addend with the greater absolute value. A positive sum does not need a sign.

Got It? Do these problems to find out.

4a. $-20 + 4$ 4b. $16 + (-5)$

Example 5

Tutor

A blue whale was at a depth of 275 feet below the surface of the water. After 10 minutes, it rose 194 feet. What is the current depth of the blue whale? Write an addition equation and then solve. Interpret the sum.

Words	Beginning depth plus increase after 10 minutes = current depth
Variable	Let d = the current depth.
Equation	$-275 + 194 = d$

Solve the equation.

$-275 + 194 = d$

$-81 = d$

Estimate $-275 + 200 = -75$.
To find the sum, subtract 194 from $|-275|$.
The sum is negative because $|-275| > |194|$.

The current depth is -81 feet or 81 feet below the surface.   **Check for Reasonableness** $-81 \approx -75$ ✔

Got It? Do this problem to find out.

5. A scuba diver is 120 feet below the water's surface. She then ascends 83 feet. What is her current depth? Write an addition equation and then solve. Interpret the sum.

Add More than Two Integers

The integers -4 and 4 are opposites. Opposites have the same absolute value but different signs. An integer and its opposite are also called **additive inverses**. The Additive Inverse Property is useful when adding integers.

Key Concept ▸ Additive Inverse Property

Words	The sum of any number and its additive inverse is zero.
Examples	$2 + (-2) = 0$
Symbols	$a + (-a) = 0$

Example 6

Find each sum.

a. $-6 + (-15) + 6$

$-6 + (-15) + 6 = -6 + 6 + (-15)$		Commutative Property
$= 0 + (-15)$		Additive Inverse Property
$= -15$		Identity Property of Addition

Adding Mentally
- One way to add a group of integers mentally is to look for addends that are opposites.
- Another way is to group the positive addends together and the negative addends together. Then add.

b. $7 + (-1) + 26 + (-13)$

$7 + (-1) + 26 + (-13) = 7 + 26 + (-1) + (-13)$	Commutative Property
$= (7 + 26) + [-1 + (-13)]$	Associative Property
$= 33 + (-14)$ or 19	Simplify.

Got It? Do these problems to find out.

6a. $4 + (-2) + (-7)$ **6b.** $-10 + 3 + (-7) + 12$

6c. $-9 + 12 + (-11)$ **6d.** $-8 + 4 + (-1) + 6$

Guided Practice

Find each sum. (Examples 1–4)

1. $-5 + (-6)$ **2.** $14 + (-5)$ **3.** $-18 + 11$ **4.** $16 + (-13)$

CCSS Reason Abstractly Write and solve an addition equation. Then interpret the sum. (Example 5)

5. A football team gained 6 yards on a play. It then lost 10 yards on the next play. What was the total change of yardage for the team?

6. The temperature in Rockford, Illinois, was $-3°F$. The temperature rose 3 degrees. What is the current temperature?

Find each sum. (Example 6)

7. $-7 + 14 + 7$ **8.** $11 + (-2) + (-10)$ **9.** $-5 + 4 + (-5) + 3$

Independent Practice

Go online for Step-by-Step Solutions   eHelp

Find each sum. (Examples 1–4)

10. $-7 + (-3)$ **11.** $-6 + (-14)$ **12.** $17 + (-8)$ **13.** $21 + (-11)$

14. $-15 + 20$ **15.** $-16 + 18$ **16.** $-25 + (-4)$ **17.** $-23 + (-2)$

18. $8 + (-13)$ **19.** $12 + (-16)$ **20.** $-11 + (-5)$ **21.** $13 + (-2)$

CCSS Reason Abstractly Write and solve an addition equation. Then interpret the sum. (Example 5)

22. A contestant has -1500 points. He loses another 1250 points. What is his new score?

23. Ty had $450 in his savings account. He made a withdrawal of $160 to buy a bicycle. What is the balance in his account after the withdrawal?

Find each sum. (Example 6)

24. $10 + (-3) + 3$

25. $-7 + (-1) + 7$

26. $-15 + 8 + (-9)$

27. $-6 + (-2) + 14$
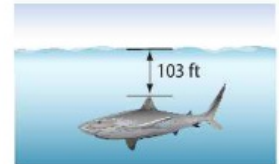
28. $5 + (-3) + 2 + (-3)$

29. $7 + (-6) + 4 + (-6)$

30. $-15 + 4 + (-5) + 10$

31 $8 + (-11) + (-19) + 11$

32. $13 + 20 + (-17) + (-13)$

33. **STEM** A shark rises 68 feet from the depth shown in the diagram. What is its current depth?

103 ft

34. Sally begins hiking at an elevation of 324 feet. Then, she descends 201 feet and then climbs 55 feet higher. Finally, she descends 83 feet. Write an addition sentence to describe the situation. Then solve and interpret the sum.

35 The table below shows the change in music sales to the nearest percent after one year.

Style of Music	Percent of Music Sold	Percent Change After One Year
rock	33	+1
rap/hip hop	10	+2
pop	9	−2
country	14	−1

a. After one year, what is the percent of music sold for each of these music categories?

b. What was the total percent change in the sale of these types of music? Interpret the sum.

Find each sum.

36. $|-4 + 15|$

37. $|-2 + 11|$

38 $|17 - 25|$

🔥 **H.O.T. Problems** Higher Order Thinking

39. **CCSS** **Model with Mathematics** Write a real-world problem that can be solved by using the number line.

$$-6 \quad -5 \quad -4 \quad -3 \quad -2 \quad -1 \quad 0 \quad 1$$

40. **CCSS** **Model with Mathematics** Describe two situations in which opposite quantities combine to make zero.

41. **CCSS** **Use a Counterexample** *True* or *false*? $-n$ always names a negative number. If *false*, give a counterexample.
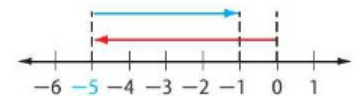
CCSS **Persevere with Problems** Name the property or properties illustrated by each equation.

42. $a[b + (-b)] = [b + (-b)]a$

43. $a[b + (-b)] = 0$

44. 🅔 **Building on the Essential Question** Explain how you know the sum of 5, 4, and −5 is positive without actually adding.

45. The outside temperature was 65°F. The table shows two temperature changes that occurred that day.

| Change 1 | +4°F |
| Change 2 | −10°F |

What was the outside temperature after the second change?

A 14°F   **C** 69°F

B 59°F   **D** 79°F

46. Short Response On a drive, a football team gained 3 yards, lost 11 yards, and gained 15 yards. What was their total yardage gained for that drive?

47. A bird is flying at an altitude of 100 feet. It descends 30 feet, and then ascends 50 feet. Which of the following expressions best represents this situation?

F $100 + 30 + (-50)$

G $100 + (-30) + (-50)$

H $100 + (-30) + 50$

J $100 + 30 + 50$

48. A team started with 4 points. They gained 3 points, lost 6 points, and gained 2 points. How many points does the team have now?

A 2   **C** 4

B 3   **D** 5

CCSS   **Common Core Review**

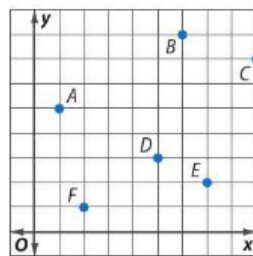**49.** The record low temperature for Wisconsin is 54°F below zero. Write an integer to represent this situation. Then write its opposite and describe its meaning. **6.NS.5**

CCSS Model with Mathematics Refer to the coordinate plane shown. Write the ordered pair that names each point. **5.G.2**

50. point A

51. point B

52. point C

53. point D

54. point E

55. point F

Name the property shown by each statement. **6.EE.3**

56. $12 \cdot 7 = 7 \cdot 12$

57. $1 \cdot 4 \cdot 0 = 0$

58. $4xy \cdot 1 = 4xy$

59. A soccer league ranks each team in their league using points. A team gets three points for a win, one point for a tie, and zero points for a loss. Write an expression that can be used to find the total number of points a team receives. **6.EE.2**

Evaluate each expression. **7.NS.3**

60. $9 \div 3 \cdot 6$

61. $25 - 12 \div 4$

62. $(7 \cdot 5) + (8 \cdot 2)$

63. $(34 \div 2) - (8 \cdot 2)$

Evaluate each expression if $a = 5$, $b = 12$, and $c = 7$. **6.EE.2**

64. $2c - 11$

65. $4a - 16$

66. $bc - ac$

67. $(3b - c) - 4c$

68. $6a + 3b$

69. $5c - a + b$

70. $(9c - ab) + a$

71. $7b + (ab - c)$