

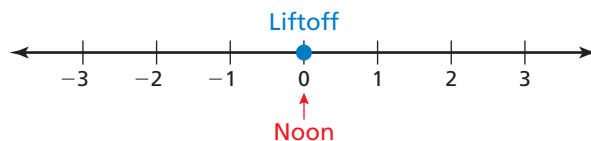
B.2 Number Line Operations

Essential Question How can you use a number line to add and subtract?

1 ACTIVITY: Adding on a Number Line

Work with a partner.

- a. It is 3 hours before liftoff of a space shuttle. Locate this point on the number line.



- b. Four hours later, what time will it be? Locate this point on the number line. To add 4 hours, did you move to the right or to the left?
- c. Use your result to find the sum of -3 and 4 .

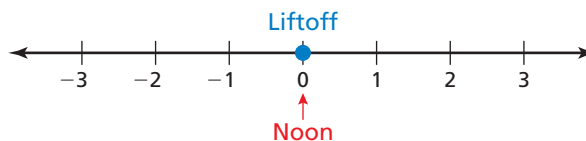
$$-3 + 4 = \square$$

3 hours before liftoff 4 hours later

2 ACTIVITY: Subtracting on a Number Line

Work with a partner.

- a. It is 2 hours after liftoff. Locate this point on the number line.



- b. Four hours earlier, what time was it? Locate this point on the number line. To subtract 4 hours, did you move to the right or to the left?
- c. Use your result to find the difference of 2 and 4 .

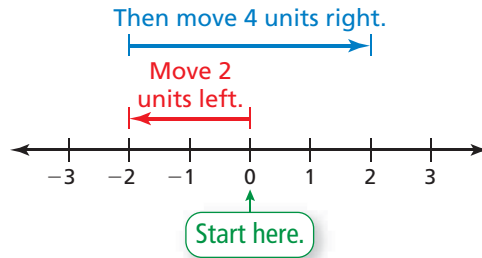
$$2 - 4 = \square$$

2 hours after liftoff 4 hours earlier

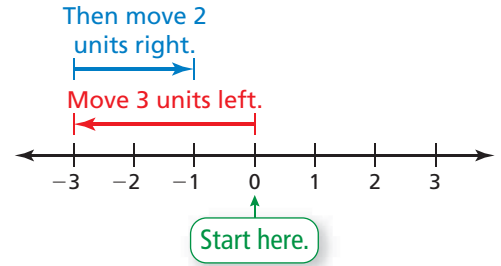
3 ACTIVITY: Adding and Subtracting on a Number Line

Work with a partner. Write the sum or difference that is shown on the number line.

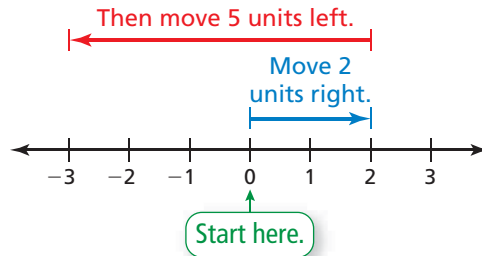
a.



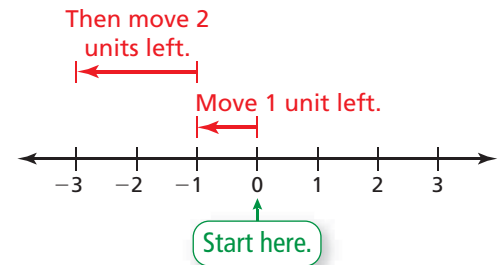
b.



c.



d.



4 ACTIVITY: Adding and Subtracting on a Number Line

Work with a partner. Use a number line to find the sum or difference.

a. $5 - 6$

b. $-2 - 3$

c. $-3 + 5$

d. $-1 + 3$

e. $-4 + 2$

f. $2 - 8$

What Is Your Answer?

5. **IN YOUR OWN WORDS** How can you use a number line to add and subtract? Write two examples of each.
6. Which of the following are possible? If so, give an example.

a. (positive) + (positive) = positive	b. (positive) + (positive) = negative
c. (negative) + (positive) = positive	d. (negative) + (positive) = negative
e. (positive) - (positive) = positive	f. (positive) - (positive) = negative
g. (negative) - (positive) = positive	h. (negative) - (positive) = negative

Practice

Use what you learned about number line operations to complete Exercises 3–6 on page A20.

Key Idea

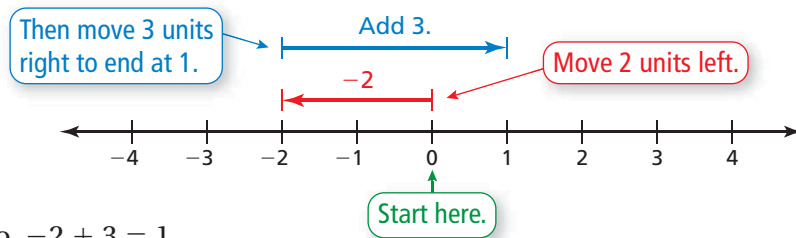
Adding and Subtracting on a Number Line

To *add* a positive number, move to the *right* on a number line.

To *subtract* a positive number, move to the *left* on a number line.

EXAMPLE 1 Adding Integers

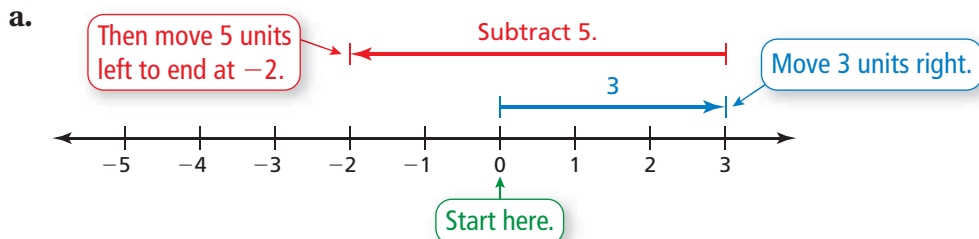
Use a number line to find $-2 + 3$.



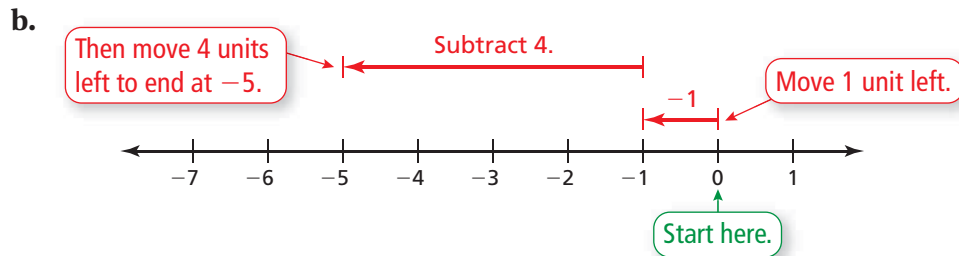
So, $-2 + 3 = 1$.

EXAMPLE 2 Subtracting Integers

Use a number line to find (a) $3 - 5$ and (b) $-1 - 4$.



So, $3 - 5 = -2$.



So, $-1 - 4 = -5$.

On Your Own

Use a number line to find the sum or difference.

- $-5 + 1$
- $-6 + 9$
- $4 - 5$
- $-6 - 8$

Now You're Ready
Exercises 3–18

EXAMPLE 3 Standardized Test Practice

Price of Stock	
Month	Change
May	Down \$4
June	Down \$14

Which expression can be used to find the change in the stock price for May and June?

- (A) $-4 + 14$ (B) $4 - 14$ (C) $-4 - 14$ (D) $14 - 4$

The word *down* indicates negative integers. So, move left on a number line for both May and June. The only expression where you move left twice on the number line is $-4 - 14$.

∴ The correct answer is (C).

EXAMPLE 4 Real-Life Application

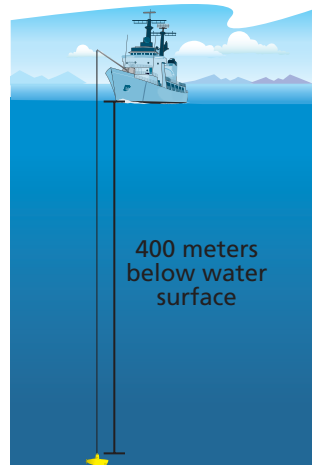
The diving capsule is raised 150 meters. Write and evaluate an expression that represents the position of the capsule after it is raised.

The phrase *below water surface* indicates a negative integer. So, -400 represents the position of the capsule before it is raised.

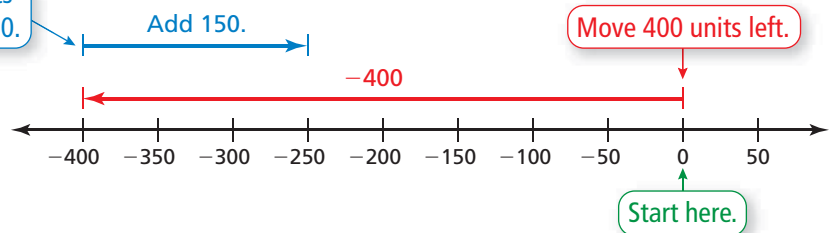
Words The position of the capsule is raised 150 meters.

Expression $-400 + 150$

An expression is $-400 + 150$.



Then move 150 units right to end at -250 .



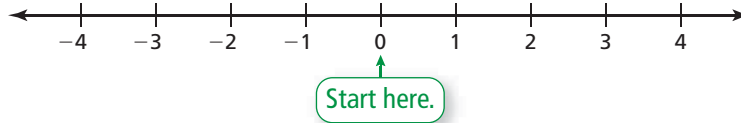
∴ The position of the capsule is -250 meters.

On Your Own

- In Example 3, the stock price is up \$8 in July. Write and evaluate an expression that represents the change in the stock price from June to July.
- WHAT IF?** In Example 4, the capsule is 125 feet below the water surface. It is then raised 150 feet. Write and evaluate an expression that represents the position of the capsule after it is raised.

Vocabulary and Concept Check

1. **NUMBER SENSE** Use the number line to find $-1 + 3$.

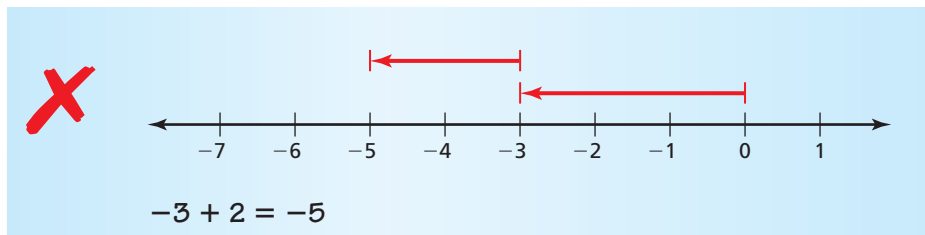


2. **NUMBER SENSE** Without using a number line, is the sum of -65 and 32 *positive* or *negative*? Explain.

Practice and Problem Solving

Use a number line to find the sum or difference.

- 1 2 3. $-1 + 4$ 4. $-7 + 3$ 5. $-2 - 6$ 6. $5 - 12$
 7. $-4 - 5$ 8. $-8 - 2$ 9. $-10 + 6$ 10. $-9 + 7$
 11. $-11 - 2$ 12. $-13 + 16$ 13. $12 - 20$ 14. $-3 + 8$
 15. $-2 - 1$ 16. $0 - 8$ 17. $-5 + 3$ 18. $-3 - 12$
19. **ERROR ANALYSIS** Describe and correct the error in finding $-3 + 2$.



20. **SOCCER** The *goal differential* for a soccer team is the difference between the number of goals scored by the team and the number of goals the team allows.
- Use a number line to find the goal differential for each team.
 - Order the goal differentials from least to greatest. Which team has the lowest goal differential? Which team has the highest?

Team	Goals Scored	Goals Allowed
Chicago	31	36
D.C. United	56	34
FC Dallas	37	44
New York	47	45
Real Salt Lake	31	45
Toronto FC	25	59

Use a number line to evaluate the expression.

21. $-4 + 10 + 3$

22. $-1 - 5 + 6$

23. $5 - 7 - 5$

24. $-9 - 1 + 2$

25. $8 + 2 - 5$

26. $-2 - 3 - 7$

Use a number line to evaluate the expression when $a = -3$ and $b = 5$.

27. $|a + b|$

28. $|a| + |b|$

29. $|a - b|$

30. $|a| - |b|$

31. **PATTERN** Describe the pattern 8, 5, 2, -1 , -4 , \dots Then use a number line to find the next three numbers in the pattern.

32. **TEMPERATURE** The temperature dropped 14°F in 5 hours. The final temperature is -8°F . What was the starting temperature? Explain how you found your answer.

33. **GAME** You have a score of -100 during a trivia game. If you answer all four of the remaining questions correctly, your score will be 25 more than triple your opponent's score.



- a. What is your opponent's score?
- b. What is the minimum number of questions you need to answer correctly in a row to have a greater score than your opponent? Explain.

34. **CRITICAL THINKING** Which positive integers, when added to -19 , give a sum

- a. greater than 0? b. less than 0? c. equal to 0?

35. **Critical Thinking** Let x and y be positive integers. Describe the relationship between x and y so that $x - y$ is negative.



Fair Game Review What you learned in previous grades & lessons

Graph the fraction or mixed number on a number line.

36. $\frac{5}{8}$

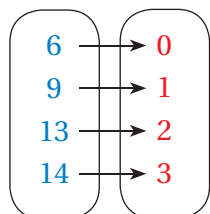
37. $3\frac{3}{4}$

38. $1\frac{2}{3}$

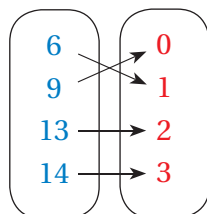
39. $5\frac{3}{8}$

40. **MULTIPLE CHOICE** Which mapping diagram represents the ordered pairs $(0, 9)$, $(1, 6)$, $(2, 13)$, and $(3, 14)$?

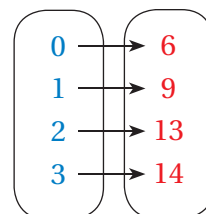
(A) **Input Output**



(B) **Input Output**



(C) **Input Output**



(D) **Input Output**

