



Lesson 7-4

Subtracting Linear Expressions

ISG Interactive Study Guide

- See pages 157–158 for:
- Getting Started
 - Real-World Link
 - Notes

EQ Essential Question

Why are algebraic rules useful?

CCSS Common Core State Standards

Content Standards
7.EE.1

Mathematical Practices
1, 3, 4, 7

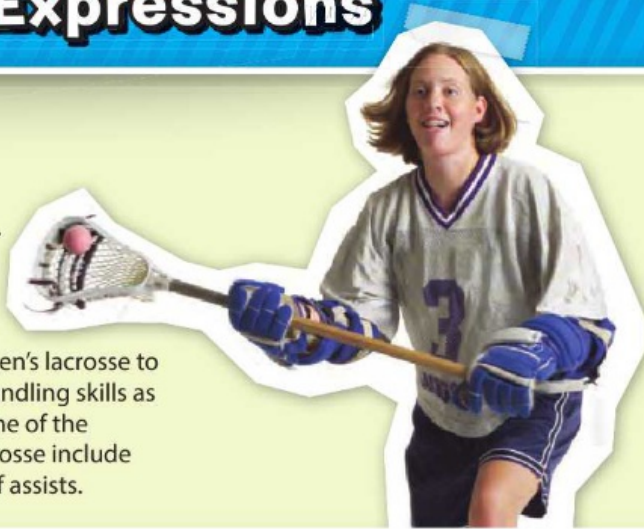
What You'll Learn

- Subtract linear expressions.
- Solve real-world problems by subtracting linear expressions.



Real-World Link

Lacrosse Middle school girls play a modified version of women's lacrosse to help them acquire good ball-handling skills as they are learning the sport. Some of the statistics that are tracked in lacrosse include number of goals and number of assists.



Subtract Linear Expressions

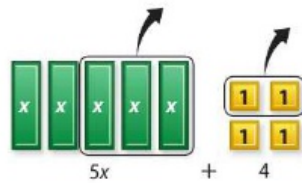
When subtracting linear expressions, subtract like terms. As with adding linear expressions, you can use models and zero pairs if needed.

Example 1



Subtract. Use models if needed.

a. $(5x + 4) - (3x + 2)$



Model the linear expression $5x + 4$.

To subtract $3x + 2$, remove three x -tiles and two 1-tiles.

Then write the linear expression for the remaining tiles.

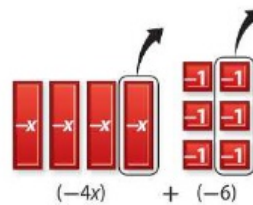
So, $(5x + 4) - (3x + 2) = 2x + 2$.

b. $-4x - 6 - (-x - 3)$

Arrange like terms in columns.
Each term is subtracted.

$$\begin{array}{r} -4x - 6 \\ - \quad -x - 3 \\ \hline \end{array} \quad \rightarrow \quad \begin{array}{r} -4x - 6 \\ + \quad x + 3 \\ \hline -3x - 3 \end{array}$$

So, $(-4x - 6) - (-x - 3) = -3x - 3$.



Got It? Do these problems to find out.

1a. $(7x - 5) - (2x - 1)$

1b. $(6x - 4) - (2x - 4)$

Example 2

 Find $(3x + 2) - (-2x + 1)$.

 Model the linear expression $3x + 2$.

 Since there are no negative x -tiles to remove, add 2 zero pairs of x -tiles.

 Remove 2 negative x -tiles and one 1-tile.

 So, $(3x + 2) - (-2x + 1) = 5x + 1$.

Got It? Do these problems to find out.

2a. Find $(x - 5) - (2x - 1)$.

2b. Find $(6m + 3) - (-4m - 1)$.


Solve Problems with Linear Expressions

You can solve real-world problems by subtracting linear expressions.


Example 3

Watch Out!

 When subtracting $(2x + 24)$, subtract both $2x$ and 24 , which is written as $-2x - 24$.

 The expression $8x + 48.75$ represents the total amount of money the soccer team earned from selling x T-shirts.

 a. If the team had to pay $(2x + 24)$ dollars in expenses, write an expression to represent their profit.

$$\begin{aligned} \text{Total} - \text{Expenses} &= (8x + 48.75) - (2x + 24) && \text{Subtract.} \\ &= 8x + 48.75 - 2x - 24 && \text{Distributive Property} \\ &= 6x + 24.75 && \text{Simplify.} \end{aligned}$$



b. If the soccer team sold 54 T-shirts, what was their profit?

$$\begin{aligned} 6x + 24.75 &= 6(54) + 24.75 && \text{Replace } x \text{ with } 54. \\ &= 324 + 24.75 \text{ or } 348.75 && \text{Simplify.} \end{aligned}$$

So, the soccer team made \$348.75 profit.


Got It? Do this problem to find out.

 3. After working x hours on Monday, Kay earns $9x$ dollars. On Tuesday, she earns $(7x + 3)$ dollars.

- Write an expression to represent how much more she earned on Monday.
- If she worked for 5 hours each day, how much more did she earn on Monday?

Guided Practice



Subtract. Use models if needed. (Examples 1 and 2)

- $(6x + 5) - (3x + 1)$
- $(-4x + 2) - (-2x + 1)$
- $(9x - 4) - (-2x + 1)$
- $(2x + 7) - (x + 1)$

5. The cost of shipping an item that weighs x pounds from Charlotte to Chicago is shown in the table. (Example 3)

Shipping Company	Cost (\$)
Atlas Service	$4x + 2.80$
Mid-Atlantic Service	$3x + 1.25$



$$\begin{array}{r} 4x + 2.80 \\ - 3x + 1.25 \\ \hline x + 1.55 \end{array}$$

- a. Write an expression to represent **how much more** Atlas charges than Mid-Atlantic for shipping an item.

- b. If an item weighs 2 pounds, how much more does Atlas charge for shipping it?

$$\$1x + \$1.55 \text{ when } x = 2 \text{ lbs} \quad \$3.55$$

Independent Practice

Go online for Step-by-Step Solutions



Subtract. Use models if needed. (Examples 1 and 2)

- $(3x + 7) - (x + 5) \quad 2x + 2$
- $(8x - 9) - (3x - 1) \quad (8x + 9) - (3x + -1)$
- $(5x + 6) - (2x + 5) \quad 3x + 1$
- $(-4x + 3) - (-x - 4) \quad -3x + 7$
- $(3x + 7) - (x - 2) \quad 2x + 9$
- $(x + 5) - (2x + 3) \quad -x + 2$

$$\begin{array}{l} 6. \quad 3x - 1x = 2x \\ \text{AND} \\ 7 - 5 = 2 \\ 2x + 2 \end{array}$$

12. **CCSS Model with Mathematics** The expression $5.5x + 2$ represents the number of miles Celeste rode her bike, and $10x$ represents the number of miles that Kimiko rode her bike, in x hours. (Example 3)

- Write an expression to show how many more miles Kimiko rode than Celeste.
- If they each rode for 2 hours, how many more miles did Kimiko ride?

$$\begin{array}{l} 7. \quad -4x - (-1x) = -3x \\ -4 - (-1) = -4 + 1 = -3 \\ \text{AND} \\ 3 - (-4) = 3 + 4 = 7 \\ -3x + 7 \end{array}$$

13. Evan plans to download x songs from a music site on the Internet. The expression $1.29x$ represents the cost at Web site A, and $0.25x + 25$ represents the cost at Web site B. How much more will Evan pay at Web site A than Web site B if he downloads an average of 30 songs per month?

14. The expression $5\frac{1}{2}x + 6$ represents the perimeter of the rectangle shown. Write an expression that represents the length of the rectangle.



$$\begin{array}{l} 8. \quad 8x - 3x = 5x \\ \text{AND} \\ -9 - (-1) = -8 \\ 5x + (-8) \\ \text{or} \\ 5x - 8 \end{array}$$

H.O.T. Problems Higher Order Thinking

- CCSS Identify Structure** Write two linear expressions that have a difference of $4x + 1$.
- CCSS Persevere with Problems** Suppose A and B represent linear expressions. If $A + B = 2x - 2$ and $A - B = 4x - 8$, find A and B .
- Building on the Essential Question** Explain how you can use a rule for subtracting integers to help subtract linear expressions.

13 Evan plans to download x songs from a music site on the Internet. The expression $1.29x$ represents the cost at Web site A, and $0.25x + 25$ represents the cost at Web site B. How much more will Evan pay at Web site A than Web site B if he downloads an average of 30 songs per month?



SITE A - SITE B

$$(1.29x) - (0.25x + 25)$$

$$(1.29x + 0) - (0.25x + 25)$$

$$1.29x - 0.25x = 1.04x \qquad 0 - 25 = -25$$

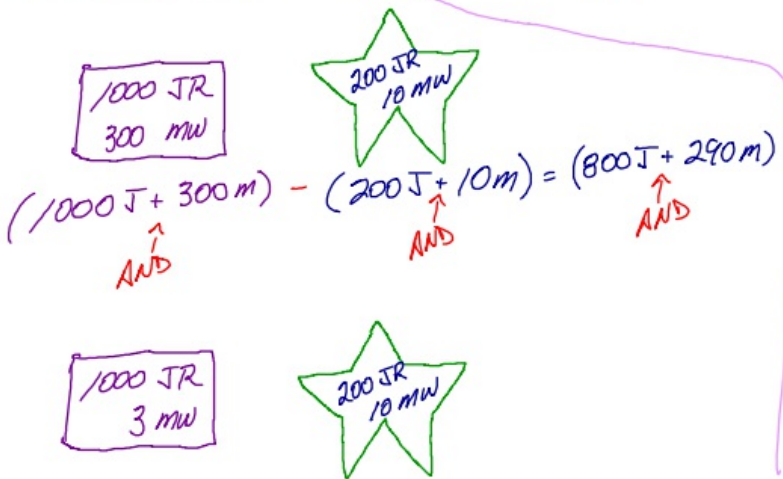
$1.04x - 25$ DIFFERENCE BETWEEN THE COST AT SITE A AND SITE B

$$1.04(30) - 25$$

$$1.04 = (1 + 0.04)^{30}$$

$$30 + 1.20 = 31.20$$

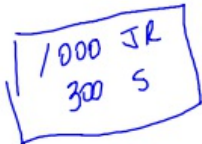
$$31.20 - 25 = \boxed{\$6.20}$$



13 Evan plans to download x songs from a music site on the Internet. The expression $1.29x$ represents the cost at Web site A, and $0.25x + 25$ represents the cost at Web site B. How much more will Evan pay at Web site A than Web site B if he downloads an average of 30 songs per month?

$A - B$

JR S



$$(1000J + 300S) - (35J + 5S)$$

$$965J + 295S$$

$$(1.29x) - (0.25x + 25)$$

$$[1.29(30)] - [0.25(30) + 25]$$

$$(1.29x + 0) - (0.25x + 25)$$

$$1.29 - 0.25 = 1.04$$

$$0 - 25 = -25$$

$$1.04x - 25$$

$$1.04(30) - 25 =$$

$$31.2 - 25 = 6.2$$

$\$6.20$

$$30(1 + 0.04)$$

$$30 + 1.2$$



Subtract. Use models if needed. (Examples 1 and 2)

1. $(6x + 5) - (3x + 1) = 3x + 4$

3. $(9x - 4) - (-2x + 1)$

1. $6x - 3x = 3x$
 $5 - 1 = 4$

~~2. $(-4x + 2) - (-2x + 1) = -2x + 3$~~

4. $(2x - 7) - (x + 1)$
 $-4 - (-2) = -2$

2. $-4x - (-2x) = -2x$
 $2 - (-1) = 2 + 1 = 3$

3. $(9x - 4) - (-2x + 1)$
 $-4 - 1 = -5$
 $//x + -5$

$(2x - 7) - (1x + 1)$
 $x - 8$ OR $x + -8$

$9 - 5 = 4$



Standardized Test Practice

18. Subtract.

$$(-3x + 4) - (-7x - 6)$$

A $-10x - 2$

B $-10x + 10$

C $4x - 2$

D $4x + 10$

$(-3x+4) - (-7x-6)$
 $-3 - (-7) = 4$
 $4 - (-6) = 10$
 $4x + 10$

19. Jorge bought x tickets to attend a football game and a baseball game. The expression $8x + 62$ represents the total cost of the football game, and $9x + 34$ represents the total cost of the baseball game. How much more did the football game cost if Jorge bought 7 tickets for each game?

F \$35

H \$11

G \$21

J \$7

20. The length of a rectangle is $7x - 4$. The width of the rectangle is $5x + 1$. Which expression represents the difference between the length and the width of the rectangle?

A $2x - 3$

B $2x + 3$

C $2x - 5$

D $2x + 5$

$(7x-4) - (5x+1)$
 $7-5 = 2$
 $-4-1 = -5$
 $2x-5$ or $2x-5$

21. **Short Response** The expression $3x + 2$ represents the number of miles Emma walked in x hours. Lea walked $4x - 1$ miles in x hours. Write an expression that represents how much farther Lea walked than Emma.

$(4x-1) - (3x+2)$
 $4-3 = 1$ | x | $-1-2 = -3$
 $x-3$
 $-1+(-2) = -3$ | $x+(-3)$



Common Core Review

Solve each problem. **7.RP.2**

22. What is 15% of 80?

24. 5 is 4% of what number?

26. 17 is what percent of 20?

23. 46 is what percent of 115?

25. Find 15% of 325.

27. 14 is 20% of what number?

Use the Distributive Property to write each expression as an equivalent expression. **7.EE.1**

28. $6(n - 3)$

29. $(w + 9)8$

30. $-7(a + 5)$

31. $-4(-b - 2)$

32. There are 21 birds at a bird sanctuary, 9 of which are parrots. Write the ratio of parrots to total birds as a fraction in simplest form. **7.RP.1**

33. In a survey about favorite movies, 54 out of 120 people preferred comedies. What percent of the people in the survey preferred comedies? **7.RP.3**

34. The temperature in Bismarck, North Dakota, is 13°F at 9 A.M. It is -3°F at 1 P.M. What is the difference in temperature between 9 A.M. and 1 P.M.? **7.NS.3**

Evaluate each expression if $a = 8$, $b = -4$, and $c = -15$. **6.EE.2a**

35. $a + c$

36. bc

37. $2a + 5b$

38. abc

39. $3ac - b$

40. $b(a + c)$

41. $ab + c$

42. $4(a - b)$

43. $3b - 5c$

Need more practice? Download Extra Practice at connectED.mcgraw-hill.com. **313**