

Solving Addition Equations

(pages 476–479)



You can use cups and counters to model solving addition equations. You can then use the same pattern as you solve addition equations with paper and pencil.

<p>Solving Addition Equations</p>	<p>In the model using counters and cups, the cup is the model for a variable (a letter that represents an unknown number). To solve an equation, you get the variable by itself on one side of the equation, with all of the counters on the other side of the equation.</p> <p>To solve an addition equation with paper and pencil</p> <ul style="list-style-type: none"> • Circle the variable (cup) you will get by itself on one side of the equation. • Ask yourself “What do I need to do to UNdo what has been done to this variable?” • Then do the same thing to each side of the equation. Your variable (cup) will then be by itself on one side of the equation, and your numbers (counters) will be on the other side of the equation.
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EXAMPLES

A Solve $8 + y = 10$.

$$8 + y = 10 \quad \text{To get } y \text{ alone, you must undo adding 8.}$$

$$8 + y = 10 \quad \text{Subtract to undo adding 8.}$$

$$\begin{array}{r} -8 \\ 8 + y = 10 \\ \hline y = 2 \end{array} \quad \text{Subtract 8 from each side.}$$

$$8 + 2 = 10 \checkmark \quad \text{Check by replacing } y \text{ with 2.}$$

B Find the value of n if $n + (-2) = 7$.

$$n + (-2) = 7 \quad \text{To get } n \text{ alone, you must undo adding } (-2).$$

$$n + (-2) = 7 \quad +2 \text{ is the opposite of } (-2).$$

$$\begin{array}{r} +2 \\ n + (-2) = 7 \\ \hline n = 9 \end{array} \quad \text{Do the same thing to each side.}$$

$$9 + (-2) = 7 \checkmark \quad \text{Check by replacing } n \text{ with 9.}$$

Try These Together

1. Solve $-3 = b + 4$.

HINT: You can either subtract 4 or add (-4) to each side of the equation.

2. Solve $t + 5 = -14$.

HINT: Subtract 5 from each side of the equation.

PRACTICE

Solve each equation. Use cups and counters if necessary.

3. $x + 7 = 11$

4. $y + 2 = 6$

5. $10 + m = 13$

6. $2 + n = 11$

7. $r + (-1) = 4$

8. $16 + t = 26$

9. $12 + w = -2$

10. $4 + z = 9$

11. Find the value of a if $a + 13 = 26$.

12. What is the value of b if $9 + b = -1$?



13. **Standardized Test Practice** Find the value of x if $x + 10 = 95$.

A 25

B 85

C 95

D 75

Answers: 1. -7 2. -19 3. 4 4. 4 5. 3 6. 9 7. 5 8. 10 9. -14 10. 5 11. 13 12. -10 13. B

Solving Subtraction Equations

(pages 480–483)



You can use cups and counters to model solving subtraction equations. You can also rewrite a subtraction equation as an addition equation and solve with paper and pencil.

Solving Subtraction Equations	<p>In the model using counters and cups, the cup models the variable (a letter that represents an unknown number). To solve an equation, you get the variable by itself on one side of the equation.</p> <p>To solve a subtraction equation</p> <ul style="list-style-type: none"> • Rewrite the subtraction equation as an addition equation. • Ask yourself, “What do I need to do to UNdo what has been done to this variable?” • Then do the same thing to each side of the equation.
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EXAMPLES

A Solve $y - 7 = 12$.

$$y - 7 = 12$$

$$y + (-7) = 12 \quad \text{Rewrite as an addition equation.}$$

$$y + (-7) = 12 \quad \text{The opposite of } (-7) \text{ is } 7.$$

$$\begin{array}{r} +7 \quad +7 \\ y = 19 \end{array} \quad \text{Add 7 to each side.}$$

$$19 - 7 = 12 \quad \checkmark \text{ Check by replacing } y \text{ with } 19.$$

B Find the value of n if $n - (-2) = 8$.

$$n - (-2) = 8 \quad \text{To get } n \text{ alone, you must undo subtracting } (-2).$$

$$n + 2 = 8 \quad \text{Subtracting } (-2) \text{ is the same as adding } 2. \text{ The opposite of adding } 2 \text{ is subtracting } 2.$$

$$\begin{array}{r} -2 \quad -2 \\ n = 6 \end{array} \quad \text{Do the same thing to each side.}$$

$$6 - (-2) = 8 \quad \checkmark \text{ Check by replacing } n \text{ with } 6.$$

Try These Together

1. Solve $x - 4 = -3$.

HINT: Rewrite as $x + (-4) = -3$ and add 4 to each side.

2. Solve $p - (-7) = -20$.

HINT: Rewrite as $p + 7 = -20$.

PRACTICE

Solve each equation. Use cups and counters if necessary.

3. $h - 5 = 2$

4. $g - 8 = 1$

5. $-3 = j - 5$

6. $k - (-4) = 10$

7. $n - (-6) = 12$

8. $r - (-1) = 6$

9. $t - 7 = 2$

10. $s - 16 = 5$

11. $d - 8 = -2$

12. $f - 10 = 5$

13. $w - 4 = -4$

14. $x - 9 = 3$

15. Find the value of z if $z - 3 = -2$.

16. If $q - (-1) = 4$, what is the value of q ?

17. **Standardized Test Practice** Martina spent \$1 on a snack after school and had \$4 left. How much money did she have before she bought the snack?

A \$6

B \$4

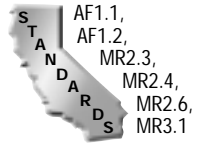
C \$3

D \$5

Answers: 1. 1 2. -27 3. 7 4. 9 5. 2 6. 6 7. 6 8. 5 9. 9 10. 21 11. 6 12. 15 13. 0 14. 12 15. 1 16. 3 17. D

Solving Multiplication and Division Equations

(pages 484–487)



You can use cups and counters to model solving multiplication and division equations. You can also solve an equation with paper and pencil by undoing what has been done.

Solving Multiplication and Division Equations	<ul style="list-style-type: none"> You need to get the variable by itself on one side of the equation by undoing what has been done to the variable. Ask yourself, “what do I need to do to UNdo what has been done to this variable?” Divide to undo multiplication. Multiply to undo division. Do the same to each side of the equation.
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EXAMPLES

A Solve $8y = 24$.

$$8y = 24 \quad \text{To get } y \text{ alone, you must undo multiplying by 8.}$$

$$8y = 24 \quad \text{Divide to undo the multiplication.}$$

$$\frac{8y}{8} = \frac{24}{8} \quad \text{Divide each side by 8.}$$

$$y = 3$$

$$8(3) = 24 \checkmark \quad \text{Check by replacing } y \text{ with 3.}$$

B Find the value of n if $\frac{2}{3}n = 10$.

$$\frac{2}{3}n = 10 \quad \text{To get } n \text{ alone, you must undo multiplying by } \frac{2}{3}.$$

$$\frac{2}{3}n = 10 \quad \text{Divide each side by } \frac{2}{3}, \text{ which is the same as multiplying by the reciprocal, } \frac{3}{2}.$$

$$\frac{3}{2}\left(\frac{2}{3}n\right) = \frac{3}{2}(10) \quad \text{Reciprocals multiply to 1.}$$

$$n = 15$$

$$\frac{2}{3}(15) = 10 \checkmark \quad \text{Check by replacing } n \text{ with 15.}$$

Try These Together

1. Solve $2.7p = -10.8$.

HINT: Divide each side by 2.7.

2. Solve $\frac{1}{6}q = 5$.

HINT: Multiply each side by 6.

PRACTICE

Solve each equation. Use cups and counters if necessary.

3. $3b = 9$

4. $2g = 10$

5. $16 = 2x$

6. $5q = 25$

7. $54 = 6r$

8. $15 = 1p$

9. $24 = 8k$

10. $10t = 40$



11. Standardized Test Practice Jalisa has to take 3 teaspoons of medicine for her cold every day until the medicine is gone. If there are 33 teaspoons of medicine in the bottle, how many days will she have to take medicine?

A 11

B 9

C 10

D 12

Answers: 1. -4 2. 30 3. 3 4. 5 5. 8 6. 5 7. 9 8. 15 9. 3 10. 4 11. A

Solving Two-Step Equations

(pages 488–491)



A two-step equation involves two different operations such as addition and multiplication. To solve a two-step equation, you work backward, reversing the order of operations.

**Solving
Two-Step
Equations**

To get the variable alone on one side of the equation

- First, undo the number that is added or subtracted.
- Second, undo the number that multiplies or divides the variable.

EXAMPLES
A Solve $3x + 7 = -5$.

$$3x + 7 = -5 \quad \text{To get } x \text{ alone, undo adding 7 first.}$$

$$3x = -12 \quad \text{Subtract 7 from each side.}$$

$$3x = -12 \quad \text{Second, undo multiplying by 3.}$$

$$\frac{3x}{3} = \frac{-12}{3} \quad \text{Divide each side by 3.}$$

$$x = -4$$

$$3(-4) + 7 = -5 \quad \checkmark \quad \text{Check by replacing } x \text{ with } -4.$$

B Solve $4 - 5p = 14$.

$$4 - 5p = 14 \quad \text{To get } p \text{ alone, undo adding 4 first.}$$

$$-5p = 10 \quad \text{Subtract 4 from each side.}$$

$$-5p = 10 \quad \text{Second, undo multiplying by } -5.$$

$$\frac{-5p}{-5} = \frac{10}{-5} \quad \text{Divide each side by } -5.$$

$$p = -2$$

$$4 - 5(-2) = 14 \quad \checkmark \quad \text{Check by replacing } p \text{ with } -2.$$

Try These Together
1. Solve $\frac{1}{3}q - 4 = 8$.

HINT: Add 4 to each side and then multiply by 3.

2. Solve $7 = 3y + 1$.

HINT: First subtract 1 from each side and then divide each side by 3.

PRACTICE
Solve each equation.

3. $2x + 4 = 8$

4. $10y + 5 = 45$

5. $4z + 2 = 14$

6. $5k + 10 = 50$

7. $6t - 9 = 9$

8. $5m + 10 = 70$

9. $8s - 4 = 28$

10. $9h - 5 = 40$

11. $15 = -3p + 9$


12. $14 = -5q - 1$

13. $26 = 3j + 2$

14. $40 = 2d + 20$

15. Five more than twice a number is 37. Find the number.

16. Eight less than three times a number is nineteen. What is the number?


17. Standardized Test Practice Devin spent \$34 at the music store. He bought two CDs for the same price each and a tape for \$10. How much did each CD cost?

A \$15

B \$5

C \$12

D \$17

Answers: 1. 36 2. 2 3. 2 4. 4 5. 3 6. 8 7. 3 8. 12 9. 4 10. 5 11. -2 12. -3 13. 8 14. 10 15. 16 16. 9 17. C



When you say “ y is a **function** of x ,” this means that the value of y depends on the value of x . If you know the input value for x , you can find the output value for y if you know the function rule. A **function table** shows you the input (x) and output (y) values for a certain function rule.

Making Function Tables and Finding Function Rules	<ul style="list-style-type: none"> To find the output values for a function table, substitute the input values for the variable in the function rule. To find the function rule when you have the function table, study the relationship between each input and output.
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EXAMPLES

A Complete the function table.

input (n)	output ($n + 2$)	
-1		$-1 + 2 = 1$
0		$0 + 2 = 2$
2		$2 + 2 = 4$

B Find the rule for the function table.

input (n)	output (?)	
1	2	Notice that the output is 1 less than three times n . The rule is $3n - 1$.
2	5	
3	8	

Try These Together

- If the input values are 3, 5, and 6, and the corresponding output values are 7, 11, and 13, what is the function rule?
HINT: Notice that 7 is 1 more than twice 3.
- If the function rule is $5n + 2$, what is the output for an input of 0?
HINT: Substitute 0 for n in the rule and simplify.

PRACTICE

Complete each function table.

3.

input (n)	output ($n - 2$)
2	
4	
8	

4.

input (n)	output ($n + 3$)
1	
3	
5	

- What is the output for an input of 7 if the function rule is $4n$?
- If the output is 4 and the function rule is $n + 3$, what is the input?



7. **Standardized Test Practice** If the function rule is $3n - 4$, what is the output for an input of 3?

- A** 12 **B** 9 **C** 4 **D** 5

Answers: 1. $2n + 1$ 2. 2 3. 0, 2, 6 4. 4, 6, 8 5. 28 6. 1 7. D

Graphing Functions

(pages 500–503)



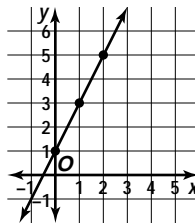
You can graph a function rule or equation on a coordinate system.

Graphing Functions	<p>When you have a function table, graph the function with these steps.</p> <ul style="list-style-type: none"> • Write ordered pairs (input, output) from the function table. • Graph each ordered pair on the coordinate system. • Join the graphed points with a line. <p>When you have a function rule, make a function table for 3 or 4 input values and then graph that table with the steps above.</p>
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EXAMPLE

Graph $y = 2x + 1$.

input	function rule	output	ordered pairs
x	$2x + 1$	y	(x, y)
0	$2(0) + 1$	1	$(0, 1)$
1	$2(1) + 1$	3	$(1, 3)$
2	$2(2) + 1$	5	$(2, 5)$



PRACTICE

Graph the functions represented by each function table.

1.

input	output
1	-1
3	1
5	3

2.

input	output
-4	-1
0	3
4	7

Complete each function table. Then graph the function

3.

n	$n - 1$
2	
4	
6	

4.

n	$n + 4$
-1	
-2	
-3	

5. **Fitness** Jakira is training for a triathlon. She runs 3 miles every day. What is the function rule that you could use to determine how far Jakira runs if the input is the number of days?



6. **Standardized Test Practice** What is y (the output) for the function rule $4x$ if $x = 10$?

A 6

B 40

C 80

D 4

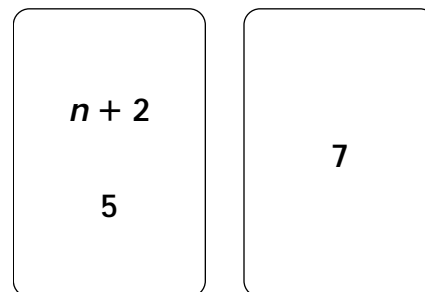
Answers: 1–2. See Answer Key. 3–4. See Answer Key for graphs. 3. 1, 3, 5 4. 3, 2, 1 5. $3n$ 6. B

Chapter 12 Review



Function Flash

You and your parent can use index cards or slips of paper to help you study functions. You can put a function rule and an input value on the front and the output value on the back. Fill in the table below to show what pieces of information you might put on various cards.



Front

Back

	Rule	Input	Output
1.	$n - 4$	2	
2.	$3n$		9
3.	$n + 3$		5.3
4.	$2n - 1$	$1\frac{1}{2}$	
5.	$2n + 1$		3

6. You can also make cards with input and output values on the front and the function rule on the back. What rule would go on the back of the card shown?

Input	Output
0	4
2	6
4	8

Answers are located on p. 111.