

Topic 4
Lesson 4-1: Understand Equations and Solutions

Equation: A mathematical sentence that uses an _____ sign to compare two _____.

Try It! Tracy received a \$21.00 gift card for phone apps. She has used \$9.00 of the value and wants to buy one more app from the list above to use up the balance. Complete the bar diagram and use the equation $\$21.00 = x + \9.00 to determine which app she should buy.



The solution is , so Tracy should buy the app.

In 5–8, substitute each given value of the variable to find which, if any, is a solution of the equation.

5. $d + 9 = 35$ $d = 16, 22, 26, 36$

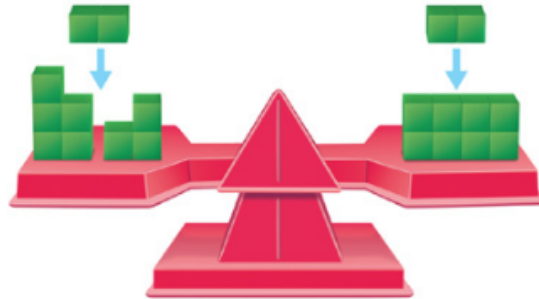
6. $14n = 35$ $n: \{2, 3, 4\}$

7. $13 - g = 8$ $g = 4, 5, 6$

8. $-5 = -36 \div m + m$ $m: \{-4, -6, -8, -9\}$

Lesson 4-2 Apply Properties of Equality

_____ Property of Equality: states that adding the same amount to each side of an equation produces an equivalent equation.



$$(5 + 3) + 2 = 8 + 2$$

_____ Property of Equality: states that subtracting the same amount from each side of an equation produces an equivalent equation.

$$5 + 3 = 8$$

$$(5 + 3) - 2 = 8 - 2$$

_____ Property of Equality: states that multiplying each side of an equation by the same amount produces an equivalent equation.

$$5 + 3 = 8$$

$$(5 + 3) \times 2 = 8 \times 2$$

_____ Property of Equality: states that dividing each side of an equation by the same amount produces an equivalent equation.

$$5 + 3 = 8$$

$$(5 + 3) \div 2 = 8 \div 2$$

If one side of the equation $-23 + 43 = 20$ is multiplied by 3, what needs to be done to the other side of the equation to keep the sides equal?

Choose Efficient Methods If one side of the equation $x + 5 = 8$ has 9 added to it and the other side has $(4 + 5)$ added to it, will the equation stay true? Explain

In 5 and 6, answer yes or no and explain why or why not.

5. If $23 + 37 = 60$, does $23 + 37 + 9 = 60 + 9$?

6. If $16 + 1 = 17$, does $(16 + 1) - 1 = 17 - 2$?

In 9–12, tell which property of equality was used.

9. $5m + 4 = 19$

$$5m + 4 - 3 = 19 - 3$$

10. $-3t = 20$

$$-3t \div 2 = 20 \div 2$$

11. $\frac{n}{6} = 9$

$$\left(\frac{n}{6}\right) \times 5 = 9 \times 5$$

12. $-5b - 6 = 14$

$$(-5b - 6) + 2 = 14 + 2$$

13. **Communicate and Justify** If $r + 9 = 42$, does $r + 9 - 9 = 42 + 9$? Why or why not?

Lesson 4-3 Write and Solve Addition and Subtraction Equations

Goal: Isolate the variable so you know what it equals!

1. Use the _____ (opposite) _____ to isolate the _____.
2. What you do to one side you must do to the _____.

$$n + 7 = 25$$

$$t - 8 = 15$$

$$-3 + y = 21$$

Try It! Cabrini had some markers. After she bought 12 more markers, she had 16. How many markers did Cabrini have at the start?

Let n represent the number of markers Cabrini had at the start.

Solve the addition equation.

$$n + 12 = 16$$

$$n + 12 \boxed{} = 16 \boxed{}$$

$$n = \boxed{}$$

Cabrini had $\boxed{}$ markers at the start.

$$y - 12 = -89$$

$$80 + r = 160$$

$$-60 = x - 16$$

$$20 = y + 12$$

$$x + 2 = -19$$

$$z - 313 = 176$$

Apply Math Models Aliyah had t seashells. After she bought 8 more seashells, she had 24 seashells. Write and solve an equation to find the number of seashells Aliyah started with.

Lesson 4-4 Write and Solve Multiplication and Division Equations

Goal: Isolate the variable so you know what it equals!

1. Use the _____ (opposite) _____ to isolate the _____.
2. What you do to one side you must do to the _____.

Juan charged the same amount for each painting. How much did he charge for each painting?

Analyze and Persevere

How do the quantities represented in the bar diagram and balance correspond to the equation?



In 10–13, solve each equation.

10. $23d = 2,392$

11. $-74f = -6,142$

12. $y \div 11 = -987$

13. $r \div 187 = 9$

In 18–21, solve each equation.

18. $d \div 2 = -108$

19. $7,200 = 800s$

20. $\frac{x}{3} = 294$

21. $-99 = -3x$

Apply Math Models There are 30 students in the drama club. They are carpooling in 5 vans to perform a play. They want each van to carry an equal number of students. Let s be the number of students in each van. Write and solve a multiplication equation to find the number of students in each van.

Mariana and her 4 sisters spent an equal amount of time cleaning their home. Their parents added their times. They found that each of the 5 girls spent 3 hours cleaning. Let c be the total number of hours the girls spent cleaning. Write and solve a division equation to find the total number of hours the girls spent cleaning.

Lesson 4-5 Write and Solve Equations with Rational Numbers

Same thing we've been doing-but now we have decimals and fractions! Woohoo!

Examples:

$$w - 3.2 = 5.6$$

$$9.6 = 1.6y$$

$$48.55 + k = 61.77$$

$$6. \ t - \frac{2}{3} = 25\frac{3}{4}$$

$$7. \ \frac{f}{2} = \frac{5}{8}$$

$$8. \ 13.27 = t - 24.45$$

$$9. \ r \div 5.5 = 18.2$$

$$11. \ 1.8x = 40.14$$

$$12. \ 17.3 + v = 22.32$$

Lesson 4-6/4-7
Write and Graph Inequalities

$<$	$>$	\leq	\geq

An _____ is a mathematical sentence that contains $<$ (less than), \leq (less than or equal to), $>$ (greater than), \geq (greater than or equal to), or \neq (not equal to).

There will be _____ than 1 solution.

6. The width of the picture, w , is shorter than 8.5 inches.

7. A value, v , does not equal $-2\frac{1}{2}$.

8. Steve's height, h , is at least 48 inches.

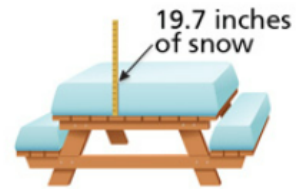
9. A number, n , is greater than -22 .

10. LaQuinta's baby brother's age, b , is not 24 months.

11. The number of quarters, q , in the jar is less than 75.

Choose Efficient Methods A certain airplane must carry no more than 134 passengers during a flight. Write an inequality to represent the number of passengers, p , that would **NOT** be allowed during this flight.

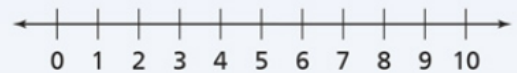
Apply Math Models A city in New England just experienced its greatest 1-day snowfall. Write an inequality to represent a snowfall that would beat this record.



Graph Inequalities

- Choose a dot!
 Closed Dot: _____ (the number IS part of the solution)
 Open Dot: _____ (the number IS NOT part of the solution)
- Then _____ the direction that includes possible answers.

Try It! Graph all of the solutions of $x < 8$.



To graph $x < 8$, draw a(n) circle at 8 on the number line.

7 and 4 are two of the many possible solutions of the inequality.

Shade the solutions to the of the circle you drew at 8.

$$n < 10$$



$$b > 7$$



$$c > 3.3$$



$$g \leq 12$$



Represent and Connect In 6 and 7, write the inequality that each graph represents.



z



d

In 8–11, substitute each given value of the variable to find which, if any, is a solution of the inequality.

8. $8 > w$ $w: \{4.3, 5.3, 8.3, 9\}$

9. $t > -25$ $t = -23, -24.1, -25, -27.5$

10. $4 \geq g$ $g = 0, 4, 5, 6$

11. $y \geq 8$ $y: \{4, 5, 6, 7\}$