

Lacrosse Coach Everly wants to order uniform shirts for all the players p on her women's lacrosse team. Each shirt costs \$20. There is an additional cost d for a player to put her name on the shirt. Use the steps below to write an equation for the total cost c if every player on the team orders a shirt with her name on it.

1. Circle the variables above and underline what they represent.
2. Write an expression that represents the cost of one shirt with a player's name on it.

$$\boxed{20} + \boxed{d}$$

cost of shirt + cost of name

3. Use the expression to write an equation that can be used to find the total cost if every player on the team orders a shirt with her name on it.

$$\boxed{p} (\boxed{20} + \boxed{d}) = c$$

number of players (cost of shirt + cost of name) = total cost

4. Suppose the total cost for 15 players to buy shirts is \$420. Write an equation to show the total cost of the shirts if all of the players put their names on the shirts.

$$15(20 + d) = 420$$



Check $6(x - 3) + 10 = 2(3x - 4)$

Write the original equation.

$6(5 - 3) + 10 \stackrel{?}{=} 2[3(5) - 4]$

Substitute any value for x.

$6(2) + 10 \stackrel{?}{=} 2(15 - 4)$

Simplify.

$22 = 22 \checkmark$

is all real #s

3. Solve $8(4 - 2x) = 4(3 - 5x) + 4x$.

$8(4 - 2x) = 4(3 - 5x) + 4x$

Write the equation.

$32 - 16x = 12 - 20x + 4x$

Distributive Property

$32 - 16x = 12 - 16x$

Collect like terms.

$+16x = +16x$

Addition Property of Equality

$32 = 12$

Simplify.



False
no solution

The statement $32 = 12$ is *never* true. The equation has no solution and the solution set is \emptyset .

Check $8(4 - 2x) = 4(3 - 5x) + 4x$

Write the equation.

$8[4 - 2(2)] \stackrel{?}{=} 4[3 - 5(2)] + 4(2)$

Substitute any value for x.

$8(0) \stackrel{?}{=} 4(-7) + 8$

Simplify.

$0 \neq -20 \checkmark$

Since $0 \neq -20$, the equation

(work)

a. -20

b. 12

Got it? Do these problems to find out.

a. $-3(9 + x) = 33$

b. $5(a - 7) = 25$

Key Concept

Number of Solutions

	Null Set	One Solution	Identity
Words	no solution	one solution	infinitely many solutions
Symbols	$a = b$	$x = a$	$a = a$
Example	$3x + 4 = 3x$ $4 = 0$	$2x = 20$ $x = 10$	$4x + 2 = 4x + 2$ $2 = 2$
	Since $4 \neq 0$, there is no solution.		Since $2 = 2$, the solution is all numbers.

has no solution.

Got it? Do these problems to find out.

c. $3(6 - 4x) = -2(6x - 9)$

$18 - 12x = -12x + 18$

$18 = 18$

true

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

$6x + 10 = 10x - 20 - 4x$

$6x + 10 = 6x - 20$
 $10 = -20$

false

- c. identity or all numbers
- d. null set or no solution

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$$\text{3} \frac{1}{3}h - 4\left(\frac{2}{3}h - 3\right) = \frac{2}{3}h - 6 \quad 6$$

$\rightarrow +2$

$$\left(\frac{1}{3}h - \frac{8}{3}h + 12\right) = \left(\frac{2}{3}h - 6\right)$$

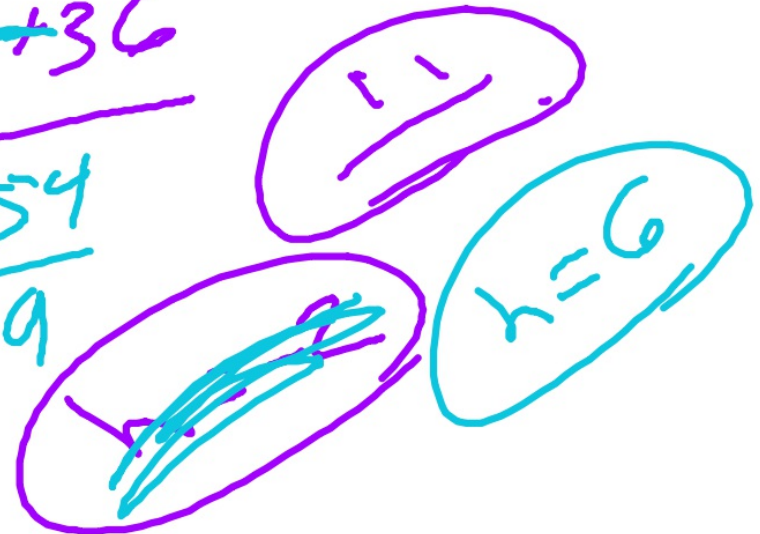
$$1h - 8h + 36 = 2h - 18$$

$$-7h + 36 = 2h - 18$$

$$-2h + 36 \quad -2h + 36$$

$$\frac{-9h = -54}{-9}$$

$$\frac{-54}{-9}$$



Guided Practice



Solve each equation. Check your solution. (Examples 1–3)


1. $-8(w - 6) = 32$ **2**

Show your work.

2. $8z - 22 = 3(3z + 11) - z$ **null set or no solution**

3. Mr. Richards' class is holding a canned food drive for charity. Juliet collected 10 more cans than Rosana. Santiago collected twice as many cans as Juliet. If they collected 130 cans altogether, how many cans did

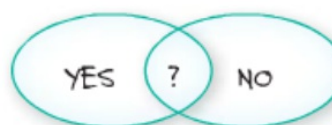
Juliet collect? (Example 4) **35 cans**

4.  **Building on the Essential Question** How many possible solutions are there to a linear equation in one variable? Describe each one.

Sample answer: There are 3 possible solutions to a linear equation in one variable: The null set where there are no solutions, one solution, or infinitely many solutions.

Rate Yourself!

Are you ready to move on?
Shade the section that applies.



For more help, go online to access a Personal Tutor.



FOLDABLES

Time to update your Foldable!



Independent Practice

Go online for Step-by-Step Solutions



Solve each equation. Check your solution. (Examples 1–3)

1. $-12(k + 4) = 60$ **-9**



3 $\frac{1}{3}h - 4\left(\frac{2}{3}h - 3\right) = \frac{2}{3}h - 6$ **6**

2. $8(3a + 6) = 9(2a - 4)$ **-14**

4. $8(c - 9) = 6(2c - 12) - 4c$ **identity or all real numbers**

Copy and Solve Solve each equation. Show your work on a separate piece of paper. (Examples 2 and 3)

5. $-10y + 18 = -3(5y - 7) + 5y$ **null set or no solution**

6. $8(t + 2) - 3(t - 4) = 6(t - 7) + 8$ **62**

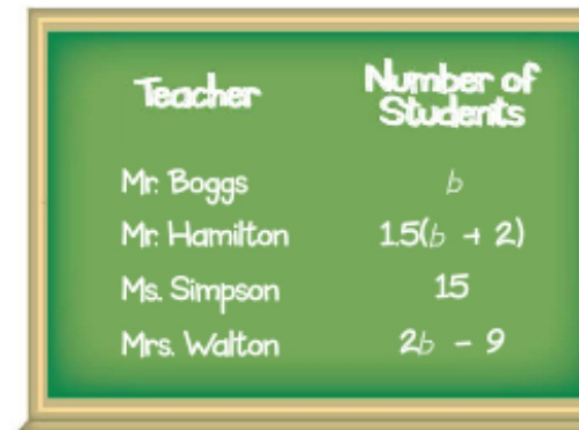
7. $4(5 + 2x) - 5 = 3(3x + 7)$ **-6**

8. $6(2x - 8) + 3 = 15$ **5**

- 9 The school has budgeted \$2,000 for an end-of-year party at the local park. The cost to rent the park shelter is \$150. How much can the student council spend per student on food if each of the 225 students receives a \$3.50 gift? (Example 4) \$4.72

10. **MP Reason Abstractly** The table shows the number of students in each homeroom.

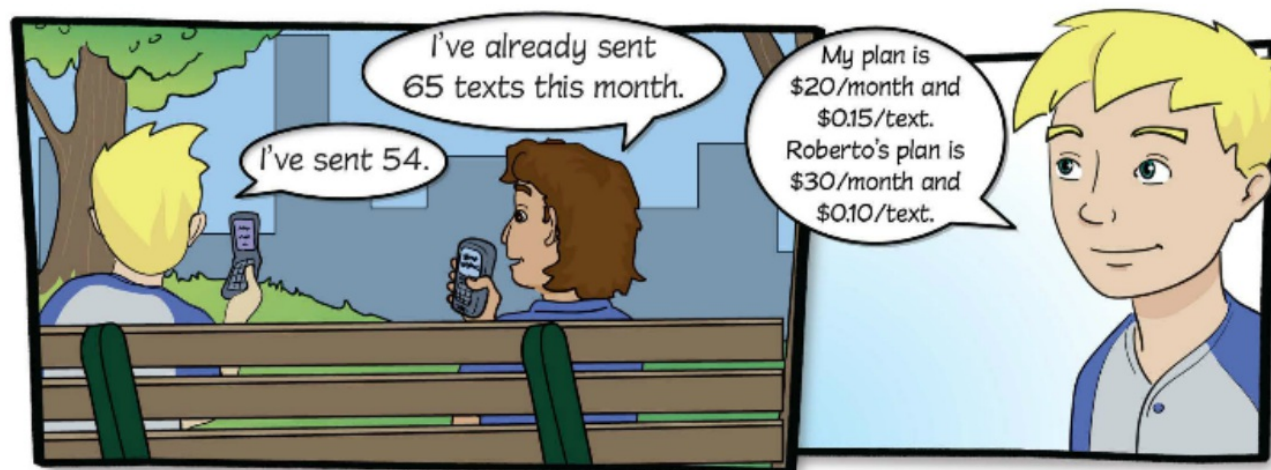
- a. Write an equation to find the number of students in Mr. Boggs' homeroom if the total number of students is 90. $90 = b + 1.5(b + 2) + 15 + (2b - 9)$
or $90 = 4.5b + 9$
- b. Solve the equation from part a to find the number of students in Mr. Boggs' homeroom. 18 students



Teacher	Number of Students
Mr. Boggs	b
Mr. Hamilton	$1.5(b + 2)$
Ms. Simpson	15
Mrs. Walton	$2b - 9$



11. **MP Model with Mathematics** Refer to the graphic novel frame below for Exercises a–b.



- a. Write an equation that can be used to determine the number of text messages Jacob and Roberto can send for their plans to cost the same.

$$20 + 0.15m = 30 + 0.1m$$

- b. Solve the equation from part a to find the number of text messages each person can send for their costs to be the same.

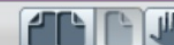
$$m = 200; 200 \text{ messages}$$



H.O.T. Problems Higher Order Thinking

12. **MP Reason Inductively** Does a system of linear equations or never have a solution? Explain.





- b. Solve the equation from part **a** to find the number of text messages each person can send for their costs to be the same.

$m = 200$; 200 messages



H.O.T. Problems Higher Order Thinking

12. **MP Reason Inductively** Does a multi-step equation *always*, *sometimes*, or *never* have a solution? Explain your reasoning.

sometimes; Sample answer: An equation like $2x + 3 = 2x + 5$ has no solution.

13. **MP Persevere with Problems** The perimeter of a rectangle is $8(2x + 1)$ inches. The length of the sides of the rectangle are $3x + 4$ inches and $4x + 3$ inches. Write and solve an equation to find the length of each side of the rectangle.

$2(3x + 4) + 2(4x + 3) = 8(2x + 1)$; 13 in. and 15 in.

14. **MP Model with Mathematics** Write a real-world problem that can be solved using the Distributive Property. Then write and solve an equation for your real-world situation. **Sample answer: The Yeoman family spent \$30 for lunch.**

They bought 5 sandwiches and 5 drinks. Each sandwich cost \$3 more than each drink. How much did each sandwich cost?; $5x + 5(x + 3) = 30$; \$4.50

