

## 5.2 Solving Systems of Linear Equations by Substitution

**Essential Question:** How can you use substitution to solve a system of linear equations?

**Learning Goals:**

- I can solve systems of linear equations by substitution
- I can use systems of linear equations to solve real-life problems

I can solve systems of linear equations by substitution

Solving equations by substitution is a 3-step process:

Step 1: Solve one of the equations for one variable

Step 2: Substitute ↗ into the other equation and solve for the other variable

Step 3: Substitute ↗ into one of the original equations and solve

Solve the system of linear equations by substitution

Examples:

1)  $y = -x + 3$

$3y + 5x = -1$

$3(-x + 3) + 5x = -1$

$-3x + 9 + 5x = -1$

$2x + 9 = -1$

$2x = -10$

$x = -5$

$y = -(-5) + 3$   
 $= 5 + 3$

$y = 8$

$(-5, 8)$

2)  $x - y = -4$

$2x + y = 4$

$x - y = -4$

$x = y - 4$

$x = 4 - 4 = 0$

$x = 0$

$2(y - 4) + y = 4$

$2y - 8 + y = 4$

$3y - 8 = 4$

$3y = 12$

$y = 4$

$(0, 4)$



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### I can solve systems of linear equations by graphing

Example: A theater earns \$3640 from a concert. An orchestra ticket costs three times as much as a balcony ticket. The theater sold 148 orchestra tickets and 76 balcony tickets. Write a system of linear equations that represent this situation. What is the price of each type of ticket?

Define your variables!

$x =$  Price of orchestra tickets

$$148x + 76y = 3640$$

$$x = 3y$$

$y =$  price of balcony tickets

$$148(3y) + 76y = 3640$$

You try:

There are a total of 64 students in a drama club and a yearbook club. The drama club has 10 more students than the yearbook club. Write a system of linear equations that represents this situation. How many students are in each club?

Define your variables!

$x =$  # of drama club

$$x = y + 10$$

$$x + y = 64$$

$y =$  # of yearbook

$$x = 27 + 10$$

$$y + 10 + y = 64$$

$$x = 37 \text{ drama}$$

club students

$$2y + 10 = 64$$

$$\begin{array}{r} 2y + 10 = 64 \\ -10 \quad -10 \\ \hline 2y = 54 \end{array}$$

$$y = 27 \text{ yearbook students}$$

Closure: What I learned today was.....