

## Warm – Up: Applications of Substitution

Two Lourdes students are purchasing grad wear. Lucas purchases three shirts and two hats for \$79.75. Amara buys four shirts and one hat for \$85.50. How much does each shirt and each hat cost?

Let  $x$  represent the cost of each shirt.

Let  $y$  represent the cost of each hat.

Lucas: ①  $3x + 2y = 79.75$

Amara: ②  $4x + y = 85.50$

Isolate  $y$  in ②

③  $y = (85.50 - 4x) \text{ new } ②$

Sub ③ into ①

①  $3x + 2(85.50 - 4x) = 79.75$

$3x + 171 - 8x = 79.75$

$-5x = 79.75 - 171$

$\frac{-5x}{-5} = \frac{-91.25}{-5}$

④  $x = 18.25$

Sub ④ into ③

$y = 85.50 - 4(18.25)$

$y = 85.50 - 73.00$

$y = 12.50$   
∴ Each shirt cost \$18.25 and each hat costs \$12.50

## Introduction to Solving Linear Systems using Elimination

1. Rearrange each equation so that they are in  $Ax + By = C$  form.
2. Eliminate one variable by adding or subtracting the equations.

### Examples

Solve each linear system using elimination.

$Ax + By = C$

a) ①  $3x + 2y = 19$

②  $x + 2y = 9$

① - ②  $\frac{2x}{2} = \frac{10}{2}$

③  $x = 5$

Sub ③ into ②

$(5) + 2y = 9$

$2y = 9 - 5$

$\frac{2y}{2} = \frac{4}{2}$

$y = 2$

∴ The P.O.I. is  $(5, 2)$

b) ①  $3x - 4y = 18$

②  $-3x - 2y = 0$

① + ②  $\frac{-6y}{-6} = \frac{18}{-6}$

③  $y = -3$

Sub ③ into ①

$3x - 4(-3) = 18$

$3x + 12 = 18$

$3x = 18 - 12$

$\frac{3x}{3} = \frac{6}{3}$

$x = 2$

∴ The P.O.I. is  $(2, -3)$

c)  $2x + 4y = 18$

$2x = 4 + 3y$

①  $2x + 4y = 18$

②  $2x - 3y = 4$

① - ②  $\frac{7y}{7} = \frac{14}{7}$

③  $y = 2$

Sub ③ into ①

$2x + 4(2) = 18$

$2x + 8 = 18$

$2x = 18 - 8$

$\frac{2x}{2} = \frac{10}{2}$

$x = 5$

∴ The P.O.I. is  $(5, 2)$

## Solving Linear Systems Using Elimination

1. Determine the point of intersection by using elimination.

$$\begin{aligned} \text{a) } 2x + 3y &= 13 \\ 4x + 3y &= 23 \end{aligned}$$

$$\begin{aligned} \text{b) } 3x + 5y &= 1 \\ 3x - 2y &= -13 \end{aligned}$$

$$\begin{aligned} \text{c) } 5x + 2y &= 7 \\ 3x - 2y &= -15 \end{aligned}$$

$$\begin{aligned} \text{d) } 2x + 4y &= 16 \\ 5y &= 2 + 2x \end{aligned}$$

2. Two friends purchase lunch in the cafeteria. Emily purchases four slices of pizza and two pop for \$12. Anna buys 2 slices of pizza and two pop for \$7.50. Create two equations and use them to determine the cost of each slice of pizza and each pop.

Let  $x$  represent the cost of one slice of pizza.

Let  $y$  represent the cost of one pop.

Answers: 1a) (5, 1), b) (-3, 2), c) (-1, 6), d) (4, 2), 2. Pizza = \$2.25, Pop = \$1.50