

## Solving Linear Systems using Substitution: Part 2

Isolated Variable  $\rightarrow \begin{cases} x = \\ y = \end{cases}$

1. Solve the following equations using substitution.

a) ①  $3x + y = 10$

②  $2x - 4y = 16$

Isolate  $y$  in ①

③  $y = (10 - 3x)$  new ①

sub ③ into ②

$$2x - 4(10 - 3x) = 16$$

$$2x - 40 + 12x = 16$$

$$14x = 16 + 40$$

$$\frac{14x}{14} = \frac{56}{14}$$

④  $x = 4$

sub ④ into ③

$$y = 10 - 3(4)$$

$$y = 10 - 12$$

$$y = -2$$

$\therefore$  The P.O.I. is  $(4, -2)$

b) ①  $5x - 2y = -4$

②  $x - 3y = 7$

Isolate  $x$  in ②

③  $x = (7 + 3y)$  new ②

sub ③ into ①

$$5(7 + 3y) - 2y = -4$$

$$35 + 15y - 2y = -4$$

$$13y = -4 - 35$$

$$\frac{13y}{13} = \frac{-39}{13}$$

④  $y = -3$

sub ④ into ③  
 $x = 7 + 3(-3)$   
 $x = 7 - 9$   
 $x = -2$   
 $\therefore$  The P.O.I. is  $(-2, -3)$   
 $x \quad y$

c) ①  $6x - 1y = 2$

②  $3x + 2y = 26$

Isolate  $y$  in ①

$$\frac{-1y}{-1} = \frac{2 - 6x}{-1}$$

③  $y = (-2 + 6x)$  new ①

sub ③ into ②

$$3x + 2(-2 + 6x) = 26$$

$$3x - 4 + 12x = 26$$

$$15x = 26 + 4$$

$$\frac{15x}{15} = \frac{30}{15}$$

④  $x = 2$

sub ④ into ③

sub ④ into ③

$$y = -2 + 6(2)$$

$$y = -2 + 12$$

$$y = 10$$

$\therefore$  The P.O.I. is  $(2, 10)$

d) ①  $4x + 2y = 8$

②  $3x - 5y = -7$

Isolate  $y$  in ①

$$\frac{2y}{2} = \frac{8 - 4x}{2}$$

③  $y = (4 - 2x)$  new ①

sub ③ into ②

$$3x - 5(4 - 2x) = -7$$

$$3x - 20 + 10x = -7$$

$$13x = -7 + 20$$

$$\frac{13x}{13} = \frac{13}{13}$$

④  $x = 1$

sub ④ into ③

sub ④ into ③  
 $y = 4 - 2(1)$   
 $y = 4 - 2$   
 $y = 2$   
 $\therefore$  The P.O.I. is  $(1, 2)$

## Practice

Solve the following linear systems.

a)  $5x + y = 14$   
 $2x - 3y = 9$

b)  $4x + 4y = -12$   
 $x - 3y = -7$

c)  $3x + 5y = 25$   
 $2x - y = 8$

d)  $3x + 6y = 12$   
 $2x + 2y = 2$

e)  $2x + 4y = 204$   
 $5x + 4y = 210$

f)  $6x - 3y = 9$   
 $4x - 5y = 3$

Answers: a) (3,-1)      b) (-4, 1)      c) (5,2)      d) (-2,3)      e)(2, 50)      f (2, 1)