

## Solving Linear Systems – Strategies

There are three techniques used to solve linear systems:

1. Graphing – is an efficient technique to use when the equations are presented in  $y = mx + b$  form and/or a Cartesian grid is provided.
2. Substitution – is an optimal technique to use when at least one of the equations has a variable that is isolated or a variable that could easily be isolated (coefficient of 1 or -1).
3. Elimination – might be an ideal method to use when a variable cannot easily be isolated (substitution is not ideal) or the coefficients of one variable are the same or opposite.

Practice

Solve the following systems using an optimal strategy.

1. a)  $\begin{cases} \textcircled{1} 2x + 4y = 6 \\ \textcircled{2} 3x - 5y = -13 \end{cases}$

$3 \times \textcircled{1} = \textcircled{3} 6x + 12y = 18$   
 $2 \times \textcircled{2} = \textcircled{4} 6x - 10y = -26$

$\textcircled{3} - \textcircled{4}$   
 $\frac{22y}{22} = \frac{44}{22}$

$\textcircled{5} y = 2$

Sub  $\textcircled{5}$  into  $\textcircled{1}$

$2x + 4(2) = 6$   
 $2x + 8 = 6$   
 $2x = 6 - 8$   
 $\frac{2x}{2} = \frac{-2}{2}$

$x = -1$   
 $\therefore$  The P.O.I. is  $(-1, 2)$

b)  $\begin{cases} \textcircled{1} 3x - 2y = 11 \\ \textcircled{2} 2x + 3y = 16 \end{cases}$

$2 \times \textcircled{1} = \textcircled{3} 6x - 4y = 22$   
 $3 \times \textcircled{2} = \textcircled{4} 6x + 9y = 48$

$\textcircled{3} - \textcircled{4}$   
 $\frac{-13y}{-13} = \frac{-26}{-13}$

$\textcircled{5} y = 2$

Sub  $\textcircled{5}$  into  $\textcircled{2}$

$2x + 3(2) = 16$   
 $2x + 6 = 16$   
 $2x = 16 - 6$   
 $\frac{2x}{2} = \frac{10}{2}$

$x = 5$   
 $\therefore$  The P.O.I. is  $(5, 2)$

2. The Ironman Fitness club charges an annual fee and an hourly <sup>rate</sup> fee to use their gym.

Arnold goes to the gym for 94 hours and pays a total fee of \$421. Cassie pays \$293 to use the gym for 62 hours. What is the annual fee and hourly <sup>rate</sup> fee?

Let  $a$  represent the annual fee (\$).  
 Let  $h$  represent the hourly rate (\$/hour).

Arnold:  $\textcircled{1} a + 94h = 421$

Cassie:  $\textcircled{2} a + 62h = 293$

Isolate  $a$  in  $\textcircled{2}$

$\textcircled{3} a = (293 - 62h)$  new  $\textcircled{2}$

Sub  $\textcircled{3}$  into  $\textcircled{1}$

$(293 - 62h) + 94h = 421$

$293 + 32h = 421$

$32h = 421 - 293$

$\frac{32h}{32} = \frac{128}{32}$

$\textcircled{4} h = 4$

Sub  $\textcircled{4}$  into  $\textcircled{3}$

$a = 293 - 62(4)$

$a = 293 - 248$

$a = 45$

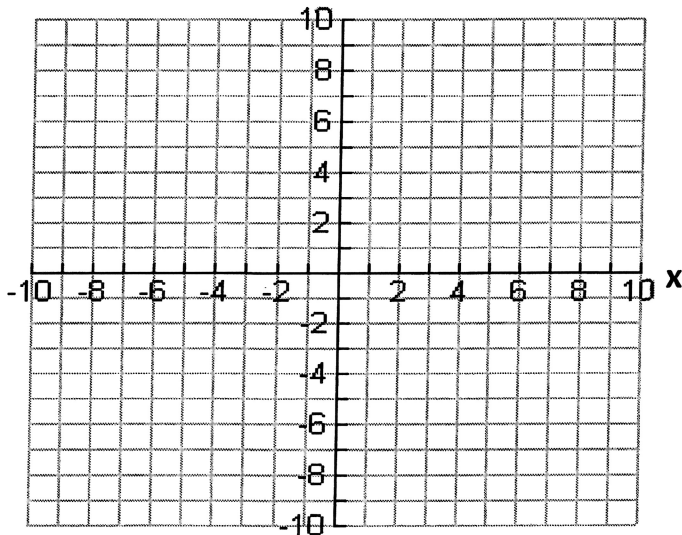
$\therefore$  The hourly rate is \$4/hr.  
 The annual fee is \$45.

## Strategies for Solving Linear Systems - Practice

1. Use an optimal strategy to solve each linear system.

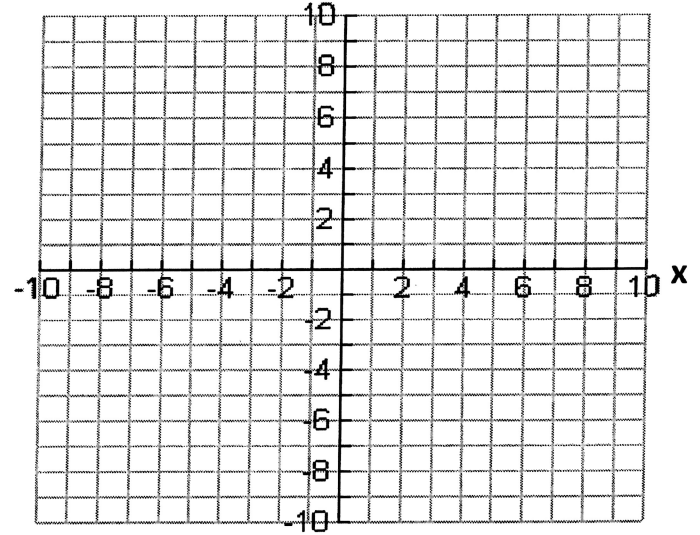
a)  $y = -3x + 1$

$y = x + 5$     y



b)  $y = 2x$

$y = -\frac{1}{3}x + 7$     y



c)  $3x + 5y = 4$

$8x - y = 25$

d)  $2x - 4y = 4$

$3x - 4y = 2$

e)  $2x - 5y = -21$

$3x + 2y = 16$

2. Four slices of pizza and three pop costs \$13.50. Three slices of pizza and two pop costs \$9.75. How much does one slice of pizza and one pop cost?

3. Your school hosted a charity volleyball tournament for mental health awareness. The event charged \$5 for adults and \$3 for students. A total of 350 people attended the charity event. If the total revenue (money brought in from player registrations) was \$1350, how many students and adults attended?

4. The math department wants to purchase spirit wear for the school to celebrate Pi day (March 14<sup>th</sup>). Wellington Wears charges a one-time design fee of \$400 plus \$25 per shirt. Noah's Team charges a flat fee of \$50 plus \$30 per shirt. Which company is cheaper? Solve this question without creating a graph.

Answers: 1. a) (-1,4) b) (3, 6) c) (3, -1) d) (-2, -2) e) (2, 5)      2. pizza = \$2.25, pop = \$1.  
3. 150 adults and 200 students      4. If less than 70 shirts, choose Noah's Team.  
If more than 70 shirts, choose Wellington Wears. If exactly 70 shirts, choose either.