Math 10 **Solving Systems of Linear Equations Graphically**

When Carmen visited Vancouver, she had to decide whether it was worth it to pay $3 per transit ticket, or buy a Compass card for $6 and pay $2.40 per ticket. To help her make her decision, she calculated the number of times she would need to buy a ticket for the Compass card to pay for itself. What equation would help her determine the answer?

x = number of tickets
y = cost

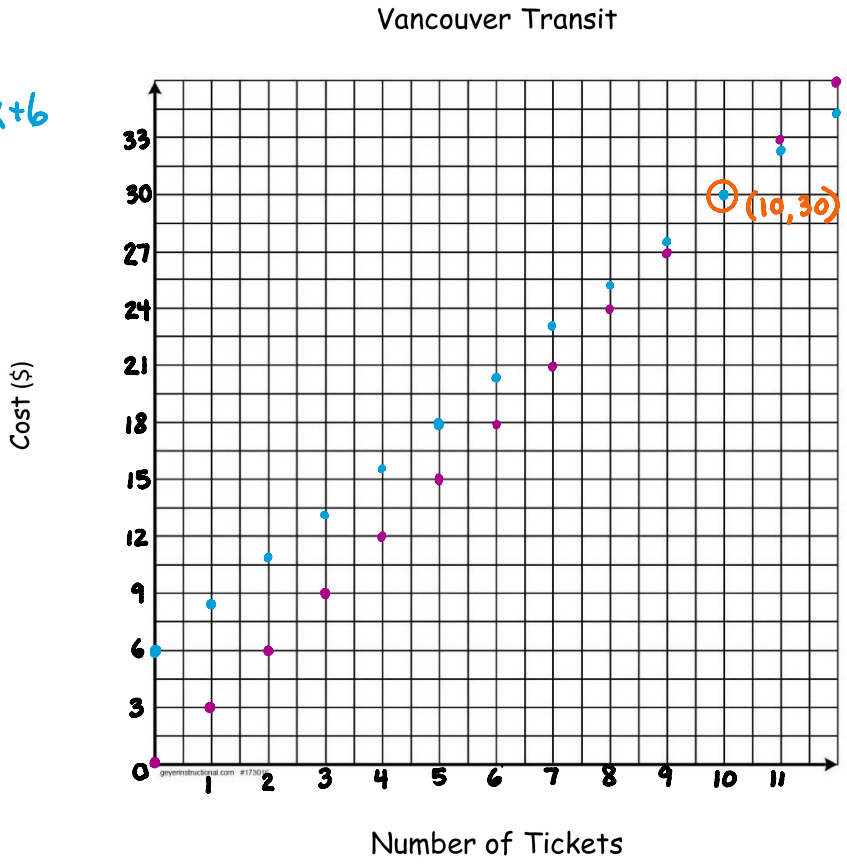
Cost without Compass card: $y = 3x$
Cost with Compass card: $y = 6 + 2.4x$

$3x = 6 + 2.4x$
$-2.4x \quad -2.4x$
$0.6x = 6$
$\div 0.6 \quad \div 0.6$
$x = 10$

Carmen should get the Compass card if she thinks she will use transit more than 10 times.

A visual representation of this scenario shows an alternate way to determine the answer. Graph each equation above. What do you notice when $x = 10$?

$y = 3x$
$y = 2.4x + 6$



x	$y = 2.4x + 6$	
0	6	←
1	8.4	
2	10.8	
3	13.2	
4	15.6	
5	18	←
6	20.4	
7	22.8	
8	25.2	
9	27.6	
10	30	←
11	32.4	

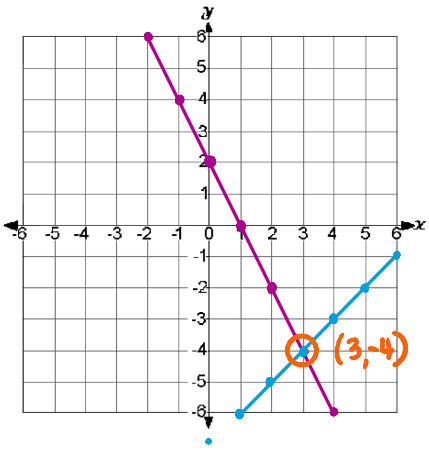
Identify the point of intersection of each system of linear equations by graphing.

a) $2x + y = 2$
$x - y = 7$

$\rightarrow y = -2x + 2$

$\hookrightarrow -y = -x + 7$

$y = x - 7$



The solution is (3,-4).

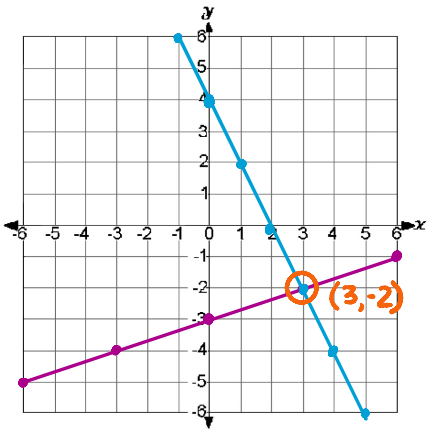
b) $x - 3y = 9$
$2x + y = 4$

$\rightarrow -3y = -x + 9$

$y = \frac{-x}{-3} + \frac{9}{-3}$

$y = \frac{1}{3}x - 3$

$y = -2x + 4$



The solution is (3,-2).

The solution can be verified by substituting the values into each equation and showing the left side is equal to the right side.

Verify the solution in part a).

$2x + y = 2$

$2(3) + (-4)$

$6 - 4 = 2$ ✓

$x - y = 7$

$3 - (-4)$

$3 + 4 = 7$ ✓

Suppose a mistake had been made when the lines were drawn in part b) and the answer had been (3, –1). Verify the solution.

$x - 3y = 9$

$3 - 3(-1)$

$3 + 3 \neq 9$

$2x + y = 4$

$2(3) + -1$

$6 - 1 \neq 4$

Assignment: handout