

Essential Question: How can we solve a linear system using the substitution method?

Do Now:

a) Solve the system below graphically.

$$\begin{array}{l} 3x + y = 17 \\ 4x - y = 18 \end{array}$$

$$y = -3x + 17$$

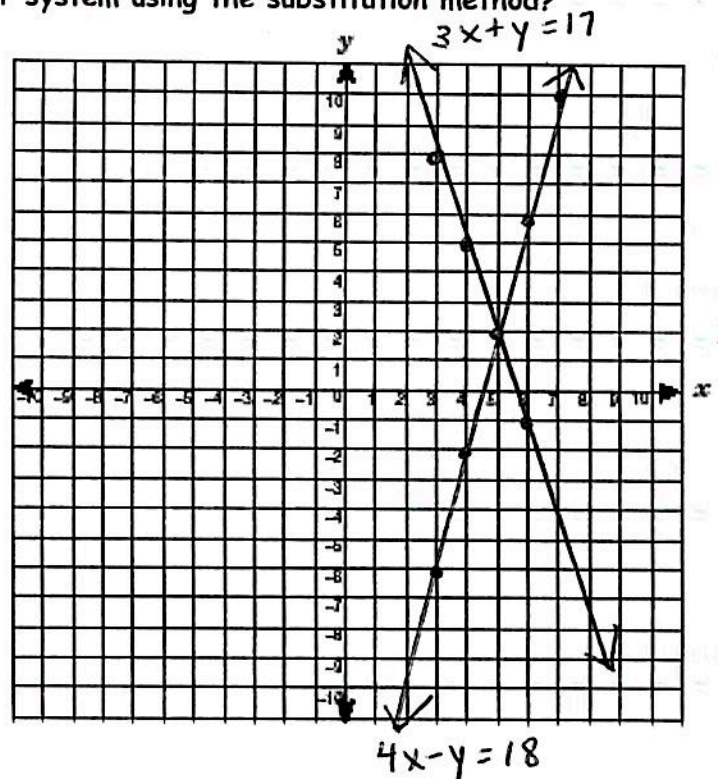
x	y
6	-1
5	2
4	5
3	8

$$4x - y = 18$$

$$-y = -4x + 18$$

$$y = 4x - 18$$

x	y
3	-6
4	-2
5	2
6	6
7	10



b) Solve the system algebraically.

$$3x + y = 17$$

$$y = -3x + 17$$

$$4x - y = 18$$

$$4x - (-3x + 17) = 18$$

$$4x + 3x - 17 = 18$$

$$7x - 17 = 18$$

$$7x = 35$$

$$x = 5$$

common
solution
(5, 2)

$$\begin{array}{l} 3x + y = 17 \\ 3(5) + y = 17 \\ 15 + y = 17 \\ y = 2 \end{array}$$

Solve the system using the substitution method. Check your solution!

$$\begin{array}{l} x - 3 = 5y \rightarrow x = 5y + 3 \\ 2x + 4y = -1 \end{array} \quad [\text{get } x \text{ or } y \text{ by itself}]$$

$$2(5y + 3) + 4y = -1$$

$$10y + 6 + 4y = -1$$

$$14y + 6 = -1$$

$$14y = -7$$

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

$$x - 3 = 5y$$

$$x - 3 = 5\left(-\frac{1}{2}\right)$$

$$x - 3 = -2.5$$

$$x = .5$$

common solution
(.5, -.5)

check

$$x - 3 = 5y$$

$$.5 - 3 = 5(-.5)$$

$$-2.5 = -2.5 \quad \checkmark$$

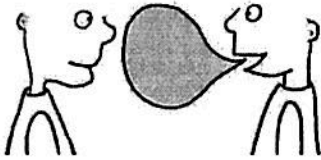
$$2x + 4y = -1$$

$$2(.5) + 4(-.5) = -1$$

$$1 - 2 = -1$$

$$-1 = -1 \quad \checkmark$$

Turn and Talk



Jenny is trying to grow her hair as long as her cousin's hair. The table shows their hair lengths (in inches) after month 3 and month 8.

	y_1	y_2
x		
Month	Jenny's Hair Length (in)	Cousin's Hair Length (in)
3	4	7
8	6.5	9

(x, y)
 month \uparrow hair length

a) Write a system of linear equations that represents this situation.

Jenny
 $(3, 4)$ $(8, 6.5)$

$y = mx + b$
 \uparrow growth per month
 \uparrow starting hair length

cousin
 $(3, 7)$ $(8, 9)$

slope $\frac{\Delta y}{\Delta x} = \frac{6.5 - 4}{8 - 3}$
 $= \frac{2.5}{5}$
 $= .5$

$y = mx + b$
 $4 = .5(3) + b$
 $4 = 1.5 + b$
 $2.5 = b$

$y_1 = .5x + 2.5$

slope $\frac{\Delta y}{\Delta x} = \frac{9 - 7}{8 - 3}$
 $= \frac{2}{5}$
 $= .4$

$y = mx + b$
 $9 = .4(8) + b$
 $9 = 3.2 + b$
 $5.8 = b$

$y_2 = .4x + 5.8$

b) Will Jenny's hair ever be as long as her cousin's hair? If so, in what month?

$y = .5x + 2.5$

$y = .4x + 5.8$

$.5x + 2.5 = .4x + 5.8$

$.1x + 2.5 = 5.8$

$.1x = 3.3$

$x = 33$ months

Yes, in 33 months, the hair length will be the same, 19 inches

$y = .4x + 5.8$
 $y = .4(33) + 5.8$
 $y = 19$

$y = .5x + 2.5$
 $y = .5(33) + 2.5$
 $y = 19$