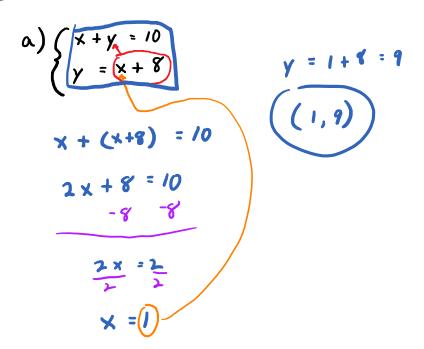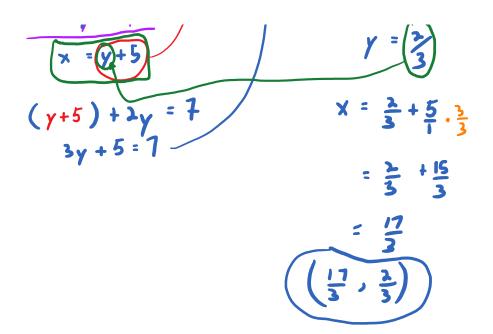# Solving Systems of Equations by Substitution or Elimination

Goal: to solve linear systems of two equations, two unknowns using either the substitution method or elimination method

(ex) Solve using the substitution method

a)
$$\begin{cases} x + y = 10 \\ y = x + 8 \end{cases}$$

$y = 1 + 8 = 9$

$x + (x+8) = 10$

$(1, 9)$

$2x + 8 = 10$

$-8 \quad -8$

$\dfrac{2x}{2} = \dfrac{2}{2}$

$x = 1$

b)
$$\begin{cases} x - y = 5 \\ x + 2y = 7 \end{cases}$$

$3y + 5 = 7$

$-5 \quad -5$

$x - y = 5$

$+y \quad +y$

$\dfrac{3y}{3} = \dfrac{2}{3}$

$x = y + 5$

$y = \dfrac{2}{3}$

$x = y + 5$

$y = \dfrac{2}{3}$

$(y+5) + 2y = 7$

$3y + 5 = 7$

$x = \dfrac{2}{3} + \dfrac{5}{1} \cdot \dfrac{3}{3}$

$= \dfrac{2}{3} + \dfrac{15}{3}$

$= \dfrac{17}{3}$

$\left(\dfrac{17}{3}, \dfrac{2}{3} \right)$

c) $\begin{cases} y = -2x + 3 \\ 2y + 4x = 6 \end{cases}$

$2(-2x+3) + 4x = 6$

$-4x + 6 + 4x = 6$

$6 = 6 \quad True$

Dependent

$\{ (x,y) \mid y = -2x + 3 \}$

ex) Solve using the Elimination Method

a) $1x - y = 7$

$1x + y = 3$

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$2x = 10$

$x = 5$

$5 + y = 3$

$-5 \qquad -5$

_____

$y = -2$

$(5, -2)$

b) $\begin{cases} 3x - 4y = 16 \\ 5x + 6y = 14 \end{cases}$

$5\,[3x - 4y = 16]$

$-3\,[5x + 6y = 14]$

$15x - 20y = 80$

$+ \quad -15x - 18y = -42$

$\quad \dfrac{-38y}{-38} = \dfrac{38}{-38}$

$y = -1$

$3x - 4(-1) = 16$

$3x + 4 = 16$

$3x = 12$

$x = 4$

$(4, -1)$

c) $-2\,[2x + y = 13]$

$\begin{bmatrix} 4x + 2y = 23 \\ -4x - 2y = -26 \end{bmatrix}$

$0 = -3 \quad \text{False}$

No solution