6.3 Solving Systems Using Elimination

* Elimination Method - use the addition & subtraction properties in order to Eliminate (reduce to zero) a variable in the system

Example:

* How can you eliminate (reduce to zero) with addition?

$? + ? = 0$

opposite #s $\Rightarrow$ $3 + -3 = 0$

$-4 + 4 = 0$

* How can you eliminate (reduce to zero) with subtraction?

$? - ? = 0$

Same #s $\Rightarrow$ $2 - 2 = 0$

$8 - 8 = 0$

(A) $2x + 5y = 17$

$+ \; 6x - 5y = -9$

$8x = 8$

$\frac{8x}{8} = \frac{8}{8}$

$x = 1$

* Make sure the system is written in column form.
* Add or subtract to eliminate

$\Longrightarrow$

$2x+5y=17$

$2(1)+5y=17$

$2+5y=17$

$-2 \quad -2$

$5y=15$

$\frac{5y}{5}=\frac{15}{5}$

$y=3$

(1, 3)

* Substitute to find the other variable in your ordered pair

One Solution, Intersecting Lines

* Check your answer.

(B) $2x-3y=11$

$-(5x-3y=14)$

$-3x=-3$

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

$x=1$

$2x-3y=11$

$2(1)-3y=11$

$2-3y=11$

$-2 \quad -2$

$-3y=9$

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

$y=-3$

Solution = (1, -3)

One Solution, Intersecting Lines

* Check your answer!

* Review Problem 2, "Solving a System by Subtracting Equation." on pg. 379

* Got it #2)
$$\begin{array}{r} 2c+3t=130 \\ -2c+5t=190 \\ \hline -2t=-60 \\ \hline -2 \\ t=30 \end{array}$$

$2c+3t=130$
$2c+3(30)=130$
$2c+90=130$
$-90 \quad -90$
$\frac{2c=40}{2}$
$c=20$

A car takes 20 minutes to wash & a truck takes 30 minutes to wash.
(*) Check your answer!

* Elimination by Multiplication

(C) $x+10y=3$
$4x+5y=5$

SOME OPTIONS
* Multiply the first equation by 4 (or -4) OR multiply the second equation by 2 (or -2)

$4(x+10y=3)$

$4x+40y=12$
$-\ 4x+5y=5$
$35y=7$
$\frac{35}{35}$
$y=\frac{1}{5}$

* Make sure to multiply each term of the equation $\Rightarrow$

$x + 10y = 3$

$x + 10\left(\frac{1}{5}\right) = 3$

$x + 2 = 3$

$-2 \quad -2$

$x = 1$

* Solve for the other variable by substitution.

Solution $= \left(1, \frac{1}{5}\right)$

* Check your answer!

* Review Problem 4, "Solving a System by Multiplying Both Equations" on pg. 380

* Got it? 4a)

$(4x + 3y = -19)\ 2$

$(3x - 2y = -10)\ 3$

$\Rightarrow$

$8x + 6y = -38$

$+\ 9x - 6y = -30$

$17x \qquad -68$

$17 \qquad 17$

$x = -4$

$4x + 3y = -19$

$4(-4) + 3y = -19$

$-16 + 3y = -19$

$+16 \qquad +16$

$3y = -3$

$-3 \quad -3$

$y = 1$

$(-4, -1)$

* Check your answer!

* Review Problem 5, "Finding the Number of Solutions" on pg. 381

* (Got it #5)

$$\begin{array}{r} -2x+5y=7 \\ -(-2x+5y=12) \\ \hline 0=-5 \end{array}$$

No solution, Parallel Lines

6-3 pg. 382 #8-30 even (12 problems)

8) $-x+5y=13$
$+\ x-y=15$
$4y=28$
$\frac{4y}{4}$
$y=7$

$x-7=15$
$+7\ \ +7$
$x=22$

(22, 7)

10) $4x-7y=8$
$-\ x-7y=-15$
$3x=18$
$\frac{3x}{3}$
$x=6$

$6-7y=-15$
$-6\ \ -6$
$-7y=-21$
$\frac{-7y}{-7}$
$y=3$

(6, 3)

12) $6x+5y=39$
$-3x+5y=27$
$3x=12$
$x=4$

$6(4)+5y=39$
$24+5y=39$
$5y=15$
$\frac{5y}{5}$
$y=3$

$6x+5(3)=39$
$6x+15=39$
$6x=24$
$\frac{6x}{6}$
$x=4$

(4, 3)

x = side leaf
y = middle

(14) $2x + y = 7$
$-\ x + y = 5.5$
$1x \quad = 1.5$
$x = 1.5$

$x + y = 5.5$
$1.5 + y = 5.5$
$-1.5 \quad -1.5$
$y = 4$ feet

(16) $(3x + y = 5)\ 2$
$2x - 2y = -2$

$\Rightarrow$
$6x + 2y = 10$
$+\ 2x - 2y = -2$
$8x \quad = 8$
$x = 1$

(1, 2)

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

18) $(3x + 2y = 17)\ 2$
$(2x + 5y = 26)\ 3$

$\Rightarrow$
$6x + 4y = 34$
$-\ 6x + 15y = 78$
$-11y = -44$
$y = 4$

(3, 4)

$3x + 2(4) = 17$
$3x + 8 = 17$
$3x = 9$
$x = 3$

20) $\begin{matrix}(5x-9y=-43)3\\(3x+8y=68)5\end{matrix} \Rightarrow \begin{matrix}15x-27y=-129\\-15x+40y=340\end{matrix}$

$\frac{-67y=-469}{-67}$

$y=7$

$(4,7)$

$3x+8(7)=68$

$3x+56=68$

$\frac{3y=12}{3}$

$x=4$

22) $\begin{matrix}(3x+4y=24)2\\6x+8y=24\end{matrix} \Rightarrow \begin{matrix}6x+8y=48\\6x+8y=24\end{matrix}$

No solution, parallel

24) $\begin{matrix}(2x-5y=17)3\\6x-15y=51\end{matrix} \Rightarrow \begin{matrix}6x-15y=51\\6x-15y=51\end{matrix}$

Same line, infinitely many

26) $(4x-8y=15)5$
$(-5x+10y=-30)4$ $\Rightarrow$ $20x-40y=75$
$+\ -20x+40y=120$
$0=-45$

No solution, parallel lines

28) $(3d+4p=11oz.)2$
$(2d+3p=9oz.)3$ $\Rightarrow$ $6d+8p=22$
$-6d+9p=27$
$-p=-5$
$p=5$

$3d+4p=11$
$3d+4(5)=11$
$3d+20=11$
$-20\ \ -20$
$3d=-9$
$d=-3$

dolls $=-3$
plush toys $=5$

can't have a $\ominus$ toy

30) $(\frac{1}{2}p+\frac{3}{4}h=765)4$
$(\frac{1}{4}p+1h=745)3$ $\Rightarrow$ $2p+3h=3060$
$-\frac{3}{4}p+3h=2,235$
$1\frac{1}{4}p=825$
$p=660$

pepperoni $=660$ calories
ham & pineapple $=580$ calories