

Notes 6.3 – Solving Systems

Warmup

a. $\begin{cases} 3x + y = -9 \\ y = 5x + 7 \end{cases}$ $(-2, -3)$

$$3x + (5x + 7) = -9$$

$$3x + 5x + 7 = -9$$

$$8x + 7 = -9$$

$$\begin{array}{r} -7 \\ -7 \end{array}$$

$$\frac{8x}{8} = \frac{-16}{8} \quad x = -2$$

$$y = 5(-2) + 7 = -10 + 7 = -3$$

b. $\begin{cases} y = 2x - 7 \\ x + 2y = 1 \end{cases}$ $(3, -1)$

$$x + 2(2x - 7) = 1$$

$$x + 4x - 14 = 1$$

$$5x - 14 = 1$$

$$\begin{array}{r} +14 \\ +14 \end{array}$$

$$\frac{5x}{5} = \frac{15}{5} \quad x = 3$$

$$y = 2(3) - 7 = 6 - 7 = -1$$

c. $\begin{cases} x + 4y = 9 \\ x - y = 4 \end{cases}$ $(5, 1)$

$$\begin{array}{r} x + 4y \\ x - y \end{array} + 4$$

$$x = y + 4$$

$$y + 4 + 4y = 9$$

$$5y + 4 = 9$$

$$\begin{array}{r} -4 \\ -4 \end{array}$$

$$\frac{5y}{5} = \frac{5}{5} \quad y = 1$$

$$\begin{array}{r} x - 1 = 4 \\ +1 \\ +1 \end{array}$$

$$x = 5$$

d. $\begin{cases} 2x + y = -15 \\ y - 5x = 6 \end{cases}$ $(-3, -9)$

$$\begin{array}{r} 2x + y \\ y - 5x \end{array} + 5x + 5x$$

$$y = 5x + 6$$

$$2x + (5x + 6) = -15$$

$$2x + 5x + 6 = -15$$

$$7x + 6 = -15$$

$$\begin{array}{r} -6 \\ -6 \end{array}$$

$$\frac{7x}{7} = \frac{-21}{7} \quad x = -3$$

$$2(-3) + y = -15$$

$$\begin{array}{r} -6 + y = -15 \\ +6 \end{array} + 6$$

$$y = -9$$

Lesson

Word	Meaning/Notation	Example
Solving by Elimination	Solve a system by adding or subtracting to eliminate a variable.	$\begin{array}{r} a + b = 4 \\ a - b = 8 \end{array} \left. \vphantom{\begin{array}{r} a + b = 4 \\ a - b = 8 \end{array}} \right\} \text{add}$ <hr/> $2a = 12$

Carlos and Clarita have a pet supply business. They are terrible about record keeping. In order to charge their customers properly, they need to figure out the costs of the supplies. Here is what they know:

1. Week 1: Carlos bought 3 bags of Tiny Tidbits and 4 bags of Fido Flakes for \$43.
Week 2: He bought 3 bags of Tiny Tidbits and 6 bags of Fido Flakes for \$54.

Tiny Tidbits: use T

Fido Flakes: use F

$$\text{Week 1: } \underline{3T} + \underline{4F} = 43$$

$$\text{Week 2: } \underline{3T} + \underline{6F} = 54$$

2. Week 3: Carlos bought 2 bags of Big Bites and 3 bags of Liver Licks for \$42.50.
Week 4: He bought 5 bags of Big Bites and 6 bags of Liver Licks for \$94.25.

Big Bites: use B

Liver Licks: use L

$$\text{Week 3: } \underline{2B} + \underline{3L} = 42.50$$

$$\text{Week 4: } \underline{5B} + \underline{6L} = 94.25$$

Steps for Solving using the Elimination method

1. Make sure both equations are in Standard Form.
2. The coefficients of one variable must be the same.
3. Subtract the two equations. make sure you subtract all 3 parts
4. Solve for remaining variable
5. Substitute into either original equation and solve.

Tiny Tidbits : \$7

Fido Flakes : \$5.50

problem #1

$$\begin{cases} 3T + 4F = 43 \\ 3T + 6F = 54 \end{cases}$$

$$\begin{cases} 3T + 4F = 43 \\ 3T + 6F = 54 \end{cases}$$

$$\begin{array}{r} 3T + 4F = 43 \\ - (3T + 6F = 54) \\ \hline -2F = -11 \end{array}$$

$$\frac{-2F}{-2} = \frac{-11}{-2} \quad F = 5.5$$

$$3T + 4(5.5) = 43$$

$$\begin{array}{r} 3T + 22 = 43 \\ -22 \quad -22 \end{array}$$

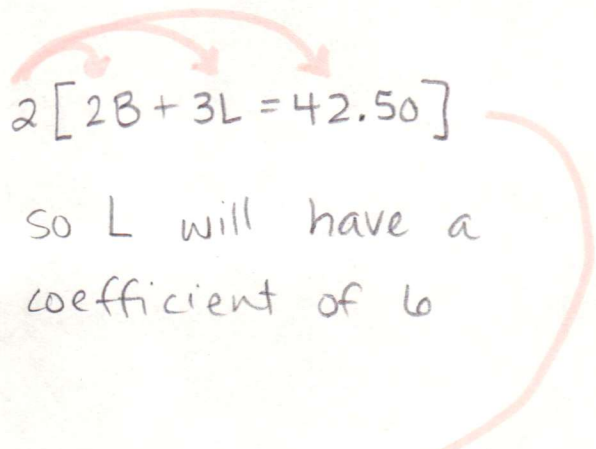
$$\frac{3T}{3} = \frac{21}{3} \quad T = 7$$

Steps for Solving using the Elimination method

1. Make sure both equations are in standard form.

$$\begin{cases} 2B + 3L = 42.50 \\ 5B + 6L = 94.25 \end{cases}$$

2. Multiply one or both equations so a coefficient is the same in both equations.


$$2[2B + 3L = 42.50]$$

So L will have a coefficient of 6

3. Subtract the equations

$$\begin{array}{r} 4B + 6L = 85 \\ - (5B + 6L = 94.25) \\ \hline \end{array}$$

4. Solve

$$\frac{-B}{-1} = \frac{-9.25}{-1}$$

$$B = 9.25$$

5. Substitute into an original equation and solve.

$$2(9.25) + 3L = 42.5$$

$$18.50 + 3L = 42.5$$

$$\begin{array}{r} -18.50 \\ \hline \end{array} \quad \begin{array}{r} -18.5 \\ \hline \end{array}$$

$$\frac{3L}{3} = \frac{24}{3}$$

$$L = 8$$

Big Bites : \$9.25

Liver Licks : \$8

3. Week 5: Carlos bought 6 dog leashes and 6 cat brushes for \$45.
 Week 6: He bought 3 more leashes and 2 more brushes for \$19.

Leash: \$4
 Brush: \$3.50

Week 5: $6L + 6B = 45$

Week 6: $3L + 2B = 19$

$2(3L + 2B = 19)$

$$\begin{array}{r} 6L + 6B = 45 \\ - (6L + 4B = 38) \\ \hline 2B = 7 \\ \frac{2B}{2} = \frac{7}{2} \quad B = 3.5 \end{array}$$

$6L + 6(3.5) = 45$

$6L + 21 = 45$
 $-21 \quad -21$

$\frac{6L}{6} = \frac{24}{6} \quad L = 4$

4. Week 7: Carlos bought 2 boxes of dog biscuits and 4 packages of cat treats for \$18.50.
 Week 8: Carlos had to return 3 packages of cat treats and bought 2 boxes of dog biscuits and only had to pay \$1.

Dog biscuits: \$4.25
 Cat treats: \$2.50

Week 7: $2B + 4T = 18.50$

Week 8: $2B - 3T = 1$

$$\begin{array}{r} 2B + 4T = 18.50 \\ - (2B - 3T = 1) \\ \hline 7T = 17.50 \\ \frac{7T}{7} = \frac{17.50}{7} \\ T = 2.5 \end{array}$$

$2B + 4(2.5) = 18.50$

$2B + 10 = 18.50$
 $-10 \quad -10$

$\frac{2B}{2} = \frac{8.5}{2}$

$B = 4.25$