

Name: **KEY**

Learning Target 4 – 2: Solving Systems – Substitution and Multi-Variable – V1

<u>Learning Target</u> <i>(L – T)</i>	<u>Procedural Context</u>
<p>4 – 2</p> <p>Solving Systems of Equations Using Substitution and Two-Variable Word Problems</p>	<ul style="list-style-type: none"> • Use the Substitution Method to Solve for Solutions <ul style="list-style-type: none"> • Algebraically Manipulate when Necessary • Substitute into a given equation to eliminate a variable • Solve and substitute to solve for the remaining variable • Understand how solutions represent (x, y) coordinates • Set-up 2-variable word problems and use elimination techniques to derive solutions

Self-Reflection

For this Learning Target I am feeling:

Discuss your work habits leading up to this Check-In:

Your Level of Understanding of this Learning Target is:

My Feedback:

Solve the following using the Substitution Method

Emerging Level Questions

1. $2x = 3y - 13$ and $y = 2x + 7$

$$2x = 3(2x + 7) - 13$$

$$2x = 6x + 21 - 13$$

$$2x = 6x + 8$$

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

$$\begin{array}{r} -4x = 8 \\ -4 \quad -4 \end{array}$$

$$x = -2$$

$$\boxed{(-2, 3)}$$

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

$$y = 3$$

2. $6x = 3y + 12$ and $4 = 2x - y$

$$y = 2x - 4$$

$$6x = 3(2x - 4) + 12$$

$$6x = 6x - 12 + 12$$

$$6x = 6x$$

$\boxed{\text{Infinite Solutions}}$

3. $2x + 3y = 36$ and $y = 6$

$$2x + 3(6) = 36$$

$$2x + 18 = 36$$

$$2x = 18$$

$$x = 9$$

$$\boxed{(9, 6)}$$

4. $6x - 3y = 4$ and $y + 2x = 0$

$$y = -2x$$

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

$$6x + 6x = 4$$

$$12x = 4$$

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

$$\boxed{\left(\frac{1}{3}, -\frac{2}{3}\right)}$$

$$y + 2\left(\frac{1}{3}\right) = 0$$

$$y = -\frac{2}{3}$$

Proficient Level Questions

5. Jerry has 150m of fencing to enclose a rectangular chicken pen. If the length of the pen is 15m less than twice the width, find the area of the chicken pen. $Area = l \cdot w$

$$2l + 2w = 150$$

$$l = 2w - 15$$

$$l + w = 75$$

$$l = 2w - 15$$

$$2w - 15 + w = 75$$

$$3w = 90$$

$$w = 30$$

$$l = 2w - 15$$

$$l = 45$$

7. Solve the following system using the substitution method.

$$2x - 3y = x - y \text{ and } -2x + 4y = 6$$

$$x = 2y$$

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$$-2(2y) + 4y = 6$$

$$-4y + 4y = 6$$

$$0 = 6$$

NO SOLUTION

6. A boat travelled 60km downstream four hours and made the return trip in five hours. Find the speed of the boat in still water and the speed of the current.

Hint: $Speed = Distance/Time$

$$D_{up} = 60 \quad t_{up} = 5$$

$$D_{down} = 60 \quad t_{down} = 4$$

$$Speed_{up} = x - y$$

$$Speed_{down} = x + y$$

$$\begin{array}{r} x - y = \frac{60}{5} \\ x + y = \frac{60}{4} \end{array} \rightarrow \begin{array}{r} x - y = 12 \\ \underline{x + y = 15} \\ 2x = 27 \end{array}$$

$$x = \frac{27}{2}$$

$$x = 13.5 \quad y = 1.5$$

Extending Level Questions

8. Solve the system.

$$4x = \frac{1}{2}y - 2 \rightarrow 8x = y - 4$$

$$\frac{1}{6}y = 8x - 1 \rightarrow y = 48x - 6$$

$$8x = 48x - 6 - 4$$

$$-40x = -10$$

$$x = \frac{1}{4}$$

$$\boxed{\left(\frac{1}{4}, 6\right)}$$

$$y = 48\left(\frac{1}{4}\right) - 6$$

$$y = 12 - 6$$

$$y = 6$$

9. Solve the system. Answers in terms of a and b

$$2x + y = a$$

$$x - 2y = b$$

$$2x + y = 2a$$

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

$$5y = a - 2b$$

$$\boxed{y = \frac{a - 2b}{5}}$$

$$2x + \frac{a - 2b}{5} = a$$

$$2x = \frac{5a}{5} + \frac{a}{5} - \frac{2b}{5}$$

$$\frac{6a - 2b}{10} = x$$

$$\boxed{x = \frac{3a - 2b}{5}}$$

10. Rubbing alcohol is sold in two concentrations: 40% and 60%. If eight litres are mixed together, producing a 55% concentration, how many litres of each strength are used?

$$x + y = 8$$

let x be 40%
y be 60%

$$y = 8 - x$$

$$0.4x + 0.6y = 0.55(8)$$

$$0.4x + 0.6y = 4.4$$

$$4x + 6y = 44$$

$$4x + 6(8 - x) = 44$$

$$4x + 48 - 6x = 44$$

$$-2x = -4$$

$$\boxed{x = 2 \quad y = 6}$$