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**Unit 1 Test #1**
**Chapter 1: Systems of Linear Equations**

AG

46 /46

**Learning Goal:**
***I will be able to create and solve a linear system of equations, using a variety of methods. (AG1)***

**Instructions and Hints:**

- Please read all questions carefully. **Following directions** will help!
- Do not forget to write **'let'** and **'therefore'** statements for ALL word problems.
- Think about your answers. Make sure that they **make sense**!!
- **Use your time wisely**. If you get stuck, move on and come back!

1. Solve the equation below using opposite operations (isolate x). (4 marks)

$$-\frac{3}{2}(x-1)+4=3-\frac{(5x-4)}{4}$$

$-\frac{3}{2}x+\frac{3}{2}+4=3-\frac{5x+4}{4}$

$-\frac{3}{2}x+\frac{3}{2}+4=3-\frac{5x}{4}+\frac{4}{4}$

$4\left(-\frac{3}{2}x\right)+4\left(\frac{3}{2}\right)+4(4)=4(3)+4\left(-\frac{5}{4}x\right)+4\left(\frac{4}{4}\right)$

$2(-3x)+2(3)+16=12-5x+4$

$-6x+6+16=12-5x+4$

$-6x+22=16-5x$

$22-16=-5x+6x$

$6=x$

4

2. Solve the following system of equations by **graphing**. Use a ruler! (3 marks)

$y=\frac{1}{2}x+3$ ①

$x+2y=-2$ ②

X-int

$x+2(0)=-2$

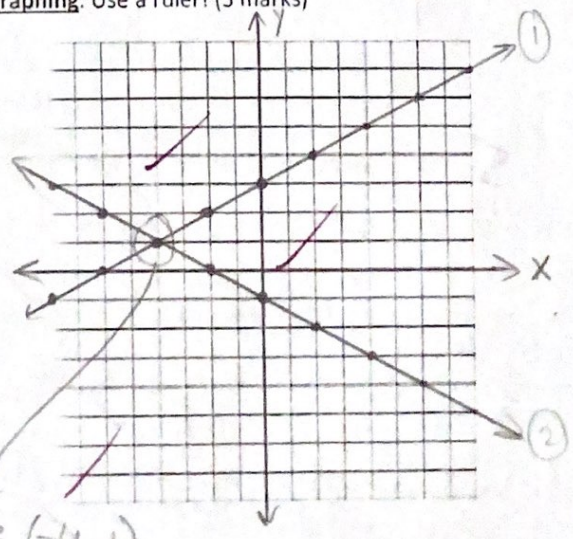
$x=-2$

y-int

$0+2y=-2$

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

$y=-1$




Solution/POI: (-4, 1)

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3. Solve using **substitution**. (4 marks)

① $x + 2y = 1 \longrightarrow x = -2y + 1$

② $3x - 4y = 8$

$3(-2y+1) - 4y = 8$

$-6y + 3 - 4y = 8$

$-10y + 3 = 8$

$-10y = 8 - 3$

$\frac{-10y}{-10} = \frac{5}{-10}$

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

4

Sub $y = \frac{-1}{2}$ into ①

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

$x - 1 = 1$

$x = 1 + 1$

$x = 2$

∴ Solution/POI: $(2, \frac{-1}{2})$

4. Solve using **elimination**. (5 marks)

① $x + 3(y - 3) = 9 \longrightarrow x + 3y - 9 = 9$

$x + 3y = 9 + 9$

$x + 3y = 18$ ①

② $\frac{1}{2}x - y - 9 = 0$

$\frac{1}{2}x - y = 9$

×2 → $x - 2y = 18$ ②

$-x + 3y = 18$ ①

$\frac{-5y}{-5} = \frac{0}{-5}$

$y = 0$

5

Sub $y = 0$ into ①

$x + 3(0) = 18$

$x = 18$

∴ Solution/POI: $(18, 0)$

5. Check **one of** your answers from questions #1 – 3 below. **Remember to check in BOTH of the original equations!** (1 mark)

4) Solution: $(18, 0)$

① $x + 3(y - 3) = 9$

$18 + 3(0 - 3) = 9$

$18 + 0 - 9 = 9$

$18 - 9 = 9$

$9 = 9$ ✓

② $\frac{1}{2}x - y - 9 = 0$

$\frac{1}{2}(18) - 0 - 9 = 0$

$9 - 9 = 0$

$0 = 0$ ✓

∴ The solution to #4 is $(18, 0)$.

1

6. We have learned three methods to solve a linear system. Explain **substitution** here. Be sure to state what you are solving for and how you are doing it. You need to teach someone that has no idea how to do it! You may want to use an example to support your explanation. Point form is acceptable. (5 marks)

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① Isolate one variable from either equation.

② Take the resulting expression and sub it into the opposite equation for the corresponding variable.

③ Solve your new equation (which should now contain only 1 variable).

④ After finding the value of one variable, plug its value into either original equation to solve for the second variable.

⑤ Solve for the 2nd variable. Write your solution as $(x, y)$ and check the solution by subbing your values for the variables into both original equations.

Solve using substitution:

Ex: ① $x + y = 18$

② $y = 3x + 4$ (y variable is already isolated)

* subbing into ②

① $x + (3x + 4) = 18$

$x + 3x + 4 = 18$

$4x + 4 = 18$

$4x = 18 - 4$

$\frac{4x}{4} = \frac{14}{4}$

$x = \frac{7}{2}$

Sub $x = \frac{7}{2}$ into ②

$y = 3\left(\frac{7}{2}\right) + 4$

$y = \frac{29}{2}$

① $x + y = 18$

$\frac{7}{2} + y = 18$

$2\left(\frac{7}{2}\right) + 2(y) = 2(18)$

$7 + 2y = 36$

$2y = 36 - 7$

$2y = 29$

$\frac{2y}{2} = \frac{29}{2}$

*∴ Solution: $(\frac{7}{2}, \frac{29}{2})$

Choose **THREE** of the following **FOUR** word problems to solve in the space provided below and on the next page. You must include:

- Proper defining and concluding statements (tell me what x and y represent)
- Two clearly defined equations
- A full, organized solution using a method of your choice

Each question is worth the marks indicated. **Choose the ones that you know how to do**. The maximum possible score is 17 marks, but wise choices will allow you to maximize your own score!

7. Student Parliament raised $3500 at a Haunted House and Halloween dance. The students put some money in a savings account that pays interest at a rate of 3% per year, and the rest of the money in a GIC that pays interest at a rate of 4.2% per year. After one year they have earned $137.10 in interest. How much did they invest in each account? (5 marks)

8. A landscaping company placed two orders with a nursery. The first order was for 13bushes and 4 trees, and totalled $487. The second order was for 6 bushes and 2 trees, and totalled $232. The bills do not list the per-item price. What were the costs of one bush and of one tree?

9. A jeweler wants to use a few pieces of silver to make a bracelet. Some of the jewelry is 80% silver and the rest is 68% silver. They need 40 g of 73% silver for the bracelet. How much of each type of silver should they use? (6 marks)

10. On weekends Chris goes for a run, partly on paved trails and partly across gravel paths. He runs at 10 km/h on the trails, but his speed is reduced to 5 km/h on the paths. One day he ran 12 km in 1.5 hours. How far did he run on gravel paths? (Hint: A table might help!) (6 marks)

**Solutions:**

Question # 10

| | speed | time | distance |
|---|---|---|---|
| Trails | 10 km/h | t | 10t |
| Gravel | 5 km/h | g | 5g |
| Total | XXXX | 1.5 hrs. | 12 km |

① $1.5 = t + g \rightarrow 1.5 - g = t$

② $12 = 10t + 5g$

t → hours on trail
g → hours on gravel

$12 = 10(1.5 - g) + 5g$
$12 = 15 - 10g + 5g$
$12 = 15 - 5g$
$12 - 15 = -5g$
$-3 = -5g$
$\frac{-3}{-5} = \frac{-5g}{-5}$
$0.6 = g$

(time on gravel paths)

distance on gravel: $5g = 5(0.6) = 3$ (km)

∴ Chris ran 3 km on gravel paths.

6

Question # 9

① $40 = x + y \rightarrow 40 - x = y$

x → # of g of 68% silver
y → # of g of 80% silver

② $0.73(40) = 0.68x + 0.8y$
$29.2 = 0.68x + 0.8y$

$29.2 = 0.68x + 0.8(40 - x)$
$29.2 = 0.68x + 32 - 0.8x$
$29.2 - 32 = -0.12x$
$\frac{-2.8}{-0.12} = \frac{-0.12x}{-0.12}$
$23.333 = x$

Sub into ①

$40 = x + y$
$40 = 23.333 + y$
$40 - 23.333 = y$
$16.6 = y$

∴ The jeweler needs to use around 23.3 g of 68% silver and 16.6 g of 80% silver.

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Question # 7

① $3500 = s + g \rightarrow 3500 - s = g$

② $137.10 = 0.03s + 0.042g$

$137.10 = 0.03s + 0.042(3500 - s)$

$137.10 = 0.03s + 147 - 0.042s$

$137.10 - 147 = -0.012s$

$-9.9 = -0.012s$

$\frac{-9.9}{-0.012} = \frac{-0.012s}{-0.012}$

$825 = s$

(sub into ①)

① $3500 = s + g$

$3500 = 825 + g$

$3500 - 825 = g$

$2675 = g$

s → # of $ put into savings a/c

g → # of $ put into GIC

∴ They put $825 in the savings account and $2675 in the GIC.

5

11. Determine the number of solutions for the system of equations given below WITHOUT SOLVING! Explain your reasoning. (3 marks)

$2x - 5y + 8 = 0 \rightarrow \frac{2x}{5} + \frac{8}{5} = \frac{5y}{5}$

$y = 0.4x - 8$

$\frac{2x}{5} + \frac{8}{5} = y$

$0.4x + 1.6 = y$

∴ Since both equations have a slope of 0.4 ($\frac{2}{5}$), there is no solution to the linear system. This is because as lines, they would be parallel, meaning they never cross/intersect.

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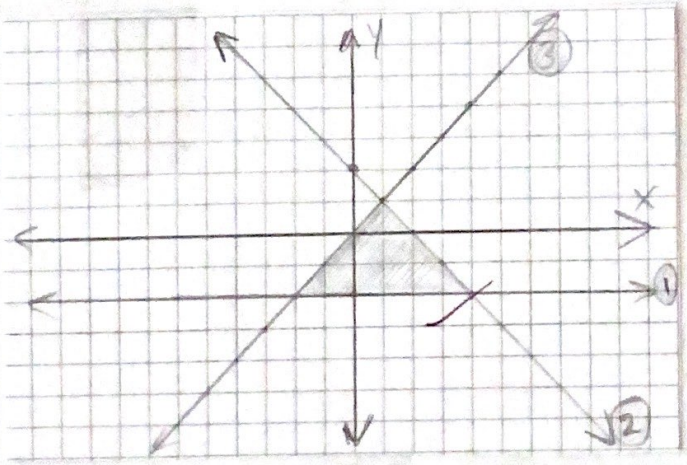
12. The lines y = -2, y = x, and y = -x + 2 form a triangle. Determine the area of the triangle. (A picture will help, so graph the lines!) (4 marks)




$A = \frac{bh}{2}$

$A = \frac{bh}{2}$

$A = \frac{(6)(3)}{2}$

$A = \frac{18}{2}$

$A = 9 \text{ units}^2$

∴ The triangle formed by lines "y = -2", "y = x" and "y = -x + 2" forms a triangle with an area of 9 units$^2$.

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