

Name: _____ Period: _____ Date: _____

APPLICATION OF LINEAR SYSTEMS Bell Work

Solve the following verbal problems involving linear systems:

1. The admission fee at a Park is \$2.00 for children and \$4.00 for adults. On Saturday, 3000 people entered the Park and \$6500 was collected. How many children and how many adults attended?
2. One number is 3 less than 2 times another. If the sum of the numbers is 36, what are the numbers?
3. A student needs to prepare a solution combining a 20% alcohol solution with a 60% alcohol solution to form 200 ml of a 45% final solution. How much of each solution should be used to form the mixture?
4. Anabel has a total investment of \$7000 in two accounts. One account paying 5% interest and the other paying 8%. If the annual interest from the two investments was \$500, how much did Anabel invest in each account?
5. Peter has 20 bills which are of \$10 and \$20. If the total amount in bills is \$200, then how many of each bill Peter has?

APPLICATION OF LINEAR SYSTEMS Bell Work**ANSWERS**

Solve the following verbal problems involving linear systems:

1. The admission fee at a Park is \$2.00 for children and \$4.00 for adults. On Saturday, 3000 people entered the Park and \$6500 was collected. How many children and how many adults attended?

- Identify variables

x: Number of children

y: Number of adults

- Set up equations

$$2x + 4y = 6500 \quad \text{and} \quad x + y = 3000$$

- Solve linear System

We will use the elimination method, like follows:

$$\begin{cases} x + y = 3000 \\ 2x + 4y = 6500 \end{cases}$$

We interchange the “x” or “y” coefficients from equation I and equation II to eliminate one of the variables. In this case, we are going to interchange the “x” coefficients of both equations, like follows:

$$\begin{cases} 2(x + y = 3000) \\ -1 (2x + 4y = 6500) \end{cases}$$

Applying distributive property:

$$\begin{cases} 2x + 2y = 6000 \\ -2x - 4y = -6500 \end{cases}$$

The result would be:

$$-2y = -500 \quad \rightarrow y = 250$$

Now, we calculate the value of variable “x” by substituting the result of “y” into one of the equations

$$x = 3000 - y = 3000 - 250 = 2750$$

Attended 2750 children and 250 adults.

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2. One number is 3 less than 2 times another. If the sum of the numbers is 36, what are the numbers?

- Identify variables

x: First unknown number

y: Second unknown number

- Set up equations

$$x + y = 36 \quad (I) \quad \text{and} \quad y = 2x - 3 \quad (II)$$

- Solve linear System

We will use the substitution method, like follows:

$$\begin{cases} x + y = 36 \\ y = 2x - 3 \end{cases}$$

Substituting equation II in equation I and then solve the equation.

$$x + 2x - 3 = 36 \quad \rightarrow \quad 3x = 39 \quad \rightarrow \quad x = 13$$

Now, we calculate the value of variable "y" by substituting the result of "x" into one of the equations

$$y = 36 - x = 36 - 13 = 23$$

The numbers are 13 and 23

3. A student needs to prepare a solution combining a 20% alcohol solution with a 60% alcohol solution to form 200 ml of a 45% final solution. How much of each solution should be used to form the mixture?

- Identify variables

x: Alcohol solution at 20%

y: Alcohol solution at 60%

- Set up equations

$$x + y = 200 \quad \text{and} \quad 0.20x + 0.60y = 0.45(200)$$

- Solve linear System

We will use the elimination method, like follows:

$$\begin{cases} x + y = 200 \\ 0.20x + 0.60y = 90 \end{cases}$$

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We interchange the “x” or “y” coefficients from equation I and equation II to eliminate one of the variables. In this case, we are going to interchange the “x” coefficients of both equations, like follows:

$$\begin{cases} 0.20(x + y = 200) \\ -1 \quad (0.20x + 0.60y = 90) \end{cases}$$

Applying distributive property:

$$\begin{cases} 0.20x + 0.20y = 40 \\ -0.20x - 0.60y = -90 \end{cases}$$

The result would be:

$$-0.40y = -50 \quad \rightarrow y = 125 \text{ ml}$$

Now, we calculate the value of variable “x” by substituting the result of “y” into one of the equations

$$x = 200 - y = 200 - 125 = 75 \text{ ml}$$

It should be used 75 ml of solution at 20% and 125 ml of solution at 60%

4. **Anabel has a total investment of \$7000 in two accounts. One account paying 5% interest and the other paying 8%. If the annual interest from the two investments was \$500, how much did Anabel invest in each account?**

- Identify variables

x: Amount invested at 5%

y: Amount invested at 8%

- Set up equations

$$x + y = 7000 \quad \text{and} \quad 0.05x + 0.08y = 500$$

- Solve linear System

We will use the elimination method, like follows:

$$\begin{cases} x + y = 7000 \\ 0.05x + 0.08y = 500 \end{cases}$$

We interchange the “x” or “y” coefficients from equation I and equation II to eliminate one of the variables. In this case, we are going to interchange the “x” coefficients of both equations, like follows:

$$\begin{cases} 0.05(x + y = 7000) \\ -1 \quad (0.05x + 0.08y = 500) \end{cases}$$

Applying distributive property:

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$$\begin{cases} 0.05x + 0.05y = 350 \\ -0.05x - 0.08y = -500 \end{cases}$$

The result would be:

$$-0.03y = -150 \quad \rightarrow y = 5000$$

Now, we calculate the value of variable “x” by substituting the result of “y” into one of the equations

$$x = 7000 - y = 7000 - 5000 = 2000$$

Anabel invested \$2000 in the account at 5% and \$5000 in the account at 8%.

5. **Peter has 20 bills which are of \$10 and \$20. If the total amount in bills is \$200, then how many of each bill Peter has?**

- Identify variables

x: Number of bills of \$10

y: Number of bills of \$20

- Set up equations

$$x + y = 20 \quad \text{and} \quad 10x + 20y = 350$$

- Solve linear System

We will use the elimination method, like follows:

$$\begin{cases} x + y = 20 \\ 10x + 20y = 350 \end{cases}$$

We interchange the “x” or “y” coefficients from equation I and equation II to eliminate one of the variables. In this case, we are going to interchange the “x” coefficients of both equations, like follows:

$$\begin{cases} 10(x + y = 20) \\ -1 (10x + 20y = 350) \end{cases}$$

Applying distributive property:

$$\begin{cases} 10x + 10y = 200 \\ -10x - 20y = -350 \end{cases}$$

The result would be:

$$-10y = -150 \quad \rightarrow y = 15$$

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Now, we calculate the value of variable “x” by substituting the result of “y” into one of the equations

$$x = 20 - y = 20 - 15 = 5$$

Peter has 5 bills of \$10 and 15 bills of \$20.