

Basic Applications of Systems of Equations- NOTES

For each application: Define variables, write a system of equations, solve the system and answer the question

1.) Tyler and Pearl went on a 20-kilometer bike ride that lasted 3 hours. Because there were many steep hills on the bike ride, they had to walk for most of the trip. Their walking speed was 4 kilometers per hour. Their riding speed was 12 kilometers per hour. How much time did they spend walking?

x = time spent walking
 y = time spent riding

$$\begin{array}{r} 4(x+y=3) \quad \leftarrow \text{relates to time} \\ -4x+12y=20 \quad \leftarrow \text{relates distance = rate} \cdot \text{time} \\ \hline -4x+4y=12 \end{array}$$

2 hours spent walking

$$\begin{aligned} 8y &= 8 \\ y &= 1 \\ x+1 &= 3 \\ x &= 2 \end{aligned}$$

2.) Kenisha sells athletic shoes part-time at a department store. She can earn either \$500 per month plus a 4% commission on her total sales, or \$400 per month plus a 5% commission on total sales.

a.) What is the total price of the athletic shoes Kenisha needs to sell to earn the same income from each pay scale?

x = total price or sales
 y = total profit income

$$\begin{aligned} \textcircled{1} \quad y &= (.04x + 500) \\ \textcircled{2} \quad y &= .05x + 400 \end{aligned}$$

slope intercept form
 *intercepts are reasonable

$$\begin{array}{r} .04x + 500 = .05x + 400 \\ -.04x - 400 \quad -.04x - 400 \\ \hline 100 = .01x \\ \frac{100}{.01} = \frac{.01x}{.01} \end{array}$$

$$10,000 = x$$

b.) Which is the better offer?

less than \$10,000 in sales \rightarrow option 1
 more than \$10,000 in sale \rightarrow option 2

Total sales to earn same income has \$10,000

① 3.) Four times one number minus three times another number is 12. Two times the first number added to three times the second number is 6. Find the numbers.

$x = 1^{\text{st}} \#$
 $y = 2^{\text{nd}} \#$

$$\begin{array}{r} \textcircled{1} \quad 4x - 3y = 12 \\ + \quad 2x + 3y = 6 \\ \hline 6x = 18 \\ x = 3 \end{array}$$

$$\begin{array}{r} 4(3) - 3y = 12 \\ 12 - 3y = 12 \\ -12 \quad -12 \\ \hline -3y = 0 \\ y = 0 \end{array}$$

1st # is 3
 2nd # is 0.

4.) Neal scored 1150 on his SAT. His math score was 250 points greater than his verbal score. What was his math score?

$x = \text{math score}$
 $y = \text{verbal score}$

$$\begin{array}{r} x + y = 1150 \quad \leftarrow \text{total} \\ x = (250 + y) \quad \leftarrow \text{math} \\ \hline 250 + y + y = 1150 \\ 250 + 2y = 1150 \\ -250 \quad -250 \\ \hline 2y = 900 \\ y = 450 \end{array}$$

$x = 250 + 450$
 $x = 700$

Math score is 700.

5.) All CDs in the budget bin are priced the same. Packs of AA batteries are on sale. Keisha's total bill (before tax) for 3 CDs and 1 pack of AA batteries was \$39. Eduardo's total for 2 CDs and 3 packs of batteries was \$33. What was the total price of a single CD?

$x = \text{price of CD}$
 $y = \text{price of batteries}$

\$12 for CDs

$$\begin{array}{l} \textcircled{1} \quad 3x + 1y = 39 \\ \textcircled{2} \quad 2x + 3y = 33 \end{array}$$

$$\begin{bmatrix} 3 & 1 \\ 2 & 3 \end{bmatrix} \cdot \begin{bmatrix} x \\ y \end{bmatrix} = \begin{bmatrix} 39 \\ 33 \end{bmatrix}$$

(12, 3)