

HW 3 - 1: Answers

1. $x = 10, y = -29$

2. $x = 4, y = 3$

3. $x = 1, y = 2, z = 4$

4. $x = 2, y = 4, z = 3$

5. He needs 24 ml of 5% solution & 16 ml of 30% solution.

6. The mixture should contain 30 lbs of expensive beans and 20 lbs of cheaper beans.

Solve the following systems. Show all work on a separate sheet of paper.

$$\begin{array}{l} 1. \quad (2x + y = -9)(-8) \\ \quad \quad 16x + 7y = -43 \\ \hline \quad -16x - 8y = 72 \\ \quad \quad 16x + 7y = -43 \\ \hline \quad \quad -y = 29 \\ \quad \quad \quad y = -29 \\ \quad 2x - 29 = -9 \\ \quad 2x = 20 \\ \quad \quad x = 10 \end{array}$$

$$\begin{array}{l} 2. \quad (3x + y = 15)(-2) \\ \quad \quad x + 2y = 10 \\ \hline \quad -6x - 2y = -30 \\ \quad \quad x + 2y = 10 \\ \hline \quad \quad -5x = -20 \\ \quad \quad \quad x = 4 \\ \quad 4 + 2y = 10 \\ \quad \quad 2y = 6 \\ \quad \quad \quad y = 3 \end{array}$$

$$\begin{array}{l} 3. \quad x+y=3 \rightarrow x=3-y \\ \quad y+z=6 \\ \quad x+z=5 \end{array}$$

$$\begin{array}{r} y+z=6 \\ 3-y+z=5 \\ \hline 3+2z=11 \\ 2z=8 \\ z=4 \\ x+4=5 \\ x=1 \\ 1+y=3 \\ y=2 \end{array}$$

$$\begin{array}{l} 4. \quad x=2(y-z) \rightarrow x=2y-2z \\ \quad 2z=3(y-x) \quad 2z=3y-3x \\ \quad x+z=2y-3 \quad x+z=2y-3 \end{array}$$

$$\begin{array}{r} x-2y+2z=0 \\ 3x-3y+2z=0 \\ -x+2y-z=3 \\ \hline z=3 \\ 3x-3y+2z=0 \\ -3x+6y-3z=9 \\ \hline 3y-z=9 \\ 3y=12 \\ y=4 \\ -x+2(4)-3=3 \\ -x+5=3 \\ x=2 \end{array}$$

5. A chemist needs to make 40 ml of a 15% acid solution. He has a 5% acid solution and a 30% acid solution on hand. If he uses the 5% and 30% solutions to create the 15% solution, how many milliliters of each will he need?

Let:

$x = 5\%$ solution

$y = 30\%$ solution

$$x + y = 40 \rightarrow x = 40 - y$$

$$.05x + .30y = .15(40)$$

$$.05(40 - y) + .30y = 6$$

$$2 - .05y + .30y = 6$$

$$.25y = 4$$

$$y = 16$$

$$x = 24$$

He needs 24 ml of
5% solution and
16 ml of 30% sol'n.

6. A store sells two different types of coffee beans; the more expensive one sells for \$8 per pound, and the cheaper one sells for \$4 per pound. The beans are mixed to provide a mixture of 50 pounds that sells for \$6.40 per pound. How much of each type of coffee bean should be used to create 50 pounds of the mixture?

Let:

x = expensive beans

y = cheaper beans

$$x + y = 50 \rightarrow x = 50 - y$$

$$8x + 4y = 6.4(50)$$

$$8(50 - y) + 4y = 320$$

$$400 - 8y + 4y = 320$$

$$-4y = -80$$

$$y = 20$$

$$x = 30$$

The mixture should contain 30 lbs of expensive beans and 20 lbs of cheaper beans.

U3D2

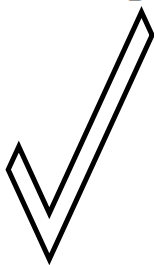
**More
Solving Linear Systems
in 3-Variables**

With your group, solve the following systems of equations.

1. ① $2x + y - z = 8$ $x = 4$

② $y + z = 4$ $y = 2$

③ $x - y = 2$ $z = 2$



$$\begin{array}{rcl} \textcircled{1} + \textcircled{2} & 2x + 2y = 12 & \Rightarrow 2x + 2y = 12 \\ \textcircled{3} & x - y = 2 & \xrightarrow{\times 2} 2x - 2y = 4 \\ \hline & & 4x = 16 \\ & & \textcircled{x = 4} \end{array}$$

$$\textcircled{3} \quad 4 - y = 2$$

$$\textcircled{y = 2}$$

$$\textcircled{2} \quad 2 + z = 4$$

$$\textcircled{z = 2}$$

2. ① $x - 3y + 3z = -4$

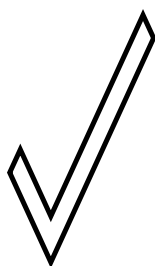
② $2x + 3y - z = 15$

③ $4x - 3y - z = 19$

$x = 5$

$y = 1$

$z = -2$



①+② $3x + 2z = 11$

②+③ $6x - 2z = 34$

$9x = 45$

$x = 5$

$3(5) + 2z = 11$

$15 + 2z = 11$

$2z = -4$

$z = -2$

$5 - 3y + 3(-2) = -4$

$-3y - 1 = -4$

$-3y = -3$

$y = 1$

3. $x = 3(y - z) \Rightarrow x = 3y - 3z \Rightarrow \textcircled{1} x - 3y + 3z = 0$
 $y = 5(z - x) \Rightarrow y = 5z - 5x \Rightarrow \textcircled{2} 5x + y - 5z = 0$
 $x + y = z + 4 \Rightarrow \textcircled{3} x + y - z = 4$

$$\begin{array}{r} \textcircled{1} x - 3y + 3z = 0 \\ 3 \times \textcircled{3} 3x + 3y - 3z = 12 \\ \hline 4x = 12 \\ x = 3 \end{array}$$

Sub both in
to find
 $y = 5$

$$\begin{array}{r} \textcircled{2} 5\left(\frac{15}{3}\right) + y - 5z = 0 \\ y - 5z = -15 \end{array}$$

$$\begin{array}{r} \textcircled{3} 3 + y - z = 4 \\ y - z = 1 \end{array}$$

$$\begin{array}{r} x' \left\{ \begin{array}{l} y - 5z = -15 \\ y - z = 1 \end{array} \right. \\ \hline -4z = -16 \\ z = 4 \end{array}$$

4. You bought breakfast at the school cafeteria 3 mornings this week. Since you have an account, you haven't paid any attention to the individual prices of your items. Your mom asked you how much each thing cost but all you could remember was what you bought and the total that you spent. On Monday, you bought 2 scones and a juice for \$4.00, Tuesday you bought 2 juices and a scone for \$3.50, and on Thursday you bought 2 juices, 2 breakfast sandwiches and 2 scones for \$9.00. How much does each item cost?

Let S = cost of a scone \$1.50

J = cost of a juice \$1.00

B = cost of a breakfast sand \$2.00

$$\begin{array}{rcl} 2S + J & = & 4.00 \Rightarrow 2S + J = 4 \\ S + 2J & = & 3.50 \xrightarrow{\times(-2)} -2S - 4J = -7 \\ \hline 2S + 2J + 2B & = & 9.00 \end{array}$$

$$-3J = -3$$

$$J = \$1$$

$$\begin{array}{l} S + 2(1) = 3.5 \\ S = 1.50 \end{array}$$


$$\begin{array}{l} 2(1.5) + 2(1) + 2B = 9 \\ 5 + 2B = 9 \\ 2B = 4 \\ B = 2 \end{array}$$

5. You love to go to the movies; this month you went three times. The first time you went, you bought a soda and popcorn and spent \$18 including the price of the ticket. The second time, you treated your best friend to his/her show and snacks, you each got a soda and shared popcorn; including tickets you spent \$30. The third time you went you decided you'd eaten enough popcorn that month so just got a ticket and a two sodas for \$16. How much does each item cost?

Let S = cost of a soda \$4
 P = cost of a popcorn \$6
 T = cost of a ticket \$8

$$\begin{aligned} S + P + T &= 18 \\ 2S + P + 2T &= 30 \\ 2S &+ T = 16 \end{aligned}$$

$$\begin{array}{r} \textcircled{1} \times (2) \quad -2S - 2P - 2T = -36 \\ \quad 2S + P + 2T = 30 \\ \hline \quad \quad -P = -6 \\ \quad \quad P = \$6 \end{array}$$



$$\begin{aligned} 4 + 6 + T &= 18 \\ T &= 8 \end{aligned}$$

$$\begin{aligned} S + 6 + T &= 18 \\ -S + T &= 12 \\ \textcircled{3} \quad 2S + T &= 16 \\ \hline S &= 4 \end{aligned}$$