

Written HWs 9+10 Due Friday

Next week review for Final Exam Tuesday

Final Exam (5/5 @ 8-10am LD136)

Lesson 34: Applications of Systems of Equations

Ex 1: The sum of two positive numbers is 48. Their difference is 16. What are the numbers?

Let x and y be two positive number

$$\begin{cases} x+y=48 & \textcircled{1} \\ x-y=16 & \textcircled{2} \end{cases}$$

Add $\textcircled{1}$ and $\textcircled{2}$

$$\begin{array}{r} x+y=48 \\ + x-y=16 \\ \hline 2x=64 \\ x=32 \end{array}$$

Plug $x=32$ into $\textcircled{1}$

$$\begin{array}{r} 32+y=48 \\ -32 \quad -32 \\ \hline y=16 \end{array}$$

Ex 2: Two angles are complementary [sum to 90°]. The measure of one angle is 18° more than twice the other angle, find the measure of each angle.

Let α and β to be the angles.

$$\begin{cases} \alpha+\beta=90^\circ & \textcircled{1} \\ \alpha=18^\circ+2\beta & \textcircled{2} \end{cases}$$

Plug $\textcircled{2}$ into $\textcircled{1}$.

$$\begin{array}{r} (18^\circ+2\beta)+\beta=90^\circ \\ 18^\circ+3\beta=90^\circ \\ -18 \quad \quad 18^\circ \\ \hline \quad \quad \quad \quad 72^\circ \end{array}$$

Plug $\beta=24^\circ$ into $\textcircled{2}$

$$\begin{aligned} \alpha &= 18^\circ + 2(24^\circ) \\ &= 18^\circ + 48^\circ \\ &= 66^\circ \end{aligned}$$

$$\begin{array}{r} 18^\circ \\ -18^\circ \\ \hline 3\beta^\circ = 72^\circ \\ \frac{3}{3} \quad \frac{72}{3} \\ \beta = 24^\circ \end{array} = 66^\circ$$

Ex 3: One week, Tim worked 30 hrs at McDonalds and 20 hours at the car wash. His total pay, before taxes, was \$500. His pay at McDonalds is \$1.25 per hour more than his pay at the car wash. Find Tim's hourly pay at each job.

Let a be $\frac{\$}{\text{hr}}$ at mcdonalds and b be $\frac{\$}{\text{hr}}$ at car wash

$$\begin{cases} a \cdot 30 + b \cdot 20 = 500 \\ a = 1.25 + b \end{cases} \Rightarrow \begin{cases} 3a + 2b = 50 \text{ ①} \\ a = 1.25 + b \text{ ②} \end{cases}$$

Plug ② into ①

Plug $b = 9.25$ into ②

$$3(1.25 + b) + 2b = 50$$

$$a = 1.25 + 9.25 = 10.50$$

$$3.75 + 3b + 2b = 50$$

$$3.75 + 5b = 50$$

$$5b = 50 - 3.75$$

$$b = \frac{50 - 3.75}{5} = 9.25$$

Ex 4: Almonds cost \$6.50 per pound. Cashews cost \$9.00 per pound. How many pounds of almonds and cashews are needed to make 9 pounds of mixed nuts that costs \$8.00 per pound?

Let a be almonds per pound and c be cashews per pound

$$\begin{cases} a + c = 9 \text{ ①} \\ 6.5a + 9c = 8(9) = 72 \text{ ②} \end{cases}$$

Multiply ① by 9 so when we subtract the c 's cancel.

$$9a + 9c = 81$$

Multiply ① by 4 so when we subtract the c terms,

$$\begin{array}{r} 9a + 9c = 81 \\ -(6.5a + 9c = 72) \\ \hline 2.5a = 9 \\ a = 3.6 \end{array}$$

Plug $a = 3.6$ into ①

$$\begin{array}{r} 3.6 + c = 9 \\ -3.6 \quad -3.6 \\ \hline c = 5.4 \end{array}$$

Ex 5: An experiment calls for a 5% salt solution. Only a 3% salt solution and an 8% salt solution are available. How many gallons of each must be combined to obtain 30 gallons of a 5% salt solution.

salt/gallon

Let x be the amount of 3% salt solution
 y be the amount of 8% salt solution

$$\begin{cases} x + y = 30 & \text{①} \\ 0.03x + 0.08y = 30(0.05) = 1.5 & \text{②} \end{cases}$$

⇒ Multiply ② by 100.

$$\begin{cases} x + y = 30 & \text{①} \\ 3x + 8y = 150 & \text{②} \end{cases}$$

Multiply ① by 3 and subtract from each other

$$\begin{array}{r} 3x + 3y = 90 \\ -(3x + 8y = 150) \\ \hline -5y = -60 \\ y = 12 \end{array}$$

Plug $y = 12$ into ①

$$x + 12 = 30 \Rightarrow x = 18$$

Plug $y=12$ into \cup
 $x+12=30 \Rightarrow x=18$