

Math 107
Fall 2016
Lecture 14

Mixtures :

$$\begin{array}{c} \boxed{\begin{array}{c} \text{Type A} \\ \$3/\text{lb.} \end{array}} \\ 20-x \end{array} + \begin{array}{c} \boxed{\begin{array}{c} \text{Type B} \\ \$5/\text{lb} \end{array}} \\ x \end{array} = \begin{array}{c} \boxed{\begin{array}{c} \text{Mixture} \\ \$3.50/\text{lb.} \end{array}} \\ 20 \text{ lb.} \end{array}$$

we need 20 lb. of mixture

$$3(20-x) + 5x = 3.50(20)$$

Solve for x .

Two acid solutions

$$\begin{array}{c}
 \boxed{\begin{array}{c} 40\% \\ \text{Acid} \end{array}} + \boxed{\begin{array}{c} 70\% \\ \text{Acid} \end{array}} = \boxed{\begin{array}{c} \text{Mixture} \\ 50\% \\ \text{Acid} \end{array}} \\
 \begin{array}{ccc}
 40 - x & x & 40 \text{ Liters}
 \end{array} \\
 40\%(40-x) + 70\%x = 50\%(40)
 \end{array}$$

we have unlimited supply of two different brand of Coffee. \$7/lb. & \$4/lb.
we need 21 pounds at \$5/lb.

$$\begin{array}{c}
 \boxed{\begin{array}{c} \text{Type A} \\ \$7 \end{array}} + \boxed{\begin{array}{c} \text{Type B} \\ \$4 \end{array}} = \boxed{\begin{array}{c} \text{Mix} \\ \$5 \end{array}} \\
 \begin{array}{ccc}
 x \text{ lb.} & 21-x & 21
 \end{array}
 \end{array}$$

$$7x + 4(21-x) = 5(21)$$

$$7x + 84 - 4x = 105$$

$$3x + 84 = 105$$

$$3x = 105 - 84$$

$$3x = 21$$

$$x = 7$$

7 lb. @ \$7/lb.

14 lb. @ \$4/lb.

I need 40 lb. of candy @ \$4/lb.

we have unlimited supply of two types of Candy. One @ \$3/lb. and another one @ \$5/lb.
How many pounds of each?

$$\begin{array}{|c|} \hline \$3 \\ \hline \end{array} \quad x \text{ lb.} \quad + \quad \begin{array}{|c|} \hline \$5 \\ \hline \end{array} \quad (40-x) \text{ lb.} = \begin{array}{|c|} \hline \$4 \\ \hline \end{array} \quad 40 \text{ lb.}$$

20 lb.
of each

$$3x + 5(40-x) = 4(40)$$

$$3x + 200 - 5x = 160$$

$$-2x + 200 = 160$$

$$-2x = 160 - 200$$

$$-2x = -40$$

$$x = 20$$

we have two supplies of alcohol solutions.
One is pure alcohol & the other one is 40% alcohol. we need 50 liters of 70% alcohol.
How many liters of each?

$$\begin{array}{|c|} \hline 100\% \\ \hline \end{array} \quad x \quad + \quad \begin{array}{|c|} \hline 40\% \\ \hline \end{array} \quad (50-x) = \begin{array}{|c|} \hline 70\% \\ \hline \end{array} \quad 50$$

25 liters
of each

$$100\% \cdot x + 40\% \cdot (50-x) = 70\% \cdot (50)$$

$$100x + 40(50-x) = 70(50)$$

$$100x + 2000 - 40x = 3500$$

$$60x = 3500 - 2000$$

$$60x = 1500$$

$$x = \frac{1500}{60}$$

$$x = 25$$

we need 70 liters of 30% acid.
 we have unlimited supply of 25% acid &
 60% acid. how many liters of each?

$$\begin{array}{|c|} \hline 60\% \\ \hline \end{array} + \begin{array}{|c|} \hline 25\% \\ \hline \end{array} = \begin{array}{|c|} \hline 30\% \\ \hline \end{array}$$

x liters $(70-x)$ liters 70 liters

10 liters of
 60% acid &
 60 liters of
 25% acid

$$\begin{aligned} 60\% \cdot x + 25\% \cdot (70-x) &= 30\% \cdot 70 \\ 60x + 25(70-x) &= 30(70) \\ 60x + 1750 - 25x &= 2100 \end{aligned}$$

$35x = 2100 - 1750$
 $35x = 350$
 $x = 10$

we need 30 gallons of 20% alcohol.
 we have unlimited supply of 40% & 10% alcohol.
 how many gallons of each?

$$\begin{array}{|c|} \hline 40\% \\ \hline \end{array} + \begin{array}{|c|} \hline 10\% \\ \hline \end{array} = \begin{array}{|c|} \hline 20\% \\ \hline \end{array}$$

x ga. $(30-x)$ ga. 30 ga.

$$40\% \cdot x + 10\% \cdot (30-x) = 20\% \cdot (30)$$

$$40x + 10(30-x) = 20(30)$$

$$40x + 300 - 10x = 600$$

$$30x = 600 - 300$$

$$30x = 300$$

$$x = 10$$

10 gallons of
 40% &
 20 gallons of
 10%

Find how many liters of each using the drawing below?

4 liters @ 70%.
8 liters @ 40%.

$$\boxed{40\%} + \boxed{70\%} = \boxed{50\%}$$

(12-x) liters x liters 12 Liters

$$40\% \cdot (12-x) + 70\% \cdot x = 50\% \cdot (12)$$

$$40(12-x) + 70x = 50(12)$$

$$480 - 40x + 70x = 600$$

$$\Rightarrow 480 + 30x = 600$$

$$30x = 600 - 480$$

$$30x = 120$$

$$x = 4$$