Feb 27

MPM2D **Solving Mixture and Investment Problems**

* Wed (March 4) is Unit 2 Test!

Example 1 Manny has a bottle of 5% acetic acid and a bottle of 10% acetic acid. How much should he use to make 250mL of 8% acetic acid?

5% + 10% = 8%

Solution: Ⓐ Ⓑ Ⓒ = Ⓐ × Ⓑ

	Solution Amount (ml)	Concentration (%)	Amount of Solute (ml)
Solution 1	x mL	5%	$0.05x$
Solution 2	y mL	10%	$0.1y$
New Solution	250 mL	8%	20 → $250 \times 0.08 = 20$

V → $x + y = 250$ Ⓐ

AS → $0.05x + 0.1y = 20$ Ⓑ

Rearrange: Ⓐ $y = 250 - x$ → Ⓒ

Sub Ⓒ into Ⓑ

$5x + 10(250 - x) = 2000$

$5x + 2500 - 10x = 2000$

$\frac{-5x}{-5} = \frac{-500}{-5}$

$\therefore x = 100$

$\therefore y = 150$

∴ Many should use 100 mL of 5% aa and 150mL of 1% of aa. (yield)

Ⓑ × 100: $5x + 10y = 2000$ → Ⓑ'

Example 2 Pierre invested $8000, ~~part at~~ 9% interest rate, and the remainder at 10% interest rate. After one year his total interest from these two investments was $740. How much did he invest at each rate?

x 9% + y 10% = $8000 $740

Solution:

	Amount ($)	Interest Rate (%)	Interest ($)
Investment 1	x	9%	$0.09x$
Investment 2	y	10%	$0.1y$
Total	$8000		$740

in total: some of them were invested in savings acct which

Ⓐ $x + y = 8000$

Ⓑ $0.09x + 0.1y = 740$

Ⓑ × 100: $9x + 10y = 74000$ → Ⓑ'

Ⓐ × 9: $9x + 9y = 72000$ → Ⓐ'

Ⓑ' − Ⓐ' $0 + 1y = 2000$

$\therefore y = 2000$

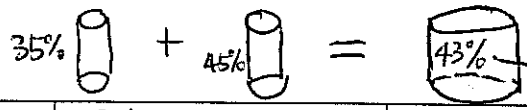
Sub $y = 2000$ into Ⓐ

Ⓐ $x + 2000 = 8000$

$\therefore x = 6000$

∴ Pierre invested $6000 into 9% savings account and $2000 into 10% savings account.

Example 3 Jackie has a bottle of 35% salt solution and a bottle of 45% salt solution. How much of each solution should she use to make 500mL of 43% ~~acetic acid~~?

Solution: 

	Solution Amount	Concentration	Amount of Solution (salt in)
Solution 1	x	35 %	$0.35x$
Solution 2	y	45 %	$0.45y$
New solution	500 mL	43 %	$0.43(500) = 215$

(V) $x + y = 500$ (A) $\rightarrow$ $x = 500 - y$ (A)'

$0.35x + 0.45y = 215$ (B)

(B) $\times 100$: $35x + 45y = 21500 \rightarrow$ (B')

(A) $\times 35$: $35x + 35y = 17500 \rightarrow$ (A')

(B') $-$ (A') $\quad 0 + 10y = 4000$

$\frac{10y}{10} = \frac{4000}{10}$

$\therefore y = 400$

Sub into (A)

$x + 400 = 500$

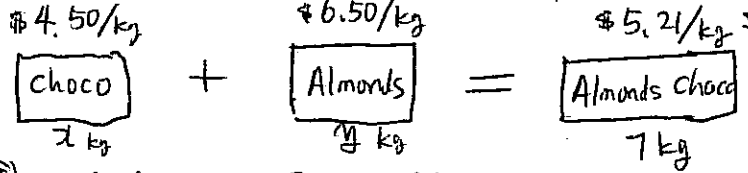
$\therefore x = 100$

∴ She should use 100mL of 35% salt solution and 400 mL of 45% salt solution.

Example 4 Seth and Amanda mixes chocolates costing \$4.50/kg with almonds costing \$6.50/kg to form a mixture which costs \$36.50 for a 7 kg box. How many kg of chocolates should Seth and Amanda use for one box? How many kg of almonds should they use?

Solution:

	(A) Amount (kg)	(B) \$ / kg	(C) = (A) × (B) Total Cost = Amount × \$/kg
Chocolate	x	\$4.50	$4.5x$
Almonds	y	6.50	$6.5y$
Box	7	5.21	36.50



(A) $x + y = 7$ (kg)

(B) $4.5x + 6.5y = 36.50$ (Cost)

Rearrange (A) $y = 7 - x \rightarrow$ A'

(B) $4.5x + 6.5(7 - x) = 36.50$

$4.5x + 45.5 - 6.5x = 36.50$

$-2x = 36.5 - 45.5$

$x = \frac{36.5 - 45.5}{-2}$

$\therefore x = 4.5$

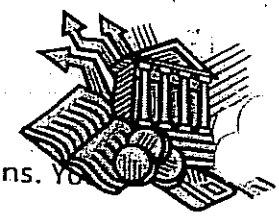
Sub $x =$ int (A)

$\therefore y = 7 \rightarrow y = 7$

$\therefore y = 2.5$ $\therefore y =$

∴ We need kg of chocolate and kg of Almonds.

Homework: Worksheet (next 2 pages)



1. For the following problems, define your variables and state the two initial equations. You do not need to solve the problem.

   a. Peggy invested $1000, part at 8% per year and the remainder at 9% per year. After on year her total interest from these investments was $84. How much did she invest at each rate?

   b. How many kilograms of 30% salt solution by mass and 40% salt solution by mass should be mixed to form 200 kg of 37% salt solution by mass?

   c. Jelly beans and mints, worth $2.10/kg and $2.70/kg respectively, were mixed to make 500 kg of mixture which sold for $2.52/kg. How many kilograms of mints were used?

2. **Solve** the following problems. Remember to define your variables and give a concluding statement.

   a. The student council invested $6000, part at 7.5% per year and the remainder at 8.5% per year. The total interest, after one year, from these investments was $480. How much was invested at each rate?

   b. A lab technician wants to make 500 kg of 28% alcohol solution by mixing 40% alcohol solution and 20% alcohol solution. How many kilograms of each type should be used?

   c. Coffee that sells for $7.20/kg is mixed with coffee that sells for $4.80/kg to make 1200 kg of coffee that will sell for $5.60/kg. How many kilograms of each type of coffee were used?

   d. A hardware store manager mixes nails that sell for $3.30/kg and nails that sell for $3.60/kg to get 100 kg of nails that he puts in 1 kg bags. He sells each bag for $3.42. How many kilograms of each type of nail does he use?

   e. A gas station attendant wishes to make 100L of 48% ethylene glycol solution by mixing some 40% solution with some 60% solution of ethylene glycerol. How much of each solution should the attendant use?

Answers:

1 a. x= amount at 8%
y= amount at 9%
$x + y = 1000$
$0.08x + 0.09y = 84$

b. x= # of kg of 30% sol
y= # of kg of 40% sol
$x + y = 200$
$0.30x + 0.40y = 0.37(200)$

c. x= # of kg jelly beans
y= # of kg mints
$x + y = 500$
$2.10x + 2.70y = 2.52(500)$

2 a. $3000 at 7.5%, $3000 at 8.5%
b. 200kg at 40%, 300kg at 20%
c. 400kg at $7.20/kg, 800kg at $4.80/kg
d. 60 kg at $3.30/kg, 40kg at $3.60/kg
e. 60 L at 48%, 40 L at 40%