

Mixture Problems
Unit 5: Real World Applications

Solve each question. Round your answer to the nearest hundredth when needed.

1. $6 m^3$ of soil containing 40% silt was mixed into $2 m^3$ of soil containing 52% silt. What is the silt content of the mixture?

43%

2. 3 lbs. of premium salad mix was made by combining 2 lbs. of arugula which costs \$2/lbs. with 1 lbs. of spinach which cost \$5/lbs. Find the cost per lbs. of the mixture.

\$3/lbs

3. 12 kg of mixed nuts containing 26% peanuts were mixed with 9 kg of another kind of mixed nuts that contain 40% peanuts. Peanuts are what percent of the new mixture?

32%

4. 21 oz. of Brand M Cinnamon was made by combining 7 oz. of Indonesian cinnamon which costs \$17/oz. with 14 oz. of Thai Cinnamon which costs \$14/oz. Find the cost per oz. of the mixture.

\$15/oz

5. Lydia wants to make a 42% acid solution. She has already poured 5 gal of pure water into a beaker. How many gallons of a 72% acid solution must she add to this to create the desired mixture?

7 gal

6. How many gallons of a 40% saline solution must be mixed with 8 gallons of a 90% saline solution to make a 60% solution?

12 gal

7. How many oz. of mixed nuts that contain 35% peanuts must Sebastian add to 8 oz. of mixed nuts that contain 20% peanuts to make a mixture with 30% peanuts?

16 oz.

8. How much soil with 59% sand do you need to add to $1 ft^3$ of soil with 29% sand in order to make a soil with 53% sand?

4 ft^3

9. Shyann and her brother mixed some soil and some silt to make $5 yd^3$ of soil with a 70% silt content. They used $2 yd^3$ of silt and $3 yd^3$ of a soil they purchased. What was the silt content of the soil they purchased?

50%

10. Emily made a nut mixture that contains 40% peanuts by mixing 10 kg of mixed nuts that contain 58% peanuts and 15 kg of a different brand of mixed nuts. The second brand of mixed nuts contained what percent peanuts?

28%

11. What is the price per lb. of Indonesian cinnamon if 3 lbs. were mixed with 2 lbs. of Thai cinnamon which costs \$9/lb. to make 5 lbs. of Brand M Cinnamon which costs \$12/lb.?

\$14/lb

12. Perry and his brother mixed some soil and some silt to make 15 m^3 of soil with a 67% silt content. They used 6 m^3 of silt and 9 m^3 of soil they purchased. What was the silt content of the soil they purchased?

45%

13. To build the garden of your dreams you need 12 m^3 of soil containing 37% sand. You have two types of soil you can combine to achieve this: soil with 52% sand and soil with 16% sand. How much of each soil should you use?

7 m^3 of the 52% sand
 5 m^3 of the 16% sand

14. Farmer John's Produce Stand sells 30 lbs. bags of mixed nuts that contain 41% peanuts. To make his product he combines Brand A mixed nuts which contain 60% peanuts and Brand B mixed nuts which contain 30% peanuts. How much of each does he need to use?

11 lbs of Brand A
19 lbs of Brand B

15. Juan wants to make 15 ml of a 34% alcohol solution by mixing a 10% alcohol solution and a 40% alcohol solution. How much of each solution must he use?

3ml of the 10% solution
12ml of the 40% solution

16. Molly asked you to make 7 L of fruit punch that contains 44% fruit juice by mixing some amount of Brand A fruit punch and some amount of Brand B fruit punch. Brand A contains 48% fruit juice and Brand B contains 34% fruit juice. How much of each do you need?

5 L of Brand A
2 L of Brand B

17. Kristin wants to make 18 fl. oz. of a 45% sugar solution by mixing a 55% sugar solution and a 40% sugar solution. How much of each solution must she use?

6 oz of the 55% solution
12 oz of the 40% solution

18. A metallurgist needs to make 12 oz. of an alloy containing 75% gold. She is going to melt and combine one metal that is 40% gold with pure gold. How much of each should she use?

5 oz of the 40% gold
7 oz of the pure gold

$$\textcircled{1} \quad 6(0.40) + 2(0.52) = (6+2)(x)$$

$$2.4 + 1.04 = 8x$$

$$\frac{3.44}{8} = \frac{8x}{8}$$

$$0.43 = x$$

move decimal 2 places to the right

43%

$$\textcircled{2} \quad 2(\$2) + 1(\$5) = 3(x)$$

$$\$4 + \$5 = 3x$$

$$\frac{\$9}{3} = \frac{3x}{3}$$

$$\boxed{\$3/\text{lb.} = x}$$

$$\textcircled{3} \quad 12(0.26) + 9(0.40) = (12+9)(x)$$

$$3.12 + 3.6 = 21x$$

$$\frac{6.72}{21} = \frac{21x}{21}$$

$$0.32 = x$$

Move decimal 2 places to the right.

32%

$$\textcircled{4} \quad 7(\$17) + 14(\$14) = 21x$$

$$\$119 + \$196 = 21x$$

$$\frac{\$315}{21} = \frac{21x}{21}$$

$$\boxed{\$15/\text{oz.} = x}$$

⑤ Note: Pure water has no acid meaning 0%

$$5(0.00) + x(0.72) = (5+x)(0.42)$$

$$\begin{array}{r} 0 + 0.72x = 2.1 + 0.42x \\ -0.42x \qquad -0.42x \\ \hline \end{array}$$

$$\frac{0.30x}{0.3} = \frac{2.1}{0.3}$$

$$x = 7 \text{ gal}$$

⑥ $x(0.40) + 8(0.90) = (x+8)(0.60)$

$$\begin{array}{r} 0.40x + 7.2 = 0.60x + 4.8 \\ -0.40x \quad -4.8 \quad -0.40x \quad -4.8 \\ \hline \end{array}$$

$$\frac{2.4}{0.2} = \frac{0.20x}{0.20}$$

$$12 \text{ gal} = x$$

⑦ $x(0.35) + 8(0.20) = (x+8)(0.30)$

$$\begin{array}{r} 0.35x + 1.6 = 0.30x + 2.4 \\ -0.30x \quad -1.6 \quad -0.30x \quad -1.6 \\ \hline \end{array}$$

$$\frac{0.05x}{0.05} = \frac{0.80}{0.05}$$

$$x = 16 \text{ oz}$$

⑧ $x(0.59) + 1(0.29) = (x+1)(0.53)$

$$\begin{array}{r} 0.59x + 0.29 = 0.53x + 0.53 \\ -0.53x \quad -0.29 \quad -0.53x \quad -0.29 \\ \hline \end{array}$$

$$\frac{0.06x}{0.06} = \frac{0.24}{0.06}$$

$$x = 4 \text{ ft}^3$$

$$\textcircled{9} \quad 2(1.00) + 3(x) = 5(0.70)$$

$$\begin{array}{r} 2 + 3x = 3.5 \\ -2 \qquad -2 \end{array}$$

$$\frac{3x}{3} = \frac{1.5}{3}$$

$$x = 0.50$$

Move decimal 2 places to the right. 50%

$$\textcircled{10} \quad 10(0.58) + 15(x) = (10+15)(0.40)$$

$$5.8 + 15x = (25)(0.40)$$

$$\begin{array}{r} 5.8 + 15x = 10 \\ -5.8 \qquad -5.8 \end{array}$$

$$\frac{15x}{15} = \frac{4.2}{15}$$

$$x = 0.28$$

Move decimal 2 places to the right. 28%

$$\textcircled{11} \quad 3(x) + 2(\$9) = 5(\$12)$$

$$\begin{array}{r} 3x + \$18 = \$60 \\ -18 \qquad -18 \end{array}$$

$$\frac{3x}{3} = \frac{\$42}{3}$$

$$x = \$14/1b$$

$$\textcircled{12} \quad 6(1.00) + 9(x) = 15(0.67)$$

$$\begin{array}{r} 6 + 9x = 10.05 \\ -6 \qquad -6 \end{array}$$

$$\frac{9x}{9} = \frac{4.05}{9}$$

$$x = 0.45$$

move decimal 2 places to the right. 45%

- # 13 - 18 will require a system of equations.
- You may solve them using Substitution or Elimination

- 13) Let x = amount of soil with 52% sand
 Let y = amount of soil with 16% sand

Total Soil Equation

$$x + y = 12$$

Mixture Equation

$$0.52x + 0.16y = 12(0.37)$$

$$0.52x + 0.16y = 4.44$$

Method 1: Substitution

- Solve $x + y = 12$ for x or y

$$\begin{array}{r} x + y = 12 \\ x + y = 12 \\ -y \quad -y \\ \hline x = 12 - y \end{array}$$

- Replace x in mixture equation

$$\begin{array}{l} 0.52x + 0.16y = 4.44 \\ 0.52(12 - y) + 0.16y = 4.44 \\ 6.24 - 0.52y + 0.16y = 4.44 \end{array}$$

$$\begin{array}{l} 6.24 - 0.36y = 4.44 \\ -6.24 \quad -6.24 \\ \hline -0.36y = -1.8 \\ -0.36 \quad -0.36 \\ \hline y = 5 \text{ m}^3 \end{array}$$

$$\boxed{y = 5 \text{ m}^3}$$

- Using Total Soil Equation now

$$\begin{array}{l} x + y = 12 \\ x + 5 = 12 \\ -5 \quad -5 \\ \hline x = 7 \text{ m}^3 \end{array}$$

$$\boxed{x = 7 \text{ m}^3}$$

Method 2: Elimination

- Multiply Total Soil Equation by -0.16

$$\begin{array}{l} -0.16(x + y = 12) \\ -0.16x - 0.16y = -1.92 \end{array}$$

- Add the two equations together

$$\begin{array}{l} 0.52x + 0.16y = 4.44 \\ -0.16x - 0.16y = -1.92 \\ \hline 0.36x = 2.52 \\ 0.36 \quad -0.36 \\ \hline x = 7 \text{ m}^3 \end{array}$$

$$\boxed{x = 7 \text{ m}^3}$$

- Using Total Soil Equation now

$$\begin{array}{l} x + y = 12 \\ 7 + y = 12 \\ -7 \quad -7 \\ \hline y = 5 \text{ m}^3 \end{array}$$

$$\boxed{y = 5 \text{ m}^3}$$

7 m^3 of the 52% sand
 5 m^3 of the 16% sand

- 14) Let x = amount of Brand A
 Let y = amount of Brand B

Total Mixed Nuts Eqn

$$x + y = 30$$

Method 1: Substitution

- Solve Mixed Nuts Eqn for x or y

$$\begin{array}{r} x + y = 30 \\ -y \quad -y \\ \hline x = 30 - y \end{array}$$

- Replace x in Mixture Equation

$$\begin{array}{l} 0.60x + 0.30y = 12.3 \\ 0.60(30 - y) + 0.30y = 12.3 \\ 18 - 0.60y + 0.30y = 12.3 \end{array}$$

$$\begin{array}{r} 18 - 0.30y = 12.3 \\ -18 \quad -18 \\ \hline \end{array}$$

$$\begin{array}{r} -0.30y = -5.7 \\ -0.30 \quad -0.30 \\ \hline \end{array}$$

$$\boxed{y = 19 \text{ lbs}}$$

- Using Total Mixed Nuts Equation

$$\begin{array}{r} x + y = 30 \\ x + 19 = 30 \\ -19 \quad -19 \\ \hline \end{array}$$

$$\boxed{x = 11 \text{ lbs}}$$

Mixture Equation

$$\begin{array}{l} 0.60x + 0.30y = 30(0.41) \\ 0.60x + 0.30y = 12.3 \end{array}$$

Method 2: Elimination

- Multiply Mixed Nuts Eqn by -0.30

$$\begin{array}{r} -0.30(x + y = 30) \\ -0.30x - 0.30y = -9 \end{array}$$

- Add the two equations together

$$\begin{array}{r} 0.60x + 0.30y = 12.3 \\ -0.30x - 0.30y = -9 \\ \hline 0.30x \qquad \qquad = 3.3 \\ 0.30 \qquad \qquad \quad 0.30 \end{array}$$

$$\boxed{x = 11 \text{ lbs}}$$

- Using the Total Mixed Nuts Eqn

$$\begin{array}{r} x + y = 30 \\ 11 + y = 30 \\ -11 \quad -11 \\ \hline y = 19 \text{ lbs} \end{array}$$

$\boxed{\begin{array}{l} 11 \text{ lbs of Brand A} \\ 19 \text{ lbs of Brand B} \end{array}}$

- 15) Let x = amount of 10% solution
 Let y = amount of 40% solution

Total Equation

$$x + y = 15$$

Mixture Equation

$$0.10x + 0.40y = 15(0.34)$$

$$0.10x + 0.40y = 5.1$$

Method 1: Substitution

- solve Total Equation for x or y

$$\begin{array}{r} x + y = 15 \\ -y \quad -y \\ \hline x = 15 - y \end{array}$$

- Replace x in Mixture Equation

$$\begin{array}{r} 0.10x + 0.40y = 5.1 \\ 0.10(15 - y) + 0.40y = 5.1 \\ 1.5 - 0.10y + 0.40y = 5.1 \\ 1.5 + 0.30y = 5.1 \\ -1.5 \quad -1.5 \\ \hline 0.30y = 3.6 \end{array}$$

$$\frac{0.30y}{0.30} = \frac{3.6}{0.30}$$

$$y = 12 \text{ ml}$$

- Using Total Equation now

$$\begin{array}{r} x + y = 15 \\ x + 12 = 15 \\ -12 \quad -12 \\ \hline x = 3 \text{ ml} \end{array}$$

Method 2: Elimination

- Multiply Total Eqn by -0.10

$$\begin{array}{r} -0.10(x + y = 15) \\ -0.10x - 0.10y = -1.5 \end{array}$$

- Add the two equations together

$$\begin{array}{r} 0.10x + 0.40y = 5.1 \\ -0.10x - 0.10y = -1.5 \\ \hline 0.30y = 3.6 \end{array}$$

$$\frac{0.30y}{0.30} = \frac{3.6}{0.30}$$

$$y = 12 \text{ ml}$$

- Using Total Equation now

$$x + y = 15$$

$$\begin{array}{r} x + 12 = 15 \\ -12 \quad -12 \\ \hline x = 3 \text{ ml} \end{array}$$

3ml of the 10% solution
 12ml of the 40% solution

- 16 Let x = amount of Brand A
 Let y = amount of Brand B

Total Equation

$$x + y = 7$$

Mixture Equation

$$0.48x + 0.34y = 7(0.44)$$

$$0.48x + 0.34y = 3.08$$

Method 1: Substitution

- solve Total Equation for x or y

$$\begin{array}{r} x + y = 7 \\ -y \quad -y \\ \hline x = 7 - y \end{array}$$

- Replace x in mixture Equation

$$0.48x + 0.34y = 3.08$$

$$0.48(7 - y) + 0.34y = 3.08$$

$$3.36 - 0.48y + 0.34y = 3.08$$

$$3.36 - 0.14y = 3.08$$

$$\begin{array}{r} 3.36 - 0.14y = 3.08 \\ -3.36 \quad -3.36 \\ \hline -0.14y = -0.28 \end{array}$$

$$\frac{-0.14y}{-0.14} = \frac{-0.28}{-0.14}$$

$$y = 2 \text{ L}$$

- Using Total Equation Now

$$\begin{array}{r} x + y = 7 \\ x + 2 = 7 \\ -2 \quad -2 \\ \hline x = 5 \text{ L} \end{array}$$

$$x = 5 \text{ L}$$

Method 2: Elimination

- Multiply Total Equation by -0.34

$$-0.34(x + y = 7)$$

$$-0.34x - 0.34y = -2.38$$

- Add the two equations together

$$\begin{array}{r} 0.48x + 0.34y = 3.08 \\ -0.34x - 0.34y = -2.38 \\ \hline 0.14x = 0.70 \end{array}$$

$$\frac{0.14x}{0.14} = \frac{0.70}{0.14}$$

$$x = 5 \text{ L}$$

- Using Total Equation now

$$\begin{array}{r} x + y = 7 \\ 5 + y = 7 \\ -5 \quad -5 \\ \hline y = 2 \text{ L} \end{array}$$

$$\begin{array}{l} 5 \text{ L of Brand A} \\ 2 \text{ L of Brand B} \end{array}$$

- 17 Let x = amount of 55% sugar solution
 Let y = amount of 40% sugar solution

Total Equation

$$x + y = 18$$

Mixture Equation

$$0.55x + 0.40y = 18(0.45)$$

$$0.55x + 0.40y = 8.1$$

Method 1: Substitution

- Solve Total Equation for x or y

$$\begin{array}{r} x + y = 18 \\ -y \quad -y \\ \hline x = 18 - y \end{array}$$

- Replace x in Mixture Equation

$$0.55x + 0.40y = 8.1$$

$$0.55(18 - y) + 0.40y = 8.1$$

$$9.9 - 0.55y + 0.40y = 8.1$$

$$\begin{array}{r} 9.9 - 0.15y = 8.1 \\ -9.9 \quad -9.9 \\ \hline -0.15y = -1.8 \\ -0.15 \quad -0.15 \\ \hline y = 12 \text{ oz} \end{array}$$

$$\boxed{y = 12 \text{ oz}}$$

- Using Total Equation now

$$\begin{array}{r} x + y = 18 \\ x + 12 = 18 \\ -12 \quad -12 \\ \hline x = 6 \text{ oz} \end{array}$$

$$\boxed{x = 6 \text{ oz}}$$

Method 2: Elimination

- Multiply Total Eqn by -0.40

$$-0.40(x + y = 18)$$

$$-0.40x - 0.40y = -7.2$$

- Add the two equations together

$$\begin{array}{r} 0.55x + 0.40y = 8.1 \\ -0.40x - 0.40y = -7.2 \\ \hline 0.15x = 0.9 \end{array}$$

$$\frac{0.15x}{0.15} = \frac{0.9}{0.15}$$

$$\boxed{x = 6 \text{ oz}}$$

- Using Total Equation now

$$\begin{array}{r} x + y = 18 \\ 6 + y = 18 \\ -6 \quad -6 \\ \hline y = 12 \text{ oz} \end{array}$$

$$\boxed{y = 12 \text{ oz}}$$

6 oz. of the 55% solution
 12 oz. of the 40% solution

- 18) Let x = amount of 40% gold
 Let y = amount of pure gold

Total Equation

$$x + y = 12$$

Mixture Equation

$$0.40x + 1.00y = 12(0.75)$$

$$0.40x + y = 9$$

Method 1: Substitution

- Solve Total Equation for x or y

$$\begin{array}{r} x + y = 12 \\ -y \quad -y \\ \hline \end{array}$$

$$x = 12 - y$$

- Replace x in Mixture Equation

$$0.40x + 1.00y = 9$$

$$0.40(12 - y) + y = 9$$

$$4.8 - 0.40y + y = 9$$

$$\begin{array}{r} 4.8 + 0.60y = 9 \\ -4.8 \quad -4.8 \\ \hline \end{array}$$

$$\begin{array}{r} 0.60y = 4.2 \\ 0.60 \quad 0.60 \\ \hline \end{array}$$

$$y = 7 \text{ oz}$$

- Using Total Equation now

$$x + y = 12$$

$$x + 7 = 12$$

$$\begin{array}{r} -7 \quad -7 \\ \hline \end{array}$$

$$x = 5 \text{ oz}$$

Method 2: Elimination

- Multiply Total Eqn by -1

$$-1(x + y = 12)$$

$$-x - y = -12$$

- Add the two equations together

$$0.40x + y = 9$$

$$-x - y = -12$$

$$\begin{array}{r} -0.60x = -3 \\ -0.60 \quad -0.60 \\ \hline \end{array}$$

$$x = 5 \text{ oz}$$

- Using Total Eqn now

$$x + y = 12$$

$$5 + y = 12$$

$$\begin{array}{r} -5 \quad -5 \\ \hline \end{array}$$

$$y = 7 \text{ oz}$$

5oz of the 40% gold
 7oz of the pure gold

