

Mixture Problems

1. The owner of the Fancy Food Shoppe wishes to mix cashews selling at \$8.00 per kilogram and pecans selling for \$7.00 per kilogram. How much of each kind of nut should be mixed to get 8 kg worth \$7.25 per kilogram?

	Number of kilograms × Price per kilogram = Total cost		
Cashews	<i>X</i>	<i>8</i>	<i>8x</i>
Pecans	<i>8 - x</i>	<i>7</i>	<i>7(8 - x)</i>
Mixture	<i>8</i>	<i>7.25</i>	<i>8(7.25)</i>

$$\text{Vol(con) of Cashews} + \text{Vol(con) of Pecans} = \text{vol(con) of Mixture}$$

$$8x + 7(8 - x) = 8(7.25)$$

2. A chemist has 40 grams of a solution that is 50% acid. How much water should she add to make a solution that is 10% acid?

	Total amount × % acid = Amount of acid		
Original Solution	<i>40</i>	<i>0.5</i>	<i>(0.5)(40)</i>
Added Water	<i>x</i>	<i>0</i>	<i>0x</i>
New Solution	<i>40 + x</i>	<i>0.1</i>	<i>0.1(40 + x)</i>

$$\text{Vol(con) of Original Solution} + \text{Vol(con) of Water} = \text{Vol(con) of New Solution}$$

$$(0.5)(40) + (0x) = 0.1(40 + x)$$

3. A chemist has 800 g of a solution that is 15% salt. How much salt should be added to make a solution that is 20% salt?

	Total amount × % salt = Amount of salt		
Original Solution	<i>800</i>	<i>0.15</i>	<i>800(0.15)</i>
Added salt	<i>x</i>	<i>1.00</i>	<i>1x</i>
Mixture	<i>800 + x</i>	<i>0.2</i>	<i>0.2(800 + x)</i>

$$\text{Vol(con) of Original Solution} + \text{Vol(con) of salt} = \text{Vol(con) of mixture}$$

$$800(0.15) + 1x = 0.2(800 + x)$$

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4. A chemist mixes together 20 L of a solution that is 60% acid and 30L of a solution that is 20% acid. What is the acid percentage of the mixture?

	<i>Volume × Concentration = Amount of Acid</i>		
<i>Acid 1</i>	<i>20</i>	<i>0.6</i>	<i>0.6(20)</i>
<i>Acid2</i>	<i>30</i>	<i>0.2</i>	<i>0.2(30)</i>
<i>Solution</i>	<i>(20 + 30) = 50</i>	<i>x</i>	<i>50x</i>

$$\begin{aligned} \text{Acid 1} + \text{Acid2} &= \text{Solution} \\ (0.6)(20) + (0.2)(30) &= 50x \end{aligned}$$

5. A grocer mixes together four pounds of peanuts costing \$2 per pound with two pounds of walnuts costing \$5 per pound. What should the price per pound of this mixture be?

	<i>Weight × price per pound = amount of mixture</i>		
<i>Peanuts</i>	<i>4</i>	<i>2</i>	<i>4(2)</i>
<i>Walnuts</i>	<i>2</i>	<i>5</i>	<i>2(5)</i>
<i>Mixture</i>	<i>2 + 4 = 6</i>	<i>x</i>	<i>6x</i>

$$\begin{aligned} \text{Peanuts} + \text{walnuts} &= \text{mixture} \\ 4(2) + 5(2) &= 6x \end{aligned}$$

6. How many grams of water must be added to 50 g of a 30% acid solution in order to produce a 20% acid solution?

	<i>Amount of solution × concentration = amount</i>		
<i>Acid</i>	<i>50 g</i>	<i>0.30</i>	<i>50(0.3)</i>
<i>Water</i>	<i>x</i>	<i>0</i>	<i>0x</i>
<i>New Sol</i>	<i>50 + x</i>	<i>0.2</i>	<i>0.2(50 + x)</i>

$$\begin{aligned} \text{Acid solution} + \text{water} &= \text{new solution} \\ 50(0.3) + 0x &= 0.2(50 + x) \end{aligned}$$

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7. How many kilograms of water must be added to 80 kg of a 60% iodine solution in order to dilute it to a 40% iodine solution?

	<i>Volume × concentration = amount of solution</i>		
<i>Water</i>	<i>x</i>	<i>0</i>	<i>0x</i>
<i>Iodine</i>	<i>80</i>	<i>0.6</i>	<i>80(0.6)</i>
<i>New Sol</i>	<i>x + 80</i>	<i>0.4</i>	<i>0.4(x + 80)</i>

Water solution + Iodine = new solution

$$0x + 80(0.6) = (0.4)(x + 80)$$

8. How many kilograms of salt must be added to 30 kg of a 20% salt solution in order to increase the salt content to 25%?

	<i>Volume × concentration = amount of solution</i>		
<i>Salt</i>	<i>x</i>	<i>1.0</i>	<i>1x</i>
<i>Salt Sol</i>	<i>30</i>	<i>0.2</i>	<i>0.2(30)</i>
<i>New Sol</i>	<i>x + 30</i>	<i>0.25</i>	<i>(0.25)(x + 30)</i>

Salt + Salt solution = new solution

$$1x + (0.2)(30) = (0.25)(x + 30)$$

9. A grocer mixes two kinds of nuts. One kind costs \$5.00 per kilogram and the other \$5.80 per kilogram. How many kilograms of each type are needed to make 40 kg of a blend worth \$5.50 per kilogram?

	<i>Volume × concentration = amount</i>		
<i>Nuts1</i>	<i>x</i>	<i>5.</i>	<i>5x</i>
<i>Nuts2</i>	<i>40 - x</i>	<i>5.80</i>	<i>5.8(40 - x)</i>
<i>New Mix</i>	<i>40</i>	<i>5.5</i>	<i>5.5(40)</i>

Nuts 1 + Nuts 2 = new Mixture

$$5x + 5.8(40 - x) = 5.5(40)$$

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10. A chemist wishes to mix some pure acid with some water to produce 8 L of a solution that is 40% acid. How much pure acid and how much water should be mixed?

	<i>Volume × Concentration = amount</i>		
<i>Acid</i>	<i>x</i>	<i>1.00</i>	<i>1x</i>
<i>Water</i>	<i>8 - x</i>	<i>0</i>	<i>0(8 - x)</i>
<i>Solution</i>	<i>8</i>	<i>0.4</i>	<i>0.4(8)</i>

Acid solution + Water = new solution

$$1x + 0(8 - x) = 0.4(8)$$

11. How many kilograms of water must be evaporated from 10 kg of a 40% salt solution to produce a 50% salt solution?

	<i>Volume × Concentration = amount</i>		
<i>Water</i>	<i>x</i>	<i>0</i>	<i>0x</i>
<i>Salt</i>	<i>10</i>	<i>0.40</i>	<i>0.4(10)</i>
<i>Solution</i>	<i>10 - x</i>	<i>0.5</i>	<i>0.5(10 - x)</i>

Salt - Water = new solution

$$0.4(10) - 0x = 0.5(10 - x)$$

12. How many kilograms of water must be evaporated from 12 kg of a 20% salt solution to produce a 60% solution?

	<i>Volume × Concentration = amount</i>		
<i>Water</i>	<i>x</i>	<i>0</i>	<i>0x</i>
<i>Salt</i>	<i>12</i>	<i>0.2</i>	<i>0.2(12)</i>
<i>New Sol</i>	<i>12 - x</i>	<i>0.6</i>	<i>0.6(12 - x)</i>

Salt - Water = new solution

$$0.2(12) - 0x = 0.6(12 - x)$$