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Mixture Problems

For each of the following mixture problems:

a) The weight goes outside the bin and the price or percentage goes inside the bin.
b) Set an equation by multiplying the weight outside the bin by price or percentage inside the bin.
c) Set up the equations you will use to solve the equation and check the answers.

1) A chemistry experiment calls for a 30% sulfuric acid solution. If the lab supply room has only 50% and 20% sulfuric acid solutions on hand, how much of each should be mixed to obtain 12 liters of a 30% solution? Answer: 4 and 8.

\[
\begin{align*}
20\% & \hspace{1cm} + \hspace{1cm} 50\% \\
X & \hspace{1cm} 12 - x \\
\end{align*}
\]

\[
20x + 50(12 - x) = 30(12) \Rightarrow 20x + 600 - 50x = 360 \Rightarrow -30x = -240 \Rightarrow x = 8 \text{ liters of 20%}
\]

2) How many gallons of a 3% salt solution must be mixed with 50 gallons of a 7% solution to obtain a 5% solution? Answer: 50

\[
\begin{align*}
3\% & \hspace{1cm} + \hspace{1cm} 7\% \\
X & \hspace{1cm} 50 \\
\end{align*}
\]

\[
20x + 50(12 - x) = 30(12) \Rightarrow 20x + 600 - 50x = 360 \Rightarrow -30x = -240 \Rightarrow x = 8 \text{ liters of 20%}
\]

3) To make low fat cottage cheese, milk containing 4% butterfat is mixed with 10 gallons of milk containing 1% butterfat to obtain a mixture containing 2% butterfat. How many gallons of the richer milk is used? Answer: x = 5

\[
\begin{align*}
\hspace{3cm} & \hspace{3cm} \\
\hspace{3cm} & \hspace{3cm} \\
\end{align*}
\]

3. 

4) A 100% concentrate is to be mixed with a mixture having a concentration of 40% to obtain 55 gallons of a mixture with a concentration of 75%. How much of the 100% concentrate will be needed? Answer: x = 32.08 gallons

\[
\begin{align*}
\hspace{3cm} & \hspace{3cm} \\
\hspace{3cm} & \hspace{3cm} \\
\end{align*}
\]

4. 

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5) A grocer mixes peanuts that cost $2.49 per pound and walnuts that cost $3.89 per pound to make 100 pounds of a mixture that costs $3.19 per pound. How much of each kind of nut is put into the mixture? \textit{Answer: 50 pounds of peanuts and 50 pounds of walnuts must be used to obtain 100 pounds costing $3.19 per pound}

\[
\frac{x}{2.49} + \frac{100-x}{3.89} = \frac{3.19}{100}
\]

\[
2.49x + 3.89(100 - x) = 3.19(100) \Rightarrow 2.49x + 389 - 3.89x = 319 \Rightarrow -1.40x = -70 \Rightarrow x = 50 \text{ pounds of peanuts}
\]

6) 1 ounce of the mixture containing 6% salt is to be mixed with 2 ounces of a mixture which is 15% salt, in order to obtain a mixed solution. What is the percentage of salt in the resulting solution? \textit{Answer: 12%}

\[
\frac{6}{1} + \frac{15}{2} = \frac{x}{3}
\]

\[
x = 12
\]

7) 400 tickets were sold to a ballgame. Adult tickets were $2, Child tickets were $3. Tickets sold totaled $1050. How many of each ticket were sold? \textit{Answer: 150 adults and 250 children}

\[
2x + 3y = 1050
\]

\[
x = 150, y = 250
\]

8) I want to make the perfect 12-ounce cup of chocolate milk. It requires that the mixture is 40% chocolate syrup. What I have right now is 8 ounces of milk/syrup mixture that I know contains 30% syrup. What must the syrup concentration be in the remaining mixture that I must add in order to achieve perfection? \textit{Answer: 60%}

\[
\frac{8}{30} + \frac{x}{60} = \frac{12}{40}
\]

\[
x = 60
\]
9) What is the strength of a salt solution that contains 12 gallons of salt and 18 gallons of pure water? Answer: 40%

\[
\text{Salt} + \text{Water} = \text{Solution}
\]

9. _________

10) If 1 quart of orange juice concentrate is added to 4 qt of a solution that is 20% concentrate in water, what is the percent of concentrate in the new solution? Answer: 36%

\[
\text{Concentrate} + \text{Water} = \text{Solution}
\]

10. _________

11) A lawn-and-garden dealer wants to make a new blend of grass seed by using 200 pounds of $0.45 per pound seed and some $0.65 per pound seed. How much of the $0.65 seed does the dealer need to make a $0.55 per pound blend? Answer: 200 pounds

\[
\text{Seed} \quad \text{Cost} = \text{Blended Seed}
\]

11. _________

12) A 5-gallon radiator containing a mixture of water and antifreeze was supposed to contain a 50% antifreeze solution. When tested, it was found to have only 40% antifreeze. How much must be drained out and replaced with pure antifreeze so that the radiator will then contain the desired 50% antifreeze solution? Answer: 5/6 gallons

\[
\text{Antifreeze} - \text{Drained} + \text{Pure Antifreeze} = \text{Solution}
\]

12. _________
13) John has 20 ounces of a 20% of salt solution. How much salt should he add to make it a 36% solution? Answer: 5 ounces

\[ \square \ + \square = \square \]

14) How many pounds of chocolate worth $1.20 a pound must be mixed with 10 pounds of chocolate worth 90 cents a pound to produce a mixture worth $1.00 a pound? Answer: 5 pounds

\[ \square + \square = \square \]

15) A tank has a capacity of 10 gallons. When it is full, it contains 30% alcohol. How many gallons must be replaced by an 80% alcohol solution to give 10 gallons of 70% solution? Answer: 8 gallons

\[ \square - \square + \square = \square \]

16) John has 20 ounces of a 20% of salt solution. How much water should he evaporated to make it a 25% solution? Answer: 4 ounces

\[ \square - \square = \square \]

17) I want to make the perfect 12-ounce cup of chocolate milk. It requires that the mixture is 32% chocolate syrup. What I have right now is 8 ounces of milk/syrup mixture that I know contains 28% syrup. What must the syrup concentration be in the remaining mixture that I must add in order to achieve perfection? Answer: 46 ounces

\[ \square + \square = \square \]