Mixing Liquid Formulations

The pesticide label says to use 3 pints of pesticide in 100 gallons of water. You want to fill a 300-gallon tank. How much pesticide must you add? Develop a ratio or proportion, with the same units on the top, and the same units on the bottom.

\[
\frac{3 \text{ pints}}{100 \text{ gallons}} = \frac{N \text{ pints}}{300 \text{ gallons}}
\]

Cross multiply

\[
\frac{3 \text{ pints}}{100 \text{ gallons}} \times \frac{N \text{ pints}}{300 \text{ gallons}}
\]

\[(100 \times N) = (3 \times 300)\]

\[100 \times N = 900\]

Divide each side by 100 to solve for N:

\[
\frac{100 \times N}{100} = \frac{900}{100}
\]

\[N = 9 \text{ pints}\]

How many pints of pesticide will you use if you just need 20 gallons of spray mixture?

\[
\frac{3 \text{ pints}}{100 \text{ gallons}} = \frac{N \text{ pints}}{20 \text{ gallons}}
\]

Cross multiply

\[
\frac{3 \text{ pints}}{100 \text{ gallons}} \times \frac{N \text{ pints}}{20 \text{ gallons}}
\]

\[(100 \times N) = (3 \times 20)\]

\[100 \times N = 60\]

Divide each side by 100 to solve for N:

\[
\frac{100 \times N}{100} = \frac{60}{100}
\]

\[N = 0.6 \text{ pints}\]

How many fluid ounces is that? 1 pint = 16 fluid ounces

\[
0.6 \text{ pints} \times \frac{16 \text{ fluid ounces}}{1 \text{ pint}} = 9.6 \text{ fluid ounces}
\]
Practice:

1. The pesticide label says to use 2.5 pints of pesticide in 100 gallons of water. You want to fill a 400-gallon tank. How many pints of pesticide must you add?

   a. How many gallons? (8 pints = 1 gallon)

2. What if you need just 10 gallons of spray mixture?

3. The pesticide label says to use 3 pints of pesticide in 100 gallons of water. You want to fill a 600-gallon tank. How many pints of pesticide must you add?

4. How many pints must you add if you need just 200 gallons of spray mixture?

Answers:

1. The pesticide label says to use 2.5 pints of pesticide in 100 gallons of water. You want to fill a 400-gallon tank. How many pints of pesticide must you add?

   \[
   \frac{2.5 \text{ pints}}{100 \text{ gallons}} = \frac{N \text{ pints}}{400 \text{ gallons}}
   \]

   Cross multiply

   \[
   \frac{2.5 \text{ pints}}{100 \text{ gallons}} \times \frac{N \text{ pints}}{400 \text{ gallons}}
   \]

   \[
   (100 \times N) = (2.5 \times 400)
   \]

   \[
   100 \times N = 1,000
   \]

   Divide each side by 100 to solve for N:

   \[
   \frac{100 \times N}{100} = \frac{1,000}{100}
   \]

   \[
   N = 10 \text{ pints}
   \]
a. How many gallons of pesticide? (8 pints = 1 gallon)

\[
\begin{align*}
10 \text{ pints} & \times \frac{1 \text{ gallon}}{8 \text{ pints}} = 1.25 \text{ gal}
\end{align*}
\]

2. What if you need just 10 gallons of spray mixture?

\[
\begin{align*}
2.5 \text{ pints} & = N \text{ pints} \\
100 \text{ gallons} & = 10 \text{ gallons}
\end{align*}
\]

Cross multiply

\[
\begin{align*}
2.5 \text{ pints} & \times \frac{N \text{ pints}}{10 \text{ gallons}} \\
100 \text{ gallons} & \times 10 \text{ gallons}
\end{align*}
\]

\[(100 \times N) = (2.5 \times 10)\]

\[100 \times N = 25\]

Divide each side by 100 to solve for \(N\):

\[
\begin{align*}
\frac{100 \times N}{100} & = \frac{25}{100} \\
N & = 0.25 \text{ pints}
\end{align*}
\]

3. The pesticide label says to use 3 pints of pesticide in 100 gallons of water. You want to fill a 600-gallon tank. How many pints of pesticide must you add?

\[
\begin{align*}
3 \text{ pints} & = N \text{ pints} \\
100 \text{ gallons} & = 600 \text{ gallons}
\end{align*}
\]

Cross multiply

\[
\begin{align*}
3 \text{ pints} & \times \frac{N \text{ pints}}{600 \text{ gallons}} \\
100 \text{ gallons} & \times 600 \text{ gallons}
\end{align*}
\]

\[(100 \times N) = (3 \times 600)\]

\[100 \times N = 1,800\]

Divide each side by 100 to solve for \(N\):

\[
\begin{align*}
\frac{100 \times N}{100} & = \frac{1,800}{100} \\
N & = 18 \text{ pints}
\end{align*}
\]
4. **How many pints must you add if you need just 200 gallons of spray mixture?**

\[
\frac{3 \text{ pints}}{100 \text{ gallons}} = \frac{N \text{ pints}}{200 \text{ gallons}}
\]

\[(100 \times N) = (3 \times 200)\]

\[100 \times N = 600\]

Divide each side by 100 to solve for N:

\[
\frac{100 \times N}{100} = \frac{600}{100} \quad N = 6 \text{ pints}
\]

Another way of doing these problems is to see if you can find a relationships:

*The pesticide label says to use 2 pints of pesticide in 100 gallons of water. You want to fill a 500-gallon tank. How much pesticide must you add?*

\[
\frac{500 \text{ gallons}}{100 \text{ gallons}} = 5
\]

If you need 5 times the amount of water, you’ll need 5 times the amount of product (2 pints X 5 = 10 pints).