

## Objective 57

Solve a mixture problem that can be represented by a system of equations

**PROBLEM**

During a science experiment, Alma created a 9% alcohol solution by mixing 7 fluid ounces of a 14% alcohol solution with a certain amount of a 2% alcohol solution. How many fluid ounces of the 9% alcohol solution did she create?

**STEP 1**

Determine the unknowns from the question.

"a certain amount of a 2% alcohol solution"  
The number of ounces of 2% solution used is unknown.  
Use  $x$  to represent the amount of 2% solution used.

"How many fluid ounces of the 9% alcohol solution did she create?"  
The number of ounces of 9% solution created is unknown.  
Use  $y$  to represent the amount of 9% solution created.

**STEP 2**

Make a chart to set up the equations. List the amount of each solution, using the variables from Step 1 for the unknown amounts.

	2% alcohol	14% alcohol	9% alcohol
amt of solution (oz)	$x$	7	$y$

**STEP 3**

Complete the chart by writing expressions for the number of ounces of alcohol in each solution. Multiply the percent of alcohol in each solution by the number of ounces of solution.

	2% alcohol	14% alcohol	9% alcohol
amt of solution (oz)	$x$	7	$y$
amt of alcohol (oz)	$0.02x$	$0.14(7)$	$0.09y$

**STEP 4**

Write two equations using the information from the chart. Use the information from the second line of the chart to write the first equation. Use the information from the third line of the chart to write the second equation.

$$\begin{array}{ccccccc} \text{amt of 2\% solution} & + & \text{amt of 14\% solution} & = & \text{amt of 9\% solution} & & \\ x & + & 7 & = & y & & \end{array}$$

$$\begin{array}{ccccccc} \text{amt of alcohol(2\%)} & + & \text{amt of alcohol(14\%)} & = & \text{amt of alcohol(9\%)} & & \\ 0.02x & + & 0.14(7) & = & 0.09y & & \end{array}$$

**STEP 5**

Substitute the value of  $y$  from the first equation,  $x + 7 = y$ , into the second equation. Simplify both sides of the equation.

$$0.02x + 0.14(7) = 0.09y$$

$$0.02x + 0.14(7) = 0.09(x + 7)$$

$$0.02x + 0.98 = 0.09x + 0.09(7)$$

$$0.02x + 0.98 = 0.09x + 0.63$$

**STEP 6**

Solve the equation from Step 5 for  $x$ .

$$\begin{aligned}0.02x + 0.98 &= 0.09x + 0.63 \\0.02x + 0.98 - 0.02x &= 0.09x + 0.63 - 0.02x \\0.98 &= 0.07x + 0.63 \\0.98 - 0.63 &= 0.07x + 0.63 - 0.63 \\0.35 &= 0.07x \\\frac{0.35}{0.07} &= \frac{0.07x}{0.07} \\5 &= x\end{aligned}$$

There are 5 ounces of 2% solution used in the mixture.

**STEP 7**

Substitute the value of  $x$  into the equation  $x + 7 = y$  and solve to determine the amount of 9% alcohol solution Alma created.

$$\begin{aligned}x + 7 &= y \\5 + 7 &= y \\12 &= y\end{aligned}$$

Alma created 12 fluid ounces of 9% alcohol solution.

**ANSWER**

12 fl oz

**Guided Practice:**

During a science experiment, Nico created a 17% alcohol solution by mixing 5 fluid ounces of an 18% alcohol solution with a certain amount of a 12% alcohol solution. How many fluid ounces of the 17% alcohol solution did he create?

Mr. Petek mixes an 85% sugar cinnamon-flavored solution with a 90% sugar cherry-flavored solution to make 15 gallons of a new product. The new product is 89% sugar. How much of the cherry-flavored solution did he use?

**Practice:**

Ms. Sanders mixes an 80% sugar cinnamon-flavored solution with a 75% sugar cherry-flavored solution to make 20 gallons of a new product. The new product is 77% sugar. How much of the cherry-flavored solution did she use?

During a science experiment, Nico created an 18% alcohol solution by mixing 6 fluid ounces of a 22% alcohol solution with a certain amount of a 6% alcohol solution. How many fluid ounces of the 18% alcohol solution did he create?

**Additional Resources**

[https://www.montereyinstitute.org/courses/Algebra1/COURSE\\_TEXT\\_RESOURCE/U06\\_L2\\_T2\\_text\\_final.html](https://www.montereyinstitute.org/courses/Algebra1/COURSE_TEXT_RESOURCE/U06_L2_T2_text_final.html)  
<https://www.youtube.com/watch?v=9nQmEQk09ko&noredirect=1>