6-5 Apply Systems of Linear Equations

Name _____ Date _____

Juan mixes a 30% acid solution and a 60% acid solution to get 6 quarts of a 50% acid solution. How many quarts of each solution does he use?

Let x = amount of 30% solution. Let y = amount of 60% solution.

	30% Solution	+	60% Solution	=	50% Solution		equation
Amount of solution (qt)	x	+	y	=	6	→	$x + y = 6$
Amount of acid (qt)	$0.3x$	+	$0.6y$	=	$0.5(6)$	→	$0.3x + 0.6y = 3$

Solve: $\begin{cases} x + y = 6 \\ 0.3x + 0.6y = 3 \end{cases}$

❶ Add the equations.

$\begin{array}{l} -0.3(x + y = 6) \\ + 0.3x + 0.6y = 3 \\ \hline -0.3x - 0.3y = -1.8 \\ + 0.3x + 0.6y = 3 \\ \hline 0.3y = 1.2 \end{array}$ ← Use the Multiplication Property of Equality.

← Use the Addition Property of Equality to combine equations.

$\dfrac{0.3y}{0.3} = \dfrac{1.2}{0.3}$ ← Use the Division Property of Equality.

$y = 4$

❷ Substitute 4 for y into one of the original equations. Solve for x.

$x + (4) = 6$ ← Solve for x by substituting 4 for y.

$x + 4 - 4 = 6 - 4$ ← Use the Subtraction Property of Equality.

$x = 2$

Check: Substitute 2 for x and 4 for y in both of the original equations to check.

$x + y = 6$
$(2) + (4) \stackrel{?}{=} 6$
$6 = 6$ **True**

$0.3x + 0.6y = 3$
$0.3(2) + 0.6(4) \stackrel{?}{=} 3$
$0.6 + 2.4 \stackrel{?}{=} 3$
$3 = 3$ **True**

So Juan uses 2 quarts of 30% acid solution and 4 quarts of 60% acid solution.

Solve each problem by writing and solving a system of linear equations. Check your answer on a separate sheet of paper.

1. The Drama Club sold 787 tickets to the school play for $1889. Tickets cost $3 for adults and $2 for students. How many adult tickets and how many student tickets did the club sell?

Let a = number of adult tickets sold.
Let s = number of student tickets sold.

Solve: $\begin{cases} a + s = 787 \\ 3a + 2s = 1889 \end{cases}$

$\begin{array}{l} -2(a + s = 787) \\ \\ -2a - 2s = -1574 \\ + 3a + 2s = 1889 \\ \hline a = 315 \end{array}$ $\begin{array}{l} a + s = 787 \\ \\ (315) + s = 787 \\ s = 472 \end{array}$

adult tickets: 315; student tickets: 472

2. A theater sold 925 tickets for $4725. Tickets cost $6 for adults and $3 for children. How many adult tickets and how many children's tickets did the theater sell?

Solve each problem by writing and solving a system of linear equations.
Check your answer on a separate sheet of paper.

3. A boat takes 4 hours to go 44 miles downstream with the current. It takes 8.8 hours to go 44 miles upstream against the current. What is the speed of the current? What is the speed of the boat? (*Hint:* distance = rate • time)

4. A boat takes 3 hours to go 42 miles downstream with the current. It takes 4.2 hours to go 42 miles upstream against the current. What is the speed of the current? What is the speed of the boat?

5. In 4 years, John will be $\frac{4}{3}$ Grace's age. Five years ago, John was 1 year more than twice Grace's age. How old are John and Grace now?

6. In 6 years, Sylvia will be $\frac{6}{5}$ Hue's age. Four years ago, Sylvia was 10 years less than twice Hue's age. How old are Sylvia and Hue now?

7. A gardener mixes a 10% nitrogen solution with a 20% nitrogen solution to make 4 quarts of a 16.25% nitrogen solution. How many quarts of each does he use?

8. A farmer mixes a 20% fertilizer solution with a 40% fertilizer solution to make 8 quarts of a 33.75% fertilizer solution. How many quarts of each does he use?

MENTAL MATH

Multiply.

9. 42(51)

10. $\frac{5}{6}\left(12\frac{1}{2}\right)$

11. −15(29)

12. −9(7.2)