

9-3 Solving Problems with Two Variables

Objective: To use systems of linear equations in two variables to solve problems.

Example 1 Joel has 14 coins, all dimes and quarters, worth \$2.60. How many dimes and quarters does Joel have?

Solution

Step 1 The problem asks for the number of dimes and the number of quarters.

Step 2 Let d = the number of dimes and q = the number of quarters. Make a chart.

	Number \times Value per coin = Total value		
Dimes	d	10	$10d$
Quarters	q	25	$25q$

Step 3 The two facts not recorded in the chart are the total number of coins, 14, and the total value, \$2.60. Use these facts to write a system of equations.

$$\begin{aligned}d + q &= 14 \\10d + 25q &= 260\end{aligned}$$

Step 4

$$\begin{aligned}d &= 14 - q && \text{Find } d \text{ in terms of } q. \\10(14 - q) + 25q &= 260 && \text{Substitute.} \\140 - 10q + 25q &= 260 \\15q &= 120 \\q &= 8\end{aligned}$$

$$\begin{aligned}d &= 14 - q \\d &= 14 - 8 \\d &= 6\end{aligned}$$

Step 5 The check is left for you. Joel has 6 dimes and 8 quarters.

Solve, using two equations in two variables.

- Rod has 40 coins, all dimes and quarters, worth \$7.60. How many dimes and how many quarters does he have?
- Gayle has 36 coins, all nickels and dimes, worth \$2.40. How many dimes does she have?
- Leo has \$4.80 in dimes and quarters. He has 6 more dimes than quarters. How many quarters does he have?
- Nancy and Kerry have the same number of coins. Nancy has only dimes and Kerry has only quarters. If Kerry has \$3.00 more than Nancy, how much does she have?
- Ben has \$3.40 in nickels and dimes. He has 4 more dimes than nickels. How many dimes does he have?

9-3 Solving Problems with Two Variables (continued)

Example 2 Connie has \$4000 invested in stocks and bonds. The stocks pay 6% interest and the bonds pay 8% interest. If her annual income from the stocks and bonds is \$270, how much is invested in stocks?

Solution

Step 1 The problem asks for the amount invested in stocks.

Step 2 Let s = amount invested in stocks and b = amount invested in bonds.

	Principal	\times Rate	= Interest
Stocks	s	0.06	$0.06s$
Bonds	b	0.08	$0.08b$
Total	4000		270

Step 3 $s + b = 4000$ The total amount invested is \$4000.
 $0.06s + 0.08b = 270$ The total amount of interest earned is \$270.
 $s = 4000 - b$ Find s in terms of b .

Step 4 $0.06(4000 - b) + 0.08b = 270$ Substitute.
 $6(4000 - b) + 8b = 27,000$ { Multiply each side of the equation
 $24,000 - 6b + 8b = 27,000$ { by 100 to eliminate decimals.
 $24,000 + 2b = 27,000$
 $2b = 3000$
 $b = 1500$ $s = 4000 - b$ or $s = 2500$

Step 5 The check is left for you. Connie has \$2500 invested in stocks.

Solve, using two equations in two variables.

- Sam invests \$6000 in treasury notes and bonds. The notes pay 8% annual interest and the bonds pay 10% annual interest. If the annual income is \$550, how much is invested in bonds?
- Kathleen has \$8000 invested in stocks and bonds. The stocks pay her 6% annual interest and the bonds pay 9% interest. If her annual income from the stocks and bonds is \$630, how much is invested in stocks?
- Marty invested \$7000 in treasury notes and stocks. The stocks paid 7% and the notes paid 8%, giving an annual income of \$535. How much is invested in treasury notes?

Mixed Review Exercises

Solve.

1. $\frac{1}{3}x + 3 = 1$

2. $\frac{1}{2}y = 3\frac{1}{2}$

3. $\frac{x+3}{2} = 6$

4. $2(a+1) = 8 - 4(a-6)$

5. $-9 = n + 4$

6. $3x + 15 = x + 5$