

35. Let d be the number of dimes and q be the number of quarters. This gives

$$\begin{array}{rcl} d + q = 14 & \times -1 & -d - q = -14 \\ 0.10d + 0.25q = 2.75 & \times 10 & \Rightarrow \frac{d + 2.5q = 27.5}{1.5q = 13.5} \Leftrightarrow q = 9 \end{array}$$

So $d + (9) = 14 \Leftrightarrow d = 5$. Thus the number of dimes is 5 and the number of quarters is 9.

37. Let x be the speed of the plane in still air and y be the speed of the wind. This gives

$$\begin{array}{rcl} 2x - 2y = 180 & \times -6 & 12x - 12y = 1080 \\ 1.2x + 1.2y = 180 & \times 10 & \Rightarrow \frac{12x + 12y = 1800}{24x = 2880} \Leftrightarrow x = 120. \end{array}$$

So $2(120) - 2y = 180 \Leftrightarrow -2y = -60 \Leftrightarrow y = 30$. Therefore, the speed of the plane is 120 mi/h and the wind speed is 30 mi/h.

39. Let x be the cycling speed and y be the running speed. (Remember to divide by 60 to convert minutes to decimal hours.) We have

$$\begin{array}{rcl} 0.5x + 0.5y = 12.5 \times -2 & & -x - y = -25 \\ 0.75x + 0.2y = 16 & \times 5 & \Rightarrow \frac{3.75x + y = 80}{2.75x = 55} \Leftrightarrow x = 20. \end{array}$$

So $20 + y = 25 \Leftrightarrow y = 5$. Thus, the cycling speed is 20 mi/h and the running speed is 5 mi/h.

41. Let a be the grams of food A and b be the grams of food B. This gives

$$\begin{array}{rcl} 0.12a + 0.20b = 32 & \times -250 & -30a - 50b = -8000 \\ 100a + 50b = 22000 & \times 1 & \Rightarrow \frac{100a + 50b = 22000}{70a = 14000} \Leftrightarrow a = 200. \end{array}$$

So $0.12(200) + 0.20b = 32 \Leftrightarrow 0.20b = 8 \Leftrightarrow b = 40$. Thus, she should use 200 grams of food A and 40 grams of food B.

43. Let x and y be the sulfuric acid concentrations in the first and second containers.

$$\begin{array}{rcl} 300x + 600y = 900(0.15) & \times -1 & -300x - 600y = -135 \\ 100x + 500y = 600(0.125) & \times 3 & \Rightarrow \frac{300x + 1500y = 225}{900y = 90} \Leftrightarrow y = 0.10. \end{array}$$