IMPLEMENTATION: Solve the equation:

$$4x + 3(20 - x) = 3.75(20)$$
$$4x + 60 - 3x = 75$$
$$x + 60 = 75$$
$$x + 60 - 60 = 75 - 60$$
$$x = 15 \text{ pounds of \$4 coffee}$$
$$20 - x = 20 - 15 = 5 \text{ pounds of \$3 coffee}$$

Hence 15 pounds of coffee costing \$4 a pound must be mixed with 5 pounds of coffee costing \$3 a pound to get 20 pounds of coffee costing \$3.75 a pound.

EVALUATION: Check the equation:

$$4x + 3(20 - x) = 3.75(20)$$
$$4(15) + 3(5) = 3.75(20)$$
$$60 + 15 = 75$$

Try These

1. How much cream that is 20% butterfat should be mixed with milk that is 5% butterfat to get 10 gallons of cream that is 14% butterfat?
2. How much of a 90% alloy must be combined with a 70% gold alloy in order to make 60 ounces of an 85% gold alloy?
3. How much of an alloy that is 40% zinc should be added to 75 pounds of an alloy that is 65% zinc to get an alloy that is 50% zinc?

4. How much of a solution that is 18% fertilizer must be mixed with a solution that is 30% fertilizer to get 50 gallons of a solution that is 27% fertilizer?
5. How much pure alcohol (100%) should be added to 40 ounces of a solution which is 20% alcohol to get 40 ounces of a solution which is 25% alcohol?
6. A merchant blends a \$2.50 per pound tea with a \$3.75 per pound tea to get 10 pounds of tea costing \$3.00 per pound. How many pounds of each did the merchant use?
7. A candy maker mixes some candy costing \$1.25 a pound with some candy costing \$0.75 per pound to get 5 pounds of candy costing \$0.90 per pound. How many pounds of each did he use?
8. A baker has 8 pounds of cookies costing \$1.50 per pound and wants to mix them with some cookies costing \$2.00 per pound. How much of the latter should be mixed in order to get a mixture of the two types of cookies costing \$1.80 per pound?
9. How many pounds of cashew nuts costing \$5.00 a pound must be mixed with peanuts costing \$2.20 a pound to get 20 pounds of nuts costing \$3.18 a pound?
10. A candy store owner wants to make 30 one-pound boxes of candy costing \$5.00 a box. If she wishes to use 12 pounds of candy costing \$8.00 per pound, what should be the cost of the other type of candy she should use?

SOLUTIONS:

1. Let $x =$ the amount of liquid that is 20% butterfat and $10 - x =$ the amount of liquid that is 5% butterfat.

$$20\%x + 5\%(10 - x) = 14\%(10)$$

$$0.20x + 0.05(10 - x) = 0.14(10)$$

$$0.20x + 0.5 - 0.05x = 1.4$$

$$0.15x + 0.5 - 0.5 = 1.4 - 0.5$$

$$0.15x = 0.9$$

$$\frac{\cancel{0.15}^{1}x}{\cancel{0.15}^{1}} = \frac{0.9}{0.15}$$

$$x = 6 \text{ ounces of 20\% butterfat liquid}$$

$$10 - x = 10 - 6 = 4 \text{ ounces of 5\% butterfat liquid}$$

2. Let x = the amount of 90% alloy and $60 - x$ = the amount of 70% alloy.

$$90\%x + 70\%(60 - x) = 85\%(60)$$

$$0.90x + 0.70(60 - x) = 0.85(60)$$

$$0.90x + 42 - 0.7x = 51$$

$$0.20x + 42 - 42 = 51 - 42$$

$$0.20x = 9$$

$$\frac{\cancel{0.20}^{1}x}{\cancel{0.20}^{1}} = \frac{9}{0.20}$$

$$x = 45 \text{ ounces of the 90\% alloy}$$

$$60 - x = 60 - 45 = 15 \text{ ounces of the 70\% alloy}$$

3. Let x = the amount of 40% alloy.

$$40\%x + 65\%(75) = 50\%(75 + x)$$

$$0.40x + 0.65(75) = 0.50(75 + x)$$

$$0.40x + 48.75 = 37.5 + 0.50x$$

$$0.40x - 0.50x + 48.75 = 37.5 + 0.50x - 0.50x$$

$$-0.10x + 48.75 = 37.5$$

$$-0.10x + 48.75 - 48.75 = 37.5 - 48.75$$

$$-0.10x = -11.25$$

$$\frac{-0.10^{1}x}{-0.10^{1}} = \frac{-11.25}{-0.10}$$

$$x = 112.5 \text{ pounds}$$

4. Let x = the amount of 18% fertilizer and $50 - x$ = the amount of the 30% fertilizer.

$$18\%x + 30\%(50 - x) = 27\%(50)$$

$$0.18x + 0.30(50 - x) = 0.27(50)$$

$$0.18x + 15 - 0.30x = 13.5$$

$$-0.12x + 15 = 13.5$$

$$-0.12x + 15 - 15 = 13.5 - 15$$

$$-0.12x = -1.5$$

$$\frac{-0.12^{1}x}{-0.12^{1}} = \frac{-1.5}{-0.12}$$

$$x = 12.5 \text{ gallons of the 18\% solution}$$

$$50 - x = 50 - 12.5 = 37.5 \text{ gallons of the 30\% solution}$$

5. Let x = the amount of pure alcohol to be added and the amount of the 20% solution to be removed.

$$20\%(40) - 20\%x + 100\%x = 25\%(40)$$

$$0.20(40) - 0.20x + 1.00x = 0.25(40)$$

$$8 + 0.8x = 10$$

$$8 - 8 + 0.8x = 10 - 8$$

$$0.8x = 2$$

$$\frac{0.8^{1}x}{0.8^{1}} = \frac{2}{0.8}$$

$$x = 2.5 \text{ ounces}$$

Hence 2.5 ounces of pure alcohol must be added to increase the concentration after 2.5 ounces have been removed.

6. Let x = the number of pounds of \$2.50 tea and $10 - x$ = the number of pounds of \$3.75 tea.

$$2.50x + 3.75(10 - x) = \$3.00(10)$$

$$2.50x + 37.5 - 3.75x = 30$$

$$-1.25x + 37.5 = 30$$

$$-1.25x + 37.5 - 37.5 = 30 - 37.5$$

$$-1.25x = -7.5$$

$$\frac{-1.25^{1}x}{-1.25^{1}} = \frac{-7.5}{-1.25}$$

$$x = 6 \text{ pounds of \$2.50 tea}$$

$$10 - x = 10 - 6 = 4 \text{ pounds of \$3.75 tea}$$

7. Let x = the number of pounds of candy costing \$1.25 per pound and $5 - x$ = the number of pounds of candy costing \$0.75 per pound.

$$1.25x + 0.75(5 - x) = 0.90(5)$$

$$1.25x + 3.75 - 0.75x = 4.50$$

$$0.5x + 3.75 = 4.50$$

$$0.5x + 3.75 - 3.75 = 4.50 - 3.75$$

$$0.5x = 0.75$$

$$\frac{0.5^{1}x}{0.5^{1}} = \frac{0.75}{0.5}$$

$$x = 1.5 \text{ pounds of \$1.25 candy}$$

$$5 - x = 5 - 1.5 = 3.5 \text{ pounds of \$0.75 candy}$$

8. Let x = the number of pounds of the \$2.00 cookies.

$$1.50(8) + 2.00x = 1.80(8 + x)$$

$$12 + 2.00x = 14.4 + 1.8x$$

$$12 + 2.00x - 1.8x = 14.4 + 1.8x - 1.8x$$

$$12 + 0.2x = 14.4$$

$$12 - 12 + 0.2x = 14.4 - 12$$

$$0.2x = 2.4$$

$$\frac{\cancel{0.2}^{1}x}{\cancel{0.2}^{1}} = \frac{2.4}{0.2}$$

$$x = 12 \text{ pounds}$$

9. Let x = the number of pounds of cashews and $20 - x$ = the number of pounds of peanuts.

$$5.00x + 2.20(20 - x) = 3.18(20)$$

$$5.00x + 44 - 2.20x = 63.6$$

$$2.8x + 44 = 63.6$$

$$2.8x + 44 - 44 = 63.6 - 44$$

$$2.8x = 19.6$$

$$\frac{\cancel{2.8}^{1}x}{\cancel{2.8}^{1}} = \frac{19.6}{2.8}$$

$$x = 7 \text{ pounds of cashews}$$

$$20 - x = 20 - 7 = 13 \text{ pounds of peanuts}$$

10. Let x = the cost of the other type of candy she will need to use.

$$8.00(12) + x(18) = 5.00(30)$$

$$96 + 18x = 150$$

$$96 - 96 + 18x = 150 - 96$$

$$18x = 54$$

$$\frac{\cancel{18}^{1}x}{\cancel{18}} = \frac{54}{18}$$

$$x = 3 = \$3.00$$