Back substitute $y = 30$ into one of the original equations.

$$x + (30) = 100$$
$$x = 70 \quad \text{Amount of 20\%}$$

70 gallons of the 20% solution should be added to 30 gallons of the 30% solution. This will produce 100 gallons of a 23% solution.

Now work margin exercise 4.

Margin Exercise Answers

1. Fergus has invested \$5000 at 9% and \$5800 at 12%.
2. He should invest \$2500 at 9% and \$6500 at 5%.
3. 50 ounces of the 18% solution and 100 ounces of the 12% solution.
4. 96 gallons of the 22% solution and 24 gallons of the 17% solution.

9.5 Exercises

Concept Check

Fill-in-the-Blank. Complete each sentence using information found in this section.

1. The formula used to calculate interest depends on the frequency of _____ and the type of _____.

2. In the interest formula $I = Prt$, P stands for the _____.

3. In the interest formula $I = Prt$, I stands for the interest _____ or _____.

4. In the interest formula $I = Prt$, r stands for the _____ of interest.

5. In the interest formula $I = Prt$, t stands for the _____ in years.

6. When solving a mixture problem, the basic plan is to write a/an _____ that deals with only one part of the mixture.

True/False. Determine whether each statement is true or false. If a statement is false, explain how it can be changed so that the statement will be true. (**Note:** There may be more than one acceptable change.)

7. When interest is calculated on an annual basis, we have $t = 0$ and the formula becomes $I = Pr$.

8. Problems involving mixture occur in the sciences such as physics and chemistry.

9. In an interest problem, time can be given in parts of a year.

10. When two or more items are mixed, the final mixture should satisfy certain conditions of percentage of concentration.

Applications

Solve each problem by setting up a system of two equations in two unknowns and solving the system. See Examples 1 through 4.

1. Carmen invested \$9000. She invested part in a 6% passbook account and the rest in a 10% certificate account. If her annual interest was \$680, how much did she invest at each rate?

2. Mr. Brown has $12,000 invested. Part is invested at 6% and the remainder at 8%. If the annual interest from the 6% investment is $230 more than the annual interest from the 8% investment, how much is invested at each rate?

3. Ten thousand dollars is invested, part at 5.5% and part at 6%. The annual interest from the 5.5% investment is $251 more than the annual interest from the 6% investment. How much is invested at each rate?

4. On two investments totaling $9500, Darius lost 3% on one and earned 6% on the other. If his net annual receipts were $282, how much was each investment?

5. Merideth has money in two savings accounts. One rate is 8% and the other is 10%. If she has $200 more in the 10% account, how much is invested at 8% if the total annual interest is $101?

6. Money is invested at two rates. One rate is 9% and the other is 13%. If there is $700 more invested at 9%, find the amount invested at each rate if the total annual interest is $239.

7. Ethan has half of his investments in stock paying an 11% dividend and the other half in a debentured stock paying 13% interest. If his total annual interest is $840, how much does he have invested?

8. Betty invested some of her money at 12% interest. She invested $300 more than twice that amount at 10%. How much is invested at each rate if her interest income is $318 annually?

9. A company invested some money in a development yielding 24% and $9000 less in a development yielding 18%. If the first investment produces $2820 more per year than the second, how much is invested in each development?

10. Victoria invests a certain amount of money at 7% annual interest and three times that amount at 8%. If her annual interest income is $232.50, how much does she have invested at each rate?

11. Jamal has a certain amount of money invested at 5% annual interest and $500 more than twice that amount invested in bonds yielding 7%. His total annual income from interest is $187. How much does he have invested at each rate?

12. A total of $6000 is invested, part at 8% and the remainder at 12%. How much is invested at each rate if the annual interest is $620?

13. Ms. Merriman has invested $12,000. Part is invested at 9% and the remainder at 11%. If the interest from the 9% investment is $380 more than the interest from the 11% investment, how much is invested at each rate?

14. Eight thousand dollars is invested, part at 15% and the remainder at 12%. If the annual interest income from the 15% investment is $66 more than the annual interest income from the 12% investment, how much is invested at each rate?

15. Morgan inherited $124,000 from her uncle. She invested a portion in bonds and the remainder in a long-term certificate account. The amount invested in bonds was $24,000 less than 3 times the amount invested in certificates. How much was invested in bonds and how much in certificates?

16. Sang has invested $48,000, part at 6% and the rest in a higher risk investment at 10%. How much did she invest at each rate to receive $4000 in interest after one year?

17. A metallurgist has one alloy containing 20% copper and another containing 70% copper. How many pounds of each alloy must he use to make 50 pounds of a third alloy containing 50% copper?

18. A manufacturer has received an order for 24 tons of a 60% copper alloy. His stock contains only alloys of 80% copper and 50% copper. How much of each will he need to melt together to fill the order?

19. A tobacco shop wants 50 ounces of tobacco that is 24% rare Turkish blend. How much each of a 30% Turkish blend and a 20% Turkish blend will be needed?

20. How many liters each of a 40% acid solution and a 55% acid solution must be used to produce 60 liters of a 45% acid solution?

21. A dairy farmer wants to mix a 35% protein supplement and a standard 15% protein supplement to make 1800 pounds of a high-grade 20% protein supplement. How many pounds of each should he use?

22. To meet the government's specifications, a certain alloy must be 65% aluminum. How many pounds each of a 70% aluminum alloy and a 54% aluminum alloy will be needed to produce 640 pounds of the 65% aluminum alloy?

23. A butcher shop has ground beef that is 40% fat and extra lean ground beef that is only 15% fat. How many pounds of each will be needed to obtain 50 pounds of lean ground beef that is 25% fat?

24. George decides to mix grades of gasoline in his truck. He puts in 8 gallons of regular and 12 gallons of premium for a total cost of $55.80. If premium gasoline costs $0.15 more per gallon than regular, what was the price of each grade of gasoline?

25. How many grams of pure acid (100% acid) and how many grams of a 40% solution should be mixed together to get a total of 30 grams of a 60% solution?

26. Dark chocolate made with 100% cacao by weight is mixed with dark chocolate that is 60% cacao. How much of each (100% cacao and 60% cacao) should be used to get a mixture of 50 pounds of chocolate that is 70% cacao by weight?

27. Pure salt is to be added to a 4% salt solution. How many ounces of salt and how many ounces of the 4% solution should be mixed together to get 60 ounces of a 20% salt solution?

28. How many liters each of a 12% iodine solution and a 30% iodine solution must be used to produce a total mixture of 90 liters of a 22% iodine solution?

29. A candymaker is making truffles using a mixture of a melted dark chocolate that is 72% cocoa and milk chocolate that is 42% cocoa. If she wants 6 pounds of melted chocolate that is 52% cocoa, how much of each type of chocolate does she need?

30. A dairy supplier needs 360 gallons of milk containing 4% butterfat. How many gallons each of milk containing 5% butterfat and milk containing 2% butterfat must be used to obtain the desired 360 gallons?

31. Care guidelines recommend that new body piercings are clearned with a 1% salt solution for the first few weeks with the new piercing. You have a 0.5% solution and a 5% solution, and you need to make 8 ounces of the 1% solution. How much of the 0.5% and 5% solutions will you need? (Round your answers to the nearest hundredth.)

32. A pharmacist has two solutions of alcohol. One is 25% alcohol. The other is 45% alcohol. He wants to mix these two solutions to get 36 ounces that is 30% alcohol. How many ounces of each of these two solutions should he mix together?

33. Sanjay has $5000 to invest, and he has an option to split the amount between two simple interest accounts. Account A is expected to earn 4% interest and Account B is expected to earn 9% interest. If he has a goal to make $350 in interest after one year, how much should he invest in each account?

a. Use a table to set up a system of linear equations to describe the situation. Use the variable x to represent the amount invested in Account A and the variable y to represent the amount invested in Account B.

b. Solve the system of linear equations from part a.

c. Write a complete sentence to answer the question from the problem.

d. Is it possible for Sanjay to earn more than $350 in interest? If yes, explain how.

34. You have 3% hydrogen peroxide and 12% hydrogen peroxide. You need 20 ounces of 6% hydrogen peroxide. How many ounces of each grade of hydrogen peroxide do you need to mix together to obtain the required amount of 6% hydrogen peroxide?

a. Set up a system of linear equations to describe the situation. Use the variable x to represent the amount of 3% solution and the variable y to represent the amount of 12% solution.

b. Solve the system of linear equations.

c. Write a complete sentence to answer the question from the problem.

35. King Nut Company sells freshly roasted nuts. A one-pound bag of broken fancy cashews costs $5. A one-pound bag of almonds costs $7.50. The manager wants to sell a mixture of the nuts that will cost $6.50 for a one-pound bag. How much of each type of nut should he combine to make a one-pound bag of mixed nuts?

a. Write two equations to describe the situation. Use the variable x to represent the amount of cashews and the variable y to represent the amount of almonds.

b. Solve the system of linear equations.

c. Write a complete sentence to answer the question from the problem.

Writing & Thinking

36. Your friend has $20,000 to invest and decided to invest part at 4% interest and the rest at 10% interest. Why might you advise him (or her) to invest all of it

a. at 4%?

b. at 10%?