LESSON 22 Applications of Systems of Linear Equations

☐ **REFRESH YOUR SKILLS**

(Lesson 7) For each problem, 1) define a variable, 2) set up an equation to model the given situation, 3) solve the equation as usual, and then 4) answer what's being asked.

1. The sum of three consecutive even integers is 12. Find the integers.

2. The price of an apple rose by 15% to $1.38/lb. What was the original price?

3. Olivia has $0.90 in dimes and nickels. She has three more nickels than dimes. How many dimes and nickels does she have?

4. Dale is six years older than Kate. Three years ago, Dale was twice as old as Kate. How old are they now?

☐ **SOLVING WORD PROBLEMS INVOLVING SYSTEMS OF LINEAR EQUATIONS**

Sometimes, when a situation is complex, you may need more than one variable and more than one equation to model the situation. However, the basic strategy remains the same: 1) define a variable or variables, 2) set up an equation or a system of equations to model the given situation, 3) solve the equation or the system of equations as usual, and then 4) answer what's being asked.

➔ **EXAMPLE** Pears cost $2 each. Mangos cost $3 each. Elijah bought a total of 8 pears and mangos, and spent $19. How many pears and how many mangos did Elijah buy?

1. Let x = number of pears
   Let y = number of mangos
2. A total of 8 pears and mangos, so $x + y = 8$.
   $19 at $2/pear and $3/mango, so $2x + 3y = 19$.
3. Solve the system, and you get $x = 5$, $y = 3$.
4. Elijah bought 5 pears and 3 mangos.

➔ **TRY IT 5.** Movie tickets cost $9 for adults and $7 for children. A group bought 10 tickets and paid $78 in total. How many adults and how many children were in the group?

➔ **EXAMPLE** Emma bought four cookies and one muffin and paid $10. Kyle bought two cookies and three muffins and paid $15. How much does a cookie cost, and how much does a muffin cost?

1. Let x = price of a cookie
   Let y = price of a muffin
2. $10 for 4 cookies and 1 muffin, so $4x + y = 10$.
   $15 for 2 cookies and 3 muffins, so $2x + 3y = 15$.
3. Solve the system, and you get $x = 1.5$, $y = 4$.
4. Cookies cost $1.50 each. Muffins cost $4 each.

➔ **TRY IT 6.** At an amusement park, a family bought 2 adult tickets and 3 child tickets for a total of $48. Another family bought 1 adult ticket and 4 child tickets for a total of $44. How much did each ticket cost?

Sometimes you may find using two variables easier than using just one variable.

➔ **EXAMPLE** Olivia has \$0.90 in dimes and nickels. She has three more nickels than dimes. How many dimes does she have?

You could use just one variable as you did in Problem 3. Do whichever is easier for you!

1. Let x = number of dimes
   Let y = number of nickels
2. Three more nickels than dimes, so $y = x + 3$.
   Total value = \$0.90, so $0.10x + 0.05y = 0.90$.
3. Solve the system, and you get $x = 5$, $y = 8$.
4. Olivia has 5 dimes.

➔ **TRY IT 7.** Emma has \$0.95 in dimes and nickels. She has five more dimes than nickels. How many dimes and nickels does she have?

☐ **EXERCISE YOUR SKILLS**

For each problem, 1) define a variable or variables, 2) set up an equation or a system of equations to model the given situation, 3) solve the equation or the system of equations as usual, and then 4) answer what's being asked.

8. Consider two integers. The sum of three times the larger integer and the smaller is 3. The difference of the larger and three times the smaller is 11. Find the integers.

9. Josh used 24 flowers to make a bouquet of roses and lilies. Roses cost \$2.20 each and lilies cost \$1.80 each. He spent \$48 in total. How many roses and how many lilies did Josh use?

10. Mason bought five apples and four pears and paid \$9.20. Julia bought three apples and two pears and paid \$5. How much does an apple cost, and how much does a pear cost?

11. Mr. Kim has a total of 27 bills in five- and ten-dollar bills. The total value of the money is \$205. How many five-dollar bills and how many ten-dollar bills does Mr. Kim have?

12. Joey is three times as old as Anna. In five years, Joey will be twice as old as Anna. How old are they now?

13. A 100-point test has a total of 35 questions. The multiple-choice questions are worth 2 points each, and the short-answer questions are worth 5 points each. How many questions of each type are on the test?

14. A cafeteria has 12 tables that can seat a total of 58 people. Some tables seat 4 people, and the others seat 6 people. How many tables seat 6 people? How many tables seat 4 people?

15. The length of a rectangle is twice its width. The perimeter is 18 feet. Find the dimensions of the rectangle.

16. The sum of the digits of a two-digit number is 5. When the digits are reversed, the number is decreased by 9. What is the number?