NAME

Module 4 Solving Problems Using Linear Equations of One Variable

Lesson 4 Solving Mixture and Rate Problems Using Equations of One Variable

Solve.

1. The Pep Club sold hot chocolate and colas at a football game. Hot chocolates cost $1.50 and colas cost $1.25. The number of hot chocolates sold was 23 less than the number of colas sold. How many of each beverage were sold if the Pep Club's revenue was $144.25?

   42 hot chocolates; 65 colas

2. The coin collection box in a soda machine contains only quarters and dimes. The number of quarters is eight more than half the number of dimes. How many of each type of coin are there if the total value of the coins is $17.30?

   42 quarters; 68 dimes

3. Hank has 4 lb of a coffee mix that contains 60% vanilla-flavored beans. How many pounds of vanilla-flavored beans should he add in order to produce a mix that is 75% vanilla-flavored beans?

   2.4 lb

4. An ambulance and a fire truck leave the scene of a highway accident at the same time. The ambulance heads due north at 75 mph, and the fire truck heads due south at 60 mph. After how long are the ambulance and fire truck 54 miles apart?

   0.4 hours, or 24 min

5. A delivery truck traveled from a depot to its destination at a constant rate of 45 mph. On the return trip, it traveled at a constant rate of 50 mph. What is the distance from the depot to the destination if the total traveling time was 4.75 hours?

   112.5 miles

6. Rob left the dock at 4:00 P.M. and paddled due east in his canoe at a constant rate of 5 mph. One hour later, a motorboat left the same dock and followed Rob's route at a constant rate of 30 mph. At what time will the motorboat catch up to Rob?

   5:12 P.M.

Journal

1. Consider the problem:
   How many ounces of water must evaporate from 50 oz of a solution that is 88% water to make a solution that is 85% water?
   How is this problem like the ones studied in this lesson? How is it different?
2. Solve the problem in Journal Question 1 and interpret the result.
3. In a distance/rate/time problem, explain how you know whether to add expressions that represent distance on one side of an equation or to form an equation by setting two distance expressions equal. What clues or keywords appear in the problem?

4. Consider the problem:

Ron began jogging a course at 5:00 P.M. at a constant rate of 4.5 mph. Rick began the same course at 5:15 P.M. at a constant rate of 5.0 mph. At what time will Rick catch up to Ron?

To solve the problem, Lauren wrote the equation $4.5t = 5.0(t - 15)$. Susan wrote the equation $4.5t = 5.0(t - 0.25)$. Which student is correct and why?

5. Consider the problem:

A piggy bank contains $3.80 in dimes and quarters. In all, there are 20 coins in the bank. How many dimes are in the piggy bank?

To solve the problem, a student wrote the equation $10d + 25(20 - d) = 3.80$. Identify the student's mistake and explain two different ways to fix it.

Cumulative Review

Identify each statement as true or false.

1. $0 < 3$ **True**

2. $7 < 7$ **False**

3. $-5 < -2$ **True**

4. $-10 > 2$ **False**

5. $5 \geq 1 + 3$ **True**

6. $-2 - 5 > -10$ **True**

7. $|-3| \geq 3$ **True**

8. $9 - 10 \leq 1 - 5$ **False**

9. $3x - 4 \geq 7$ when $x = 4$ **True**

10. $4 - 2x < 10$ when $x = -3$ **False**

Possible Journal Answers

1. This problem is like the ones studied in the lesson because it involves solutions. This problem is different because it has to do with evaporation, or removing some of the water from a solution. Therefore, the problem will use subtraction instead of addition.

2.
$$0.85(50 - x) = 44 - x$$
$$42.5 - 0.85x = 44 - x$$
$$0.15x = 1.5$$
$$x = 10$$

Ten ounces of pure water must evaporate, leaving 40 ounces of a solution that is 85% water. Of the 40 ounces, 34 ounces are water and 6 ounces are something else.

3. When the objects travel in opposite directions, add the distances. When the problem is about one catching up to another, set the distances equal. Keywords are "opposite directions," "catch up," "due north" and "due south" ("due east" and "due west"), etc.

4. Susan is correct because her equation, $4.5t = 5.0(t - 0.25)$, uses 0.25 to express time in hours. Lauren's equation, $4.5t = 5.0(t - 15)$, is incorrect because it uses 15 to express time in minutes. Time should be expressed in hours because both 4.5 and 5.0 represent miles per hour, not miles per minute.

5. The student's mistake was expressing money on the left side in cents and on the right side in dollars. She used "10" for the value of a dime and "25" for the value of a quarter on the left side, but "3.80" for the value of $3.80 on the right side. To fix this, she can either express all the values in cents (10, 25, 380) or all the values in dollars (0.10, 0.25, 3.80).