CHAPTER 2

Solving Equations and Inequalities

2.3 Value Mixture and Uniform Motion Problems

Objectives

1 Value mixture problems

2 Uniform motion problems

Value mixture problems

Value mixture problems

A value mixture problem involves combining two ingredients that have different prices into a single blend. For example, a coffee merchant may blend two types of coffee into a single blend, or a candy manufacturer may combine two types of candy to sell as a “variety pack.”

The solution of a value mixture problem is based on the equation $\boldsymbol{V = AC}$, where V is the value of an ingredient, A is the amount of the ingredient, and C is the cost per unit of the ingredient.

Example 1

How many ounces of a silver alloy that costs \$6 per ounce must be mixed with 10 oz of a silver alloy that costs \$8 per ounce to make a mixture that costs \$6.50 per ounce?

Strategy:

- Ounces of \$6 alloy: x
  Ounces of \$8 alloy: 10
  Ounces of \$6.50 mixture: $x + 10$

	Amount	Cost	Value
\$6 alloy	x	6	$6x$
\$8 alloy	10	8	$8(10)$
\$6.50 mixture	$10 + x$	6.50	$6.50(10 + x)$

- The sum of the values before mixing equals the value after mixing.

Example 1 – *Solution*

$$6x + 8(10) = 6.50(10 + x)$$

The value of the \$6 alloy plus the value of the \$8 alloy equals the value of the mixture.

$$6x + 80 = 65 + 6.5x$$

$$-0.5x + 80 = 65$$

$$-0.5x = -15$$

$$x = 30$$

30 oz of the \$6 silver alloy must be used.

Uniform motion problems

Uniform motion problems

A train that travels constantly in a straight line at 50 mph is in *uniform motion*. **Uniform motion** means the speed of an object does not change.

The solution of a uniform motion problem is based on the equation $d = rt$, where d is the distance traveled, r is the rate of travel, and t is the time spent traveling.

Example 2

Two cars, the first traveling 10 mph faster than the second, start at the same time from the same point and travel in opposite directions. In 3 h, they are 288 mi apart. Find the rate of the second car.

Strategy:

- Rate of second car: r

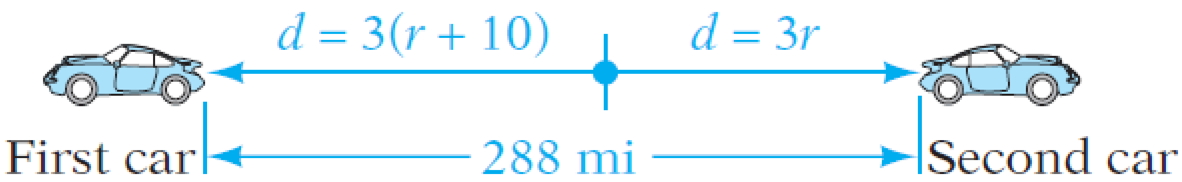
  Rate of first car: $r + 10$

	Rate	Time	Distance
First car	$r + 10$	3	$3(r + 10)$
Second car	r	3	$3r$

Example 2

cont'd

- The total distance traveled by the two cars is 288 mi.



Solution:

$$3(r + 10) + 3r = 288$$

The distance traveled by the first car plus the distance traveled by the second car is 288 mi.

$$3r + 30 + 3r = 288$$

$$6r + 30 = 288$$

$$6r = 258$$

$$r = 43$$

The second car is traveling 43 mph.

Example 3

A bicycling club rides out into the country at a speed of 16 mph and returns over the same road at 12 mph. How far does the club ride out into the country if it travels a total of 7 h?

Strategy:

- Time spent riding out: t

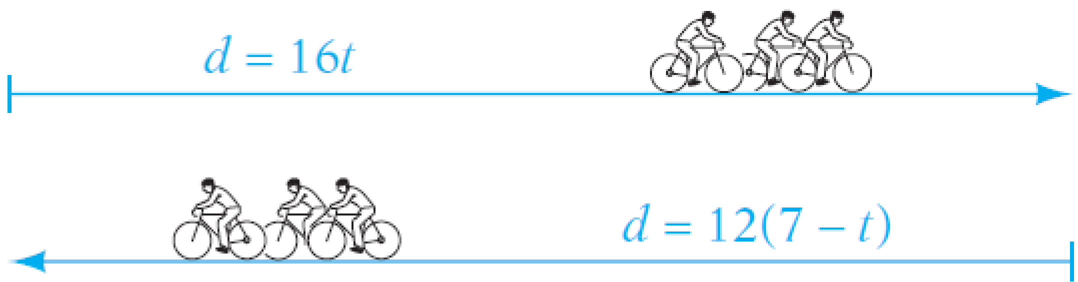
  Time spent riding back: $7 – t$

	Rate	Time	Distance
Out	16	t	$16t$
Back	12	$7 - t$	$12(7 - t)$

Example 3

cont'd

- The distance out equals the distance back.



Solution:

$16t = 12(7 - t)$

$16t = 84 - 12t$

$28t = 84$

$t = 3$

The time is 3 h. Find the distance.

The distance out = $16t = 16(3) = 48$.

The club rides 48 mi into the country.