

### Lesson 3-9

#### Example 1 Solve a Mixture Problem with Prices

Mya wants to invest her money to save for college next year. She is considering two different funds for investment. She will invest \$14,000 in a fund that pays 5% simple interest. She will invest the rest of the money in a fund that pays 4% simple interest. If the combined interest is 4.56%, how much did she invest in the second fund? (The formula for simple interest is  $I = Prt$  where  $I$  represents the amount of interest,  $P$  represents the amount invested,  $r$  represents the interest rate, and  $t$  represents the time invested in years).

Let  $a$  = the amount invested in the second fund. Make a table. Then write and solve an equation using the information in the table.

	Amount Invested	Interest Rate	Time (years)	Interest
Fund #1	14,000	0.05	1	$14,000(0.05)(1)$
Fund #2	$a$	0.04	1	$a(0.04)(1)$
Total	$14,000 + a$	0.0456	1	$(14,000 + a)(0.0456)(1)$

Interest from fund #1	plus	Interest from fund #2	equals	Total interest
$14,000(0.05)(1)$	+	$a(0.04)(1)$	=	$(14,000 + a)(0.0456)(1)$

$$14,000(0.05)(1) + a(0.04)(1) = (14,000 + a)(0.0456)(1)$$

$$700 + 0.04a = 638.4 + 0.0456a$$

$$700 + 0.04a - 0.04a = 638.4 + 0.0456a - 0.04a$$

$$700 = 638.4 + 0.0056a$$

$$700 - 638.4 = 638.4 + 0.0056a - 638.4$$

$$61.6 = 0.0056a$$

$$\frac{61.6}{0.0056} = \frac{0.0056a}{0.0056}$$

$$11,000 = a$$

Equation

Distributive Property

Subtract  $0.04a$  from each side.

Simplify.

Subtract 638.4 from each side.

Simplify.

Divide each side by 0.0056.

Simplify.

Mya invested \$11,000 in the second fund to get a combined interest rate of 4.56%.

### Example 2 Solve a Mixture Problem with Percents

Kayla wants to obtain a milk mixture that is 2% butterfat. She has 8 cups of a 1% butterfat milk and has some amount of a 4% butterfat milk. How much of the 4% butterfat milk should she mix with the 8 cups of the 1% butterfat milk to obtain the 2% butterfat milk?

Let  $x$  = the amount of the 4% butterfat milk. Make a table. Then write and solve an equation using the information in the table.

	Amount of Milk (cups)		Amount of Butterfat										
1% Butterfat Milk	8		0.01(8)										
4% Butterfat Milk	$x$		$0.04x$										
2% Butterfat Milk	$8 + x$		$0.02(8 + x)$										
<table style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 25%;">Amount of Butterfat in 1%</td> <td style="width: 10%; text-align: center;">plus</td> <td style="width: 25%;">Amount of Butterfat in 4%</td> <td style="width: 10%; text-align: center;">equals</td> <td style="width: 30%;">Amount of Butterfat in 2%</td> </tr> <tr> <td style="text-align: center;">0.01(8)</td> <td style="text-align: center;">+</td> <td style="text-align: center;">0.04x</td> <td style="text-align: center;">=</td> <td style="text-align: center;">0.02(8 + x)</td> </tr> </table>				Amount of Butterfat in 1%	plus	Amount of Butterfat in 4%	equals	Amount of Butterfat in 2%	0.01(8)	+	0.04x	=	0.02(8 + x)
Amount of Butterfat in 1%	plus	Amount of Butterfat in 4%	equals	Amount of Butterfat in 2%									
0.01(8)	+	0.04x	=	0.02(8 + x)									

$$\begin{aligned}
 0.01(8) + 0.04x &= 0.02(8 + x) && \text{Equation} \\
 0.08 + 0.04x &= 0.16 + 0.02x && \text{Distributive Property.} \\
 0.08 + 0.04x - 0.02x &= 0.16 + 0.02x - 0.02x && \text{Subtract } 0.02x \text{ from each side.} \\
 0.08 + 0.02x &= 0.16 && \text{Simplify.} \\
 0.08 + 0.02x - 0.08 &= 0.16 - 0.08 && \text{Subtract } 0.08 \text{ from each side.} \\
 0.02x &= 0.08 && \text{Simplify.} \\
 \frac{0.02x}{0.02} &= \frac{0.08}{0.02} && \text{Divide each side by } 0.02. \\
 x &= 4 && \text{Simplify.}
 \end{aligned}$$

Kayla should add 4 cups of the 4% butterfat milk to 8 cups of the 1% butterfat milk to obtain the 2% butterfat milk.

### Example 3 Solve for Average Speed

Megan ran 6 miles in 1 hour and then ran 4 more miles in 0.5 hours. What was her average speed?

To find the average speed, rewrite  $d = rt$  as  $r = \frac{d}{t}$ .

First part of the run

$$\begin{aligned}
 r &= \frac{d}{t} \\
 &= \frac{6 \text{ miles}}{1 \text{ hour}} \text{ or } 6 \text{ miles per hour}
 \end{aligned}$$

Second part of the run

$$\begin{aligned}
 r &= \frac{d}{t} \\
 &= \frac{4 \text{ miles}}{0.5 \text{ hours}} \text{ or } 8 \text{ miles per hour}
 \end{aligned}$$

Now, find the weighted average speed for the run.

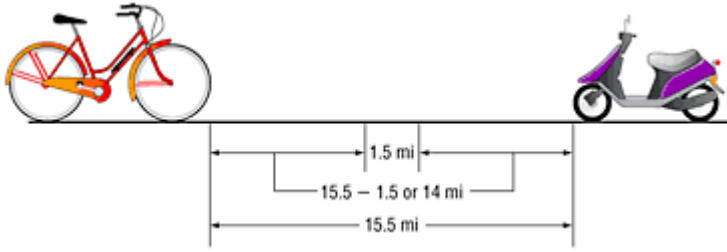
$$\begin{aligned}
 M &= \frac{6(1) + 8(0.5)}{1 + 0.5} && \text{Definition of weighted average} \\
 &= \frac{10}{1.5} \text{ or about } 6.67 && \text{Simplify.}
 \end{aligned}$$

Megan's average speed was 6.67 miles per hour.

#### Example 4 Solve a Problem Involving Speeds of Two Vehicles

Eli and Beth live in 2 towns that are 15.5 miles apart. Eli is going on a bike ride to visit Beth. He rides at 14 miles per hour. At the same time, Beth will drive her moped to visit Eli traveling at 30 miles per hour. When will they be 1.5 miles apart?

Draw a diagram. You want to know when they are 1.5 miles apart. The total distance traveled by Eli and Beth equals  $15.5 - 1.5 = 14$



Let  $t$  = the time when they are 1.5 miles apart. Make a table of the information.

	$r$	$t$	$d = rt$
Eli	14	$t$	$14t$
Beth	30	$t$	$30t$

Write an equation.

Distance traveled by Eli	plus	distance traveled by Beth	equals	14 miles
$14t$	+	$30t$	=	14

Solve the equation.

$14t + 30t = 14$	Original equation
$44t = 14$	Simplify.
$\frac{44t}{44} = \frac{14}{44}$	Divide each side by 44.
$t \approx 0.32$	Simplify.

Eli and Beth will be 1.5 miles apart in approximately 0.32 hour, or about 19 minutes.