



## Problem of the Week

### Problem E and Solution

#### Coffee Sales

#### Problem

For the months of April, May and June, *Coffee Only* sold coffee for \$2.50 per cup.

In May, they sold  $y\%$  more cups of coffee than in April, where  $y \geq 0$ . In June, they sold  $y\%$  fewer cups of coffee than in May.

Their records for sales in May were misplaced. They sold \$31 250 worth of coffee in April. In June they sold \$30 800 worth of coffee.

Determine the total value of the coffee they sold in May.

#### Solution

Since the company had sales of \$31 250 in April, the amount of coffee sold in April was  $\frac{31250}{2.50} = 12\,500$  cups.

Since the company had sales of \$30 800 in June, the amount of coffee sold in June was  $\frac{30800}{2.50} = 12\,320$  cups.

In May, *Coffee Only* sold  $y\%$  more cups of coffee than in April. In other words, they sold

$$12\,500 + 12\,500 \left( \frac{y}{100} \right) = 12\,500 \left( 1 + \frac{y}{100} \right)$$

cups of coffee in May.

In June, they sold  $y\%$  fewer cups of coffee than in May. In other words, they sold

$$\left[ 12\,500 \left( 1 + \frac{y}{100} \right) \right] - \left[ 12\,500 \left( 1 + \frac{y}{100} \right) \right] \left( \frac{y}{100} \right) = \left[ 12\,500 \left( 1 + \frac{y}{100} \right) \right] \left( 1 - \frac{y}{100} \right)$$

cups of coffee in June.

We also know that *Coffee Only* sold 12 320 cups of coffee in June. Therefore,

$$\begin{aligned} 12\,500 \left( 1 + \frac{y}{100} \right) \left( 1 - \frac{y}{100} \right) &= 12\,320 \\ \left( 1 + \frac{y}{100} \right) \left( 1 - \frac{y}{100} \right) &= \frac{616}{625} \\ 1 - \frac{y^2}{10\,000} &= \frac{616}{625} \\ \frac{y^2}{10\,000} &= \frac{9}{625} \\ y^2 &= 144 \end{aligned}$$

Since  $y \geq 0$ , we have  $y = 12$ . Therefore, in May *Coffee Only* sold

$$12\,500 \left( 1 + \frac{y}{100} \right) = 12\,500 \left( 1 + \frac{12}{100} \right) = 14\,000$$

cups of coffee. The total value of the coffee sold in May was  $14\,000 \times \$2.50 = \$35\,000$ .