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 $31250 worth of coffee in April. In June they sold $30800 worth of coffee.

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

Solution
Since the company had sales of $31250 in April, the amount of coffee sold in April was \( \frac{31250}{2.50} = 12500 \) cups.

Since the company had sales of $30800 in June, the amount of coffee sold in June was \( \frac{30800}{2.50} = 12320 \) cups.

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

\[
12500 + 12500 \left( \frac{y}{100} \right) = 12500 \left( 1 + \frac{y}{100} \right)
\]
cups of coffee in May.

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

\[
\left[ 12500 \left( 1 + \frac{y}{100} \right) \right] - \left[ 12500 \left( 1 + \frac{y}{100} \right) \right] \left( \frac{y}{100} \right) = \left[ 12500 \left( 1 + \frac{y}{100} \right) \right] \left( 1 - \frac{y}{100} \right)
\]
cups of coffee in June.

We also know that Coffee Only sold 12320 cups of coffee in June. Therefore,

\[
12500 \left( 1 + \frac{y}{100} \right) \left( 1 - \frac{y}{100} \right) = 12320
\]

\[
\left( 1 + \frac{y}{100} \right) \left( 1 - \frac{y}{100} \right) = \frac{616}{625}
\]

\[
1 - \frac{y^2}{10000} = \frac{616}{625}
\]

\[
\frac{y^2}{10000} = \frac{9}{625}
\]

\[
y^2 = 144
\]

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

\[
12500 \left( 1 + \frac{12}{100} \right) = 12500 \left( 1 + \frac{12}{100} \right) = 14000
\]
cups of coffee. The total value of the coffee sold in May was \( 14000 \times 2.50 = 35000 \).