

# Coffee at Mom's Diner

## Task

At Mom's diner, everyone drinks coffee. Let  $C$  = the event that a randomly-selected customer puts cream in their coffee. Let  $S$  = the event that a randomly-selected customer puts sugar in their coffee. Suppose that after years of collecting data, Mom has estimated the following probabilities:

$$\begin{aligned}P(C) &= 0.6P(S) \\ &= 0.5P(C \text{ or } S) \\ &= 0.7\end{aligned}$$

Estimate  $P(C \text{ and } S)$  and interpret this value in the context of the problem.



**Commentary**

This task assesses a student's ability to use the addition rule to compute a probability and to interpret a probability in context.

While the most obvious use of this task is as an assessment item, it could also be used in instruction as a practice problem,

**Solution**

Using the addition rule,  $P(C \text{ or } S) = P(C) + P(S) - P(C \text{ and } S)$ , it follows that:

$$\begin{aligned} 0.7 &= 0.6 + 0.5 - P(C \text{ and } S) \\ P(C \text{ and } S) &= 0.6 + 0.5 - 0.7 \\ &= 0.4 \end{aligned}$$

The probability that a randomly-selected customer at Mom's has both cream and sugar in his or her coffee is 0.4.

