Probability of purchase for randomly selected customer:

\[ \Pr\{\text{Milk}\} = 0.5 \quad \Pr\{\text{Cereal}\}=0.3 \quad \Pr\{\text{Both}\}=0.2 \]

Rule:  \( \text{Cereal} \Rightarrow \text{Milk} \)  “A person who buys cereal will buy milk”

**Support** of rule is \( \Pr\{\text{Both}\} = \Pr\{\text{Cereal and Milk}\} = 0.20 = 20\% \)

**Confidence** of the rule is \( \Pr\{\text{Milk}\mid\text{Cereal}\}=2/3 \)

Recall:  \( \Pr\{\text{Milk}\mid\text{Cereal}\} \) is read as “the probability of milk given cereal” so it is the proportion of milk purchasers from among the cereal purchasers. That is \( 0.20/0.30 \). In general this is the probability of both divided by the probability of the event to the right of the bar |.

\[ \Pr\{\text{Milk}\mid\text{Cereal}\} = \frac{\Pr\{\text{Milk and Cereal}\}}{\Pr\{\text{Cereal}\}} \]

You’re thinking about putting a milk flier in the cereal aisle. Does it seem like cereal buyers are more likely to purchase milk
than the average shopper? In our sample, half of the customers buy milk so the expected proportion of milk purchasers in any randomly selected group would be 1/2. This is the expected confidence if the grouping is not predictive. If the group is cereal purchasers, however, then 2/3 of them buy milk so the “lift” that you get by marketing to cereal purchasers is 2/3 divided by 1/2 or 1.333.

Lift of the rule is: \[
\frac{\text{confidence}}{(\text{expected confidence})} = \frac{\text{Pr}\{\text{Milk|Cereal}\}}{\text{Pr}\{\text{Milk}\}}
\]

Question: is the lift for the rule Cereal=>Milk the same as that for the rule Milk=>Cereal?