Sampling Distribution of $\hat{p}$

- Shape: Approximately Normal
- Center: The mean is $p$.
- Spread: The standard deviation is

$$\sqrt{\frac{p(1-p)}{n}}$$

Reeses Pieces

- Sampling distribution of $\hat{p}$
  - Shape: Approximately Normal.
  - Center: The mean is 0.45
  - Spread: The standard deviation is

$$\sqrt{\frac{p(1-p)}{n}} = \sqrt{\frac{0.45(0.55)}{25}} = 0.0995$$
**Conditions**

- The sampled values must be independent of each other.
- The sample size, \( n \), must be large enough.

**Conditions**

- 10% Condition
  - When sampling without replacement, the sample size should be less than 10% of the population size.
  - Reeses Pieces – the number of pieces in the machine is much greater than 250.

**Conditions**

- Success/Failure Condition
  - The sample size must be large enough so that \( np \) and \( n(1-p) \) are both bigger than 10.
  - Reeses Pieces – \( np = 11.25 \) and 
    \[ n(1-p) = 13.75 \]  which are both greater than 10.
Comment

• To be able to use these results you need to know what the value of the population parameter, $p$, is.
• This is no problem in the Reeses Pieces simulation because we can choose the proportion of Orange pieces.

Inference

• For most populations we don’t know $p$, the population proportion.
• We can use the sampling distribution of $\hat{p}$ to help us make inferences about the reasonable or plausible value of $p$. 