

## Where are all the orange Reese's Pieces?



Reese loves orange Reese's pieces, but the last time she got a fun size bag there were no orange! The bag was manufactured at a factory where 1,000 Reese's Pieces are made (40% orange) in each batch. To make a fun size bag, 10 Reese's pieces are randomly chosen from a batch.

- Is this a perfectly binomial setting? Explain.   
I-Independent? No! There is no replacement. This is not binomial!  
B-Binary <sup>Success -> Orange</sup> <sup>Failure -> Not orange</sup>
- Find the probability of getting 0 orange Reese's pieces in a group of 10 from the factory if this is **not** a binomial setting (use rules of probability). Show your work.

$$P(\text{No oranges}) = \frac{1000}{1000} \times \frac{999}{999} \times \dots \times \frac{991}{991} = .0059$$

- Find the probability of getting 0 orange Reese's pieces in a group of 10 from the factory if this were a binomial setting (use binomial formula). Show your work.

$$P(\text{No oranges}) = {}_{10}C_0 \times .4^0 \times .6^{10} = .0060$$

**10% Rule**  
 If sample is less than 10% of pop., independence can be assumed.

- How do your answers from #2 and #3 compare? Why do you think this is?

They are practically the same. There are so many Reese's pieces that removing 1 hardly changes it.

To ensure that Reese gets more orange Reese's pieces, she buys a jumbo bag of Reese's pieces which contains 600 Reese's pieces. Let  $X$  = number of orange Reese's pieces in a bag of 600 Reese's pieces. Use a binomial distribution to model the situation.

- What is the probability of getting at most 210 orange Reese's pieces?

$$\text{binomcdf}(600, 0.40, 210) = 0.0067$$

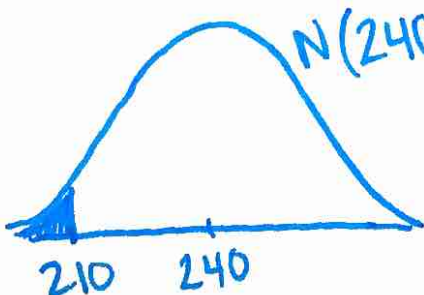
- If we were to make a histogram of  $X$ , what do you think the shape would be?

Approximately normal

- Find the mean and standard deviation of  $X$ .

Mean = 240    SD = 12  
 $\mu_x = n \times p$      $\sigma_x = \sqrt{n \times p \times (1-p)}$

- Redo problem #5 above with a normal distribution and compare your answers.



$$z = \frac{x - \mu_x}{\sigma_x}$$

$$z = \frac{210 - 240}{12} = -2.5 \rightarrow 0.0062$$