Sampling distributions for proportions:

A sampling distribution is a model created based on what the mean proportion would be if we took multiple samples of the same size. Basically, it's what a histogram would look like if we took the means of lots and lots of samples.

We need three pieces of info:

p: probability of success

q: probability of failure (1-p)

n: the sample size

We can create if a sampling distribution if:

* The sample is random or reasonably representative.
* Sample is big enough - (10 successes and 10 failures)
  $np \geq 10$ $nq \geq 10$
* Individuals are reasonably independent - 10% condition
  Sample cannot be more than 10% of the population

Sampling Distribution Model for Proportions:

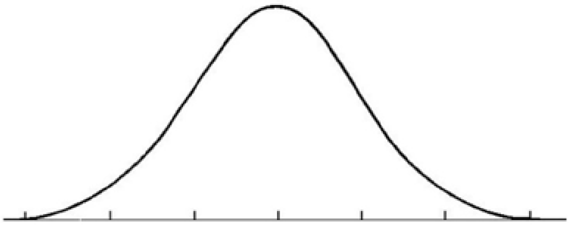
$\mu = p$

mean

probability of success

$$\sigma = \sqrt{\frac{pq}{n}}$$

standard deviation



Example:

It is generally believed that nearsightedness affects about 12% of all children. A school district has registered 170 incoming kindergarten children. Check the conditions and create a sample distribution for the proportion of kids the school might expect to be nearsighted.

* Not random, but reasonably representative

p = 0.12   q = 0.88   n = 170   np = 170(0.12) = 20.4 ≥ 10   *   nq = 170(0.88) = 149.6 ≥ 10

* 170 is less than 10% of all kindergarten children.

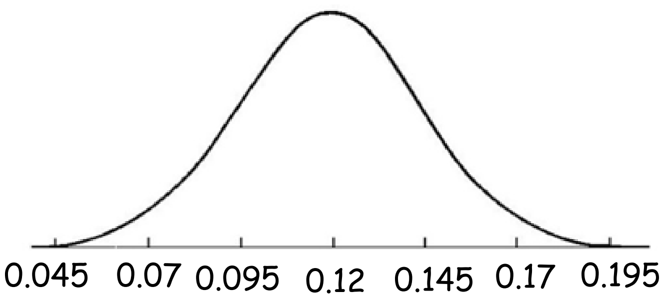
What is the probability that less than 9% of the incoming kindergarten children are nearsighted?

p = 0.12   q = 0.88   n = 170

$$\sigma = \sqrt{\frac{pq}{n}}$$

$$= \sqrt{\frac{(0.12)(0.88)}{170}}$$

$$= 0.025$$



z-score: $\frac{0.09 - 0.12}{0.025} = -1.2$

normalcdf(-99,-1.2) = 0.115 or 11.5%