Problem 1

Poisson Distribution Formula

$$P(X = x) = \frac{\lambda^x e^{-\lambda}}{x!}$$

where

x = 0, 1, 2, 3, ... **Mean** $= \lambda$ **SD** $= \sqrt{\lambda}$

λ = mean number of occurrences in the interval

e = Euler's constant $\approx$ 2.71828

`ppois` gives you the probability to the left of the quantile (x-value).

If we observe an event, we cannot say that there was a 0% chance of observing it.

$P(X \leq 2) =$ **ppois(2, lambda=1.5)**

$P(X < 2) = \frac{(1.5)^1 e^{-1.5}}{1!} + \frac{(1.5)^0 e^{-1.5}}{0!} =$ **ppois(q=1, lambda=1.5)**

$P(X < 2) =$ **dpois(q=0, lambda=1.5) + dpois(q=1, lambda=1.5)**

$P(X \geq 109) = 1 - P(X < 109) =$ **1-ppois(q=108, lambda=1.5)**

Problem 2

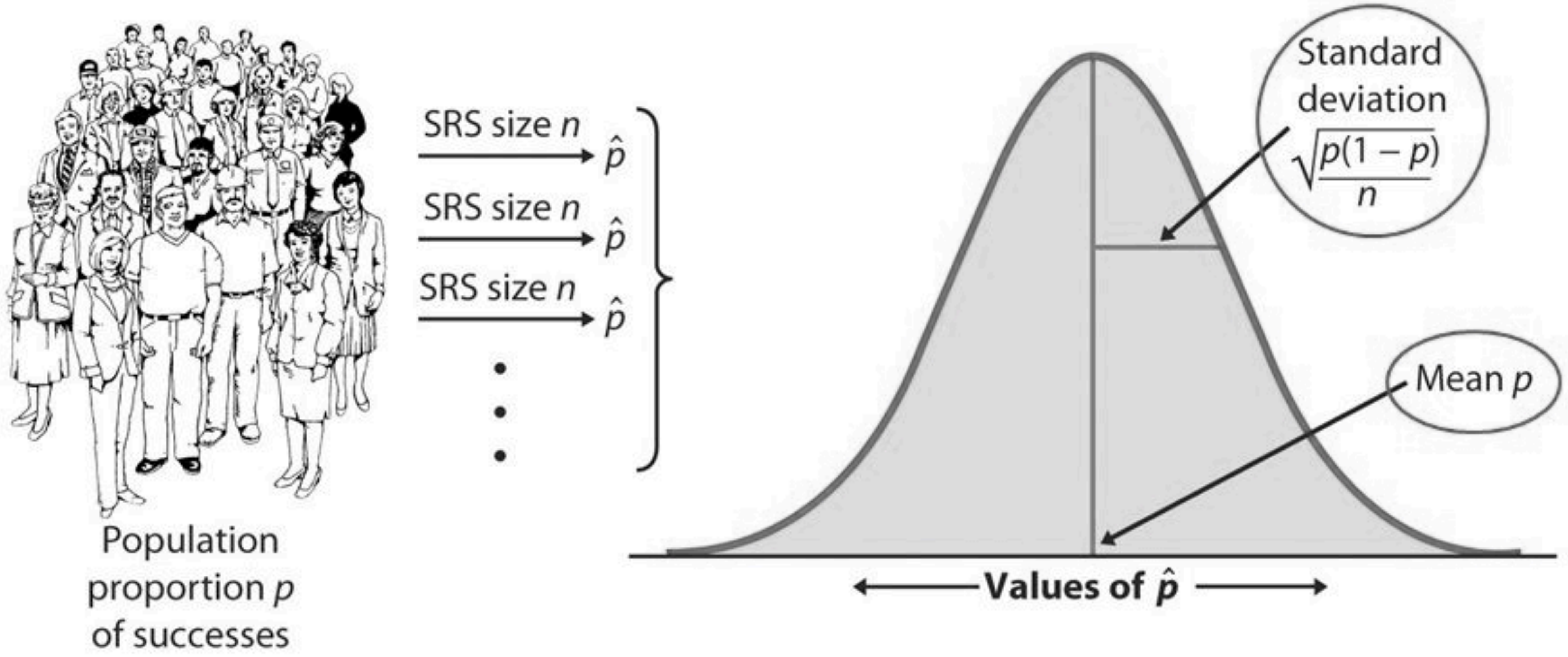
$p = 0.53$

$$SD = \sqrt{\frac{p(1-p)}{n}} = 0.025$$

$n = 400$

The sampling distribution of $\hat{p}$ is **never exactly normal**. But as the sample size increases, the sampling distribution of $\hat{p}$ becomes approximately normal.

The normal approximation is most accurate for any fixed *n* when *p* is close to 0.5, and least accurate when *p* is near 0 or near 1.



For the CLT to take effect, we want n ≥ 30.

Population has to be at least 20% larger than the sample.

np > 10
n(1-p) > 10

***Make distinction between sampling distribution and distribution of a sample.**

Problem 3

The values of $\hat{p}$ **are distributed** $N(p, \frac{p(1-p)}{n})$.

$$Mean = E(\hat{p}) = p = 0.08$$

$$SD = \sqrt{\frac{0.08(1-0.08)}{75}}$$