9.2 Sample Proportions $\hat{p}$

9.1 was all about distributions of p(hat) and x(bar) from many samples of a population.

9.2 will focus on p(hat) and 9.3 on x(bar)

$$\hat{p} = \frac{\text{count of "successes" in sample}}{\text{size of sample}} = \frac{X}{n}$$

sampling distribution of p(hat) shows variation in all possible samples of size n from the population.

mean of sampling distribution $\mu_{\hat{p}} = p$ (p-hat is unbiased)

standard deviation of sampling distribution: $\sigma_{\hat{p}} = \sqrt{\frac{pq}{n}}$
(use when population ≥ 10n [RoT1])

Normal Approximation $N(\mu_{\hat{p}}, \sigma_{\hat{p}})$

Only use when np ≥ 10 **and** nq ≥ 10 [RoT2]

rewrite your probability using z score(s):

$$z = \frac{\hat{p} - p}{\sigma}$$

use Table A to generate approximate probabilities using z-scores

OR: normalcdf(LB,UB) if using z-scores

OR: normalcdf(LB,UB,μ,σ) if using actual values from distribution

What you need to be able to do:

- Recognize or calculate p from the context of the problem
- Recognize that the mean of the $\hat{p}$ distribution is p and use it to calculate standard deviation of $\hat{p}$.

- Check RoT1 to see if standard deviation can be calculated.

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- Check RoT2 to see if Normal approximation can be used.

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- be able to describe the shape of a sampling distribution and justify (approximately Normal when RoT 1 & 2 are both met)
- Use mean and standard deviation of a sampling distribution to convert to standardized scores and calculate probability.