Sample Proportion Sampling Dist: $\mu_{\hat{p}} = p$ and $\sigma_p = \sqrt{\frac{p(1-p)}{n}}$

Popular Z values:

Confidence	Error Probability	Z
.9	.1	1.65
.95	.05	1.96
.99	.01	2.58

Population Proportion Confidence Interval: $\hat{p} \pm z * \sqrt{\frac{\hat{p}(1-\hat{p})}{n}}$

Test Statistic for Proportion Hypothesis Test: $z^* = \frac{\hat{p}-p_0}{\sqrt{\frac{p_0(1-p_0)}{n}}}$

Hypothesis Test Decisions:

Alternative Hypothesis	Probability	P-Value
$\boldsymbol{H_a: p > p_0}$	Right Tail	P(Z>z*)
$\boldsymbol{H_a: p < p_0}$	Left Tail	P(Z<z*)
$\boldsymbol{H_a: p \neq p_0}$	Two Tail	2*P(Z<-|z*|)

1) John Lester, a Red Sox starting pitcher, throws two types of pitches – strikes and balls. In a random sample of 113 pitches, 73 were strikes.

    a. Find a 99% confidence interval for the population proportion of strikes to pitches for John Lester and give a good interpretation of the interval.

    b. Find a 95% confidence interval for the population proportion of strikes to pitches for John Lester and give a good interpretation of the interval.

    c. Name one of the two ways to make the confidence interval from part b narrower.

d. Test, with 95% confidence that John Lester throws more strikes than balls. Give a good interpretation of your results.

   i. State Hypothesis:

   ii. Check Assumptions:

   iii. Calculate Test Statistic

   iv. Find p-value

   v. Interpret

e. Are the results the same at 99.99% confidence? Why or why not?

f. Test, with 95% confidence that the proportion of strikes John Lester throws differs from .75. Give a good interpretation of your results.

i. State Hypothesis:

ii. Check Assumptions:

iii. Calculate Test Statistic

iv. Find p-value

v. Interpret

2) A random sample of 27 students shows that 18 rated themselves higher than they rated the class.

   a) Find a 99% confidence interval for the population proportion of students that rated themselves higher than the rest of the class.

   b) Find a 95% confidence interval for the population proportion of students that rated themselves higher than the rest of the class.

   c) **(7 points)** Name one of the two ways to make the confidence interval from part b narrower.

d) Test, with 95% confidence that more students rate themselves higher than the rest of the class. Note: You can assume normality in this case, despite n=27<30.

i. State Hypothesis:

ii. Check Assumptions:

iii. Calculate Test Statistic

iv. Find p-value

v. Interpret

e) **(6 points)** Are the results the same at 99.99% confidence? Why or why not?