1- PROPORTION Z-TEST

This test is used to compare a sample proportion ( \( \hat{p} \) ) to a population proportion (p) or to determine a confidence interval for a population proportion.

In 1995, 7,741 students identified themselves as binge drinkers (from an SRS of 140 colleges and 17,592 students).

Does this constitute strong evidence that more than 40% of college students were binge drinkers in 1995?

P) IDENTIFY POPULATION PARAMETER:

\( p \) = proportion of US college students who were binge drinkers in 1995

H) STATE HYPOTHESES:

\( H_0 : p = .40 \quad Ha : p > .40 \)

A) VERIFY CONDITIONS REQUIRED FOR TEST:

a) SRS… says so in problem

b) \( N > 10 \) (17,592) > 175,920… probably

c) \( n p_0 > 10 \) \( n(1 – p_0) > 10 \)

\( (17,592)(.40) = 7036.8 > 10 \quad (17,592)(.60) = 10,555.2 > 10 \)
T) PERFORM TEST USING

a) TABLE C:

Calculate z test statistic and compare to critical $z^*$ (or use normalcdf)

$$z = \frac{\hat{p} - p_0}{\sqrt{\frac{p_0(1 - p_0)}{n}}} = 10.84$$

The largest $z^*$ in Table C is 3.291… since $10.84 > 3.291$, $p < .0005$

$\text{DISTR} \rightarrow \text{normalcdf (10.84, 100)} = 1.14 \times 10^{-27}$

b) CALCULATOR:

STAT $\rightarrow$ TESTS $\rightarrow$ 1-Prop Z Test $\rightarrow$ p = $1.17 \times 10^{-27}$ = 0

$X = \# \text{ of successes}$

S) STATE CONCLUSION:

There is extremely strong evidence to reject $H_0$ (P-value almost 0) and conclude that more than 40% of college students in the US were binge drinkers in 1995.

CONFIDENCE INTERVAL (Use PAIS):

After checking for normal distribution [$n \hat{p} > 10$, $n(1 - \hat{p}) > 10$], a 95% confidence interval for the proportion of college students who have engaged in binge drinking can be found using:

STAT $\rightarrow$ TEST $\rightarrow$ 1-Prop Z Int = (.433, .447)

*We are 95% confident that between 43.3% and 44.7% of college students were binge drinkers in 1995.*