

November 17th 2020.

1. In words,
 (a) H_0 : The average number of students in Smithville High School attend an average of 3.4 parties.

H_a : The average number of students in Smithville High School who attend parties per month is not 3.4

Symbol

$$H_0: \mu = 3.4$$

$$H_a: \mu \neq 3.4$$

level of significance $\alpha = 0.05$

Test statistic = The proportion z-test

$$n = 219, \quad s = 0.37, \quad \bar{x} = 3.9, \quad \mu = 3.4$$

$$z^* = \frac{\bar{x} - \mu}{s}$$

$$= \frac{3.9 - 3.4}{0.37} = 1.35135$$

$$= -1.352^* < 1.35$$

$$= -1.35 < z^* < 1.35 \text{ (from normal distribution table)}$$

$$0.08851 < z^* < 0.9115$$

$$p = 0.9115 - 0.08851$$

$$= 0.82299 > 0.05$$

Hence we fail to reject null hypothesis at 5% level of significance and conclude that the average number of students in Smithville High is significant.

(b) H_0 : Seniors attend a significant greater number of parties on average than whole student body
 H_a : Seniors does not attend a significant greater number of parties on an average than whole student body

$$H_0: \mu \geq 3.9$$

$$H_a: \mu < 3.9$$

The test is left-tailed, assuming the level of significance is 0.05

$$\text{Test statistic} = Z^* = \frac{\bar{x} - \mu}{\sigma}$$

$$\bar{x} = 3.4, \quad \mu = 3.9, \quad \sigma = 0.37$$

$$Z^* = \frac{3.4 - 3.9}{0.37} = \frac{-0.5}{0.37} = -1.35$$

(from left-tailed normal table -1.35)

$$= 0.08851$$

$$P = 0.08851, \quad P > 0.05 = 0.08851 > 0.05$$

$$\text{Rejection region} = P < 0.05$$

Yes, Interpretation changes
Hence we fail to reject null hypothesis at 5% level of significance and conclude that seniors attend a significant greater number of parties on average than whole student body.

2

$H_0: \mu_{\text{seniors}} = \text{The seniors average score on the verbal portion of SAT is 478}$

$H_a: \mu_{\text{seniors}} \neq \text{The seniors average score on the verbal portion of the SAT is NOT 478}$

$$H_0: \mu_{\text{seniors}} = 478$$

$$H_a: \mu_{\text{seniors}} \neq 478$$

Alpha significance level of 0.05 ($\alpha = 0.05$)

$$\text{Test statistic } Z^* \text{-test} = Z^* = \frac{\bar{x} - \mu}{s}$$

$$n = 147, s = 18, \bar{x} = 492, \mu = 478$$

$$Z^* = \frac{492 - 478}{18} = \frac{14}{18} \approx 0.777$$

$$\approx 0.78$$

$$-0.78 < Z^* < 0.78 \quad (\text{from normal table})$$

$$Z^* = 0.2823 - 0.21770$$

$$= 0.0646$$

$$P > 0.05, \quad 0.0646 > 0.05$$

Therefore we fail to reject null hypothesis and conclude that the average score on the verbal portion of the SAT is 478.

3

H_0 : The average salary of Peoria people is 30,000 per year.
 H_a : The average salary of Peoria people is not 30,000 per year.

$$H_0: \mu = 30,000$$

$$H_a: \mu \neq 30,000$$

This is a two-tailed test because of the equal signs ($=, \neq$)

let Alpha level of significance be 0.05

So, at $\alpha = 0.05$

$$\text{Test statistic (Z-test)} = \frac{\bar{X} - \mu}{\sigma}$$

$$\bar{X} = 32,225, \mu = 30,000, \sigma = 1443$$

$$Z^* = \frac{32,225 - 30,000}{1443} = 1.541926$$

$$Z^* = -1.54$$

$$-1.54 < Z^* < 1.54 \quad (\text{From normal distribution table})$$

Right-tailed

$$0.06178 < Z^* < 0.9382$$

$$Z^* = 0.9382 - 0.06178$$

$$= 0.93264$$

$$\approx 0.9226$$

Since $0.9226 > 0.05$, Therefore we fail to reject the null hypothesis at 5% level of significance and conclude that the average salary of Peoria people is 30,000 per year.

4 H_0 : There is significant difference between college students and the rest of the state's population

H_a : There is no significant difference between college students and the rest of the state's population

$$H_0: \mu = 14.7$$

$$H_a: \mu \neq 14.7$$

let α level of significance be equal to 0.05

$$\text{Test statistic} = Z^* = \frac{\bar{x} - \mu}{\sigma}$$

$$\bar{x} = 14.3, \mu = 14.7, \sigma = 1.2$$

$$Z^* = \frac{14.3 - 14.7}{1.2} = \frac{-0.4}{1.2}$$

$$= -0.3333$$

$$Z = -0.33 \text{ (from normal tables)}$$

This is a left-tailed test thus we located the point from left-tailed on normal tables

$$P = 0.37070, \text{ rejection region } P < 0.05$$

$P > 0.05$, $0.37070 > 0.05$ thus we fail to reject

null hypothesis and conclude that there is a significant difference between mean of college students and the rest of the population