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19-1319
MAT 499
09/04/2022

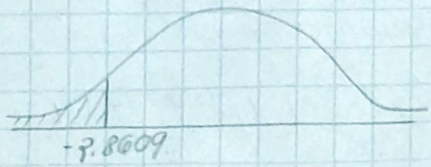
1. Standard deviation = 95 hours
mean = 1014 hours
sample = 90 bulbs
CI = 99%

$\mu = \bar{x} \pm t_{(n-1, \frac{\alpha}{2})} \frac{\sigma}{\sqrt{n}}$

$= t_{(90-1), \frac{\alpha}{2}})$

$= 89, 0.005$

$= 2.8609$



$\mu = \bar{x} - t \times \frac{\sigma}{\sqrt{n}}$

$= 1014 \pm 2.8609 \times \frac{95}{\sqrt{90}}$

$\mu \approx 998.00, 1029.99$

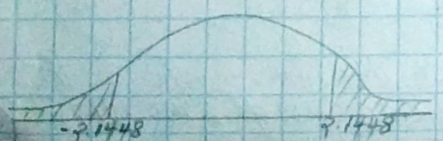
2. sample = 15 rods
CI = 95%

$\mu = \bar{x} \pm t_{(n-1, \frac{\alpha}{2})} \frac{\sigma}{\sqrt{n}}$

$t_{(15-1), \frac{\alpha}{2}})$

$14, 0.025$

$= 2.1448$



$\bar{x} = \frac{8.94 + 8.91 + 8.93 \ldots + 8.94}{15}$

$\bar{x} = 8.934$
standard deviation $= 0.03$

$= 8.934 \pm 2.1448 \times \frac{0.03}{\sqrt{15}}$

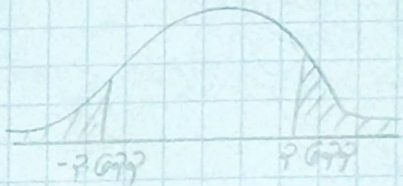
$= 8.95mm, 8.917mm$

3. H_0 $\mu = 1500hrs$
H_A $\mu \neq 1500hrs$

$t_{(10-1, 0.025)}$

$t_{(9, 0.025)}$

$= 2.262$



$t = \frac{\bar{x} - \mu_0}{\frac{\sigma}{\sqrt{n}}}$

$= \frac{1410 - 1500}{\frac{90}{\sqrt{10}}} = \frac{-90}{28.46}$

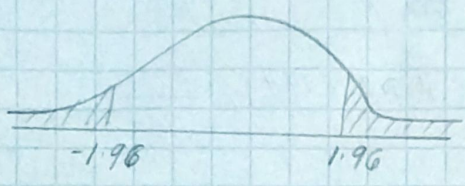
$= -3.2$

$t \approx -3.2$

We reject the null hypothesis that expected lifetime of electric bulbs is 1500hrs.

4 standard deviation = 500grams
CI = 95%
sample size

$$n = \left(\frac{z\delta}{E}\right)^2$$



$$\left(\sqrt{n}\right)^2 = \left(\frac{1.96 \times \delta}{100}\right)^2$$

$$n = \left(\frac{1.96 \times 500}{100}\right)^2$$

$$= 96.04$$

5 H_0:
38% another org
39% self employed
23% freelancing
7% own companies

H_A Observed

another org	199
self emp	85
freelancing	76
own	17
total	300

$\frac{38}{100} \times 300 = 114$

$\frac{39}{100} \times 300 = 96$

$\frac{23}{100} \times 300 = 69$

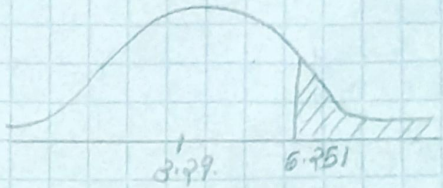
$\frac{7}{100} \times 300 = 21$

$$\chi^2 = \frac{(199-114)^2}{114} + \frac{(85-96)^2}{96} + \frac{(76-69)^2}{69} + \frac{(17-21)^2}{21}$$

$$= 0.56 + 1.96 + 0.71 + 0.76 = 3.99$$

$$\chi^2_{(4-1,\,0.10)}$$

$$\chi^2_{(3,\,0.10)} = 6.251$$



We accept the null hypothesis

6 H_0 reported height
H_A measured height

$$\chi^2 = \frac{(66.8-68)^2}{68} + \frac{(73.9-74)^2}{74} +$$

$$\frac{(66.1-66.5)^2}{66.5} + \frac{(67.2-69)^2}{69} + \frac{(67.9-68)^2}{68}$$

$$+\frac{(69.4-71)^2}{71} + \frac{(69.9-70)^2}{70} + \frac{(68.6-70)^2}{70}$$

$$+\frac{(67.9-67)^2}{67} + \frac{(67.6-68)^2}{68} + \frac{(68.8-70)^2}{70}$$

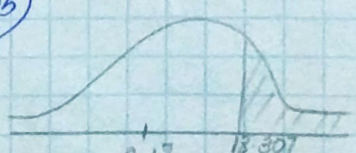
$$= 0.09 + 0.000135 + 0.0024 + 0.05 + 0.00015 + 0.036 + 0.00014 + 0.098 + 0.019 + 0.0024 + 0.09$$

$$= 0.171$$

$$\chi^2_{(11-1,\,0.05)}$$

$$= (10, 0.05)$$

$$= 18.307$$



We accept the null hypothesis that students exaggerated their heights