Equitable Equations: *Hypothesis testing with t*

Instructions

For each of the following problems,

(a) Write null and alternative hypotheses appropriate to this study.

(b) Compute the t-score of the sample mean.

(c) Compute the p-value of the sample mean.

(d) Are the results statistically significant at level $\alpha = .05$?

(e) What conclusions, if any, can be drawn from this study? Answer in ordinary human language.

(f) Verify your calculations using the `t.test` function.

Problem 1

A fluorescent lamp manufacturer advertises that the mean life of their lamps is 10,000 hours. You worry that it's less. Use the `lamp` data set, available on Moodle, to test this claim at significance level $\alpha = .05$.

Problem 2

A guidebook says that the average time between eruptions of the Wyoming's Old Faithful geyser is 75 minutes. Use built-in R data set `faithful` to test this clasim at significance level $\alpha = .05$.

1) a) $H_0 : \mu = 10{,}000$ hours

$H_a : \mu < 10{,}000$ hours

b) $t = \dfrac{\text{mean(lamps\$hours\_of\_use)} - 10{,}000}{\text{sd(lamps\$hours\_of\_use)/sqrt(32}}$

$t = -1.38$

c) $p = pt(t, 31)$

$p = 0.0893$

d) $p > \alpha$ ∴ results are statistically significant

e) The data supports the advertisment claim that the average life of a lamp is 10,000 hours.

f) t.test(lamps$hours_of_use, alternative="less", mu=10 000)

$t = -1.38$

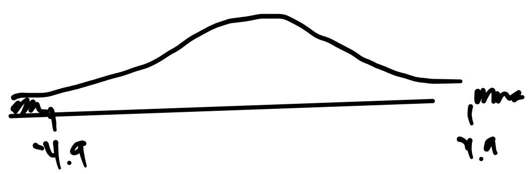
$p = 0.0893$

2) a) $H_0: N = 75$ min

$H_a: N \neq 75$ min

b) $t = \dfrac{\text{mean(faithful\$waiting)} - 75}{\text{sd(faithful\$waiting)/sqrt(272)}}$

$t = -4.98$



c) $p = pt(t, 271) * 2$

$p = 1.15 \times 10^{-6} = 0.00000115$

d) $p < \alpha$ ∴ p is not statistically significant

e) The data does not support the average waiting time of

75 minutes stated by the guidebook

f) `t.test(faithful$waiting, mu=75)`

$t = -4.98$

$p = 1.15 \times 10^{-6}$