Homework-10

1. Problem 7 on page 372

Given,

$n_1 = 125$
$\bar{x}_1 = 2.7186$
$s_1 = 0.63342$

[Sample 1]

Sample 2:

$n_2 = 88$
$\bar{x}_2 = 2.8639$
$s_2 = 0.49241$

Significance level: $\alpha = 0.01$

State the hypotheses

Null Hypothesis

$H_0: \mu_1 = \mu_2$

Alternative Hypothesis

$H_a: \mu_1 \neq \mu_2$

Calculate the test statistic

$$t = \frac{\bar{x}_1 - \bar{x}_2}{\sqrt{\frac{s_1^2}{n_1} + \frac{s_2^2}{n_2}}} = \frac{2.7186 - 2.8639}{\sqrt{\frac{0.63342^2}{125} + \frac{0.49241^2}{88}}}$$

$$= \sim \cancel{0}\,1.88$$

*Degree of freedom:

$$df = \frac{(s_1^2/n_1 + s_2^2/n_2)^2}{\frac{(s_1^2/n_1)^2}{n_1-1} + \frac{(s_2^2/n_2)^2}{n_2-1}}$$

$$\approx 222$$

The critical t-value

$df \approx 222$ and $\alpha = 0.01$

$t_{critical} \approx \pm 2.576$

A decision:-

$|t| = 1.88 < 2.576$,

we fail to reject the null hypothesis.

2. Problem 32 (b) on page 381

Given,

Group	Sample n	Sample $\bar{x}$	Sample SDs
Older	28	801	117
Younger	16	780	72

Hypotheses

H_0 vs H_α

$\mu_1 = \mu_2$

$\mu_1 > \mu_2$ (Right-tailed)

Standard deviation

$$S_p = \sqrt{\frac{(n_1-1)S_1^2 + (n_2-1)S_2^2}{n_1+n_2-2}}$$

≈ 103.2

*Test statistics

$$t = \frac{\bar{x}_1 - \bar{x}_2}{S_p\sqrt{\frac{1}{n_1}+\frac{1}{n_2}}} \approx 0.6495$$

Degree of freedom

$$df = n_1 + n_2 - 2$$
$$= 42$$

t-distribution table:-

$t_{critical}$ (one-tailed, $\alpha = 0.05$, $df = 42$) ≈ 1.682

*Conclusion:-

$t = 0.6495 < t_{critical} = 1.682$

we fail to reject the null hypothesis

3. Problem 42 (a) on page 390

let,

d_i = Before$_i$ − After$_i$

Data

Before: 15 26 66 115 62 64

After: 16 24 42 80 78 73

so,

difference are:-

$d = [-1, 2, 24, 35, -16, -9]$

state the hypotheses

H_0 Vs H_A

$\mu_d = 0$ $\mu_d \neq 0$

*Compute sample statistics

$$\bar{d} = \frac{-1+2+24+35-16-9}{6}$$

$$\simeq 5.83$$

$$s_d = \sqrt{\frac{\Sigma(d_i - \bar{d})^2}{n-1}} \simeq 26.77$$

$$SE = \frac{s_d}{\sqrt{n}} \simeq 10.93$$

* Test statistic $t = \frac{\bar{d} - 0}{SE} \simeq 0.534$

* Degree of freedom:

$d_f = n-1 = 5$

* p-value:-

p-value $\simeq 0.615$

At,

$\alpha = 0.05$, since $p > \alpha$, we fail to reject H_0.