Exercise 10.1:

Q2: Consider the following hypothesis test $H_0: \mu_1 - \mu_2 \leq 0$ D_0

$H_1: \mu_1 - \mu_2 > 0$

The following results are for two independent samples taken from the two populations.

Sample 1	Sample 2
$n_1 = 40$	$n_2 = 50$
$\bar{x}_1 = 25.2$	$\bar{x}_2 = 22.8$
$s_1 = 5.2$	$s_2 = 6.0$

2.4

$\sqrt{0.676 + 0.72}$

$\frac{2.4}{1.18}$

(1) What is the value of the test statistic?

$$Z = \frac{(\bar{x}_1 - \bar{x}_2) - D_0}{\sqrt{\frac{s_1^2}{n_1} + \frac{s_2^2}{n_2}}} = \frac{(25.2 - 22.8) - 0}{\sqrt{\frac{(5.2)^2}{40} + \frac{36}{50}}} = 2.03$$

0.9788

(2) What is the p-value? By Ztable.

$$\text{p-Value} = 1 - 0.9788$$
$$= 0.0212$$

من الجدول

$Z = 2.03$

بالجدول بعطيني الي عاليسار دايما

(3) With $\alpha = 0.05$, what is your hypothesis testing conclusion?

Reject H_0 if p-Value $\leq \alpha$

$$0.0212 \overset{?}{\leq} 0.05 \quad ✓$$

So we Reject H_0.

Q3: Consider the following hypothesis test $\quad H_0: \mu_1 - \mu_2 = 0$ $\quad$ $\boxed{\text{Two tailed test}}$

$\qquad\qquad\qquad\qquad\qquad\qquad\qquad\qquad H_1: \mu_1 - \mu_2 \neq 0$

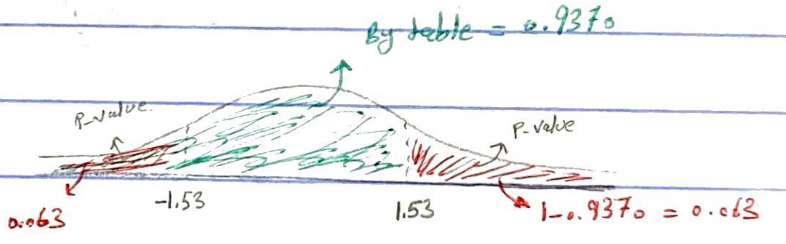
The following result are for two independent samples taken from the two value pop.

sample 1	sample 2
$n_1 = 80$	$n_2 = 70$
$\bar{x}_1 = 104$	$\bar{x}_2 = 106$
$s_1 = 8.4$	$s_2 = 7.6$

(a) What is the value of the test statistic?

$$Z = \frac{(\bar{x}_1 - \bar{x}_2) - D_0}{\sqrt{\frac{s_1^2}{n_1} + \frac{s_2^2}{n_2}}} = \frac{104 - 106}{\sqrt{\frac{70.56}{80} + \frac{57.76}{70}}} = -1.53$$

(b) What is the p-value? By Z-table.



$$\text{P-value} = 2(1 - 0.9370)$$
$$= (0.063 + 0.063)$$
$$= 0.126$$

(C) With $\alpha = 0.05$, what is your hypothesis testing conclusion?

p-value $\square$ α

$0.126 > 0.05$ so we don't reject H_0 ($\alpha = 0.05$).

Q4:

	Men	Women
	$n_1 = 100$	$n_2 = 85$
	$\bar{X}_1 = 14.9$ years	$\bar{X}_2 = 10.3$ years
	$\sigma_1 = 5.2$ years	$\sigma_2 = 3.8$ years.

(a) What is the point estimate of the difference between the two pop. mean?

point estimate for $\mu_1 - \mu_2 = \bar{X}_1 - \bar{X}_2 = 14.9 - 10.3 = 4.6$ years.

(b) At 95% confidence, what is the margen of error? E

$$E = Z_{\frac{\alpha}{2}} \sqrt{\frac{\sigma_1^2}{n_1} + \frac{\sigma_2^2}{n_2}} =$$

$1-\alpha = 0.95 \rightarrow \alpha = 0.05$

$\frac{\alpha}{2} = 0.025$

$$= Z_{0.025} \sqrt{\frac{27.04}{100} + \frac{14.44}{85}} =$$

$$= 1.96 \sqrt{\quad 11 \quad} = 1.3$$

(c) What is the 95% CI estimate of the difference between the two pop. mean?

$$(1-\alpha)\,CI = (\bar{X}_1 - \bar{X}_2) \mp Z_{\frac{\alpha}{2}} \sqrt{\frac{\sigma_1^2}{n_1} + \frac{\sigma_2^2}{n_2}}$$

ادرسناها فوق

$$= 4.6 \pm 1.3$$

$$= (3.3\,,\,5.9)$$

← مرة بجمع و مرة بطرح

Q6 : Male : $n_1 = 40$ female $n_2 = 30$

$\sigma_1 = 35$ $\sigma_2 = 20$

$\bar{x}_1 = 135.67$ $\bar{x}_2 = 68.64$

a. point estimater for $\mu_1 - \mu_2 = \bar{x}_1 - \bar{x}_2 = 67.03$

b. 99% CI , what is the margin of error :

$$E = Z_{\frac{\alpha}{2}} \sqrt{\frac{\sigma_1^2}{n_1} + \frac{\sigma_2^2}{n_2}}$$

$$= Z_{0.005} \sqrt{\frac{35^2}{40} + \frac{20^2}{30}}$$

$$= 2.576 \times \sqrt{43.95833333}$$

$$= 17.08$$

$1 - \alpha = 0.99$

$1 - 0.99 = \alpha$

$\alpha = 0.01 \rightarrow \frac{\alpha}{2} = 0.005$

$Z_{0.005} = 2.576$

By t-table

$df = \infty$ with 0.005

C. 99% CI for $\mu_1 - \mu_2$:

$$99\%\ CI = (\bar{x}_1 - \bar{x}_2) \mp E$$

$$= 67.03 \mp 17.08$$

$$= (49.95, 84.11)$$