Ⓑ T-TEST FOR 2 POPULATION MEANS

EXAMPLE 5-5 P244-245 CASE 2: σ_1^2 AND σ_2^2 (σ_1 AND σ_2) ARE UNKNOWN BUT $\sigma_1^2 \neq \sigma_2^2$ - TWO SIDED TEST

$\overline{X}_1 = 12.5, S_1 = 7.63, n_1 = 10, \overline{X}_2 = 27.5, S_2 = 15.3, n_2 = 10$

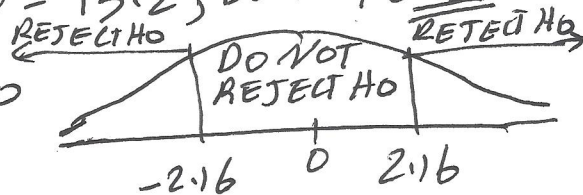① $H_0: \mu_1 - \mu_2 = 0$ or $\mu_1 = \mu_2$ $D_0 \mu_0 = 0$ HERE, $D_0 = \mu_1 - \mu_2$
   $H_1: \mu_1 - \mu_2 \neq 0$ or $\mu_1 \neq \mu_2$

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② $\alpha = .05, \alpha/2 = .025,$ $df = \upsilon = \dfrac{\left(\dfrac{S_1^2}{n_1} + \dfrac{S_2^2}{n_2}\right)^2}{\dfrac{(S_1^2/n_1)^2}{n_1-1} + \dfrac{(S_2^2/n_2)^2}{n_2-1}}$

$\upsilon = \left(\dfrac{7.63^2}{10} + \dfrac{15.3^2}{10}\right)^2 \Big/ \dfrac{(7.63^2/10)^2}{10-1} + \dfrac{(15.3^2/10)^2}{10-1}$, $\upsilon = 13.2$, DOWN TO 13 APPROXIMATE

$t_{.025,13} = 2.16$

IF $t_{OBT} > 2.16$ or $t_{OBT} < -2.16$ REJECT H_0

③ $t_{OBT} = \dfrac{\overline{X}_1 - \overline{X}_2 - D_0}{\sqrt{\dfrac{S_1^2}{n_1} + \dfrac{S_2^2}{n_2}}} = \dfrac{12.5 - 27.5}{\sqrt{\dfrac{7.63^2}{10} + \dfrac{15.3^2}{10}}} = -2.77$

④ AS $t_{OBT} < -t_{\alpha/2}$ AS $-2.77 < -2.16$ REJECT H_0, H_1 IS TRUE $\mu_1 \neq \mu_2$

⑤ WE ARE 95% CONFIDENT THAT THE MEAN ARSENIC CONCENTRATION IN THE DRINKING WATER OF ALL RURAL ARIZONA IS NOT EQUAL TO THE MEAN ARSENIC CONCENTRATION IN DRINKING WATER OF ALL METROPOLITAN OF PHOENIX COMMUNITIES.

USING THE CONFIDENCE INTERVAL P249 - CASE 2

②A IF 0 IS INSIDE CI, DO NOT REJECT H_0

③A CI: $\overline{X}_1 - \overline{X}_2 - (t_{\alpha/2,\upsilon})\left(\sqrt{\dfrac{S_1^2}{n_1} + \dfrac{S_2^2}{n_2}}\right) \leq \mu_1 - \mu_2 \leq \overline{X}_1 - \overline{X}_2 + (t_{\alpha/2,\upsilon})\left(\sqrt{\dfrac{S_1^2}{n_1} + \dfrac{S_2^2}{n_2}}\right)$

CI: $12.5 - 27.5 - (2.16)\left(\sqrt{\dfrac{7.63^2}{10} + \dfrac{15.3^2}{10}}\right) \leq \mu_1 - \mu_2 \leq 12.5 - 27.5 + (2.16)\left(\sqrt{\dfrac{7.63^2}{10} + \dfrac{15.3^2}{10}}\right)$

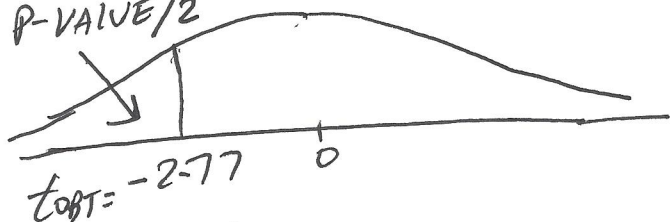④A CI: $-26.678 \leq \mu_1 - \mu_2 \leq -3.322$
   AS 0 IS NOT INSIDE CI, REJECT H_0

USING THE P-VALUE

②B IF P-VALUE $< \alpha$ REJECT H_0, IF P-VALUE < 0.05 REJECT H_0

③B $t_{OBT} = \dfrac{\overline{X}_1 - \overline{X}_2 - D_0}{\sqrt{\dfrac{S_1^2}{n_1} + \dfrac{S_2^2}{n_2}}} = -2.77$

AT $\upsilon = 13$, $2.65 < |t_{OBT}| < 3.012$ (2.77)

$0.005 < \dfrac{P\text{-}VALUE}{2} < 0.01$, or $0.01 < P\text{-}VALUE < 0.02$, ASSUME P-VALUE $= 0.015$

④B AS P-VALUE $< \alpha$, AS $0.015 < 0.05$
   REJECT H_0