(3) HYPOTHESIS TEST FOR TWO POPULATIONS' MEANS

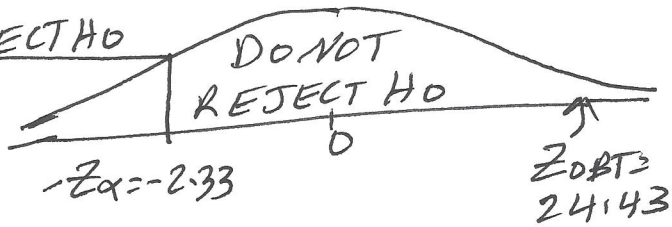
EXAMPLE 5-3 P236-237 σ_1 AND σ_2 OR σ_1^2 AND σ_2^2 ARE KNOWN

$\bar{X}_1 = 87.6, \bar{X}_2 = 74.5, \sigma_1 = 1, \sigma_2 = 1.5, n_1 = 10, n_2 = 12, \alpha = 0.01$

IF WE ARE ASKED IF THE MEAN TENSILE STRENGTH OF ALL ALUMINUM GRADE 1 IS LESS THAN THE TENSILE STRENGTH OF ALL ALUMINUM GRADE 2, THIS IS STATED AS $\mu_1 < \mu_2$ ONE SIDED TEST

(1) $H_0: \mu_1 \geq \mu_2$ or $\mu_1 - \mu_2 \geq 0$

$H_1: \mu_1 < \mu_2$ or $\mu_1 - \mu_2 < 0$



(2) If $Z_{OBT} < -Z_\alpha$ REJECT H_0

$\alpha = 0.01, -Z_\alpha = -2.33$

(3) $Z_{OBT} = \dfrac{\bar{X}_1 - \bar{X}_2 - 0}{\sqrt{\frac{\sigma_1^2}{n_1} + \frac{\sigma_2^2}{n_2}}} = \dfrac{87.6 - 74.5}{\sqrt{\frac{1}{10} + \frac{1.5^2}{12}}} = 24.43$

(4) AS $Z_{OBT} > -Z_\alpha$ or $24.43 > -2.33$, DO NOT REJECT H_0

(5) WE ARE 99% CONFIDENT THAT THE MEAN TENSILE STRENGTH OF ALL ALUMINUM GRADE 1 IS GREATER OR EQUAL TO THE MEAN TENSILE STRENGTH OF ALL ALUMINUM GRADE 2

P183 USING THE CONFIDENCE INTERVAL

(2A) If 0 > UPPER LIMIT REJECT H_0 or UPPER LIMIT < 0, REJECT H_0

(3A) $\text{UPPER LIMIT} = \bar{X}_1 - \bar{X}_2 + Z_\alpha \sqrt{\frac{\sigma_1^2}{n_1} + \frac{\sigma_2^2}{n_2}}$, $Z_\alpha = +2.33$

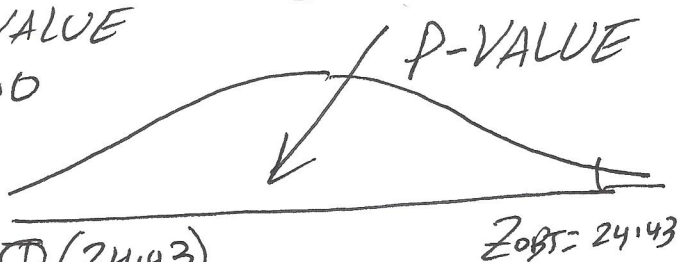
$\text{UPPER LIMIT} = 87.6 - 74.5 + 2.33 \sqrt{\frac{1}{10} + \frac{1.5^2}{12}} = 14.34932$

(4A) AS UPPER LIMIT > 0 or $14.34932 > 0$ DO NOT REJECT H_0

USING THE P-VALUE

(2B) If P-VALUE < α REJECT H_0

(3B) $Z_{OBT} = \dfrac{\bar{X}_1 - \bar{X}_2 - 0}{\sqrt{\frac{\sigma_1^2}{n_1} + \frac{\sigma_2^2}{n_2}}} = 24.43$



(4B) P-VALUE = $\Phi(24.43)$

$= \Phi(3.99) = 0.999967$

AS P-VALUE > α or $0.999967 > 0.01$ DO NOT REJECT H_0