I ONE POPULATION PROPORTION

P : POPULATION PROPORTION (IT IS DIFFERENT THAN P-VALUE)

$\hat{P}$: SAMPLE PROPORTION, $\hat{P} = \frac{X}{n}$ (FRACTION)

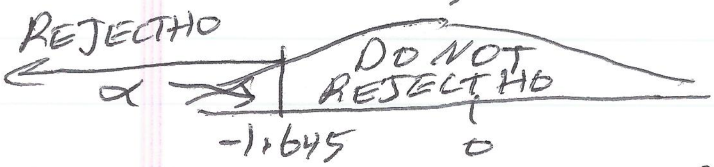
SEE EXAMPLE 4-12 ON PAGE 207

$X = 4$
$n = 200$

IF YOU ARE ASKED THAT THE FRACTION OF DEFECTIVE PARTS NOT TO EXCEED 0.05 OR SMALLER THAN 0.05, OR LESS THAN 0.05 THIS STATEMENT WILL GO IN H_1

① $H_0: P \geq 0.05$, $H_1: P < 0.05$

② IF $Z_{OBT} < -Z_\alpha$ REJECT HO, $\alpha = .05$, $Z_\alpha = 1.645$



IF $Z_{OBT} < -1.645$ REJECT HO

$n = 200, X = 4, P_0 = .05$

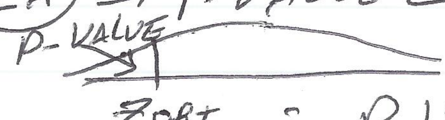
③ $$Z_{OBT} = \frac{X - nP_0}{\sqrt{nP_0(1-P_0)}} = \frac{X/n - P_0}{\sqrt{P_0(1-P_0)/n}}$$

$$Z_{OBT} = \left[4 - 200(0.05)\right] / \sqrt{200(0.05)(0.95)} = -1.95$$

④ AS $-1.95 < -1.645$ or $Z_{OBT} < \cancel{Z_\alpha}$ REJECT HO

⑤ WE ARE 95% THAT THE FALLOUT OR FRACTION OF ALL DEFECTIVE PARTS IS LESS THAN 0.05

USING P-VALUE: (2A) IF P-VALUE < α or P-VALUE < .05 REJECT HO



(3A) $Z_{OBT} = -1.95$ ∴ P-VALUE = 0.0256

(4A) AS $0.0256 < 0.05$ REJECT HO. *PROCESS IS CAPABLE

USING CI: (2B) IF $0.05 >$ UPPER LIMIT REJECT HO

(3B) UPPER LIMIT $= \hat{P} + Z_\alpha \sqrt{\hat{P}(1-\hat{P})/n} =$

$0.036285 = \frac{4}{200} + 1.645 \sqrt{0.02(0.98)/200}$

(4B) AS $0.05 > 0.036285$ REJECT HO

NOTE: $P_0 = 0.05$ IS A DIFFENT TERM THAN α ALTHOUGH HERE THEY HAVE SAME VALUE

II

$\hat{p} = \frac{4}{200} = 0.02$

$X = 4$

$n = 200$

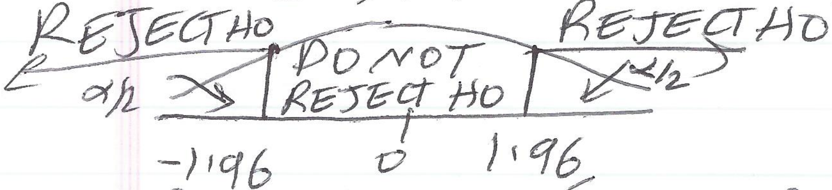
IF YOU ARE ASKED THAT THE FRACTION OR PROPORTION OF DEFECTIVE PARTS TO BE EQUAL TO, SAME, DIFFERENT OR DIFFERENT FROM 0.05, THIS IS A 2 SIDED TEST

(1) $H_0: P = 0.05$, $H_1: P \neq .05$

(2) IF $Z_{OBT} > Z_{\alpha/2}$ OR $Z_{OBT} < -Z_{\alpha/2}$ REJECT H_0

$\alpha = .05$, $\alpha/2 = .025$, $Z_{\alpha/2} = 1.96$

IF $Z_{OBT} > 1.96$ OR $Z_{OBT} < -1.96$ REJECT H_0



$$Z_{OBT} = \frac{X - nP_0}{\sqrt{nP_0(1-P_0)}}$$

(3) $Z_{OBT} = [4 - 200(0.05)] / \sqrt{200(0.05)(0.95)}$

$Z_{OBT} = -1.95$

(4) AS $-1.95 > -1.96$ <u>DO NOT REJECT HO</u> !!

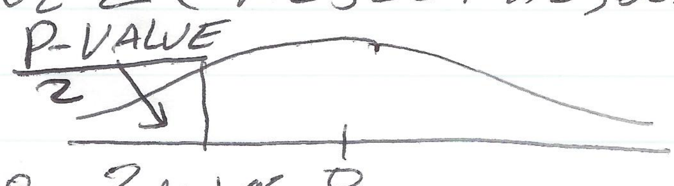
(5) WE ARE 95% CONFIDENT THAT THE FALLOUT OR FRACTION OF ALL DEFECTIVE PARTS EQUAL TO 0.05

USING THE P-VALUE AS A REJECTION RULE

(2A) IF P-VALUE $< \alpha$ REJECT HO, $\alpha = .05$

(3A) $Z_{OBT} = -1.95$

USING Z-TABLE



$\frac{\text{P-VALUE}}{2} = 0.025588$

P-VALUE $= 2(0.025588) = 0.051176$

(4A) AS $0.051176 > 0.05$ <u>DO NOT REJECT HO</u>

NOTICE HERE THE IMPORTANCE OF 5 DECIMALS

CI: (2B) IF P_0 IS INSIDE CI DO NOT REJECT HO

(3B) EQTN 4-73 ON PAGE 211

$$\hat{p} - Z_{\alpha/2}\sqrt{\frac{\hat{p}(1-\hat{p})}{n}} \leq P \leq \hat{p} + Z_{\alpha/2}\sqrt{\frac{\hat{p}(1-\hat{p})}{n}}$$

$$0.02 - 1.96\left(\sqrt{\frac{0.02 * 0.98}{200}}\right) \leq P \leq 0.02 + 1.96\left(\sqrt{\frac{0.02 * 0.98}{200}}\right)$$

$0.000596 \leq P \leq 0.03940$. (4B) AS 0.02 IS INDISE THE CI, DO NOT REJECT HO.

$0.02 > 0.00059$

$0.02 < 0.0394$

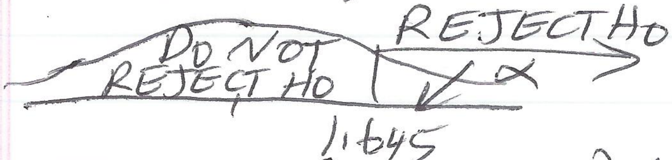
III

IF YOU ARE ASKED THAT THE FRACTION OF DEFECTIVE PARTS TO BE GREATER THAN 5% OR 0.05, THIS STATEMENT GOES IN H_1

(1) $H_0: P \leq 0.05$, $H_1: P > 0.05$

(2) If $Z_{OBT} > Z_\alpha$ REJECT H_0 , $\alpha = .05$

If $Z_{OBT} > 1.645$ REJECT H_0



$X = 4$, $n = 200$

$P_0 = 0.05$, $\hat{P} = \frac{4}{200}$

(3) $Z_{OBT} = (X - nP_0) / \sqrt{nP_0(1-P_0)}$

$Z_{OBT} = [4 - 200(0.05)] / \sqrt{200(0.05)(0.95)}$

$Z_{OBT} = -1.95$

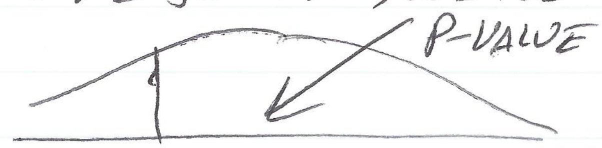
(4) AS $-1.95 < -1.645$ <u>DO NOT REJECT HO</u>

(5) WE ARE 95% CONFIDENT THAT THE FRACTION OF ALL ~~DEFE~~ECTIVE PARTS IS LESS OR EQUAL TO .05 OR 5%.

USING THE P-VALUE AS A REJECTION RULE

(2A) IF P-VALUE $< \alpha$ REJECT H_0, $\alpha = .05$

(3A) $Z_{OBT} = -1.95$



$P\text{-VALUE} = 1 - \Phi(-1.95)$ $Z_{OBT} = -1.95$

$P\text{-VALUE} = 1 - 0.025588 = 0.974412$

(4A) AS $0.974412 > 0.05$ <u>DO NOT REJECT HO</u>

USING THE CI AS A REJECTION RULE

(2B) IF $0.05 <$ LOWER BOUND REJECT HO

(3B) LOWER BOUND $= \hat{P} - Z_\alpha \sqrt{\hat{P}(1-\hat{P})/n} =$

$0.037153 = 0.02 - 1.645 * \sqrt{\frac{0.02 * 0.98}{200}}$

(4B) AS $0.05 > 0.037153$

<u>DO NOT REJECT HO</u>

II

$\hat{p} = \frac{4}{200} = 0.02$

$X = 4$

$n = 200$

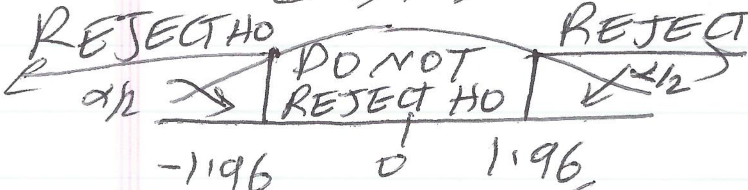
IF YOU ARE ASKED THAT THE FRACTION OR PROPORTION OF DEFECTIVE PARTS TO BE EQUAL TO, SAME, DIFFERENT OR DIFFERENT FROM 0.05, THIS IS A 2 SIDED TEST

(1) $H_0: P = 0.05$, $H_1: P \neq .05$

(2) IF $Z_{OBT} > Z_{\alpha/2}$ OR $Z_{OBT} < -Z_{\alpha/2}$ REJECT H_0

$\alpha = .05$, $\alpha/2 = .025$, $Z_{\alpha/2} = 1.96$

IF $Z_{OBT} > 1.96$ OR $Z_{OBT} < -1.96$ REJECT H_0



$$Z_{OBT} = \frac{X - nP_0}{\sqrt{nP_0(1-P_0)}}$$

(3) $Z_{OBT} = [4 - 200(0.05)] / \sqrt{200(0.05)(0.95)}$

$Z_{OBT} = -1.95$

(4) AS $-1.95 > -1.96$ <u>DO NOT REJECT HO</u> !!

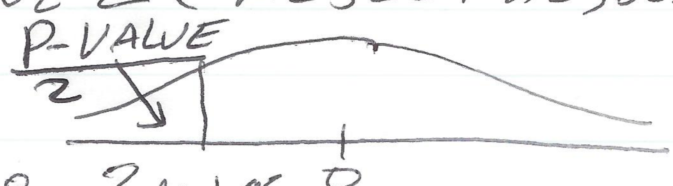
(5) WE ARE 95% CONFIDENT THAT THE FALLOUT OR FRACTION OF ALL DEFECTIVE PARTS EQUAL TO 0.05

USING THE P-VALUE AS A REJECTION RULE

(2A) IF P-VALUE $< \alpha$ REJECT HO, $\alpha = .05$

(3A) $Z_{OBT} = -1.95$

USING Z-TABLE



$\frac{\text{P-VALUE}}{2} = 0.025588$ $Z_{OBT} = -1.95$

P-VALUE $= 2(0.025588) = 0.051176$

(4A) AS $0.051176 > 0.05$ <u>DO NOT REJECT HO</u>

NOTICE HERE THE IMPORTANCE OF 5 DECIMALS

CI: (2B) IF P_0 IS INSIDE CI DO NOT REJECT HO

(3B) EQTN 4-73 ON PAGE 211

$$\hat{p} - Z_{\alpha/2}\sqrt{\frac{\hat{p}(1-\hat{p})}{n}} \le P \le \hat{p} + Z_{\alpha/2}\sqrt{\frac{\hat{p}(1-\hat{p})}{n}}$$

$$0.02 - 1.96\left(\sqrt{\frac{0.02 * 0.98}{200}}\right) \le P < 0.02 + 1.96\left(\sqrt{\frac{0.02 * 0.98}{200}}\right)$$

$0.000596 \le P \le 0.03940$. (4B) AS 0.02 IS INDISE THE CI, DO NOT REJECT HO.

$0.02 > 0.00059$

$0.02 < 0.0394$