Hypothesis Testing

1

$n = 256$

$\mu_s = 2.85$

$\mu_{pop} = 2.75$

$\sigma_s = 0.65$

(a) Null Hypo → GPA didn't change

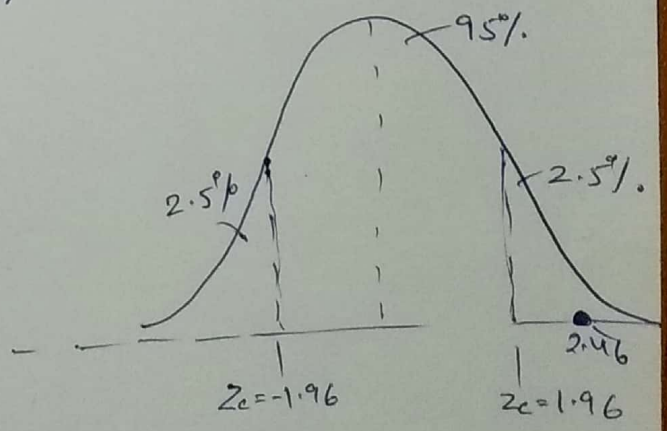
Alternate → GPA change

(b) $SE = \frac{\sigma}{\sqrt{n}} = \frac{0.65}{\sqrt{256}} = \boxed{.040}$

(c) $CR = \alpha = 0.05$

$CL = 1 - CR = 1 - .05 = .95$

Since change can be either side ∴ Two Tailed set,



(d) $Z = \frac{\bar{x} - \mu_{op}}{\sigma_s / \sqrt{n}}$

$= \frac{2.85 - 2.75}{.65/\sqrt{256}} = \frac{.1 \times 16}{.65}$

$= \boxed{2.46}$

Sample Zscore is under tail so rejecting Null Hypothesis.

2. $\mu_{pop} = 52$ $\quad \mu_s = 52.8$

$\sigma_{pop} = 4.50$ $\quad SL = 5\% = CR$

$n = 100$

Null — Average cost lower $\quad P(<52)$

Alternate — Average cost is higher $\quad P(>52)$

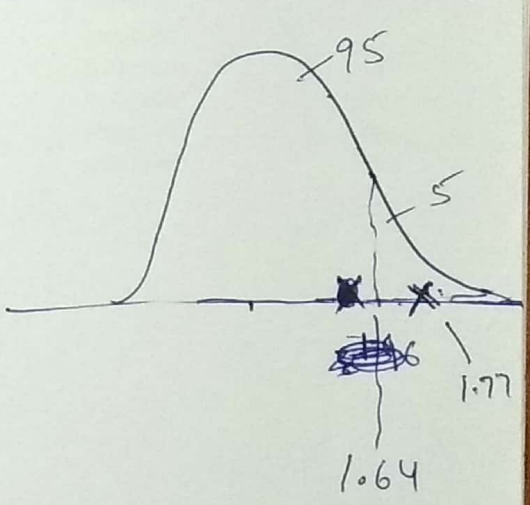
$CL = 1 - SL$

$= 1 - 5 = 95\%$

Testing is Average cost is Higher OR Lower from mean (52)

∴ One Tail Test.

Positive One Tail Test



$CL = 95\%$

$Z_{\alpha} = 1.64$

$$Z_{sample} = \frac{\bar{x}_s - \mu_{pop}}{\frac{\sigma_{pop}}{\sqrt{n}}}$$

$$= \frac{52.8 - 52}{4.50/\sqrt{100}}$$

$$= \frac{.8 \times 10}{4.5}$$

$$= 1.77$$

Sample under Tail Reject Null Hypothesis.

3 $\mu_{pop} = 34$ $\quad n = 50$

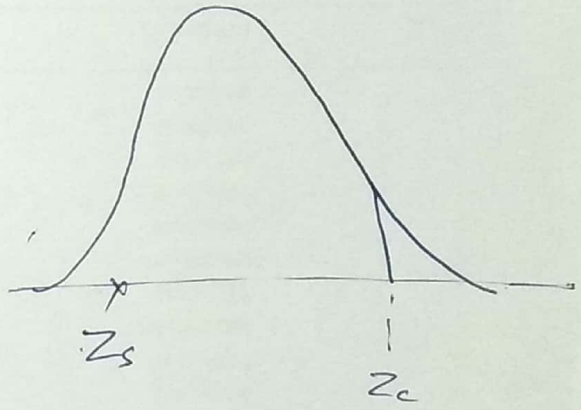
$\sigma_{pop} = 8$ $\quad \bar{x}_s = 32.5$

SI = 1% = CR

$$CL = 1 - SI = 1 - .01 = .99 \simeq 99\%$$

Null : Average lowered $\quad P(< 32.5)$

Alternate : Average high $\quad P(> 32.5)$



$\Rightarrow$ One Tail Test

$\Rightarrow$ Positive One Tail Test

$Z_c \simeq 99\% = 2.32$

$$Z_{score} = \frac{\bar{x}_s - \mu_{pop}}{\sigma_{pop}/\sqrt{n}}$$

$$= \frac{32.5 - 34}{8/\sqrt{50}}$$

$$= -1.32$$

Not falling under tail, so Null hypothesis is correct.

4 $n = 16$ $\mu_s = 12$

$\mu_{pop} = 10$ $\sigma_{\bar{s}} = 1.5$

$$t = \frac{12 - 10}{1.5/\sqrt{16}} = \frac{2 \times 4}{1.5}$$

$$= 1.6$$

5

Pop 1	Pop 2
$N_1 = 300$	$N_2 = 700$
$X_1 = 120$	$X_2 = 140$
$P_1 = S_1 = 0.53$	$P_2 = S_2 = 0.20$

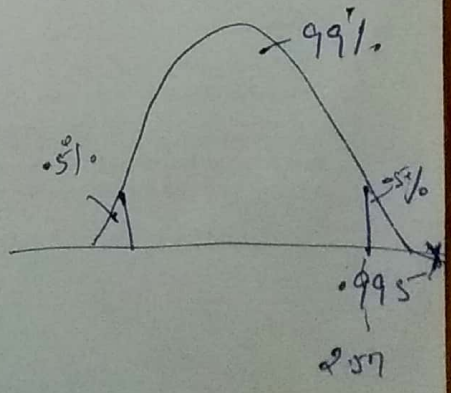
Null Hypo $\Rightarrow$ $P_1 \leq P_2 + .10$

Alternate $\Rightarrow$ $P_1 > P_2 + .10$

$$Z_c = \frac{(P_1 - P_2) - D}{\sqrt{\frac{P_1 q_1}{n_1} + \frac{P_2 q_2}{n_2}}}$$

$$= \frac{(.53 - .20) - .10}{\sqrt{\left(\frac{.53 \times .47}{300}\right) + \left(\frac{.2 \times .8}{700}\right)}} = \frac{.23}{.0325} = \boxed{7.07}$$

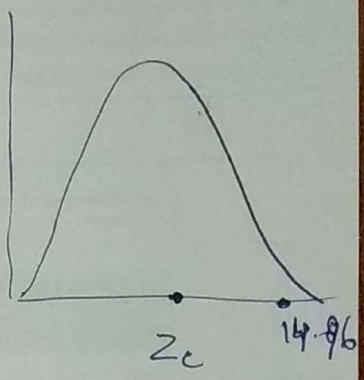
Assume Z_c for 1% SI $= \boxed{2.57}$



Null Hypo is Rejected

6

	E	O	x^2
H	25	41	10.24
R	25	19	1.4
W	25	24	.04
C	25	16	3.24
			14.96



Z_c (df=3 and CR<.05) = 7.815

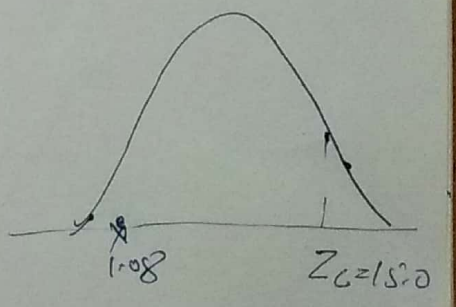
Null Hypo is Rejected.

7

						Total
	86	79	81	70	84	400
	90	76	88	82	89	425
8	82	68	73	71	81	375
Total	258	223	242	223	254	1200

O	E	χ
86	$\frac{400 \times 258}{1200} = 86$	0
90	$\frac{425 \times 258}{1200} = 91.375$	.020
82	$\frac{375 \times 288}{1200} = 80.625$	.023
81	$\frac{254 \times 375}{1200} = 79.37$	.033

$\chi^2 = 1.08$



$df = (3-1)(5-1) = 2 \times 4 = 8$

SI = 5% ≃ .05

$Z_c = 15.0$

Accept the Null Hypo

8

Null → Not Taller Singl Tailed

Alterate Hypo → Taller

$\mu_{pop} = 145$c

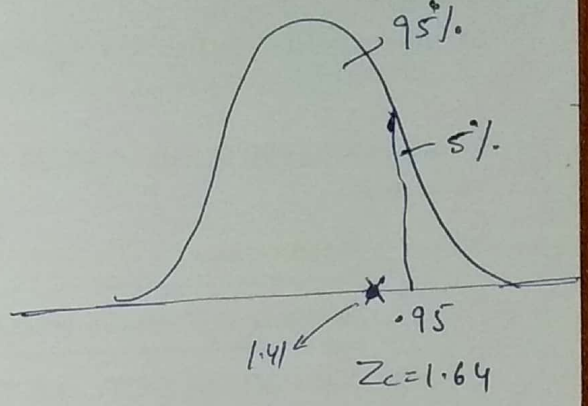
$\sigma_{pop} = 20$c

$n = 200$

$\mu_s = 147$

SI ≃ .05

$Z_{0.95} = 1.64$



Accept Null Hypothesis

$$Z = \frac{147-145}{20/\sqrt{200}} = \frac{2\times\sqrt{200}}{20} = 1.41$$

9

$\mu_{pop} = 145$

$\sigma_{pop} = 100$

$n = 144$

$\mu_s = 147$

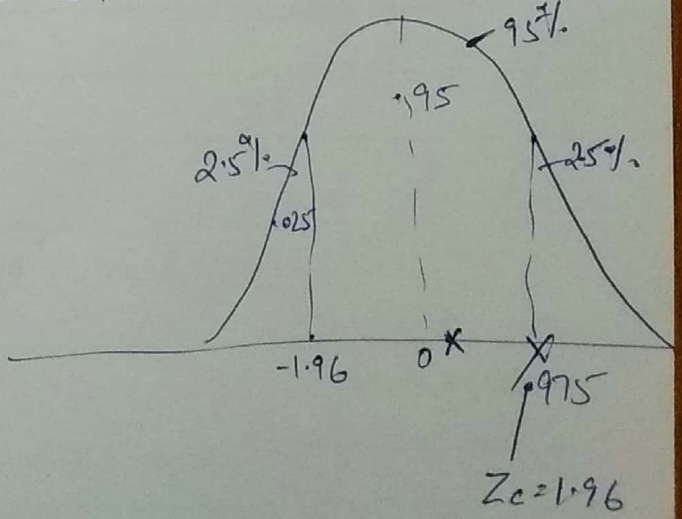
Null → No increase

Alternate → Significant increas

$$Z = \frac{147-145}{100/\sqrt{144}} = \frac{2\times\sqrt{144}}{100} = .24$$

Z_c for 5% SI = 1.96

Accept Null Hypothesis



10

Cost = 4.5 / slab

1 slab = 72 ounce

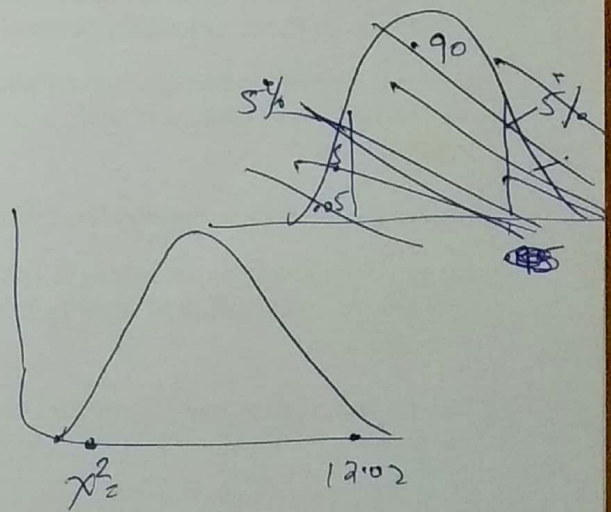
(b)

O	E		
70	72	$\frac{(70-72)^2}{72}$	.05
69	72		.125
73	72		.013
68	72		.222
71	72		.013
69	72		.125
71	72	$\frac{(71-72)^2}{72}$	.013

$\chi^2 = .569$ ⟸

(a) Null — Distribution giving less

Alternate — By chance



(c) CR = 10%

df = 7

Z_c = 12.02

Accept Null Hypo

CR = 5%

Z_c = 14.07

Accept Null Hypo

CR = 1%

Z_c = 18.48

Accept Null Hypo