① TI-84 use 2-prop-z-test

$\alpha = 0.05$

Claim $p_1 > p_2$, or $p_1 - p_2 > 0$

Given

$n_1 = 147$

$x_1 = 78$

$\hat{p}_1 = \frac{x_1}{n_1} = \frac{78}{147} \approx 0.5306$

$n_2 = 142$

$x_2 = 70$

$\hat{p}_2 = \frac{x_2}{n_2} = \frac{70}{142} \approx 0.4930$

Step 1 $H_0: p_1 - p_2 = 0$

Step 2 $H_1: p_1 - p_2 > 0$ (claim, rt-tail test)

Step 3 The test statistic is $z = \dfrac{(\hat{p}_1 - \hat{p}_2) - (p_1 - p_2)}{\sqrt{\dfrac{\bar{p}\bar{q}}{n_1} + \dfrac{\bar{p}\bar{q}}{n_2}}} = \dfrac{(0.5306 - 0.4930) - 0}{\sqrt{\dfrac{(0.5461)(4539)}{147} + \dfrac{(0.5461)(0.4539)}{142}}}$

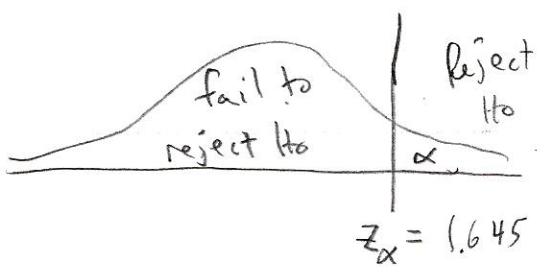
where $\bar{p} = \dfrac{x_1 + x_2}{n_1 + n_2} = \dfrac{78 + 70}{147 + 142} = \dfrac{148}{271} \approx 0.5461$

and $\bar{q} = 1 - \bar{p} = 1 - 0.5461 = 0.4539$

$\doteq \dfrac{0.0376}{0.0585817397}$

$\approx 0.6418 \approx \boxed{0.64}$

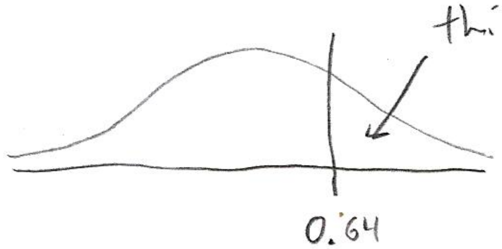
Step 4 $\boxed{\text{CV method}}$



The TS, $z = 0.64$, is not located in the critical region. Fail to reject Ho.

Step 4 $\boxed{\text{P-value}}$

this area = p-value $\doteq 0.2611$



Since p-val $> \alpha$, fail to reject Ho.

Step 5 There is not suff. sample evidence to support the claim that the proportion of educated people satisfied in their work is greater than the proportion of uneducated people satisfied in their work.

2

TI-84 use 2-prop-z-int

$n_1 = 300$ | $n_2 = 200$ | $CI = 98\%$

$\hat{p}_1 = 0.5$ | $\hat{p}_2 = 0.28$ | $\alpha = 1 - CI$

$x_1 = (300)(0.5)$ | $\bar{x}_2 = (200)(0.28) = 56$ | $= 1 - .98 = 0.02$

$= 150$

$$(\hat{p}_1 - \hat{p}_2) - E < (p_1 - p_2) < (\hat{p}_1 - \hat{p}_1) + E$$

where $E = (z_{\alpha/2})\sqrt{\frac{\hat{p}_1\hat{q}_1}{n_1} + \frac{\hat{p}_2\hat{q}_2}{n_2}} = (2.33)\sqrt{\frac{(0.5)^2}{300} + \frac{(0.28)(0.56)}{200}}$

$$\approx 0.09370$$

So,

$$(0.5 - 0.28) - 0.0937 < (p_1 - p_2) < (0.5 - 0.28) + 0.09370$$

$$0.1263 < (p_1 - p_2) < 0.3137$$

TI-84 2 prop z int gives

$0.12017 < (p_1 - p_2) < 0.31983$. This is because it approximates $z_{\alpha/2}$ to 14 decimal places, whereas we use a 2-digit approximation when we use $z_{\alpha/2} = 2.33$.

TI-84

Use 2-samp-T-test with pooled: no

3

Claim the treatment group is from a population with a smaller mean than the control group.

Symbolic form $\mu_1 < \mu_2$, or $\mu_1 - \mu_2 < 0$

assumptions Both samples are independent, random samples from a normally distributed population (the pop. of all outcomes is bell-shaped).

σ_1 and σ_2 are unknown (not given) and assumed not equal.

Step 1 $H_0: \mu_1 - \mu_2 = 0$

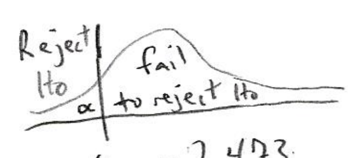
Step 2 $H_1: \mu_1 - \mu_2 < 0$ (claim, left-tailed test)

assume Ho is true

Step 3 The TS formula is $t = \dfrac{(\bar{x}_1 - \bar{x}_2) - (\mu_1 - \mu_2)}{\sqrt{\dfrac{s_1^2}{n_1} + \dfrac{s_2^2}{n_2}}} = \dfrac{(189.1 - 203.7) - 0}{\sqrt{\dfrac{(38.7)^2}{35} + \dfrac{(39.2)^2}{28}}}$

$\doteq \dfrac{-14.6}{9.882871185} \approx -1.48$

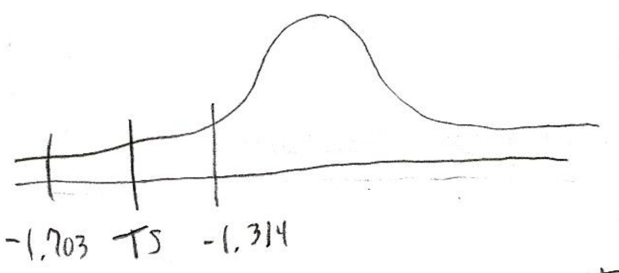
Step 4 $\boxed{\text{CV method}}$ df = smaller of $(n_1 - 1)$ and $(n_2 - 1) = 27$; $\alpha = 0.01$



$t_\alpha = -2.473$

The TS, $t = -1.48$, doesn't lie in the critical region, so fail to reject Ho.

Step 4 P-value method



using row 27 of the t-table, we find that the TS, $t = -1.48$, is between -1.703 and -1.314. The area left of -1.703 is 0.05 and the area left of -1.314 is 0.10. Thus, the p-value is between 0.05 and 0.10.

The TI-84 calculator p-val $\doteq 0.0725$.

Since p-val $> \alpha$, fail to reject H_0.

Step 5 There is not suff sample evidence to support the claim.

↑

#3

(4) TI-84 use 2-Samp-T-test with pooled: yes

<u>Claim</u>: the mean amount of time spent watching TV by women is less than the mean amount of time spent watching TV by men.

<u>Symbolic form</u>: $\mu_1 < \mu_2$, or $\mu_1 - \mu_2 < 0$. $\alpha = 0.05$

<u>assumptions</u> The 2 samples are indep, simple random samples from normally distributed populations. σ_1 and σ_2 are not given and are assumed unequal.

<u>Step1</u> $H_0: \mu_1 - \mu_2 = 0$

<u>Step2</u> $H_1: \mu_1 - \mu_2 < 0$ (claim, left-tailed test)

<u>Step3</u> The TS is
$$t = \frac{(\bar{x}_1 - \bar{x}_2) - \cancel{(\mu_1 - \mu_2)}^{=0}}{\sqrt{\frac{s_p^2}{n_1} + \frac{s_p^2}{n_2}}} \doteq \frac{(11.6 - 16.9) - 0}{\sqrt{\frac{18.1090}{14} + \frac{18.1090}{17}}}$$

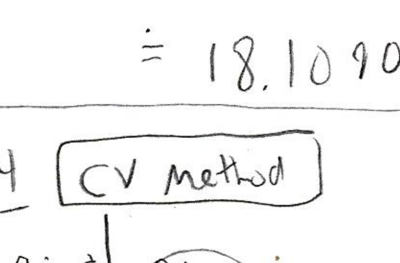
$$\approx \frac{-5.3}{1.53581768} \doteq -3.45$$

where
$$s_p^2 = \frac{(n_1 - 1)s_1^2 + (n_2 - 1)s_2^2}{(n_1 - 1) + (n_2 - 1)}$$
$$= \frac{13(4.2)^2 + 16(4.3)^2}{13 + 15}$$
$$\doteq 18.1090$$

<u>Step4</u> CV method

$df = n_1 + n_2 - 2 = 14 + 17 - 2 = 29$

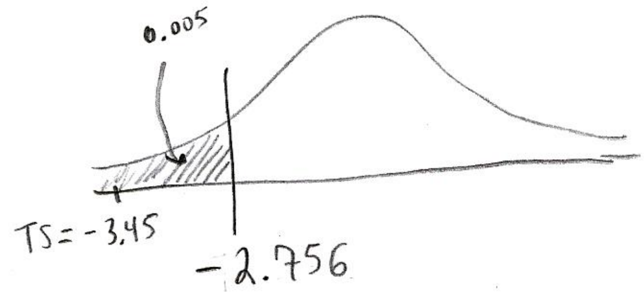
$\alpha = 0.05$



$t_\alpha = -1.699$

use row 29 of t table, area in 1 tail $= \alpha = 0.05$, gives CV, $t_\alpha = -1.699$. The TS, $t = -3.45$, is located in the critical region. Reject Ho

(4) Step 4 $\boxed{\text{P-value method}}$



The value in row 28 of the t-table closest to $|-3.45|$ is 2.756. Because of symmetry, we can locate $t = -2.756$ along the horizontal axis. The t-table tells us that $t = -2.756$ has an area left of it equal to 0.005. The p-value is the area left of the TS, $t = -3.45$. This area must be less than 0.005 since -3.45 is left of -2.756. Since p-val $\le \alpha$, reject H_0.

TI-84 pvalue $\doteq 8.6 \times 10^{-4} = 0.00086$

Step 5 The sample data support the claim that ...

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(5) $CI = 99\%$; $\alpha = 1 - CI = 1 - 0.99 = 0.01.$

Assume σ_1 and σ_2 are unknown and equal.
TI-84 use 2-Samp-T-int with pooled: yes

Confidence Interval Formula

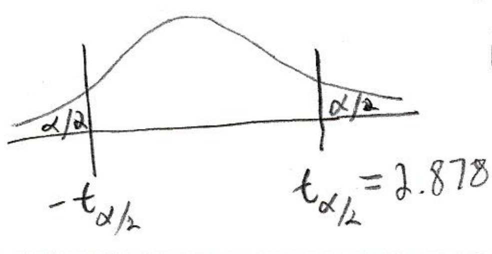
$$(\bar{x}_1 - \bar{x}_2) - E < (\mu_1 - \mu_2) < (\bar{x}_1 - \bar{x}_2) + E \quad \text{where}$$

$$E = (t_{\alpha/2}) \cdot \sqrt{\frac{s_p^2}{n_1} + \frac{s_p^2}{n_2}} \quad \text{and} \quad s_p^2 = \frac{(n_1 - 1)s_1^2 + (n_2 - 1)s_2^2}{(n_1 - 1) + (n_2 - 1)}.$$

$$s_p^2 = \frac{10(3.5)^2 + 8(3.2)^2}{10 + 8} \doteq 11.3567$$

Find $t_{\alpha/2}$ $\quad df = n_1 + n_2 - 2 = 11 + 9 - 2 = 18$

using row 18 of the t-table and an area in 2 tails $= \alpha = 0.01$ gives CV



$\boxed{t_{\alpha/2} = 2.878}$

5 TI-84 use 2-Samp-T-int with pooled: yes

$$E = \left(t_{\alpha/2}\right)\sqrt{\frac{s_p^2}{n_1} + \frac{s_p^2}{n_2}} = (2.878)\sqrt{\frac{11.3567}{11} + \frac{11.3567}{9}} \approx 4.3593$$

Then

$$(\bar{x}_1 - \vec{x}_2) - E < (\mu_1 - \mu_2) < (\bar{x}_1 - \bar{x}_2) + E$$

$$3.2 - 4.359 < (\mu_1 - \mu_2) < 3.2 + 4.359$$

$$\boxed{-1.16 < (\mu_1 - \mu_2) < 7.559}$$