$N = 100$

$\alpha = 0.05$

1 **Single-Sample t-test**

$H_0: \mu = 78$

$H_A: \mu \neq 78$

$\mu_0 = 78$

$\sigma = ?$

$\bar{x} = 80.55$

$s = 8.68$

std. error: $\dfrac{s}{\sqrt{N}} = \dfrac{8.68}{\sqrt{100}} = \dfrac{8.68}{10} = .87$

test stat: $t = \dfrac{\bar{x} - \mu_0}{\text{std. error}} = \dfrac{80.55 - 78}{.87} = 2.94$

2-tailed

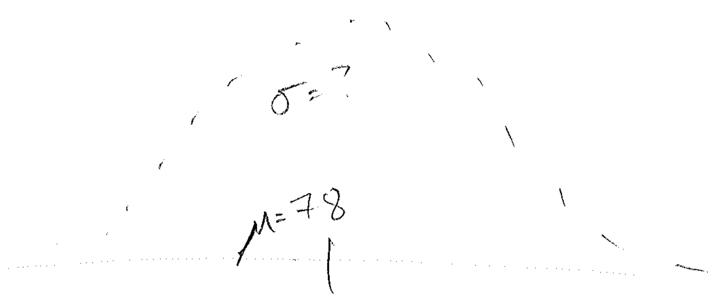
$t_{critical} = t_{(df, \alpha/2)} = t_{(N-1, \alpha/2)} = t_{(99, .025)} = \pm 1.98$ ((look-up))

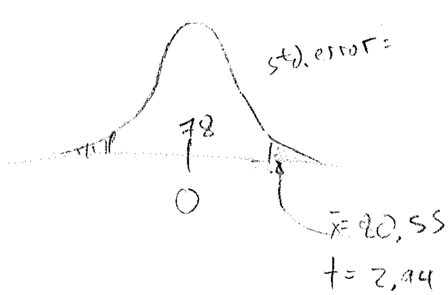
$p = .004$ ((look up or use calc.))

95% Confidence Interval: est. $\pm$ (crit value)(std. error)

$2.94 \pm (1.98)(.87)$

$2.94 \pm 1.72 \begin{cases} 78.83 \\ 82.27 \end{cases}$





$\alpha = .05$ (2)

(2) Ind. samples t-test

$H_0: \mu_♂ = \mu_♀ , \mu_♂ - \mu_♀ = 0$

$H_A: \mu_♂ \neq \mu_♀ , \mu_♂ - \mu_♀ \neq 0$

$\sigma_♂ = ?$	$\sigma_♀ = ?$
$N_♂ = 50$	$N_♀ = 50$
$\bar{X}_♂ = 79.35$	$\bar{X}_♀ = 81.75$
$s_♂ = 9.05$	$s_♀ = 8.20$

(assume $\sigma_♂ = \sigma_♀$)

(Ns large)

std. error: $\sqrt{\frac{s_♂^2}{N_♂} + \frac{s_♀^2}{N_♀}}$

$= \sqrt{1.638 + 1.345}$

$= 1.727$

test stat (t): $\frac{(\bar{x}_♂ - \bar{x}_♀) - (\mu_{♂0} - \mu_{♀0})}{\text{std. error}} = \frac{(\bar{x}_♂ - \bar{x}_♀) - 0}{\text{std. error}}$

$= \frac{(79.35 - 81.75)}{1.727} = -1.39$

2 tailed

t critical: $t_{(df, \alpha/2)} = t_{(98, .025)} = \pm 1.98$

$df = N_♂ + N_♀ - 2 = 98$

p: 0.167

95% Confidence Interval: $t \pm (\text{crit value})(\text{std. error})$

$-1.39 \pm (1.98)(1.727)$

$-1.39 \pm 3.43 \begin{cases} -5.83 \\ 1.02 \end{cases}$

$N = 100$
$\alpha = .05$

3) $\boxed{\text{Paired-samples t-test}}$

$H_0: (\mu_{final} - \mu_{mid}) \le 0$, $\mu_{Diff} = 0$
$H_A: (\mu_{final} - \mu_{mid}) > 0$

$\bar{x}_{Diff} = 11.38$

$s_{Diff} = 10.35$

std. error: $\frac{s_{Diff}}{\sqrt{N}} = \frac{10.35}{\sqrt{100}} = 1.04$

test stat (t): $\frac{\bar{x}_{Diff} - \mu_{Diff}}{\text{std. error}} = \frac{11.38 - 0}{1.04} = 10.99$

t_{crit}:

$df = N-1 = 99$ $= \pm 1.98$

p: 0.00000

95% C.I. $t \pm (\text{crit val})(\text{std error})$

$10.99 \pm (1.98)(1.04)$

$10.99 \pm 2.05 \begin{cases} 9.33 \\ 13.44 \end{cases}$

$\alpha = .05$
$N = 100$

4

(4) ANOVA, 1-way b/w-Ss

H_0: all μ =
H_A: not (all μ =)

$k = 4$

Groups	sample size	sample mean	sample variance (std.dev.^{2})
Control	25	79.46	65.92
Practice	25	81.85	68.03
Explain	25	83.55	54.80
Highlight	25	77.07	102.14

MSB = Var. b/w samples (groups)
= (sample size) (variance of sample means)
= (25) (7.984)
= 199.593

$$F_{(df_B, df_W)} = \frac{MSB}{MSW}$$

MSW : Var. w/in samples (groups) :
= (mean of sample variances)
= 72.721

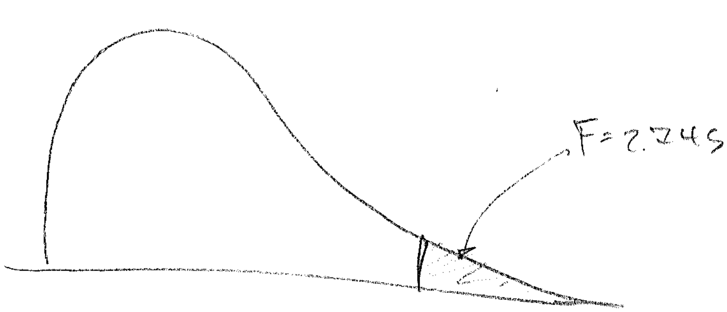
$df_{between}$: $k-1 = 4-1 = 3$

df_{within} : $N-k = 100-4 = 96$

$$F : \frac{199.593}{72.721} = 2.745$$

F_{crit}: $F_{(df_b, df_w, \alpha)} = F_{(3, 96, .05)} = 2.699$

p: 0.047



$N = 100$
$\alpha = .05$

5) Correlation

H_0: rho $= 0$
H_A: rho $\neq 0$

$$r = \frac{1}{n-1} \sum \left(\frac{x_i - \bar{x}}{s_x} \right) \left(\frac{y_i - \bar{y}}{s_y} \right)$$

$$= \frac{\sum x_i y_i - n \bar{x} \bar{y}}{(n-1) s_x s_y}$$

$$r = .699$$

$$t = \frac{r\sqrt{N-2}}{\sqrt{1-r^2}} = \frac{.699 \sqrt{98}}{\sqrt{1-0.49}} = 9.77,$$

$df = N-2 = 98$

$t_{critical}$: $t_{(98)} = 1.98$

p: $\sim 0.0000,$

6 Regression

$y = 7.81x + 58.21$

slope : $b_1 = 7.81$

y-intercept $b_0 = 58.21$

$H_0: b_1 = 0$

test stat: $\frac{b_1 - 0}{std.\ error}$

$t(df) = \ldots 24.57$

std. err: $\frac{s_y}{s_x\sqrt{N-1}} = .7917$

$p = .00\ldots$

predict ...

GPA: 3.4

$\hat{y} = 84.764$

$b_1 = r\frac{s_y}{s_x}$

$b_0 = \bar{y} - b_1\bar{x}$

7

7) Chi-Square test for Ind.

$$F_e = \frac{(\text{row total})(\text{col total})}{\text{grand total}}$$

~~ARCD~~

$$\chi^2 = \sum \frac{(F_o - F_E)^2}{F_E}$$

$$= 14.969$$

r = rows = 4
c = cols = 5

$dF = (r-1)(c-1)$
$= 12$

$\chi^2_{crit} = \chi^2_{(.05,\ 12)} = 21.03$

$p = .243$