$N = 100$

$\alpha = 0.05$

(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: $\frac{s}{\sqrt{N}} = \frac{8.68}{\sqrt{100}} = \frac{8.68}{10} = .87$

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

2-tailed

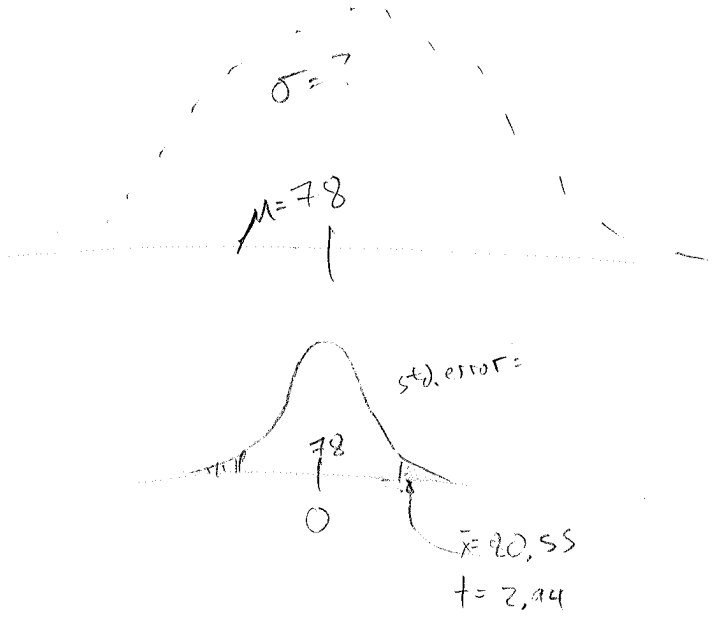
$t_{critical} = t_{(df, \alpha/2)} = t_{(N-1, \alpha/2)} = t_{(99, .025)} = \pm 1.98$ ((lookup))

$p = .004$ ((lookup or use calc.))

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

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

2.94 ± 1.72 { 78.83, 82.27



$\alpha = .05$

(2)

(2) Ind. samples t-test

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

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

$\sigma_♂ = ?$	$\sigma_♀ = ?$ (assume $\sigma_♂ = \sigma_♀$)
$N_♂ = 50$	$N_♀ = 50$
$\bar{X}_♂ = 79.35$	$\bar{X}_♀ = 81.75$
$s_♂ = 9.05$	$s_♀ = 8.70$

std. error: (Ns large)

$$= \sqrt{\frac{s_♂^2}{N_♂} + \frac{s_♀^2}{N_♀}}$$

$$= \sqrt{1.638 + 1.345}$$

$$= 1.727$$

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

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

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

$df = N_♂ + N_♀ - 2 = 98$

p: 0.167

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

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

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

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

3) Paired-samples t-test

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

$\bar{X}_{Diff} = 11.38$
$s_{Diff} = 10.35$

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 ± 2.05 $\begin{matrix} 9.33 \\ 13.44 \end{matrix}$

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

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

$k = 4$

H_0: all μ =
H_A: not (all μ =)

Groups	sample size	sample mean	sample Variance (s^2 dev.)
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 groups samples
= (sample size)(Variance of sample means)
= (25)(7.984)
= 199.593

$$F_{(df_r, df_1)} = \frac{MSB}{MSW}$$

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

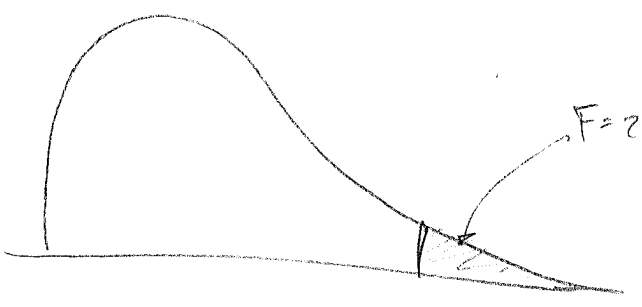
$df_{between} = k - 1 = 4 - 1 = 3$

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

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

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

p: 0.047



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

5) Correlation

$H_0: \rho_0 = 0$
$H_A: \rho_0 \neq 0$

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

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

$r = .699$

$$t = \frac{r \sqrt{N-2}}{\sqrt{1 - r^2}} = \frac{.699 \sqrt{98}}{\sqrt{1 - 0.489}} = 9.77,$$

$df = N - 2 = 98$

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

p: ~ 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: $\frac{b_1 - 0}{\text{std. error}}$

$t(df) = \ldots 24.57$

std err: $\frac{s_y}{s_x\sqrt{N-1}} = .7997$

predict ...

GPA: 3.4

$\hat{y} = 84.764$

$p = .00\ldots$

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

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

7) Chi-Square test for Ind.

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

~~AGED~~

$$\chi^2 = \sum \frac{(f_o - f_e)^2}{f_e}$$

$= 14.961$

r = rows $= 4$

c = cols $= 5$

$df = (r-1)(c-1)$

$= 12$

$\chi^2_{0.1} = \chi^2(.05, 12) = 21.03$

$p = .245$