8.14) Assume normal distribution for # push-ups.

Testing $H_0: \mu = 24$, $H_1: \mu \neq 24$ (Two sided test is what we are asked for)

If null true, $\dfrac{22.5 - 24}{3.1/\sqrt{36}}$ is a reading from t_{35}

$= -2.903$

Since $t_{\infty, .025} = 1.96$, we reject null at 5%

8.17) Assuming normal distribution of temps.

Testing $H_0: \mu = 98.6$, $H_1: \mu > 98.6$ ("Research hypothesis" is that μ has increased ... won't accept this unless there is evidence)

If null is true, $\dfrac{98.74 - 98.6}{1.1/\sqrt{100}} = 1.273$ is reading from t_{99}

p-value: Since $t_{.1, \infty} = 1.28$, p-value $= P(t_{99} \geq 1.273) > 10\%$ (ONE-sided test)

So still accept null at both 5% and 1%.

8.21) $\overline{X} = 236.9\ldots$

$S^2 = 129.5\ldots$

Testing : $H_0 : \mu \geq 240$, $H_1 : \mu < 240$ } μ = average lifetime

If null if true, $\dfrac{236.9\ldots - 240}{\sqrt{129.5\ldots}/\sqrt{18}} = -1.107$ is reading from t_{17}

From table, $P(t_{17} \leq -1.107)$ is ~~between~~ above 10%

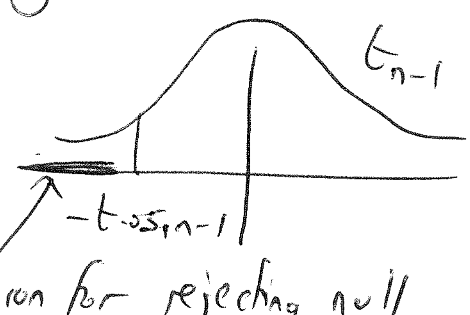
So there is not evidence to reject null.

8.25) μ = mean value of current, assumed normal.

$H_0 : \mu \geq 210$, $H_1 : \mu < 210$ } I chose this as null and alternative since we are looking to see is their evidence to suggest $\mu < 210$

Will reject claim H_0 at 5% significance if

$$\frac{\overline{X} - \mu}{S/\sqrt{n}} \leq -t_{.05, n-1}$$



In our case,

$$\frac{\overline{X} - \mu}{S/\sqrt{n}} = \sqrt{n}\left(\frac{200 - 210}{35}\right) = -.2857\sqrt{n}$$

a) $n = 25$, get reading of -1.428

$t_{.05, 24} = 1.711$ Accept null

b) $n = 64$, get reading of -2.28

$t_{.05, \infty} = 1.645$, Reject null

8.28) Solution A : $\overline{X_1} = 6.267$ (actual mean μ_1)

Solution B : $\overline{X_2} = 6.285$ (actual mean μ_2)

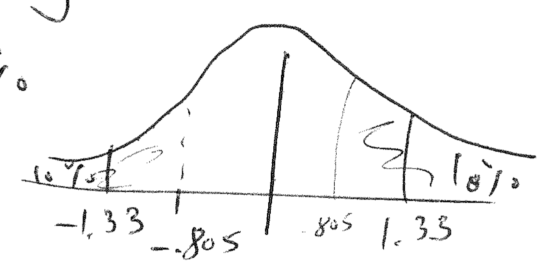
Testing : $H_0 : \mu_1 = \mu_2$

$H_1 : \mu_1 \neq \mu_2$

If null is true, $\dfrac{\bar{X}_1 - \bar{X}_2}{\sqrt{\frac{(.05)^2}{10} + \frac{(.05)^2}{10}}} = -.805$ is a reading from t_{18}

a) $t_{.05, 18} = 1.740$, so we accept null at 5%

b) Since $t_{.1, 18} = 1.33$, can say that p-value is at least 20%



8.35) Assume normal distributions in both cases, with equal (unknown) variance σ^2

Industrial engineers : mean μ_1, $\bar{x} = 47{,}700$

$s_1^2 = (2400)^2$

$n = 16$

Civil engineers : mean μ_2, $\bar{y} = 46{,}400$

$s_2^2 = (2200)^2$ $\quad m = 16$

$$s_p^2 = \frac{15(2400)^2 + 15(2200)^2}{30} = (2302.17)^2$$

Testing $H_0 : \mu_1 = \mu_2$

$H_1 : \mu_1 > \mu_2$

If null is true, $\dfrac{\bar{x} - \bar{y}}{\sqrt{\frac{s_p^2}{n} + \frac{s_p^2}{m}}} = 1.597$

is a reading from t_{30}.

$P(t_{.05,30} \geq 1.645) = .05$, so we <u>accept</u> null at 5%; p-value is a little over .05.

Not enough evidence to accept Prof's claim.

8.37) <u>Different</u> groups, so not a paired test

Assume normal distribution for fat intake.

July : Mean μ_1

$\bar{x} = 30.825$

$s_1^2 = 18.522$

$n = 12$

January : Mean μ_2

$\bar{y} = 35.13$

$s_2^2 = 20.328$

$m = 12$

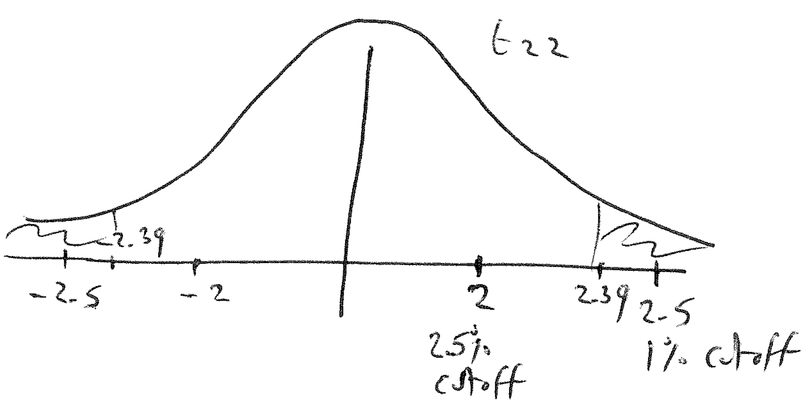
Assume common variance σ^2.

$$s_p^2 = 19.42496$$

If null is true (null $H_0 : \mu_1 = \mu_2$) then

$$\frac{\bar{x} - \bar{y}}{\sqrt{\frac{s_p^2}{n} + \frac{s_p^2}{m}}} = -2.39 \text{ is a reading from } t_{22} \ (= 24 - 2)$$

p-value $= P(t_{22} > 2.39 \text{ or } t_{22} < -2.39)$



= Something between 2% and 5%

a) ~~Accept~~ Reject null at 5%

b) ~~Reject~~ Accept at 1%

8.41) Although the two groups are "matched", we are not given individual data, so we do a difference of mean test, not a paired test

μ_1 = mean of children whose parents work with lead

μ_2 = mean of control

$H_0 : \mu_1 = \mu_2$

$H_1 : \mu_1 > \mu_2$ ← This is "research hypothesis"; it is what we need evidence to accept

Data: $\bar{X} = .015$ $\bar{Y} = .006$

$s_1^2 = (.004)^2$ $s_2^2 = (.006)^2$

$n = 33$ $m = 33$

$$s_p^2 = \frac{32(.004)^2 + 32(.006)^2}{64} = .000026$$

Test statistic: $$\frac{\bar{X} - \bar{Y}}{\sqrt{\frac{s_p^2}{n} + \frac{s_p^2}{m}}} = 7.169$$

Clearly, we should <u>strongly</u> reject null.

(p-value ≈ 0)

8.47) Let σ be standard deviation of new process.

Test $H_0 : \sigma \geq .4$

against $H_1 : \sigma < .4$

} We're not interested in evidence that σ has fallen below .5; we want to see if it has fallen below .4

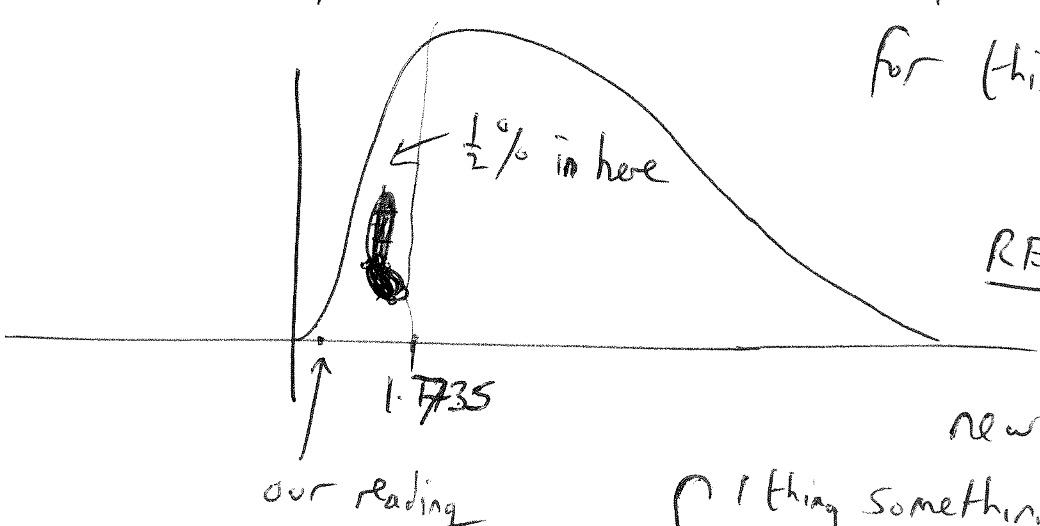
Data: $n = 10$

$s^2 = 1.64 \times 10^{-5}$ ($s = .00405175$ ~~4.055175 mg~~)

[Note: I'm assuming that given masses are in mgs]

If null is true, $\frac{(n-1)s^2}{(.4)^2} = 9.2 \times 10^{-4}$ is a reading from χ^2 with 9 degrees of freedom.

But $P(\chi_9^2 \leq 1.735) = .005$, so the p-value for this test is $\ll .005$.



REJECT null, Accept use of new procedure

[I thing something is wrong w the units in this Q!]

8.57) p = proportion of calls that are life-threatening

$H_0: p \leq .45$
$H_1: p > .45$

Chose this null + alternative because we will only accept drivers' claim (H_1) if there is evidence for it.

Data: $n = 200$, $\hat{p} = .35$

Exact test: If null is true, then # from sample of size 200 that are life-threatening is X = Binomial$(200, .45)$

Since this is a one-sided test, p-value is

$$P(X \geq 70) = \sum_{k=70}^{200} \binom{200}{k} .45^{k} .55^{200-k}$$

$$= .9984$$ ← incredibly high!

So clearly there is no reason whatsoever to belive the claim a) at 5%
b) at 1%