$$V(\bar{x}) = \sigma^2_{\bar{x}} = \frac{\sigma_x^2}{n} = \frac{V(x)}{n}$$

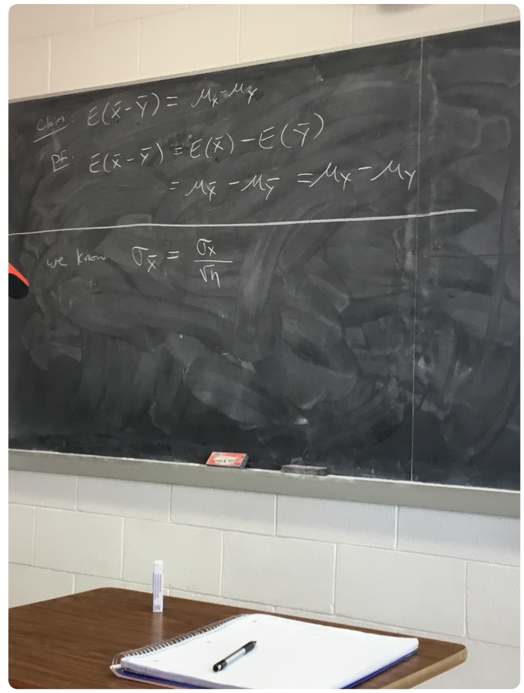
$$\sigma^2_{\bar{x}-\bar{y}} = V(\bar{x}-\bar{y})$$

$$V(\bar{x}) + V(\bar{y})$$

$$\frac{V(X)}{m} + \frac{V(Y)}{n} = \frac{\sigma_X^2}{m} + \frac{\sigma_X^2}{n}$$

$\bar{X} - \bar{Y}$ is unbiased estimator of $\mu_1 - \mu_2$

* both pops are normal, then so are samples



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2 Sample t-test

often, $\Delta_0 = 0$

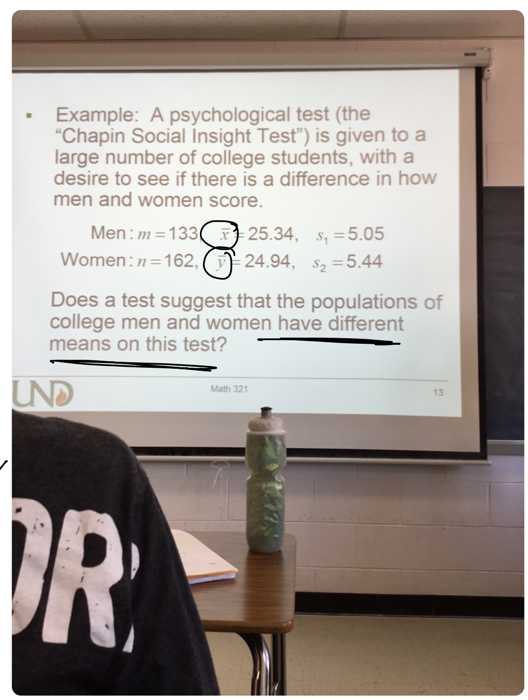
$\therefore H_0$ is $\mu_1 = \mu_2$

$H_0 = \mu_1 - \mu_2 = \Delta_0$

vs

$H_a \; \mu_1 - \mu_2 \neq \Delta_0$

evidence the difference is diff. than you thought



$\boxed{\text{ex}}$ $H_0: \mu_x - \mu_y = 0$

$H_a: \mu_x - \mu_y \neq 0$

$$z = \left(\frac{\text{point est.} - \text{null value}}{\text{standard error}} \right)$$

$pe = \bar{x} - \bar{y}$ null $= \Delta_0$ st error $\sqrt{\frac{s_1^2}{m} + \frac{s_2^2}{n}}$

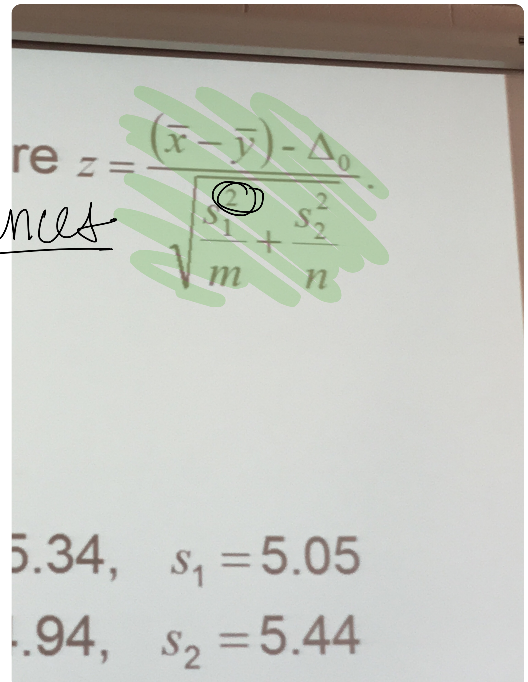
$$z = \frac{(25.34 - 24.94) - 0}{\sqrt{\frac{5.05^2}{133} + \frac{5.44^2}{162}}}$$

$= \boxed{0.6537}$ not extreme enough

(1.5 ...)

z must be > 1 for significance

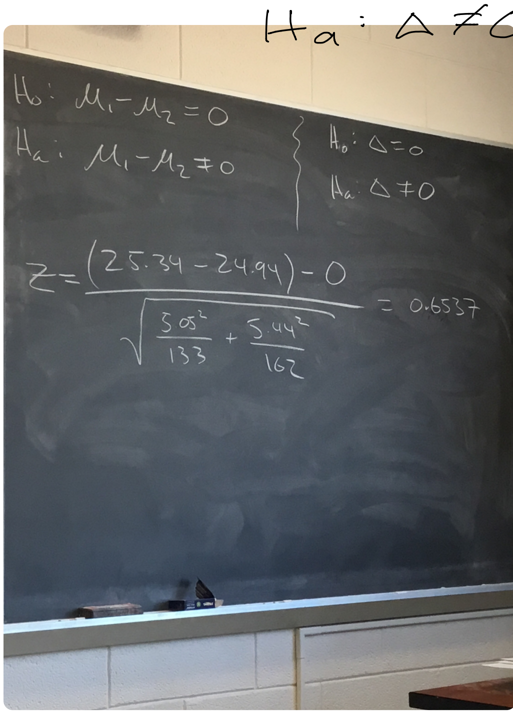
variances

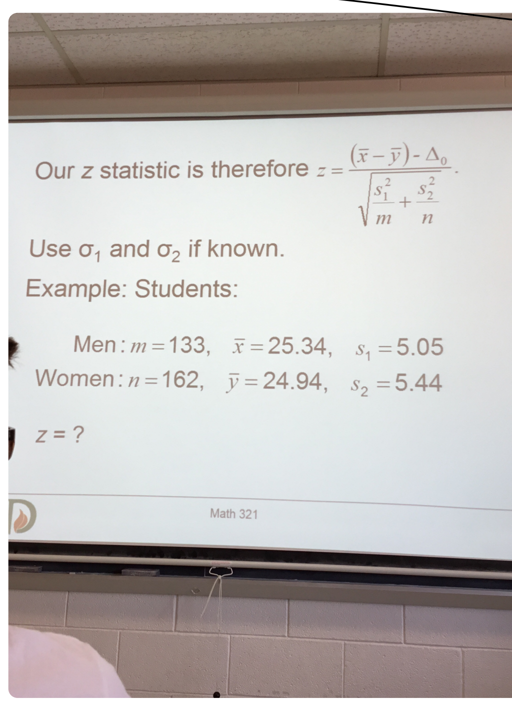


* comparing 2 sample tests *

$H_0: \Delta = 0$

$H_a: \Delta \neq 0$





* then compute p-value

$2P(z^* \leq |z|)$

$P(z^* < -0.6537)$

$2(0.2578) = 0.5156$

reject if p is small

$\alpha = 0.05$, do not reject b/cau

$p > \alpha$

(if $p < \alpha$, strong ev. H_0 is true)

Do we **know** which is true?

NO

No evidence to suggest any diff between men & women scores

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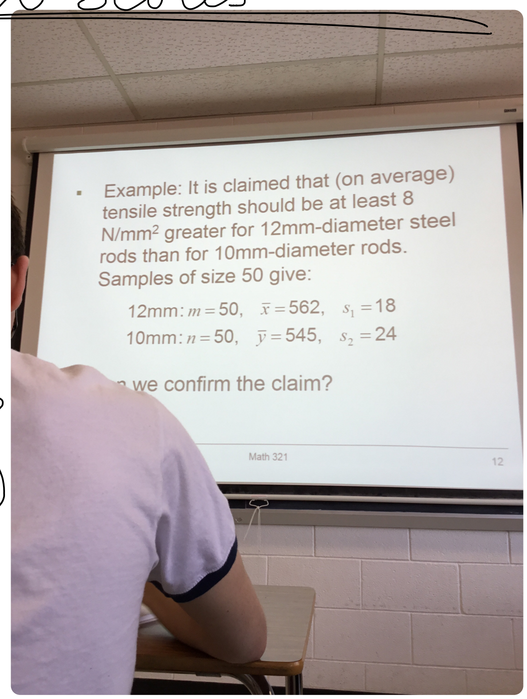
if true, $\mu_x - \mu_y \le \boxed{\Delta_0 = 8}$ (one sided)

vs

$H_a: \mu_x - \mu_y > 8$



$$z = \frac{(562 - 545) - 8}{\sqrt{\frac{18^2}{50} + \frac{24^2}{50}}} = 2.12$$

standard error

is diff more than 8 or not?

$P(Z^* > 2.12)$ or $P(Z^* < -2.12)$

$= 0.017$

at $\alpha = 0.05$, we reject H_0 b/c my

$p < \alpha = 0.05$ $(0.017 < 0.05)$

suff. evidence to conclude 12 mm rods are > than 8 stronger than 10 rod

Test @ $\alpha = 0$?

Don't reject any more

CI

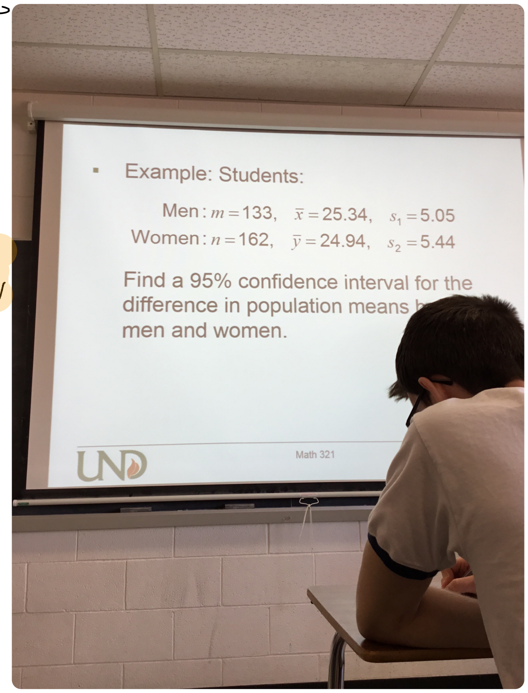
$$\bar{x} - \bar{y} \pm z_{\alpha/2}\sqrt{\frac{s_1^2}{m} + \frac{s_2^2}{n}}$$

$100(1-\alpha)\%$ CI

$(25.34 - 24.94) \pm 1.96\sqrt{\frac{5.05^2}{133} + \frac{5.44^2}{162}}$

$= 0.4 \pm \sim 1.2$

95% CI $= (0.8, 1.6)$



if null value is in interval, don't reject
otherwise reject

$\boxed{0 \in 95\%\ \text{CI for } \Delta}$

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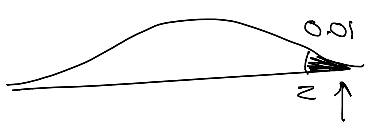
one sided

$99\%\ \text{LB} = \bar{x} - \bar{y} - z_\alpha \sqrt{\frac{s_1^2}{m} + \frac{s_2^2}{n}}$

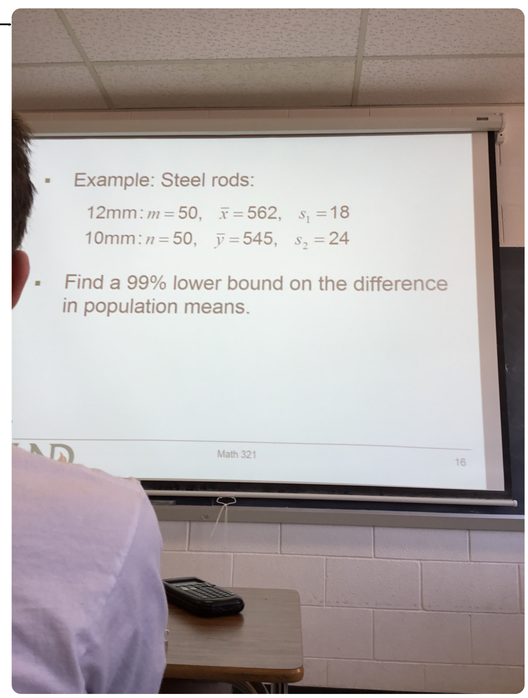
sample size

$562 - 545 - z_\alpha$



Ttable gives area to right :)

$\therefore\ z = 2.326$



$\boxed{562 - 545 - 2.326^* \left(\frac{18^2}{50} + \frac{24^2}{50}\right)}$

$= 17 - 9.87 = 7.13$

$99\%\ \text{LB} = \boxed{7.13 < \Delta}$

↳ at 95% CI, would get a bound bigger than 8