17) a) $\mu = 80 \quad \sigma = 10$

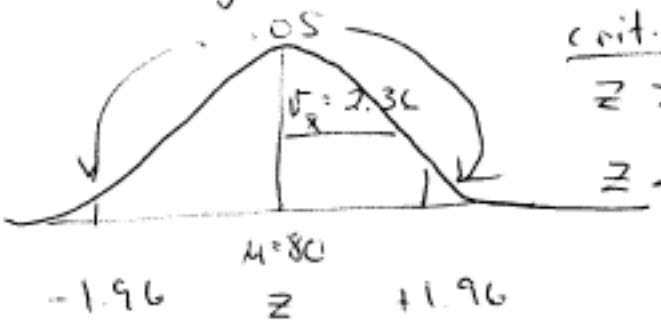
1) $H_0: \mu_{\text{score after training}} = 80$ (No effect of training on problem solving ability)

$H_1: \mu_{\text{score after training}} \neq 80$ (There is an effect of training on problem solving)

$\alpha = .05$

2) Set criteria

$$\sigma_{\bar{x}} = \frac{\sigma}{\sqrt{n}} = \frac{10}{\sqrt{18}} = \frac{10}{4.24} = 2.36$$



3) Collect sample data & compute statistic

$$z_{obt} = \frac{\bar{x} - \mu}{\sigma_{\bar{x}}} = \frac{84.44 - 80}{2.36} = \frac{4.44}{2.36} = 1.88$$

4) Fail to reject H_0 because z_{obt} of 1.88 is not in the critical region

5) Conclusion: There was no significant effect of the training on problem solving, $z = 1.88$, $p > .05$.

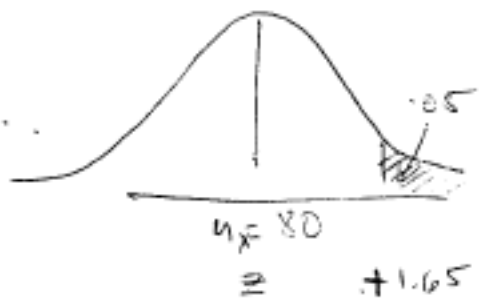
17 b) with one-tailed test

1) H_0: $\mu_{\text{after train}} \leq 80$ (training does not improve prob. solving)

H_1: $\mu_{\text{after train}} > 80$ (training improves prob. solving)

$\alpha = .05$

2)



critical region
$z > +1.65$

$\therefore$ we would reject H_0 because z_{obt} of 1.88 is in the critical region

for $\alpha = .025$ $z_{crit} = +1.96$ $\therefore$ again we would not reject H_0

Prob. 18) $\mu = 26$ anagrams solved $\bar{X} = 4$

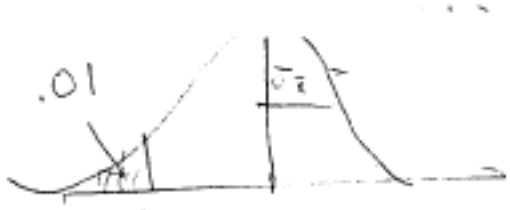
1) H_0: $\mu_{\text{anxiety-ridden perform.}} \geq 26$ (anxiety does not decrease # anagrams solved)

H_1: $\mu_{\text{anxiety-ridden performance}} < 26$ (anxiety decreases the # of anagrams solved)

$\alpha = .01$ one-tailed

(18) 2) crit region

$z < -2.33$



$\sigma_{\bar{x}} = \frac{\sigma}{\sqrt{n}}$

$= \frac{4}{\sqrt{14}}$

$= 1.07$

3) sample data $\bar{x} = 23.36$ anagrams $n = 14$

$$z_{obt.} = \frac{\bar{x} - \mu}{\sigma_{\bar{x}}} = \frac{23.36 - 26}{1.07} = -2.47$$

4) reject H_0 (because z_{obt} of -2.47 is in the critical region

5) Conclusion: Anxiety significantly reduces # of anagrams solved, $z = -2.47$, $p < .01$, one-tailed test

b) two-tailed test

1) H_0: $\mu_{\text{anx.-ridden}} = 26$ (No effect of training on # anag. solved)

H_1: $\mu_{\text{anx.-ridden}} \neq 26$ (Effect of train. on # anag probs solved)

$\alpha = .01$

2) crit region

$z > +2.58$

or

$z < -2.58$

Fail to reject H_0 (or retain)

(25) Motor Skills task $\mu = 20$, $\sigma = 4$

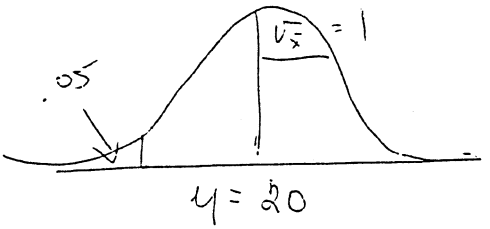
1) H_0: $\mu_{\text{perf. score with self awareness}} \geq 20$ (self-awareness does not decrease performance)

H_1: $\mu_{\text{perf score w self awareness}} < 20$ (self awareness decreases performance)

$\alpha = .05$, one-tailed test

2) Crit. region

$z < -1.65$



sampling dis

-1.65 z

$\sigma_{\bar{x}} = \frac{\sigma}{\sqrt{n}}$

$= \frac{4}{\sqrt{16}}$

$= \frac{4}{4} = 1$

3) Sample data

$\bar{X} = 15.5$ $\quad z_{obt.} = \frac{\bar{X} - \mu}{\sigma_{\bar{x}}} = \frac{15.5 - 20}{1} = -4.5$

4) Decision: Reject H_0 because z_{obt} of -4.5 in C.R.

5) Conclusion: Self-awareness significantly reduced performance on the motor skills task, $z = -4.5$, $p < .05$, one-tailed test.

(3) a) As variability increases, t becomes smaller (closer to zero)

b.) As sample size increases, the standard error decreases and the t value increases

c) The larger the diff bet $\bar{x}$ and μ, the larger the t value.

(11) $\mu = 10$ sample $n = 36$

1) $H_0: \mu_{tea} = 10$ (no different from chance)

$H_1: \mu_{test} \neq 10$ (different from chance)

$\alpha = .05$

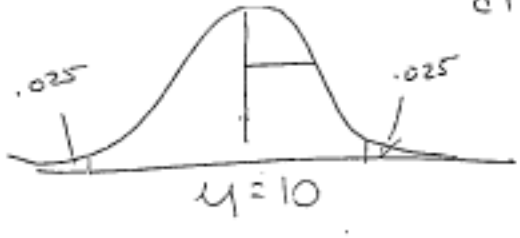
$df = 35$

2) Crit region

$t > 2.402$

or

$t < -2.402$



$\bar{x} = 13.5$

$s^2 = 144$

$s = 12$

3) $t_{obt}(35) = \frac{\bar{x} - \mu}{s_{\bar{x}}} = \frac{13.5 - 10}{2}$

$= \frac{3.5}{2} = 1.75$

$s_{\bar{x}} = \frac{s}{\sqrt{n}}$

$= \frac{12}{\sqrt{36}} = \frac{12}{6} = 2$

4) Retain Ho because $t_{obt.}$ of 1.75 is not in crit region.

5) Conclusion: Students' scores are not significantly different than what we would expect by chance, $t(35) = 1.75$, $p > .05$

(12) $\mu = 7.9$ current sample $\bar{X} = 7.3$ $SS = 99$, $n = 100$

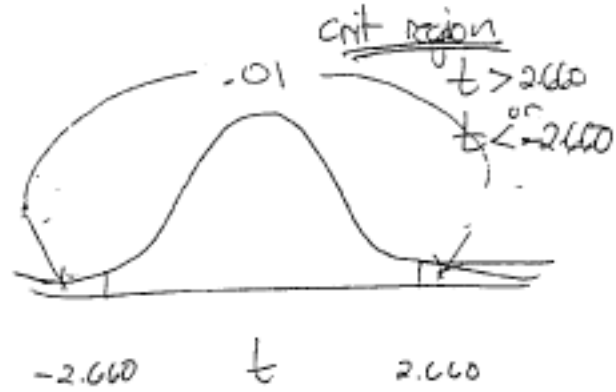
$\therefore \quad s = \sqrt{\frac{SS}{n-1}} = \sqrt{\frac{99}{99}} = \sqrt{1} = 1$

Step 1 H_0: $\mu_{\text{score now}} = 7.9$ (no change from 10 years ago)

H_1: $\mu_{\text{score now}} \neq 7.9$ (change in scores from 10 years ago)

$\alpha = .01$

Step 2 Estab. crit. region for t distrib.



Step 3 Sample data

$t_{(99)\text{obt.}} = \frac{\bar{X} - \mu}{s_{\bar{X}}}$

$s_{\bar{X}} = \frac{s}{\sqrt{n}} = \frac{1}{\sqrt{100}} = \frac{1}{10}$

$= \frac{7.3 - 7.9}{.10}$

$= \frac{-.6}{.10} = -6.00$

Step 4:) Reject H_0 because $t_{\text{obt.}}$ of -6.00 is in crit region

Step 5): Conclus: There is a significant change in scores from 10 yrs ago, $t(99) = -6.00$, $p < .01$.

(16) $\mu = 21$ g/day sample $n = 100$

$\bar{X} = 18.7$

$SS = 2475$

Step 1:

H_0: $\mu_{\text{amt eaten in humidity}} = 21$ g. (no effect of humidity on eating)

H_1: $\mu_{\text{amt. eaten in humidity}} \neq 21$ g. (humidity affects amt rats eat)

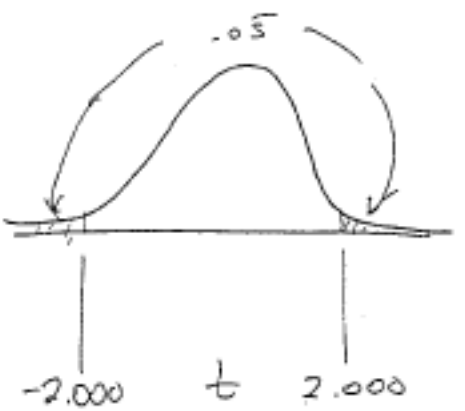
$\alpha = .05$

Step 2 Define critical region

$t > 2.000$

or

$t < -2.000$



$df = 100 - 1 = 99$

Step 3 sample data

$$t_{obt}^{(99)} = \frac{\bar{X} - \mu}{S_{\bar{X}}} = \frac{18.7 - 21}{.5}$$

$$= -4.6$$

$S_{\bar{X}} = \frac{S}{\sqrt{n}}$

$S = \sqrt{\frac{SS}{n-1}}$

$= \sqrt{\frac{2475}{99}}$

$= \sqrt{25}$

$= 5$

$\therefore S_{\bar{X}} = \frac{S}{\sqrt{n}} = \frac{5}{\sqrt{100}} = .5$

Step 4 Reject H_0 because t_{obt} of -4.6 is in the critical region

5) Conclude humidity significantly affected eating behavior, $t(99) = -4.6$; $p < .05$

(21)

Step 1

CSI Study

H_0: $\mu_{\text{ESP folks score}} \leq 20$ (no different than chance)

H_1: $\mu_{\text{ESP folks score}} > 20$ (Better than chance)

$\alpha = .05$ one-tailed test

Scores: 18, 23, 24, 22, 19, 28, 15, 26, 25

$\bar{X} = \frac{\sum X}{n} = 22.2$

X	$(X-\bar{X})$ & ?	$(X-\bar{X})^2$
18	18-22.2 = -4.2	17.64
23	23-22.2 = .8	.64
24	24-22.2 = 1.8	3.24
22	22-22.2 = -.2	.04
19	19-22.2 = -3.2	10.24
28	28-22.2 = 5.8	33.64
15	15-22.2 = -7.2	51.84
26	26-22.2 = 3.8	14.44
25	25-22.2 = 2.8	7.84

$\sum X = 200$ $\quad \sum (X-\bar{X})^2 = 139.56$

$\sum X^2 = 4584$

or

$SS = \sum X^2 - \frac{(\sum X)^2}{n}$

$= 4584 - \frac{(200)^2}{8}$

4444.44

$= 139.55$

Step 2 Crit. region

$t > +1.860$

Step 3 sample data

$t_{obt}(8) = \frac{\bar{X} - \mu}{S_{\bar{X}}} = \frac{22.22 - 20}{1.39}$

$= 1.597$

$S = \sqrt{\frac{\sum (X-\bar{X})^2}{n-1}}$

$S = \sqrt{\frac{139.6}{8}}$

$S_{\bar{X}} = \frac{S}{\sqrt{n}}$

$S_{\bar{X}} = \frac{4.17}{\sqrt{9}}$

1.39

Step 4 Retain H_0 because $t_{obt}(8) = 1.597$ not in crit region

Step 5 Conclusion: ESP folks are not signif better than chance, $t(8) = 1.597$, $p > .05$