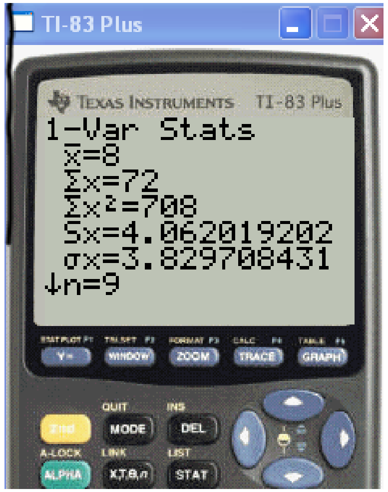
pg 359
8.61

95% c.i.

$\alpha = .05$

$\frac{\alpha}{2} = .025$



$\bar{x} = 8$

$S = 4.0620$

$\bar{x} \pm E$

$\bar{x} \pm t\, s_{\bar{x}}$

$s_{\bar{x}} = \frac{4.062}{\sqrt{9}} \approx 1.3540$

don't know σ

$E = t\, s_{\bar{x}}$

$t = \text{invT}(.025, 8)$

≈ 2.3060

$E = z\, \sigma_{\bar{x}}$

know σ

$E = \underbrace{2.3060}_{t}\,(\underbrace{1.3540}_{s_{\bar{x}}})$

≈ 3.1223 round up

≈ 3.13

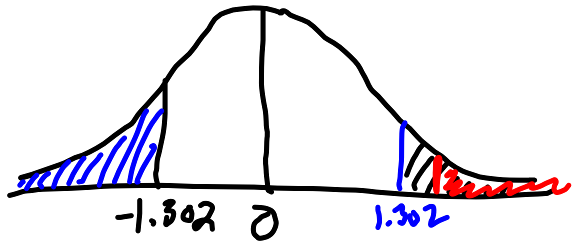
$8 + 3.13 = 11.13$

$8 - 3.13 = 4.87$

$(4.87, 11.13)$ 95% c.i.

8.4B
pg 357

a) $t = -1.302$ $df = 42$



$P(t < -1.302) = \text{tcdf}(-E99, -1.302, 42)$
$\approx .1000$

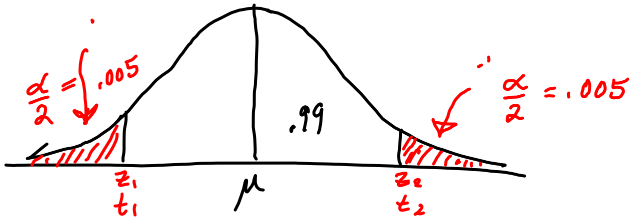
b) $t = 2.797$ $df = 24$
$n = 25$
$P(t > 2.797) = \text{tcdf}(2.797, E99, 24)$
$\approx .004999$
$\approx .0050$

c) $t = 1.397$ $n = 9$
$P(t > 1.397) = \text{tcdf}(1.397, E99, 8)$
$\approx .09997$
$\approx .1000$

d) $t = -2.383$ $df = 67$
$P(t < -2.383) = \text{tcdf}(-E99, -2.383, 67)$
$\approx .0100$

Title: May 8-9:04 AM (2 of 14)

99% c.i.



total $= 1 - .99 = .01 = \alpha$

Significance/Hypothesis Testing

$\mu = 12$ oz they say

sample $\bar{x} = 11.89$ oz.

statistically significant or not

H_0: $\mu \geq 12$ oz

null hypothesis

H_a: $\mu < 12$ oz

H_1

H_A true declared

H_0 is false

Then H_0 cannot be proven false

assuming H_0

p-value is a probability

for μ $\qquad$ $\mu =$

$$t_{obs} = \frac{\bar{x} - \mu_0}{S_{\bar{x}}}, \quad S_{\bar{x}} = \frac{s}{\sqrt{n}} \quad df = n-1$$

If we know σ

$$Z_{obs} = \frac{\bar{x} - \mu_0}{\sigma_{\bar{x}}}, \quad \sigma_{\bar{x}} = \frac{\sigma}{\sqrt{n}}.$$

for $\hat{p}$

$$Z_{obs} = \frac{\hat{p} - p_0}{S_{\hat{p}}}, \quad S_{\hat{p}} = \sqrt{\frac{\hat{p}\hat{q}}{n}}$$

we then find p-value

$P(z > Z_{obs})$

$P(t > t_{obs})$

Reject if p-value $< \alpha$

Errors - Type I
Type II

(I)

$p_0 = .60$

r/s $n = 800$

512 would vote yes

$\hat{p} = \frac{512}{800} = .64$

① assumptions - this is a simple random sample

- Since $.60(800) = 480 > 5$

$.40(800) = 320 > 5$

$\therefore$ we assume the sample is large enough

$np > 5$, $nq > 5$

(2) $H_0: p \leq .60$

$H_1: p > .60$

H_a

(3) $z_{obs} = \dfrac{\hat{p} - p_0}{S_{\hat{p}}}$ $\quad S_{\hat{p}} = \sqrt{\dfrac{pq}{n}} = \sqrt{\dfrac{.6(.4)}{800}}$

$\approx .0173205$

$= \dfrac{.64 - .60}{.0173205}$

$z_{obs} \approx 2.3094$

(4) P-value $= P(Z > 2.3094)$

$=$ normalcdf $(2.3094, E99)$

≈ 0.01046

≈ 0.0105

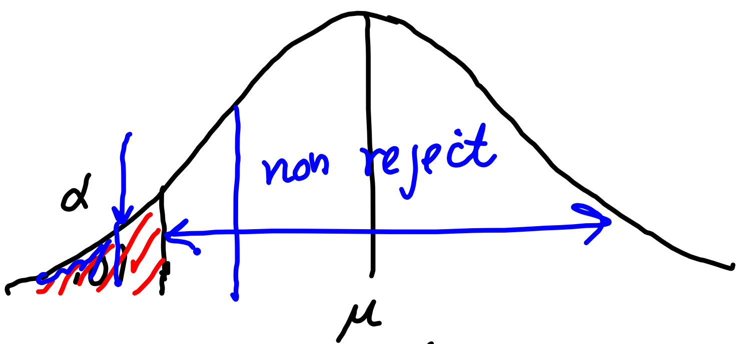
(5) Make a decision

Fairly strong evidence that H_0 should be reject

If $\alpha = .01$ would have to reject

Title: May 8-9:48 AM (7 of 14)

If P-value	Strength of evidence against H_0
.10	weak
.05	marginal (moderate)
.02	fairly strong evidence
.01	strong
.005	very strong evidence
.0001	extremely strong evidence



$P = .005 < \alpha$

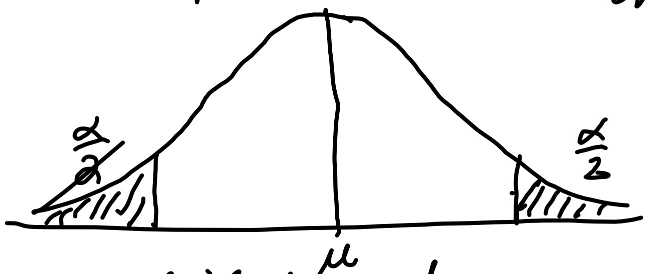
$P = .015 > \alpha$

① Two tailed test –

H_0 : p = some value

H_a : $p \neq$ that value

$\alpha =$

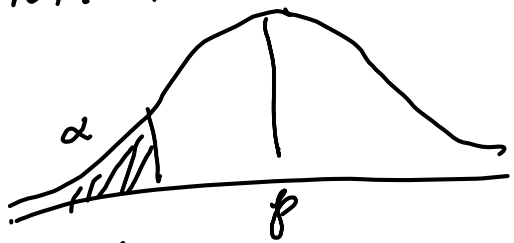


② One tailed test

i H_0 : $p \geq$ value

H_a : $p <$ value

left tailed test



ii H_0 : $p \leq$ value

H_a : $p >$ value

right tailed test

H_a never contains an equal

$\neq \quad > \quad <$

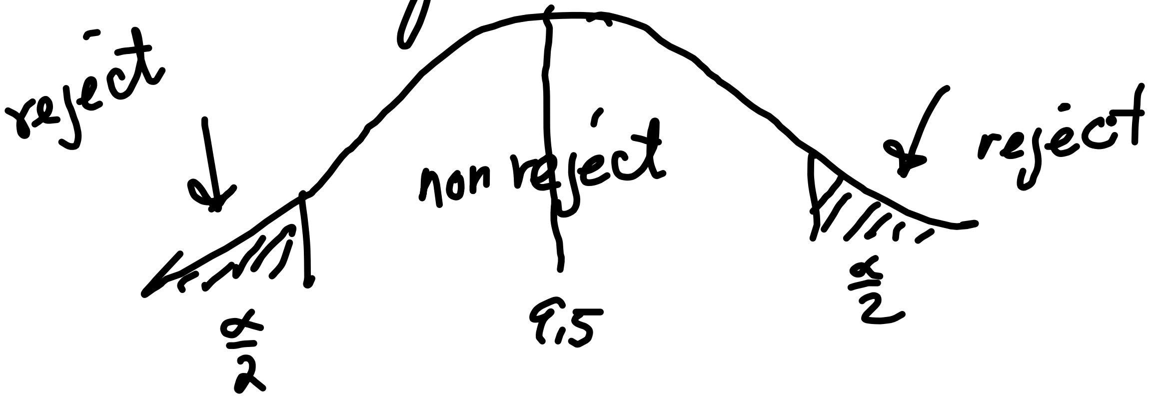
Two-tailed tests

9.10 Determine if $\mu =$ 9.5 hours

$H_0: \mu = 9.5$ hrs

$H_a: \mu \neq 9.5$ hrs. two-tailed

Could be less than 9.5 hours or greater than 9.5 hours.



One Tailed

left Ex $H_0: \mu \geq 105$

$H_a: \mu < 105$ means

left tail

right Ex 39,000 is salary greater?

$H_0: \mu \leq 3900$

$H_a: \mu > 3900$

right tailed test

If we are given α
then compare p-values to α
p-value $< \alpha$ reject H_0
p-value $> \alpha$ do not reject H_0

1. State assumptions
2. State null & alternate hypotheses
3. Calculate sample statistics
4. Calculate p-value
5. Make the decision

9-2 $\mu_0 = 10$ lbs in 1st month

$n = 36$

$\bar{x} = 9.2$ lbs

$\sigma = 2.4$ lbs   use z

Make decisions for $\alpha = .01$ and $\alpha = .05$

1. assuming - simple random sample
since $n \geq 30$ we assume sample is large enough

2. $H_0: \mu \geq 10$ lbs

$H_a: \mu < 10$ lbs
single tailed test
left tail

3. $z_{obs} = \frac{\bar{x} - \mu_0}{\sigma_{\bar{x}}} = \frac{9.2 - 10}{0.4} = -2$ $\sigma_{\bar{x}} = \frac{2.4}{\sqrt{36}} = 0.4$

$p(z < -2) =$ normalcdf$(-E99, -2)$
$\approx .02275$
$\approx .0228$

4. Decision
a) $\alpha = .01$

$.0228 > .01 \therefore$ we do not reject H_0

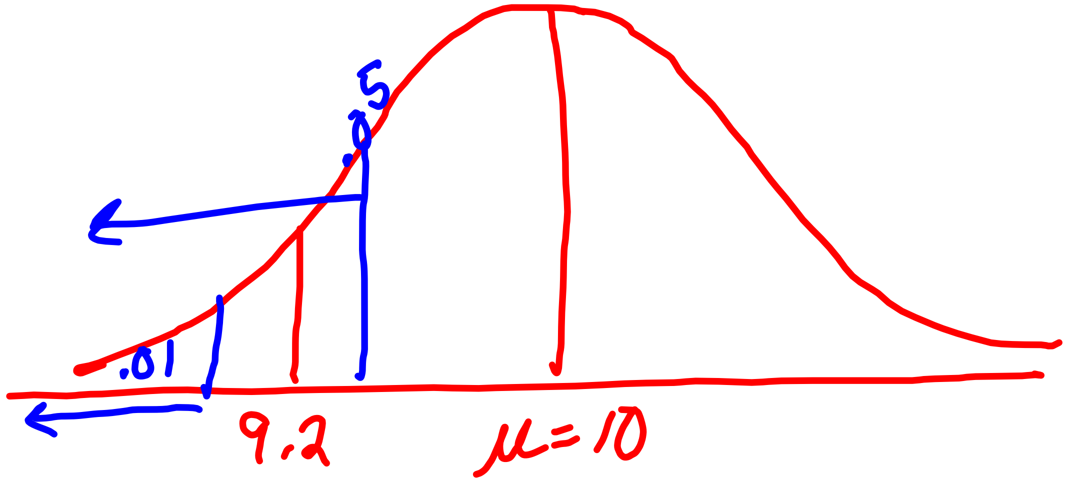
The average weight cannot be shown to be different from 10 lbs.

b) $\alpha = .05$

$.0228 < .05 \therefore$ reject H_0

The average weight loss is less than 10 lbs

Title: May 8-10:23 AM (13 of 14)



.0228

$$z = \frac{\hat{p} - p_0}{\sigma_{\hat{p}}}$$

$$\sigma_{\hat{p}} = \sqrt{\frac{pq}{n}}$$

$$s_{\hat{p}} = \sqrt{\frac{\hat{p}\hat{q}}{n}}$$