REVIEW Session

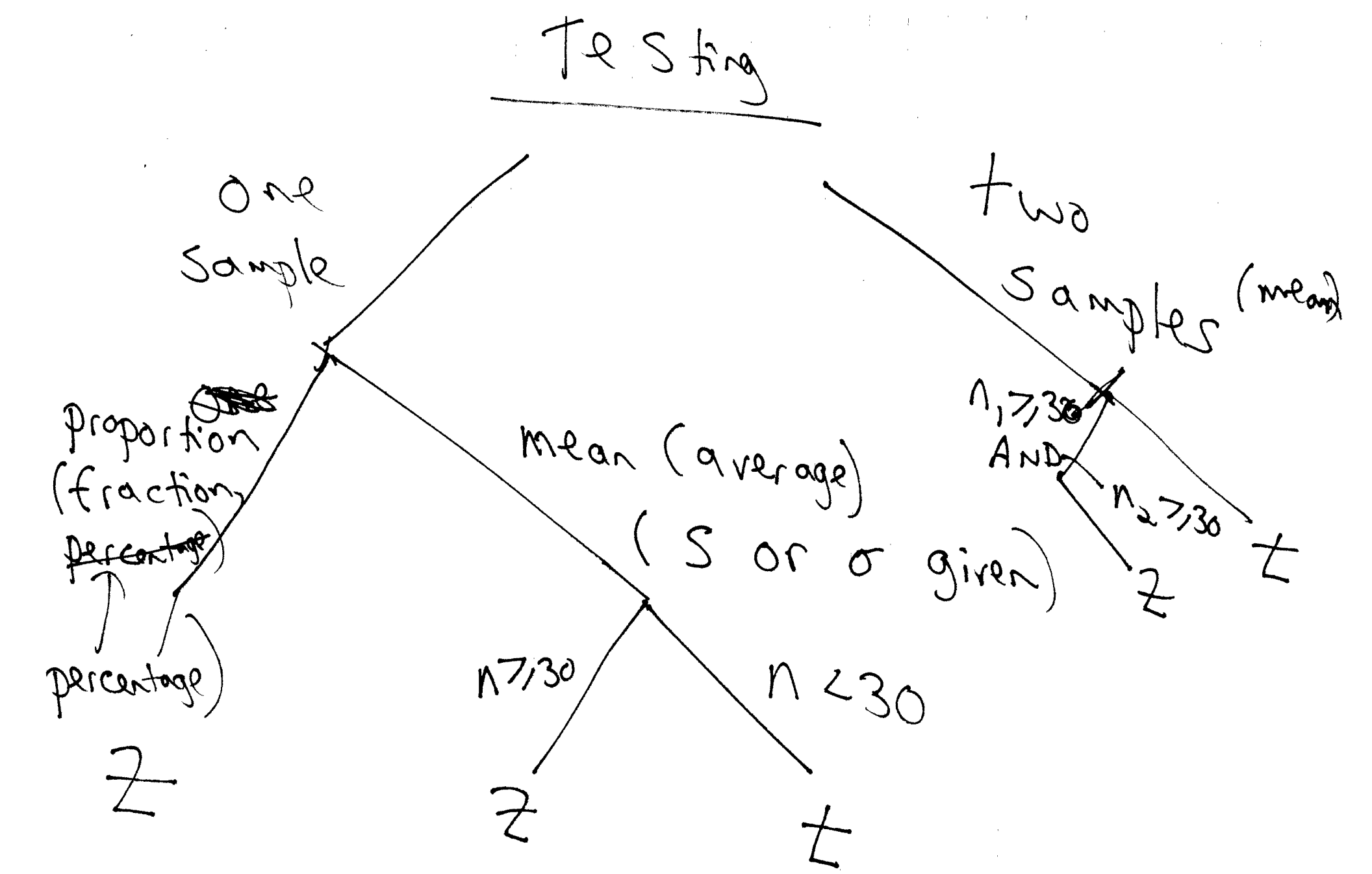
Dec. 7/09

HYPOTHESIS TESTING

If problem has word 'test' in it,

⇒ do hypothesis testing.

(i.e. H_0, H_1, test statistic, reject or don't reject H_0)


Testing
One Sample
Two Samples (mean)
Proportion (fraction, percentage)
percentage)
Z
mean (average)
(s or σ given)
n ≥ 30
n < 30
Z
t
n1 ≥ 30
AND
n2 ≥ 30
Z
t

EX: $H_0: \mu = 25$

$H_1: \mu > 25$

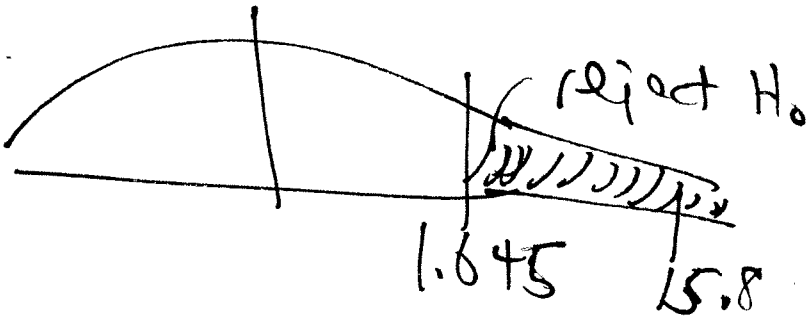
$\bar{X} = 40, \quad \sigma = 6, \quad n = 40.$

$$Z = \frac{\bar{X} - \mu}{\sigma/\sqrt{n}} = \frac{40 - 25}{6/\sqrt{40}} = \boxed{15.8}$$

Rejection Region: Reject H_0 if

$$Z > Z_\alpha.$$

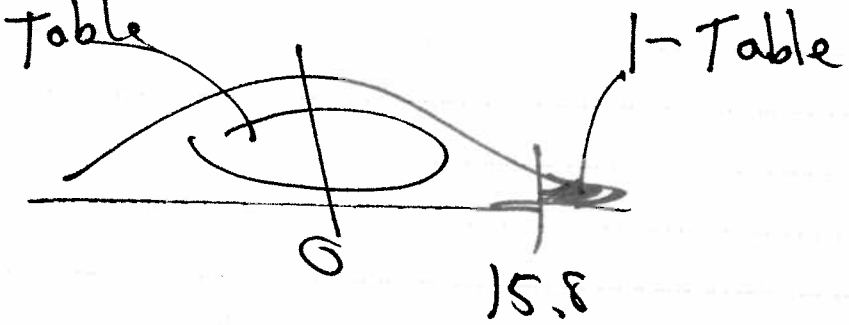
Suppose $\alpha = 0.05$ given: $Z_{.05} = 1.645$ (or 1.64 or 1.65)



Since $15.8 > 1.645$, reject H_0.

$H_1: \mu > 25$

p-value: $P(Z > 15.8)$



Use 3.70 from table:

$P(Z > 15.8) \approx 1 - .9999$

$= \boxed{0.0001}$

RULE: If p-value $\leq \alpha$, reject H_0.

$\alpha = 0.05$: Since $.0001 < .05$,

reject H_0.

ONLY NEED To be able to find p-values for Z, not t.

p. 355, #7

1 sample

EX: 5 cities are randomly selected, and it is found that $n < 30$; average mayor's salary ($\bar{x}$) for these cities is $133,000 with a standard deviation of $12000.

Does it appear that the avg. mayor's salary in all cities differs ($\neq$) from $125,000?

H_0, H_1, etc.

Test at $\alpha = 0.05$.

$H_0: \mu = 125000$

$H_1: \mu \neq 125{,}000$

$$t = \frac{\bar{x} - \mu}{s/\sqrt{n}} = \frac{133000 - 125000}{12000/\sqrt{5}}$$

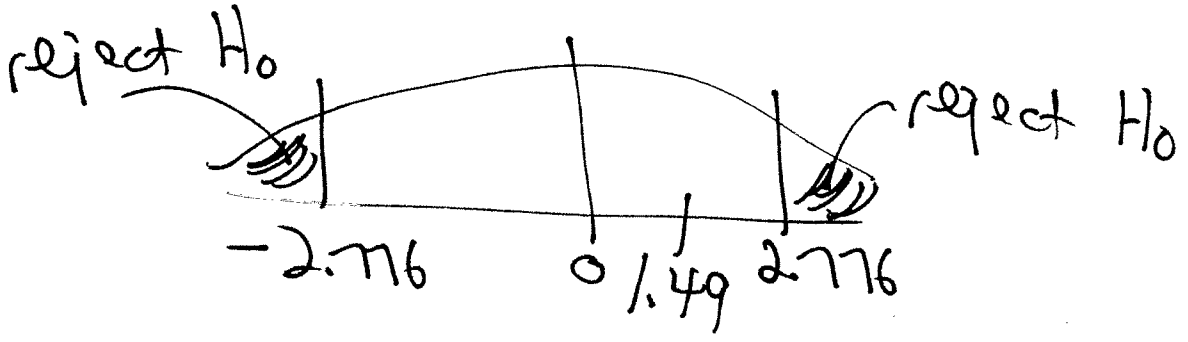
$$= \boxed{1.49}$$

$\alpha = 0.05$; Reject H_0 if

$$t > t_{\alpha/2} \quad \text{or} \quad t < -t_{\alpha/2}$$

Using (T-table) with $(n-1) = 4$ df.

$$\boxed{t_{.025} = 2.776}$$



Since $1.49 < 2.776$, don't reject H_0.

Avg. mayor's salary does not differ from \$125000.

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one-tail or two-tail?

$H_1: \mu > 25$

("greater", "above", "more than").

$H_1: p < 0.2$

("smaller", "below", "less than")

$H_1: \mu \neq 120000$

("differ", "not the same", "has changed").

EX: The mean family income in a large city is $45000.

The incomes are normally distributed and 77% of family incomes are below $51000.

Find the standard deviation of the distribution.

→ (1) Use z-score: $z = \frac{x-\mu}{\sigma}$

(2) use table.

find this ↓

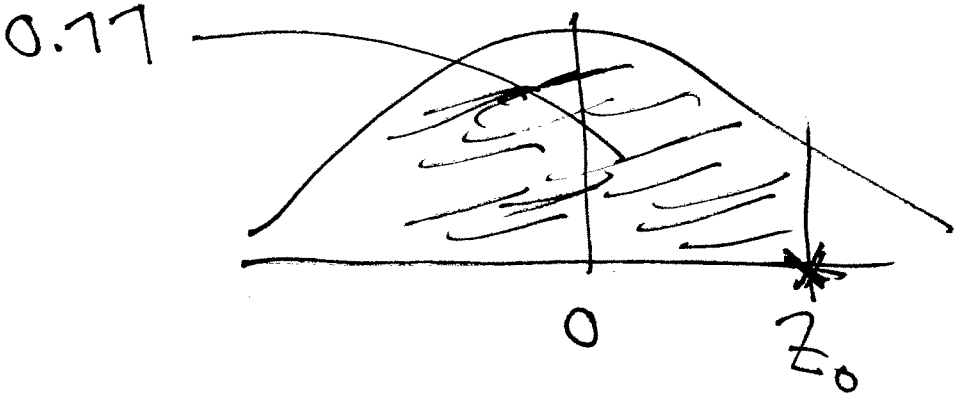
X = income. $X \sim N(45000, \sigma)$

$P(X < 51000) = 0.77$

$$P\left(Z < \frac{51000 - 45000}{\sigma}\right) = 0.77$$

$$= P\left(Z < \frac{6000}{\sigma}\right) = 0.77$$

$$\Rightarrow P(Z < z_0) = 0.77. \text{ Find } z_0.$$



find 0.77 in MIDDLE of table: $z_0 = 0.74$

$$0.74 = \frac{6000}{\sigma}$$

$$\sigma = \frac{6000}{0.74} = 8108$$

(p. 222, #15) (Sect 5-3)

EX: A lottery offers one $100 prize, 2 $50 prizes and 2 $10 prizes. 200 tickets are sold at $2 each. Find the expected profit from ~~buy~~ buying one ticket.

$$\text{profit} = \text{win} - \text{spend}$$

$$= \text{win} - 2$$

$$= \begin{cases} 100 - 2 = 98 \\ 50 - 2 = 48 \\ 10 - 2 = 8 \\ 0 - 2 = -2 \end{cases}$$

X = profit

X	98	48	8	-2
$p(X)$	$\frac{1}{200}$	$\frac{2}{200}$	$\frac{2}{200}$	$\frac{195}{200}$

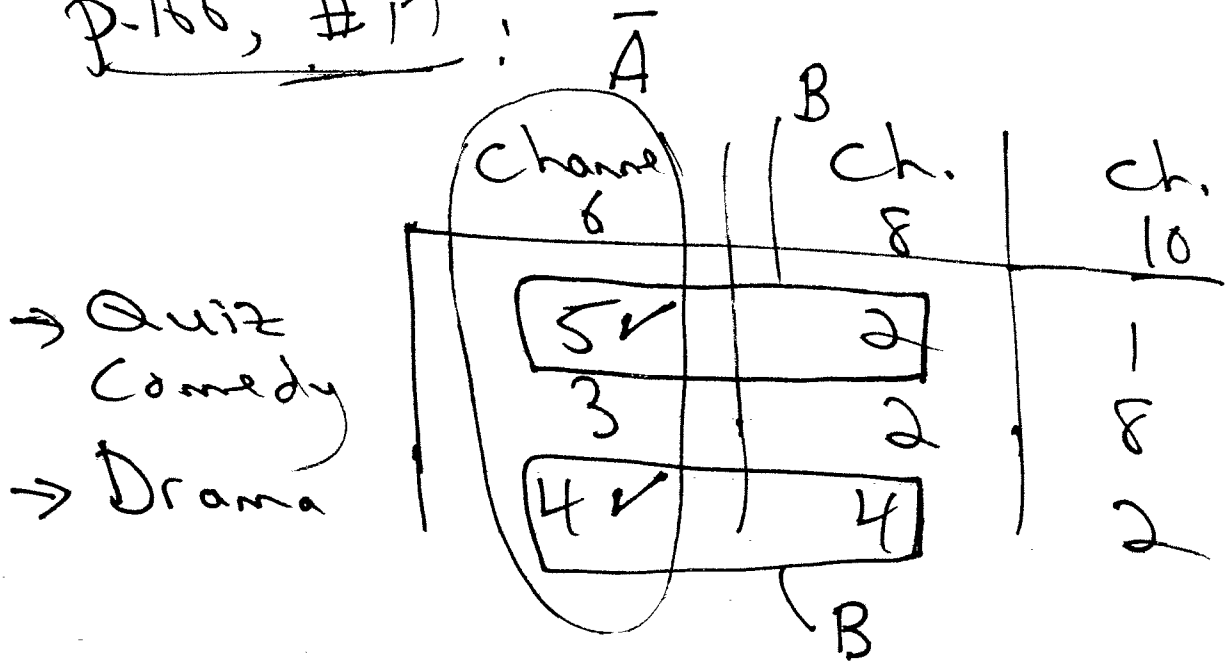
(200 − 5 winning tickets)

Expected Profit: $\mu = \sum x p(x)$

$$= 98\left(\frac{1}{200}\right) + 48\left(\frac{2}{200}\right) + 8\left(\frac{2}{200}\right) - 2\left(\frac{195}{200}\right)$$

$$= \boxed{-0.9}$$

P-166, #17 :



A: {show not on ch 6}

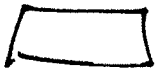
B: {show is Quiz or Drama and not on Ch 10}

$P(\bar{A} \text{ and } B) = ?$

Tried: $P(\bar{A} \text{ and } B) = P(\bar{A}) \cdot P(B)$.

Can only do this if question tells us that $\bar{A}$ and B are independent (can't assume!)

find $P(\bar{A} \text{ and } B)$ by brute force.

→ need to be in  and 

at same time

$$P(\bar{A} \text{ and } B) = \frac{5+4}{5+2+1+3+2+8+4+4+2}$$

$$= \frac{}{}$$

#25, p.179: OMIT.