STT200 1-28-09a

4.

Pop MALES $\Rightarrow$ SAMM M

$n_1 = 50$

$\bar{x}_1 = \bar{x}_M = 8322.80$

$s_1 = 1322.97$

a $\dfrac{\underbrace{x+x+x \cdots +}_{50 \text{ MALES}}}{50}$

Pop FEMALES $\Rightarrow$ SAMM F

$n_2 = 80$

$7993.06 = \bar{x}_2 = \bar{x}_F$

$s_2 = 1164.79$

z + t TABLES

$\dfrac{\sqrt{\hat{p}(1-\hat{p})}}{\sqrt{n}}$ $\dfrac{s}{\sqrt{n}}$

$\sqrt{(N-n)/(N-1)}$

ISSUE: ESTIMATE $\mu_1 - \mu_2 = \mu_M - \mu_F$

B INT EST OF $\mu_1 - \mu_2$ IS JUST $\bar{x}_1 - \bar{x}_2$

$= 8322.80 - 7993.06$ "SAMPLE TALKING"

NEXT: EST^D STD ERROR OF $\bar{X}_1 - \bar{X}_2$ WHAT IS IT?

- IS ESTIMATING SD OF A LIST (NEVER SEEN) OF ALL $\bar{X}_1 - \bar{X}_2$ WE MIGHT GET.

MAGIC EST^D STD ERROR OF $\bar{X}_1 - \bar{X}_2$

IS $\sqrt{\frac{s_1^2}{n_1}\left(\sqrt{}\right)^2 + \frac{s_2^2}{n_2}\left(\sqrt{}\right)^2}$

$s/\sqrt{n}$

ACTUALLY $\sqrt{\frac{s_1^2}{n_1} \frac{N_1 - n_1}{N_1 - 1} + s_2^2 \frac{N_2 - n_2}{N_2 - 1}}$

"COOL"

ESTD MARGIN OF ERROR OF $\bar{x}_1 - \bar{x}_2$

JUST $1.96 \sqrt{\frac{s_1^2}{n_1} \frac{N_1 - n_1}{N_1 - 1} + \text{etc}}$

FINALLY CLAIM

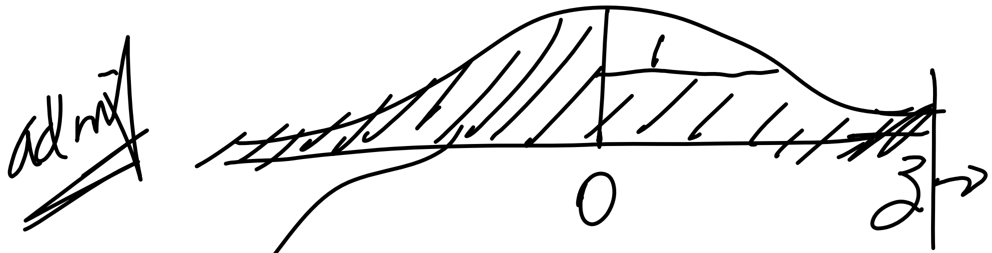
95% CI FOR $\mu_1 - \mu_2$:

$$(\bar{x}_1 - \bar{x}_2) \pm 1.96 \sqrt{\frac{s_1^2}{n_1} \frac{N_1 - n_1}{N_1 - 1} + \text{etc}}$$

POINT ESTD OF $\mu_1 - \mu_2$

ESTD MOE OF $\bar{x}_1 - \bar{x}_2$

5. Use z-TABLE 99.9 PERCENTILE OF z-SCORES



THAT z SO THAT IT JUST SURPASSES 99.9% OF TOTAL AREA (1)

.9990

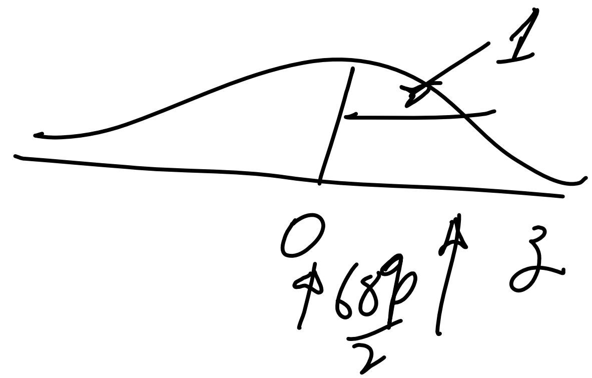
z → .00

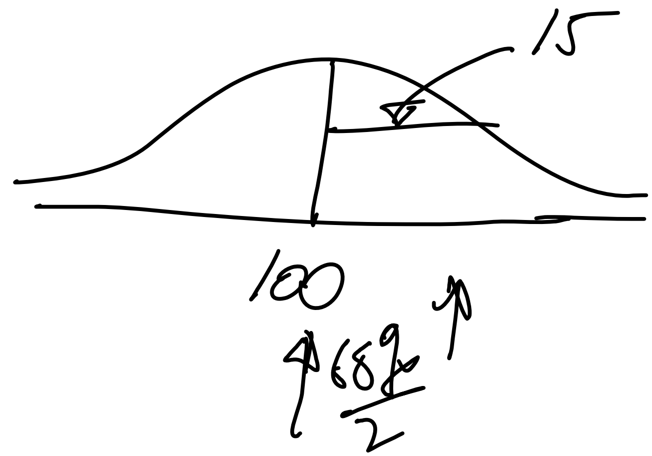
3.1 ← .9990
AREA IS SHOWN IN BODY OF TABLE

$z = 3.10$

SAY THAT $z = 3.10$ IS 99.9 PERCENTILE OF STD NORMAL

COMPARE z W/ IQ





$z = \frac{IQ - 100}{15}$ or equiv $IQ = 100 + z\,15$

HAVING FOUND 99.9 TH PERCENTILE OF z

IS $z = 3.1\underline{0}$

$\Longleftrightarrow$ 99.9 TH PERCENTILE OF IQ IS $100 + 3.10(15)$

"ALL NORMALS ARE ALIKE IN SD UNITS FROM MEAN"

6. LAB1 EST^S μ

LAB2 (INDEPENDENTLY OF LAB1) ALSO ESTS μ.

LAB1 EMOE$_1$ = 1.356

LAB2 EMOE$_2$ = 1.288

(LAB1 POINT EST) − (LAB2 POINT EST)

HAS EMOE $\sqrt{1.356^2 + 1.288^2}$ PYTHAGORAS'

THIS ASSUMES BOTH USE SAME STAT METHOD

eg BOTH HAVE 1.96 −

LATER ON WE'LL USE THIS PRINCIPLE TO GIVE EMOE OF (LAB1 POINT EST + LAB2 POINT EST)/2.

7. TINY GRANULES POP^{N} DIST OF X = WT $\approx$ NORMAL

WTS - 1.2278 1.2274 1.2269

$$\bar{x} = \frac{1.2278 + 1.2274 + 1.2269}{3} = 1.227367$$

$$s = \sqrt{\frac{(1.2278 - 1.227367)^2 + \cdots}{3-1}}$$

$$= \sqrt{\frac{(x_1-\bar{x})^2 + (x_2-\bar{x})^2 + (x_3-\bar{x})^2}{n-1}}$$

9 5 0

$\frac{14}{3}$ + 69

4.67 + 69

$N \sim \infty$ SO FPC $\sqrt{\frac{\infty - 3}{\infty - 1}} \sim 1$

4.51×10^{-4}

99% CI FOR μ : $1.227367 \pm 9.925 \frac{s}{\sqrt{3}}$

POP MEAN "EXACTLY" 99% OF SUCH CI COVER μ.

t TABLE

DF	
2	9.925
∞	2.576
CONF	99%

STT 200 1-26-096.

#4. WEEK'S HANDOUT

Pop MSU U.G. MALES

x = TUITION

$N_M \sim \infty$

μ_M ?

σ_M ?

$\Longrightarrow$ $n_M = 50$

FIND $\bar{x}_M = \dfrac{\text{SUM 50 TUITIONS}}{50} = 8322.80$

$$s_M = \sqrt{\sum_{i=1}^{50} (x_i - \bar{x}_M)^2 / 49}$$

$$\underset{\text{LONG}}{=} \sqrt{\frac{(x_1 - \bar{x}_M)^2 + (x_2 - \bar{x}_M)^2 + \cdots + (x_{50} - \bar{x}_M)^2}{n-1}}$$

$$s_M = 1322.97$$

GEN'L IDEA:

$\bar{x}_M \sim \mu_M$

$s_M \sim \sigma_M$

$N_F \sim \infty$

μ_F

σ_F

$\Longrightarrow$ $n_F = 80$

$$\bar{x}_F = 7993.06$$

$$s_F = 1164.79$$

NOW WE ENQUIRE AFTER $\mu_M - \mu_F$.

- POINT EST OF $\mu_M - \mu_F$ IS $\bar{x}_M - \bar{x}_F$

$= 8322.80 - 7993.06$

HOW VARIABLE IS THIS?

EST^D STD ERROR OF $\bar{x}_1 \ominus \bar{x}_2$:

$$\sqrt{\frac{s_M^2}{n_M}\cancel{\frac{N_M - n_M}{N_M - 1}} \oplus \frac{s_F^2}{n_F}\cancel{\frac{N_F - n_F}{N_F - 1}}}$$

EST^D S.E OF $\bar{x}_M$ IS $\dfrac{s_M}{\sqrt{n_M}}\sqrt{\dfrac{N_M - n_M}{N_M - 1}}$

square

ESTIMATES SD OF LIST OF ALL POSSIBLE $\bar{x}_M - \bar{x}_F$

$$\left(\text{EST}^D\ \text{S.E OF } \bar{x}_M - \bar{x}_F = \sqrt{\frac{1322.92^2}{50} \oplus \frac{1164.79^2}{80}}\right)$$

ESTIMATED MARGIN OF ERROR OF $\bar{x}_M - \bar{x}_F$

$$1.96 \sqrt{\frac{s_M^2}{n_M} + \frac{s_F^2}{n_F}}$$

for 95% conf.

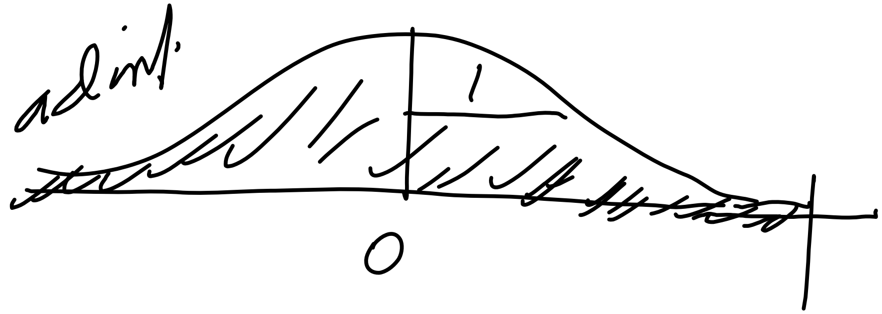
95% CI for $\mu_M - \mu_F$:

$$\bar{x}_M - \bar{x}_F \pm 1.96 \sqrt{\text{AS ABOVE}}$$

SAMPLE SIZES? SUBTLE —

$$(8322.80 - 7993.06) \pm 1.96 \sqrt{\frac{1322.97^2}{50} + \frac{1164.79^2}{80}}$$

5. FIND z adim!



TOTAL AREA UNDER z-CURVE IS 1.0.

$.9990 \leftarrow z$

TABLE

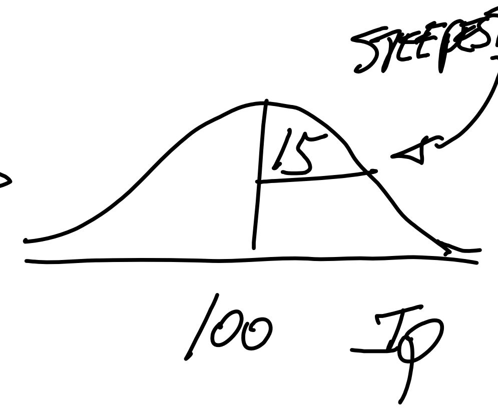
z $.00$ $.01$

$3.1 \leftarrow .9990$ $.9990$ $\Rightarrow z = 3.10$

SO .9990 PROBY IS LEFT OF $z = 3.10$

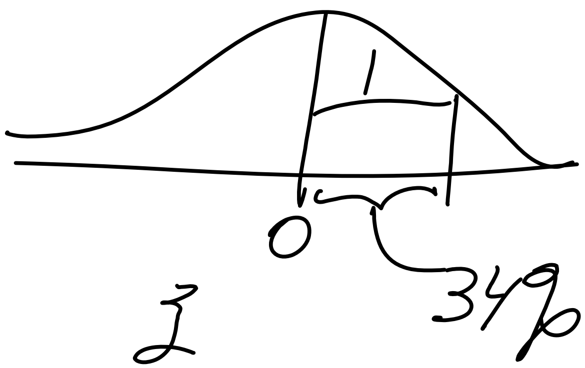
SAY 99.9TH PERCENTILE OF z IS $z = 3.10$

IQ IS NORMAL DISTRIBUTED $\Leftrightarrow$



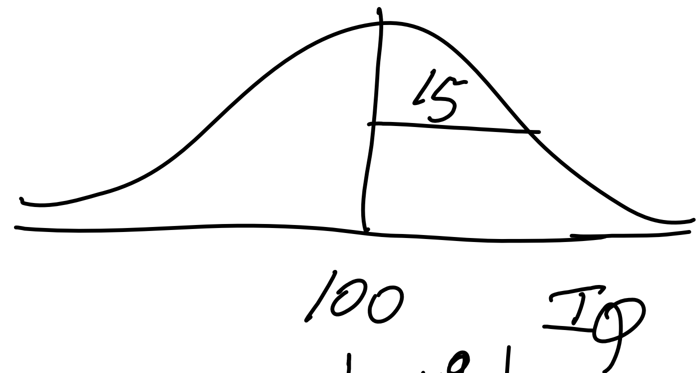
$\mu = 100 \quad \sigma = 15$

ALL NORMALS ARE ALIKE IN
SD UNITS FROM MEAN



.34

$\equiv$



|34%|

,34

ALG

$$z = \frac{IQ - 100}{15} \equiv \left(IQ = 100 + z(15) \right)$$

STD SCORE

SO 99.9TH PERCENTILE OF Z IS 3.10

$\Rightarrow$ 99.9TH PERCENTILE OF IQ IS $100 + (3.10)(15)$

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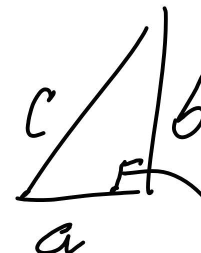
6. 'PYTHAGORAS' $\sqrt{\text{SUM OF SQUARES}}$



$a^2 + b^2 = c^2$

"INDEP"'s

a EST'D S.E.

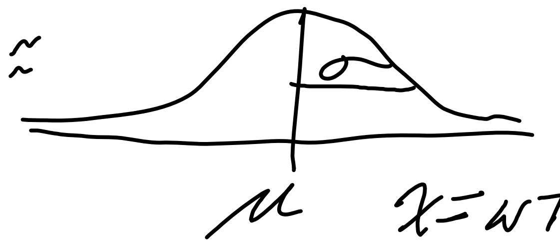
LAB1 EST'D MOE FOR THEIR EST OF "μ" 1.356

LAB2 EST'D MOE 1.288

$\underbrace{(\text{LAB1 POINT EST} - \text{LAB2 POINT EST})}$

EST'D MOE OF THIS IS $\sqrt{1.356^2 + 1.288^2}$

7. NORMAL POPN OF GRANULES. $\sim$



EST POP MEAN μ.

SAMPLE OF $n = 3$ ONLY.

DATA: 1.2278 1.2274 1.2269

$$\bar{x} = \frac{1.2278 + 1.2274 + 1.2269}{3} = 1.227367$$

78 74 69

9 5 0 $\quad \frac{14}{3} = 4.67$

$s = 4.51 \times 10^{-4}$

99% CI for μ

$$\bar{x} \pm \underbrace{9.925 \frac{4.51\ 10^{-4}}{\sqrt{3}}}$$

t

DF

2 $\boxed{9.5?}$

Conf 99%