

AMS 7

11/5/09

2-SAMPLE PROBLEMS

Read (L-186) - (L-213)

HW #3 due TUES 10 NOV

Solutions in glass case near BASKIN white boards (BE 125)

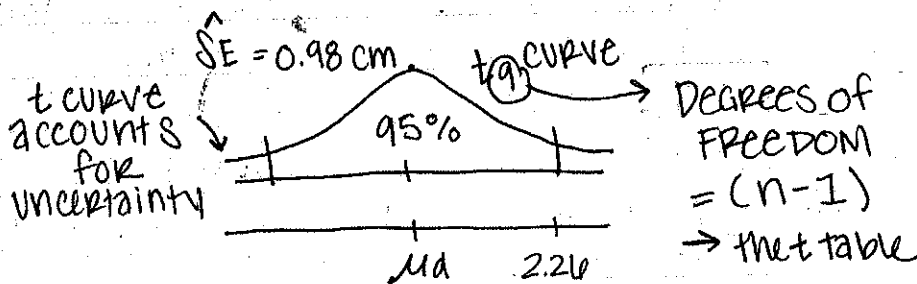
CONT FROM 11/3/09

IMAGINARY
all possible \bar{d}

3 CLT \rightarrow the closer the pop is to a normal curve, the smaller n needs to be

Sample \bar{d} values

$\begin{bmatrix} 3.3 \\ 3.4 \\ \vdots \end{bmatrix} M = \infty$



1 EV of $\bar{d} = \mu_d$

2 \hat{SE} of $\bar{d} = 0.98 \text{ cm}$

3 long RUN Histogram \rightarrow Rules out bad random sampling

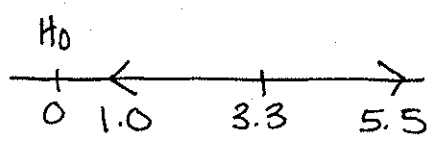
H_0 : 0cm difference between Hind & Front

Q: If you expected 0cm ± 1 cm, would you be surprised to get 3.3?

INFERENCEAL SUMMARY

POP	unknown pop quantity of interest	$\mu_d =$ pop mean diff. in Hind; fore leg length $[(H-F) = D]$
SPL	est. of μ_d	$\bar{d} = 3.3 \text{ cm}$
IMAGINARY	\pm for \bar{d} OR est of μ_d	$\hat{SE}(\bar{d}) = 0.98 \text{ cm} \approx 1 \text{ cm}$
	95% interval for μ_d	$\bar{d} \pm 2.262(1.0) = (1.0, 5.5) \text{ cm}$

$H_0 =$ null hypothesis



(L-194)

• 0 is not in the 95% interval for μ_d so this difference ($3.3 \rightarrow 0$) is STATISTICALLY SIGNIFICANT

give away different n's

(L-195)

- ANALYSIS OF 2 DIFFERENT, INDEPENDENT SAMPLES
- Average age (days) at beginning of reproduction.
 - Each # = mean based on approx. similar # of females.
 - 2 samples of $n=7$, clones
 - need to know how long they live to determine practicality
live 2 weeks: 0.04 days too small

need diff. diagrams for genetic CROSS I \rightarrow II (INDEPENDENT)

<p>CROSS I</p> <p>POP all similar Daphnia</p>	<p>SAMPLE observed Daphnia (genetic cross I)</p>	<p>IMAGINARY possible \bar{y}'s</p>
<p>age</p> <p>$N = \text{big}$</p> <p>$S^2 = 0.5047$ $S = \sqrt{0.5047} = 0.7104$</p> <p>mean $\mu_1 = ?$ SD $\sigma = ?$</p> <p>pop hist</p>	<p>like SRS = IID \rightarrow</p> <p>age</p> <p>$n_1 = 7$</p> <p>mean $\bar{y}_1 = 7.5143$ SD $s_1 = 0.7104$</p> <p>sample hist</p>	<p>sample \bar{y}</p> <p>$\begin{bmatrix} 7.5143 \\ 7.58 \\ \vdots \end{bmatrix} M = \infty$</p> <p>1 long run mean = $E_{IID}(\bar{y}_i) = \mu_1$ 2 est long run SD = $SE_{IID}(\bar{y}_i) = s/\sqrt{n_1}$ 3 long run histogram</p>

(L-196)

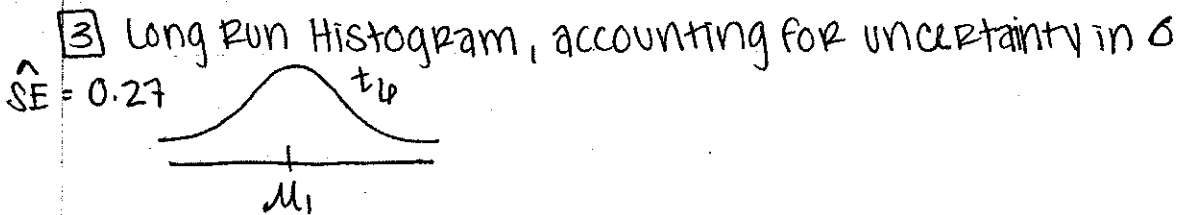
<p>CROSS II</p> <p>POP 2</p>	<p>SAMPLE 2</p>	<p>IMAGINARY</p>
<p>$N_2 = \text{big}$</p> <p>mean $\mu_2 = ?$ SD $\sigma_2 = ?$</p> <p>pop hist</p>	<p>$n_2 = 7$</p> <p>mean $\bar{y}_2 = 7.5571$ SD $s_2 = 0.6399$</p> <p>sample hist</p>	<p>$M = \infty$</p> <p>1 $E_{IID}(\bar{y}_i) = \mu_2$ 2 $SE_{IID}(\bar{y}_i) = s/\sqrt{n_2}$</p>

INFERENCEAL SUMMARY

unknown quantity of interest	$(\mu_2 - \mu_1)$ = pop mean difference in time to reproduce between I & II
est of $(\mu_2 - \mu_1)$	$(\bar{y}_2 - \bar{y}_1) = (7.5571 - 7.5143) = +0.0428$
+/- for $(\bar{y}_2 - \bar{y}_1)$ as est. of $(\mu_2 - \mu_1)$	$\hat{SE}(\bar{y}_2 - \bar{y}_1) = 0.3614$ days
95% CI for $(\mu_2 - \mu_1)$	$(\bar{y}_2 - \bar{y}_1) \pm (2.179) \hat{SE}(\bar{y}_2 - \bar{y}_1)$ formula # 12

1 EV of $\bar{y}_1 = E_{IID}(\bar{y}_1) = \mu_1$

2 \hat{SE} of $\bar{y}_1 = \hat{SE}_{IID}(\bar{y}_1) = \frac{s_1}{\sqrt{n}} \rightarrow \frac{0.7104}{\sqrt{7}} = 0.27$ days



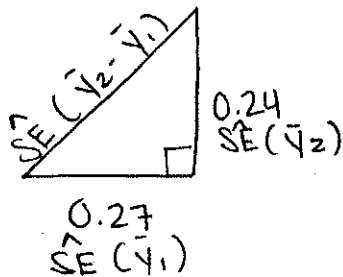
1 EV of $\bar{y}_2 = E_{IID}(\bar{y}_2) = \mu_2$

2 \hat{SE} of $\bar{y}_2 = \hat{SE}_{IID}(\bar{y}_2) = \frac{s_2}{\sqrt{n}} \rightarrow \frac{0.6399}{\sqrt{7}} = 0.24$ days

MATHFACT \Rightarrow With 2 independent samples, uncertainty in

1 $(\bar{y}_2 - \bar{y}_1)$ combines like edges of a right triangle:

2 $\frac{\hat{SE}(\bar{y}_1 - \bar{y}_2)}{\hat{SE}(\bar{y}_2 - \bar{y}_1)}$



$\hat{SE}(\bar{y}_2 - \bar{y}_1) =$

$$\sqrt{(0.27)^2 + (0.24)^2}$$

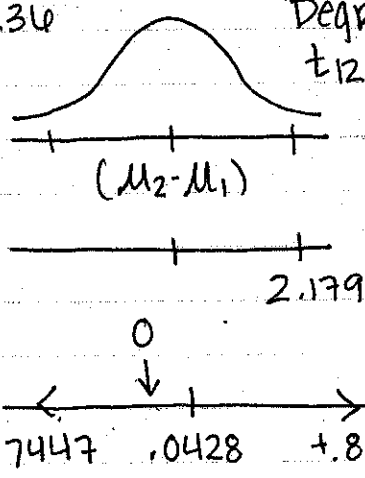
$= 0.36$ days

3 $\hat{SE}(\bar{y}_2 - \bar{y}_1) = \sqrt{[\hat{SE}(\bar{y}_1)]^2 + [\hat{SE}(\bar{y}_2)]^2} = \sqrt{\frac{s_1^2}{n_1} + \frac{s_2^2}{n_2}}$ formula # 11

long run histogram of $(\bar{v}_2 - \bar{v}_1)$, accounting for uncertainty

$\hat{\sigma}_E = 0.316$

Degrees of Freedom: $t(n_1+n_2)-2 = 12$
 $t_{12} = 2.179$



FORMULA FOR DOF ON (L-199)
 $t(n_1+n_2)-2$ is acceptable

$H_0 = \mu_2 - \mu_1 = 0$
• 0 is in the 95% CI, so
the results are NOT STAT SIG.

CASE STUDY: SUDDEN OAK DEATH PARASITE
2 INDEPENDENT SAMPLES: DICHOTOMOUS OUTCOMES

Randomly chosen redwood grove in CA (N=1000's)
245 randomly chosen trees: 9 infected

Randomly chosen redwood grove in OR (N=1000's)
281 randomly chosen trees: 20 infected

cont 11/10