Prep for Test # 2

1. You must attend class to take the test.
2. You should expect to use the textbook to help with equations, procedures, etc.
3. You should expect to use your calculator, as we used it in class, for all problems.
4. Expect to follow procedures used in class to complete the test problems. Do NOT use procedures from internet sources outside those provided for class.

Prep for Test # 2

Covers Chapters, Sections:

6.1-6.4 Normal Distribution, N Prob Plot

7.1-7.3 Distribution of Sample Mean

1) mean $\mu_{\bar{x}}$ *, 2) Std Error of mean* $\sigma_{\bar{x}}$ *, 3) n.d.*

8.1,8.3 Estimating the Pop Mean

Point Est, Confidence Interval (CI) concept

t-interval

9.1,9.3 Hypothesis Testing, p-value

9.5 1 mean t-test

not a complete list, includes all topics covered

© G. Battaly, 2024

Test Format

Part I: choice of 4 of 5 problems - (40pts @ 4 pts)

Part II: choice of 3 of 4 problems (60pts @ 20 pts)

Partial credit will be assigned for all problems.

Class Notes: Prof. G. Battaly, Westchester Community College, NY

Statistics Home Page Class Notes

1. Review Homework

   Look especially at the more complex problems from each section.

2. Review Class Notes

   a) Check first page: Do you know each topic?
   b) Redo the sections needed.

3. Review Videos

4. Review Quizzes

   Contain simpler problems, so treat them as a minimum of the information you should know.

5. ReDo all Practice Quizzes

   Each practice quiz has more problems than you see in one try, so some of the questions will be new.

6. Study in Groups with Other Students

   Talking about math helps you to think more clearly about it and to remember it.

2. Review Class Notes

6.1
http://www.battaly.com/stat/classnotes/Ch_6_1_normaldistribution.pdf

6.2
http://www.battaly.com/stat/classnotes/Ch_6_2_areaSNC.pdf

6.3
http://www.battaly.com/stat/classnotes/Ch6_3_NormallyDistribVariables.pdf

6.4
http://www.battaly.com/stat/classnotes/Ch6_4_NormalProbPlots.pdf

7.1
http://www.battaly.com/stat/classnotes/Ch7_1_SamplingDistribMean.pdf

7.2
http://www.battaly.com/stat/classnotes/Ch_7_2_mean_stdev.pdf

7.3
http://www.battaly.com/stat/classnotes/Ch7_3_Distr_SampleMean.pdf

8.1
http://www.battaly.com/stat/classnotes/Ch_8_1_PtEstimate_CI.pdf

8.3
http://www.battaly.com/stat/classnotes/Ch_8_4_CI_SteDevNOTknown.pdf

9.1
http://www.battaly.com/stat/classnotes/Ch_9_1_HypothesisTesting.pdf

9.3
http://www.battaly.com/stat/classnotes/Ch9_2_3_CritVal_Pvalue.pdf

9.5
http://www.battaly.com/stat/classnotes/Ch9_5_t_Test.pdf

8.2
http://www.battaly.com/stat/classnotes/Ch_8_2_CI_knownSteDev.pdf

8.2b
http://www.battaly.com/stat/classnotes/Ch_8_3_MarginError_SampleSize.pdf

Chapter 6

Standard Normal Curve:

$$z = \frac{x - \mu}{\sigma}$$

SNC

$\mu = 0, \quad \sigma = 1$

Total Area = 1

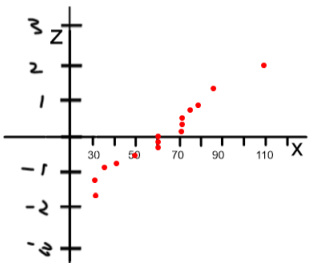
$0 \le$ area of intervals under SNC ≤ 1

$0 \le p \le 1$

normalcdf(left, right, μ, σ) = area betw left and right

invNorm(area to left,mean,stdev) = z or x score

Normal Probability Plots - use normal scores, not computed z



Class Notes: Prof. G. Battaly, Westchester Community College, NY

Statistics Home Page

Class Notes

Chapter 7

Distribution of the Sample Mean, $\bar{x}$

1. Mean of the Sample Mean

$$\mu_{\bar{x}} = \mu$$

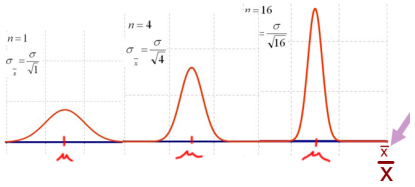
2. Standard Deviation of the Sample Mean

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

Standard Error (of the Mean)

3. Determine if normal distribution (nd)

Population **normally distributed** - easy, already done.



Class Notes: Prof. G. Battaly, Westchester Community College, NY

Statistics Home Page Class Notes

Chapter 7

Distribution of the Sample Mean, $\bar{x}$

1. Mean of the Sample Mean

$$\mu_{\bar{x}} = \mu$$

2. Standard Deviation of the Sample Mean

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

Standard Error (of the Mean)

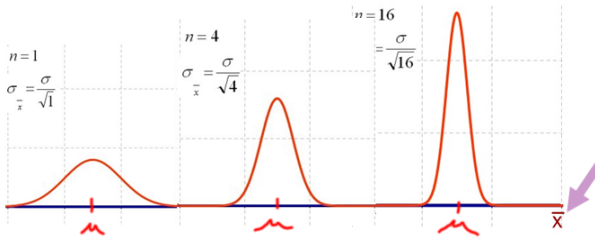
3. Determine if normal distribution (nd)

If x is n.d., then $\bar{x}$ is n.d.

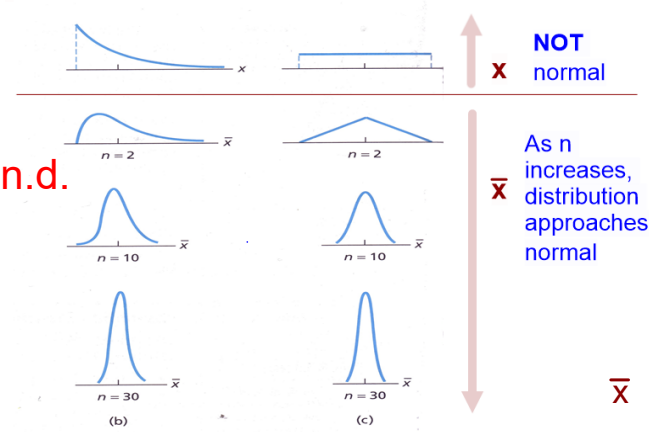
If x is NOT n.d., then $\bar{x}$ is ~ n.d.

when: n >30

Population **normally distributed** - easy, already done.



7.3 Sampling Distribution of Sample Mean



Class Notes: Prof. G. Battaly, Westchester Community College, NY

Statistics Home Page Class Notes

Chapter 8

CONFIDENCE INTERVAL

A Point Estimate of a parameter is the value of the statistic used to estimate the parameter.

An interval of numbers about a Point Estimate ($\bar{x}$) associated with a percent of confidence that the parameter lies within the interval.

CL = decimal equivalent of % confidence

significance level, α = 1 - CL

$$\bar{x} - z_{\alpha/2} \cdot \frac{\sigma}{\sqrt{n}} \le \mu \le \bar{x} + z_{\alpha/2} \cdot \frac{\sigma}{\sqrt{n}}$$

$\bar{x} \pm z_{\alpha/2} \frac{\sigma}{\sqrt{n}}$ **z-interval**

Margin of Error

$$E = z_{\alpha/2} \cdot \frac{\sigma}{\sqrt{n}}$$

$$n = \left(\frac{z_{\alpha/2}\,\sigma}{E} \right)^2$$

$$\bar{x} - t_{\alpha/2} \cdot \frac{s}{\sqrt{n}} \le \mu \le \bar{x} + t_{\alpha/2} \cdot \frac{s}{\sqrt{n}}$$

Standard Error

$\bar{x} \pm t_{\alpha/2} \frac{s}{\sqrt{n}}$ **t-interval**

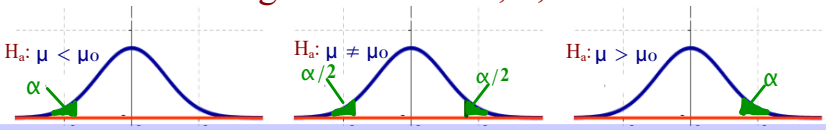
df = n-1

Minimum requirement when done with calc:
1. Check assumptions
2. sketch showing both CL and α/2
3. Write formla
4. Substitute into equation showing subscript on z
5. STAT/TESTS/7:ZInterval
6. Result as an interval
   _____ ≤ μ ≤ _____
7. Interpretation

Class Notes: Prof. G. Battaly, Westchester Community College, NY

Statistics Home Page Class Notes

9.2 & 9.3 Critical Value vs P-value Approach

Approach	Critical Value (table based, can use calculator)	P-Value (calculator based, can use table)
1 a) Assumptions first! srs, nd or large n, etc.		
1.	State the Null and Alternative Hypotheses: H_0, H_a	
2.	Decide the significance level, α, and sketch	
		
3.	Compute the test statistic: z, t, etc.	
4.	Find the critical values compares test statistic to critical value $z_\alpha, z_{\alpha/2}, t_\alpha, t_{\alpha/2}$	Find the P-value compares area beyond test statistic to α
5.	Decision: Rej. H_0 if test statistic lies beyond critical value in rejection region	Decision: Rej. H_0 if $P \le \alpha$
6	Interpret results	

Class Notes: Prof. G. Battaly, Westchester Community College, NY

Statistics Home Page Class Notes Homework

G: sample results in a 90% C.I. of $864.5 \leq \mu \leq 1010.3$

F: the sample mean, $\bar{x}$

G: sample results in a 90% C.I. of $864.5 \leq \mu \leq 1010.3$

F: the sample mean, $\bar{x}$

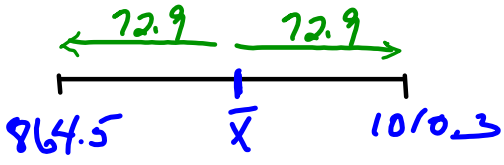
2 approaches:

1. looking for middle of an interval, simply find average of the endpoints.

$$\begin{array}{r} 864.5 \\ 1010.3 \\ \hline 1874.8 \end{array} \qquad \frac{1874.8}{2} = 937.4$$

937.4

2. find the length of CI, then find half of that length. Add that to the left endpoint.



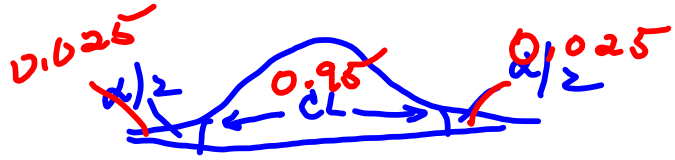
$$\begin{array}{r} 1010.3 \\ -\ 864.5 \\ \hline 145.8 \text{ length} \end{array}$$

$\frac{145.8}{2} = 72.9$ half length

$+\ 864.5$ endpoint

$937.4 = \bar{x}$

α = significance level = 1 - CL



if 2-tailed test

t-interval →

Minimum requirement when done with calc:

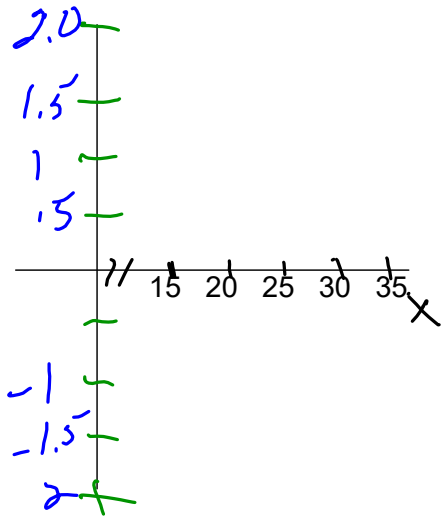
1. Check assumptions
2. sketch showing both CL and α/2
3. Write formla
4. Substitute into equation showing subscript on t
5. STAT/TESTS/8:TInterval
6. Result as an interval

   _____ ≤ μ ≤ _____
7. Interpretation

Is n.d.?

32	35	33
27	21	18
21	25	19

x	seq	norm.sc.
32		
27		
21		
35		
21		
25		
33		
18		
19		



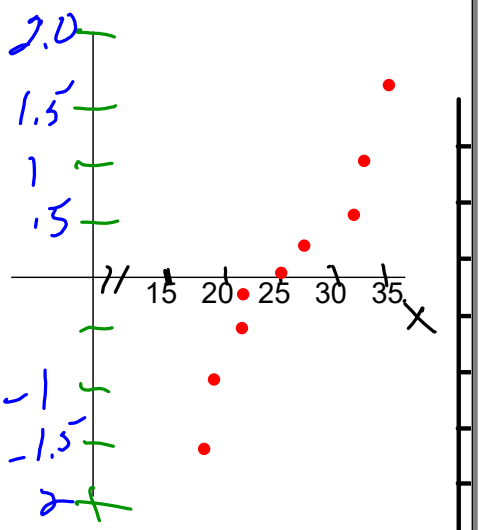
32	35	33	25	21
27	21	18	30	16
21	25	19	24	14

Is n.d.?

32	35	33
27	21	18
21	25	19

n=9

x	seq	norm.sc.
32	18	-1.59
27	19	-0.97
21	21	-0.59
35	21	-0.28
21	25	0
25	27	0.28
33	32	0.59
18	33	0.97
19	35	1.59



Yes. This is ~ n.d. because the pattern is approx a straight line.

32	35	33	25	21
27	21	18	30	16
21	25	19	24	14

What procedures? How to do?

You will not be told which procedures to use.
So, you need to recognize problem types.

5. Do problems in the Chapter Reviews

Answers in appendix, but does not include why.
Be sure to know ***why***.

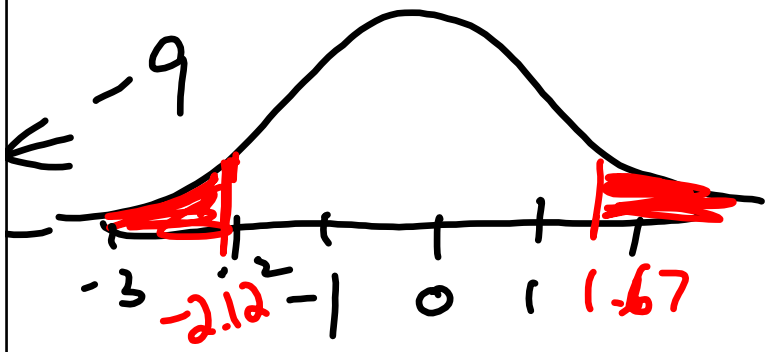
Ch 6 rev 3, 4, 9, 11, 12, 19, 25 a,d, 27
7.67 Brain weights use formulas and normalcdf,*link below
Ch 8 rev 7, 8, 12, 13, 15, 23 b,c,a
Ch 9 rev 26, 28
text appendix B has ans. including even # for review sections.

http://www.battaly.com/stat/homework/7_3_distribution_sampleMean.htm

Class Notes: Prof. G. Battaly, Westchester Community College, NY

Statistics Home Page Class Notes

6.65 Find the area under the standard normal curve that lies
a. either to the left of −2.12 or to the right of 1.67.
b. either to the left of 0.63 or to the right of 1.54.



normalcdf (-9,-2.12,0,1) + normalcdf(1.67,9,0,1)

0.0170 + 0.0475 = 0.0645

7.67 Brain Weights. In 1905, R. Pearl published the article "Biometrical Studies on Man. I. Variation and Correlation in Brain Weight" (Biometrika, Vol. 4, pp. 13–104). According to the study, brain weights of Swedish men are normally distributed with a mean of 1.40 kg and a standard deviation of 0.11 kg.
a. Determine the sampling distribution of the sample mean for samples of size 3. Interpret your answer in terms of the distribution of all possible sample mean brain weights for samples of three Swedish men.
b. Repeat part (a) for samples of size 12.
c. Construct graphs similar to those shown in Fig. 7.4 on page 343.
d. Determine the percentage of all samples of three Swedish men that have mean brain weights within 0.1 kg of the population mean brain weight of 1.40 kg. Interpret your answer in terms of sampling error.
e. Repeat part (d) for samples of size 12.

normalcdf(1.3,1.5,1.4,0.064)

= 0.882 = 88.2%

d. Determine the percentage of all samples of three Swedish men that have mean brain weights within 0.1 kg of the population mean brain weight of 1.40 kg. Interpret your answer in terms of sampling error.

normalcdf(1.3,1.5,1.4,0.032)

= 0.998 = 99.8%

7.67 Brain Weights. In 1905, R. Pearl published the article "Biometrical Studies on Man. I. Variation and Correlation in Brain Weight" (Biometrika, Vol. 4, pp. 13–104). According to the study, brain weights of Swedish men are normally distributed with a mean of 1.40 kg and a standard deviation of 0.11 kg.

G: n. d., μ = 1.40 kg, σ = 0.11 kg

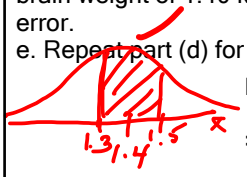
a. Determine the sampling distribution of the sample mean for samples of size 3. Interpret your answer in terms of the distribution of all possible sample mean brain weights for samples of three Swedish men.

b. Repeat part (a) for samples of size 12.

c. Construct graphs similar to those shown in Fig. 7.4 on page 343.

d. Determine the percentage of all samples of three Swedish men that have mean brain weights within 0.1 kg of the population mean brain weight of 1.40 kg. Interpret your answer in terms of sampling error.

e. Repeat part (d) for samples of size 12.



normalcdf(1.3,1.5,1.4,0.064)

= 0.882 = 88.2%

d. Determine the percentage of all samples of three Swedish men that have mean brain weights within 0.1 kg of the population mean brain weight of 1.40 kg. Interpret your answer in terms of sampling error.

normalcdf(1.3,1.5,1.4,0.032)

= 0.998 = 99.8%

d. Determine the percentage of all samples of three Swedish men that have mean brain weights within 0.1 kg of the population mean brain weight of 1.40 kg. Interpret your answer in terms of sampling error.

1.4+0.1

1.4−0.1