Prep for Test # 2

1. You must attend class to take the test.
2. Procedures from the textbook will be provided.
3. 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.

p-values will be required for all hypothesis problems

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Prep for Test # 2

Covers Chapters, Sections:

6.4	Normal 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
10.1-10.5	Hyp Testing, 2 samples pooled-t, nonpooled-t,M-W, paired-t

not a complete list, includes all topics covered

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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.

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

6.4
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

10.1
http://www.battaly.com/stat/classnotes/Ch_10_1_Diff_2_means.pdf

10.2
http://www.battaly.com/stat/classnotes/Ch_10_2_pooled_t_test.pdf

10.3
http://www.battaly.com/stat/classnotes/Ch_10_3_NONpooled_t_test.pdf

10.4
http://www.battaly.com/stat/classnotes/Ch_10_4_MannWhitney.pdf

10.3
http://www.battaly.com/stat/classnotes/Ch_10_5_Paired_t_test.pdf

Chapter 6

Standard Normal Curve:

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

SNC

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

Total Area = 1

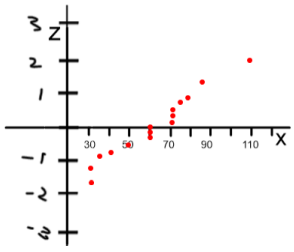
$0 \le$ area of intervals under SNC ≤ 1

$0 \le p \le 1$

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



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Chapter 7

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

1. Mean of the Sample Mean

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

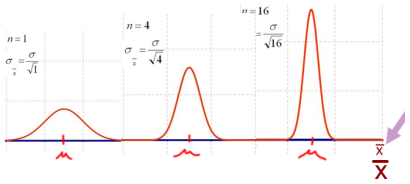
2. Standard Deviation of the Sample Mean

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

Standard Error (of the Mean)

3. Determine if normal distribution (nd)

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



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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)

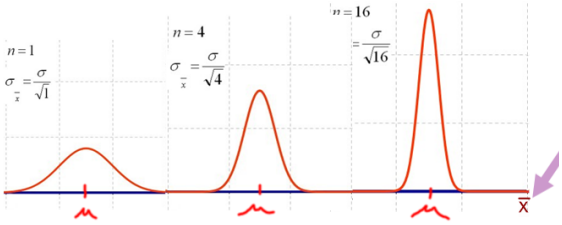
3. Determine if normal distribution (nd)

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

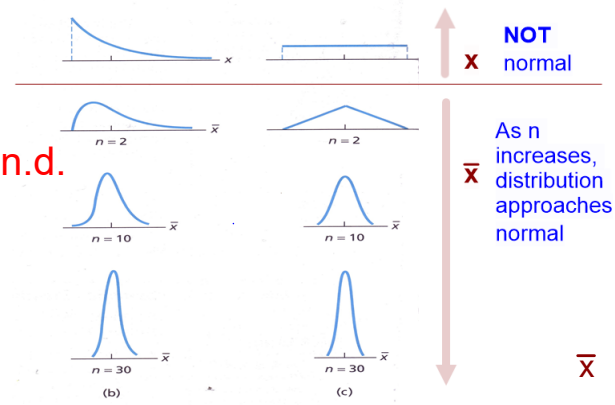
If x is NOT n.d., then $\bar{x}$ is ~ n.d.

when: n >30

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



7.3 Sampling Distribution of Sample Mean



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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

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

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

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

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

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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	
	$H_a: \mu < \mu_o$ (α) ; $H_a: \mu \neq \mu_o$ (α/2, α/2) ; $H_a: \mu > \mu_o$ (α)	
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	

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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, $\bar{x}$

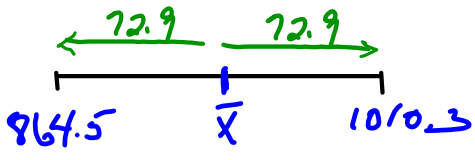
2 approaches:

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.

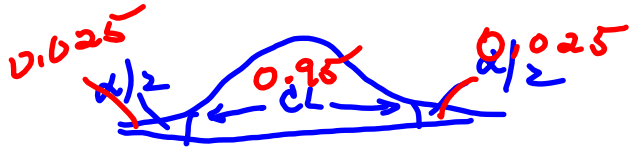


$$\begin{array}{r} 1010.3 \\ -\ 864.5 \\ \hline 145.8 \text{ length} \end{array}$$

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

$$\begin{array}{r} +\ 864.5 \text{ end point} \\ \hline 937.4 = \bar{x} \end{array}$$

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

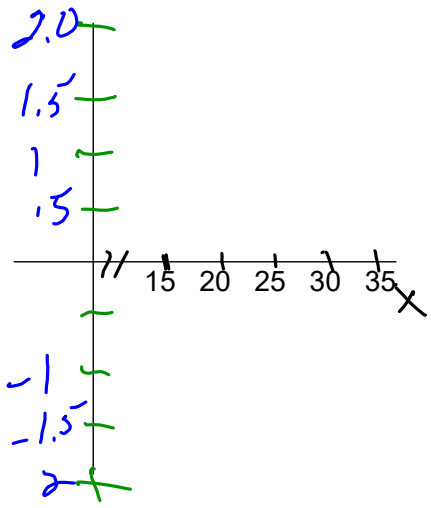
_____ ≤ μ ≤ _____

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		



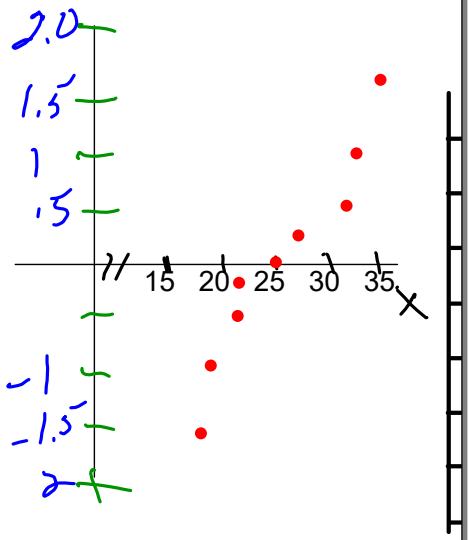
32	35	33	25	21
27	21	18	30	16
21	25	19	24	14

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

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7.77 Worker Fatigue. A study by M.Chen et al. titled "Heat Stress Evaluation and Worker Fatigue in a Steel Plant" (American Industrial Hygiene Association, Vol. 64, pp. 352–359) assessed fatigue in steel-plant workers due to heat stress. If the mean post-work systolic pressure for electric arc-melting workers equals the normal systolic pressure of 120 mmHg, find the probability that a random sample of 29 electric arc-melting workers will have a mean post-work systolic pressure exceeding 126.1 mmHg. Assume that the population standard deviation of post-work systolic pressure for electric arc-melting workers is 12.1 mmHg. State any assumptions that you are making in solving this problem.

7.77 Worker Fatigue. A study by M.Chen et al. titled "Heat Stress Evaluation and Worker Fatigue in a Steel Plant" (American Industrial Hygiene Association, Vol. 64, pp. 352–359) assessed fatigue in steel-plant workers due to heat stress. If the mean post-work systolic pressure for electric arc-melting workers equals the normal systolic pressure of 120 mmHg, find the probability that a random sample of 29 electric arc-melting workers will have a mean post-work systolic pressure exceeding 126.1 mmHg. Assume that the population standard deviation of post-work systolic pressure for electric arc-melting workers is 12.1 mmHg. State any assumptions that you are making in solving this problem.

$\mu_{\bar{x}} = \mu = 120 \quad n = 29$

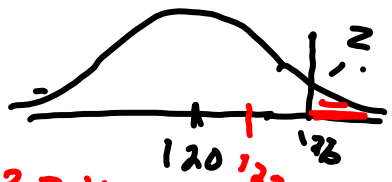
$\sigma_{\bar{x}} = \sigma/\sqrt{n} = 12.1/\sqrt{29} = 2.247$

F: $p(\bar{x} > 126.1)$

n.d.

$\mu = 120$ mm Hg

$\sigma = 12.1$



normalcdf(126, 200, 120, 12.1/√29) = 2.247 = 0.0037

8.133 "Chips Ahoy! 1,000 Chips Challenge." As reported by B. Warner and J. Rutledge in the paper "Checking the Chips Ahoy! Guarantee" (Chance, Vol. 12, Issue 1, pp. 10–14), a random sample of forty-two 18-ounce bags of Chips Ahoy! cookies yielded a mean of 1261.6 chips per bag with a standard deviation of 117.6 chips per bag. a. Determine a 95% confidence interval for the mean number of chips per bag for all 18-ounce bags of Chips Ahoy! cookies, and interpret your result in words. b. Can you conclude that the average 18-ounce bag of Chips Ahoy! cookies contains at least 1000 chocolate chips? Explain your answer.

a. 1225.0 chips per bag to 1298.2 chips per bag. We can be 95% confident that the mean number of chips per bag for all 18-ounce bags of Chips Ahoy! Cookies is somewhere between 1225.0 and 1298.2.
b. Yes, because, from part (a), we can be confident that the average bag contains at least 1225 chocolate chips.

9.119 A study found that for cardiovascular hospitalizations, the mean age of women is 68.4 years. At one hospital, a random sample of 15 of its female cardiovascular patients had the ages shown, in years.

75.1 79.7 61.4 66.7 58.2 74.8 84.3 83.9
77.2 73.4 66.3 68.7 64.1 72.9 70.5

Is the mean age of women hospitalized with cardiovascular disease at this hospital different from the average?

Find answer at back of textbook, odd problems.

10.50 Recess and Wasted Food. Wendy Bounds et al. conducted a study to determine, among other things, if scheduling recess before lunch is one way to increase children's food and nutrient consumption at lunch and reduce plate waste. Results were published in the online article "Investigation of the School Professionals' perceptions and Practices Regarding Issues Influencing Recess Placement in Elementary Schools" (National Food Service Management Institute, The University of Mississippi, 2008). Summary statistics for the score on the opinion of recess placement issues by randomly selected students are presented in the following table.

Lunch Before Recess	Lunch After Recess
$\bar{x}_1 = 3.49$	$\bar{x}_2 = 2.73$
$s_1 = 0.57$	$s_2 = 0.54$
$n_1 = 314$	$n_2 = 314$

At the 1% significance level, do the data provide sufficient evidence to conclude that the mean score for food wasted for lunches before recess exceeds that for lunches after recess?

10.81 Acute Postoperative Days. Refer to Example 10.6 (page 482). The researchers also obtained the following data on the number of acute postoperative days in the hospital using the dynamic and static systems.

Dynamic								Static		
7	5	8	8	6	7	7	||	6	18	9
9	10	7	7	7	7	8	||	7	14	9

At the 5% significance level, do the data provide sufficient evidence to conclude that the mean number of acute postoperative days in the hospital is smaller with the dynamic system than with the static system? (Note: $\bar{x}_1 = 7.36$, $s_1 = 1.22$, $\bar{x}_2 = 10.50$, and $s_2 = 4.59$.)

10.127 Weekly Earnings. The Bureau of Labor Statistics publishes data on weekly earnings of full-time wage and salary workers in Employment and Earnings. Independent random samples of male and female workers gave the data on weekly earnings, in dollars, found in the following table.

Men		Women	
924	575	2078	358
2621	415	2193	374
1888	405	594	1181
386	816	375	1445
		510	412

At the 5% significance level, do the data provide sufficient evidence to conclude that the median weekly earnings of male full-time wage and salary workers exceeds the median weekly earnings of female full-time wage and salary workers?

10.169 Antiviral Therapy. In the article "Improved Outcome for Children With Disseminated Adenoviral Infection Following Allogeneic Stem Cell Transplantation" (British Journal of Haematology, Vol. 130, Issue 4, p. 595), B. Kampmann et al. examined children who received stem cell transplants and subsequently became infected with a variety of ailments. A new antiviral therapy was administered to 11 patients. Their absolute lymphocyte counts (ABS lymphs) (×109/L) at onset and resolution were as shown in the following table. (Lymphocytes help to fight infections.)

Onset	Resolution	Onset	Resolution
0.08	0.59	0.31	0.38
0.02	0.37	0.23	0.39
0.03	0.07	0.09	0.02
0.64	0.81	0.10	0.38
0.03	0.76	0.04	0.60
0.15	0.44		

Is the antiviral thrapy helpful in controlling the viruses?