

STAT 345 - Summer, 2005 - Practice Exam 3

BASED ON SECTIONS: 6.1 – 6.4, 7.4, 7.5, 8.1 – 8.3, 8.5, 9.1 – 9.3, 9.5

- The amount of time that a customer spends waiting at an airport check-in counter is a random variable with mean 8.2 minutes and standard deviation 3.5 minutes. Suppose that a random sample of $n = 49$ customers is observed. Find the probability that the average time waiting in line for these customers is
 - Less than 10 minutes
 - Between 8 and 10 minutes
 - Longer than 7 minutes
- The following data are direct solar intensity measurements (watts/m²) on different days at a location in southern Spain:
562, 869, 708, 775, 775.
Calculate the sample mean and sample standard deviation.
- The female students in an undergraduate engineering core course at ASU self-reported their heights to the nearest inch. The data are

62 64 66 67 65 68 61 65 67 65 64 63 67 68 64 66 68 69 65 67 62 66 68
67 66 65 69 65 70 65 67 68 65 63 64 67 67
 - Construct a stem-and-leaf diagram for the height data and comment on any important features that you notice.
 - Find the 5 number summary.
- Histograms for three different data sets are given in the plots in Figure 1 on page 6. Describe each histogram.
- The U.S. Department of Agriculture compiles information on acreage, production, and value of potatoes and publishes its findings in *Agricultural Statistics*. The potato yield for a random sample of plots in Nevada (in thousands of pounds per acre) for thirty-two 1-acre plots is in Table 1 below.
 - Draw a stem-and-leaf plot (use 5 splits per stem). Describe the shape. Are there any outliers?
 - Give a 90% confidence interval for the mean potato yield in Nevada. Use $\bar{x} = 38.38$ and $s = 3.76$.

Table 1: Nevada potato yield

30	32	33	34	34	34	35	35
36	37	38	38	38	38	38	38
38	39	39	40	40	40	41	41
47	45	43	42	42	41	41	41

6. People who were born between 1978 and 1983 are sometimes classified by demographers as belonging to Generation Y. According to a recent Forrester Research Survey, 459 of 850 randomly sampled Generation Y web users reported using the Internet to download music.
- What is the sample proportion \hat{p} ?
 - Show that both $n\hat{p}$ and $n(1 - \hat{p})$ are 5 or more.
 - Give a 95% confidence interval for p , the proportion of Generation Y web users who use the internet to download music.
 - Explain clearly in terms of this problem what “95% confidence ” means.
 - How large a random sample is required to obtain a margin of error of 0.03 in a 95% confidence interval?
7. A regional computer center wants to evaluate the performance of its disk memory system. One measure of performance is the average time between failures of its disk drive. To estimate this value, the center recorded the time between failures for a random sample of 45 disk drive failures. The follow sample statistics were computed:

$$\bar{y} = 1,762 \text{ hours}, \quad s = 215 \text{ hours}.$$

- Estimate the true mean time between failures with a 90% confidence interval.
 - If the disk memory system is running properly, the true mean time between failures will exceed 1700 hours. Based on the interval in part (a), what can you infer about the disk memory system?
8. The Geothermal Loop Experimental Facility, located in the Salton Sea in southern California, is a U.S. Department of Energy operation for studying the feasibility of generating electricity from the hot, highly saline water of the Salton Sea. Operating experience has shown that these brines leave silica scale deposits on metallic plant piping, causing excessive plant outages. Jacobsen, et al. (*Journal of Testing and*

Evaluation 1981) have found that scaling can be reduced somewhat by adding chemical solutions to the brine. In one screening experiment, each of five antiscalants was added to an aliquot of brine, and the solutions were filtered. A silica determination (parts per million of silicon dioxide) was made on each filtered sample after a holding time of 24 hours, with the following results: 229 255 280 203 229.

Estimate the mean amount of silicon dioxide present in the five antiscalant solutions. Use a 99% confident interval.

9. The “Black Hole” survey, sponsored by the Professional Employment Research Council, reports on the toughest jobs to fill on recruiters lists. In a 1990 survey, 95 of 285 recruiters listed engineering positions as the “toughest to fill” (*Industrial Engineering* 1990). Estimate the true percentage of recruiters who find it toughest to fill engineering positions. Use a 99% confidence interval.
10. Humerus bones from the same species of animal tend to have approximately the same length-to-width ratios. When fossils of humerus bones are discovered, archeologists can often determine the species of animal by examining the length-to-width ratios of the bones. It is known that species A has a mean ratio of 8.5. Suppose 41 fossils of humerus bones were unearthed at an archeological site in East Africa, which species A is believed to have inhabited. (Assume that the unearthed bones are all from the same unknown species). The length-to-width ratios of the bones were measure and are summarized as follows: $\bar{x} = 9.25$ and $s = 1.16$ Could these humerus bones be from species A? Set up and perform the appropriate two-tailed hypothesis test. Use $\alpha = 0.05$.
11. The sodium content of thirty 300-gram boxes of organic corn flakes was determined. The data (in milligrams) are as follows:

131.15, 130.69, 130.91, 129.54, 129.64, 128.77, 130.72, 128.33, 128.24, 129.65, 130.14, 129.29, 128.71, 129.00, 129.39, 130.42, 129.53, 130.12, 129.78, 130.92, 131.15, 130.69, 130.91, 129.54, 129.64, 128.77, 130.72, 128.33, 128.24, and 129.65.

The summary statistics from Minitab are:

Variable	N	Mean	Median	StDev	SE Mean
Sodium	30	129.75	129.64	0.93	0.17

Variable	Minimum	Maximum	Q1	Q3
Sodium	128.24	131.15	128.94	130.70

See the plots in Figure 2 on page 7 for the histogram, boxplot, and normal probability plot.

- (a) Can you support a claim that mean sodium content of this brand of cornflakes is 130 milligrams? Use $\alpha = 0.05$.
 - (b) Is there evidence that sodium content is normally distributed? (Use Figure 2).
 - (c) Explain how the question in part (a) could be answered by constructing a two-sided confidence interval on the mean sodium content.
12. Let μ be the average number of ounces in Coke bottles bottled by a certain bottling company. Assume that we have the following number of ounces measured in $n = 10$ Coke-bottles randomly selected by the company: 12.2, 11.7, 12.1, 11.3, 12.7, 11.9, 12.0, 12.1, 12.4, 11.3. We assume the data is approximately normal and obtain the following Minitab output:

Test of mu = 12 vs mu not = 12

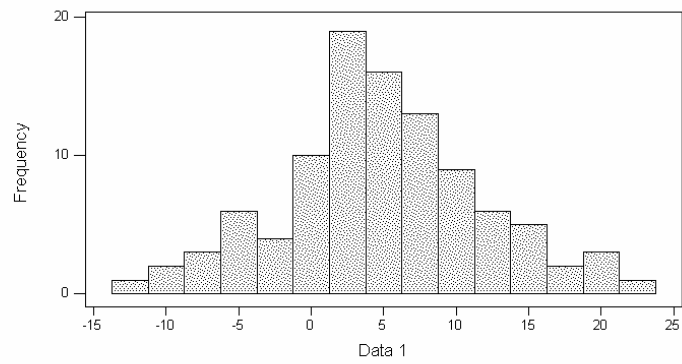
Variable	N	Mean	StDev	SE Mean
data	10	11.970	0.445	0.141

Variable	95.0% CI	T	P
data	(11.652, 12.288)	-0.21	0.836

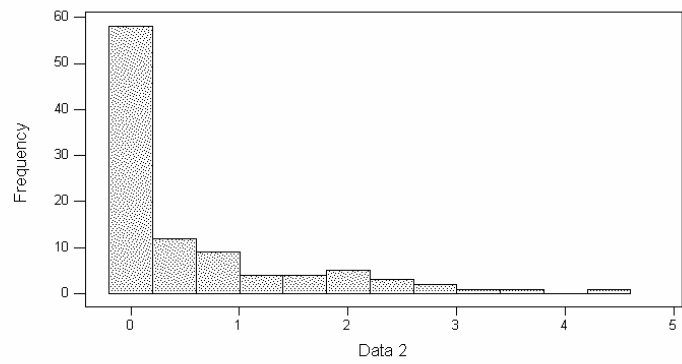
- (a) What is the p -value for testing $H_0 : \mu = 12$ versus $H_0 : \mu \neq 12$? Would you reject $H_0 : \mu = 12$ at the $\alpha = 0.1$ significance level?
 - (b) What is the 95% C.I. for μ , the population mean number of ounces in Coke bottles? Is 13 ounces within this plausible range for μ ?
13. The National AIDS Behavioral Survey interviewed a sample of adults in cities where AIDS is most common. The sample included 803 heterosexuals who reported having more than one sexual partner in the

past year. We can consider this a random sample of size 803 from the population of all heterosexuals in high-risk cities who have multiple partners. Of the 803, 304 said they never use condoms. Is this strong evidence that more than one-third of this population never use condoms? Set up and test the appropriate hypotheses test. Give the p-value for the test. State and check any necessary assumptions.

Histogram of Data 1



Histogram of Data 2



Histogram of Data 3

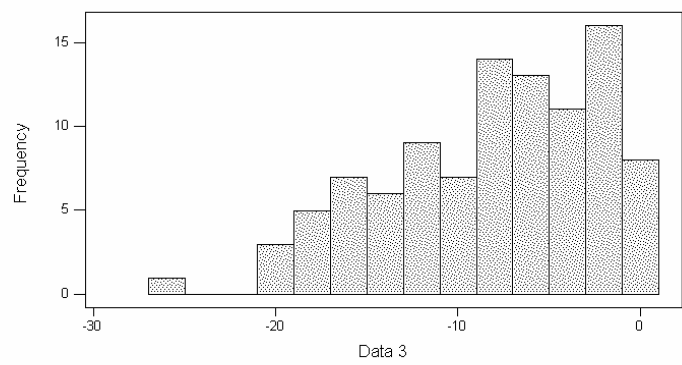


Figure 1: Histograms

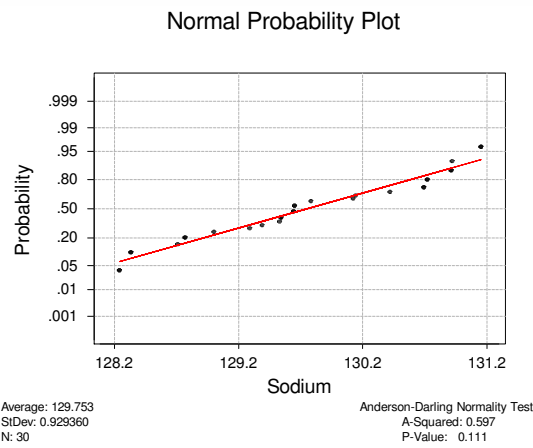
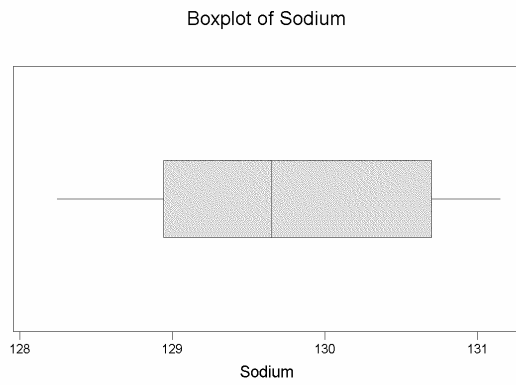
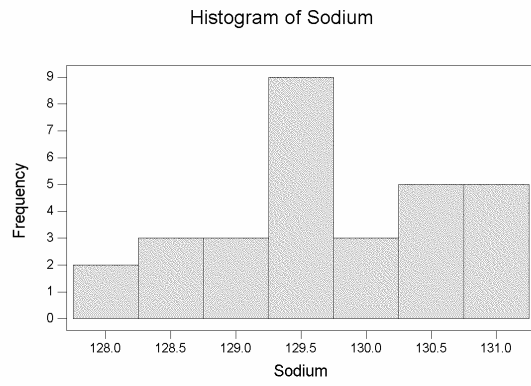


Figure 2: Histogram, boxplot, normal probability plot of sodium data