

Show all work for maximum credit. Each page is worth 25 points. You may use the following formulas and table as needed.

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

$$m = \frac{z}{2} \sqrt{n} \quad n = \left( \frac{z}{2m} \right)^2$$

Confidence	z
90%	1.645
95%	1.960
99%	2.576

1. The following values give the salaries of the employees where you work (represented in \$1000s).

21    24    26    27    28    32    34    36    41    62

a. Construct a *frequency table* using nine classes, where the first grouping is from 20 to 24.  
[6]

<u>Class</u>	<u>Frequency</u>	<u>Class</u>	<u>Frequency</u>
20–24			

b. Use your frequency table to construct a *histogram* of this data.  
[6]

c. Describe the *overall pattern* you see in your histogram (peaks, symmetry, skewness) and any *exceptions* to the main pattern (gaps, outliers).  
[6]

d. Based on your histogram will the mean be greater than, less than or about the same as the median? **Without doing any calculations, give two reasons to support your answer.**  
[4]

e. Determine the *mean* salary.  
[3]

f. Determine the *median* salary.  
[3]

2. The heights of 10-year-old boys in the U.S. are normally distributed with a mean of 54 inches and standard deviation of 3 inches.

a. What percent of these boys measure *between 54 and 59 inches*?

[8]

b. You are concerned about the rate of your son's physical growth. He is 10 years old and measures 47 inches. What percent of his peers are *shorter than he is*?

[8]

c. State a range that contains "almost all" (that is 99.7%) of the boys' heights in this age group.

[6]

3. An April 22<sup>nd</sup>, the Gallup organization surveyed 1001 adults in the U.S., asking “Do you approve or disapprove of the way George W. Bush is handling his job as president?” 701 replied “approve.” Complete the following steps to construct a 99% *confidence interval* for the percent of all adults in the U.S. who approve. (<http://www.gallup.com/poll/releases/pr030501.asp>, May 1, 2003)

a. Determine an *estimate* for the nationwide percentage by computing the percent of the sample that approves.  
[4]

b. Determine the *margin of error* (using 99% a confidence level) for the estimate you made in (a).  
[6]

c. Use the results from (a) and (b) to construct your *confidence interval*.  
[4]

d. Using a full sentence, interpret your interval in the context of this study.  
[3]

e. Suppose you wish to maintain 99% confidence in your result but reduce the margin of error to 3%. How many people would need to be surveyed?  
[5]

4. Consider the following survey:

*You wish to know the percent of unemployed people in the U.S. You live in Chicago and figure you can find lots of people to survey going into Wrigley field on game day. You ask as many people as you can whether they are employed.*

[12]

a. For this survey identify the:

- population of interest
  
- sampling frame
  
- sample
  
- characteristic of interest

b. Identify two reasons (or more for extra credit) this survey method is inherently biased. Your answers must include why the bias is present and whether it will cause the sample result to be too high or too low.

[6]

5. Fill-In

[10]

- a. The total area under any normal curve is \_\_\_\_\_ .
- b. When the sample size is increased the margin of error will \_\_\_\_\_ .
- c. When the confidence level is increased the accuracy of an estimate will \_\_\_\_\_ .
- d. For skewed data it is best to measure the center using the \_\_\_\_\_ since it better represents the majority of the data.
- e. For symmetric data it is best to measure the center using the \_\_\_\_\_ since this measure is more precise.