**FORMULAS: (see box below)**

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**STATISTICS ESSENTIALS:** Know: 1) what a confidence interval represents and how to calculate one given specific conditions; 2) what a margin of error is and how to obtain it; 3) how determine the mean and margin of error if given a confidence interval; 4) how to determine which formula to use based upon provided data.; 5) obtaining Zcritical values; 6) the table above. . **[NOTE: see Orange sheets for additional problems and resources.]**

**PROBLEMS:**

1. What is a point estimate?

A sample value used to estimate a population parameter.

1. Why are confidence intervals symmetric?

For the point estimate (here the sample mean) we could be overestimating or under estimating the true population mean, . As we do not know in which direction the true mean lies, we split the interval into equal portions, having the **sample mean** as the center point.

1. Given a 98% confidence interval, (18.04, 20.04), identify the mean and the margin of error.

Mean = 19.04; E = 1

1. Identify on a normal curve the area associated with Z.025.

It is an area of .0250 in the right tail of the normal curve.

**Large Samples**

1. Sound it out: Phonics is an instructional method in which children are taught to connect sounds with letters or groups of letters. A sample of 134 first-graders who were learning English were asked to identify as many letter sounds as possible in a period of one minute. The average number of letter sounds identified was 34.06 with a standard deviation of 23.83.
2. Construct a 98% confidence interval for the mean number of letter sounds identified in one minute. (29.19, 38.93)
3. If a 95% confidence interval were constructed with these data, would it be wider or narrower than the interval constructed in part a? Explain.

[Navidi; pg 315]

1. 98% C.I. = 

[NOTE: large sample with sample std.dev. Sub sample std. dev. for sigma.]

1. Narrower because there is a smaller probability that the true mean will be contained in the new interval. Confidence decreased, precision increased.
2. Software instruction: A hybrid course is one that contains both online and classroom instruction. In a study performed at Macon State College, a software package was used as the main source of instruction in a hybrid college algebra course. The software tracked the number of hours it took for each student to meet the objectives of the course. In a sample of 45 students, the mean number of hours was 80.5, with a standard deviation of 51.2.
3. Construct a 95% confidence interval for the mean number of hours it takes for a student to meet the course objectives.
4. If a sample of 90 students had been studied, would you expect the confidence interval to be wider or narrower than the interval constructed in part a?

[Navidi; pg 315]

1. 95% C.I. = hrs.
2. Narrower because the fraction, s/sqrt n, would be smaller.
3. Baby talk: In a sample of 77 children, the mean age at which they first began to combine words was 16.51 months, with a standard deviation of 9.59 months.
4. Construct a 95% confidence interval for the mean age at which children first began to combine words.
5. If a sample of 50 children had been studied, would you expect the confidence interval to be wider or narrower than the interval in part a? Explain.

[Navidi; pg 315]

1. 95% C.I. = yrs.
2. Wider because the fraction, s/sqrt n, will be larger.

**Small Samples**

1. A process has been developed that can transform ordinary iron into a kind of super iron called *metallic glass*. Metallic glass is three to four times stronger than the toughest steel alloys. To estimate the mean temperature, , at which a particular type of metallic glass becomes brittle, 25 pieces of this metallic glass were randomly sampled from a recent production run. Each piece was subjected to higher and higher temperatures until it became brittle. The temperature at which brittleness first appeared was recorded for each piece in the sample. The following results were obtained:  = 480oF and s = 11oF. Construct a 95% confidence interval to estimate .

95% C.I. =  Fo

1. Health insurers and the federal government are both putting pressure on hospitals to shorten the average length of stay (LOS) of their patients. A random sample of 27 hospitals in one state had a mean LOS in 1998 of 3.8 days and a standard deviation of 1.2 days. Construct a 98% confidence interval to estimate the population mean of the LOS for the state’s hospitals in 1998.

98% C.I. = days

**Proportions**

1. Studies are performed to estimate the percentage of the nation’s 10 million asthmatics who are allergic to sulfites. In one survey, 38 of 500 randomly selected U.S. asthmatics were found to be allergic to sulfites. [Weiss; page 608
2. Find a 95% confidence interval for the proportion of all U.S. asthmatics who are allergic to sulfites.
3. Interpret your result from part a.

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1. 



1. We are 95% confident that the true population proportion is between .053 and .099.
2. A *Reader’s Digest/Gallup Survey* on the drinking habits of Americans estimated the percentage of adults across the country who drink beer, wine, or hard liquor, at least occasionally. Of the 1516 adults interviewed, 985 said they drank. [Weiss; page 608]
3. Determine the 95% confidence interval for the proportion of all Americans who drink wine, beer, or hard liquor, at least occasionally.
4. Interpret your results from part a.
5. 



1. We are 95% confident that our true population proportion lies between .626 and .674.

**Sample Size**

1. A researcher wants to determine the 99% confidence interval for the mean number if hours per week that adults spend doing community service. How large of a sample should the researcher select so that the estimate will be within 1 hour of the population mean? Assume that the standard deviation for hours spent per week by adults doing community service is 3.

Recall E – margin of error, here 1 hr.

hours => round to 60 hrs.