STA 1020 Section 002: Hand-In HW #6

Directions: Show all work when appropriate. You are to work on this assignment in your groups. Your engagement will be included in your participation score. Upload this assignment to the dropbox on Canvas. This assignment is out of 20 points.

Telling the difference between a Chapter 6 Problem and a Chapter 7 Problem

It is very easy, when initially studying chapters 6 and 7, to follow along with the steps and procedures for the problems. Where the difficulty lies is on the exam and final exam, when there is little to no guidance on telling the difference between which chapter these problems come from. Getting it wrong can cost you nearly all of the points for the problem; a mistake we want to avoid. The discussion presented below is intended to help you to spot the key differences in the problems that will hopefully mean correct answers!

To begin, we have to remind ourselves what the differences between chapters 6 and 7 really are.

Perhaps the most obvious place to start is with the formulas. Here they are:

	Chapter 6		**Chapter 7**
1	$Z = \frac{x - \mu}{\sigma}$	3	$z = \frac{\hat{p} - \mu_{\hat{p}}}{\sigma_{\hat{p}}} = \frac{\hat{p} - p}{\sqrt{\frac{p(1-p)}{n}}}$
2	$x = Z\sigma + \mu$	4	$z = \frac{\bar{x} - \mu_{\bar{x}}}{\sigma_{\bar{x}}} = \frac{\bar{x} - \mu_{\bar{x}}}{\frac{\sigma}{\sqrt{n}}}$

Compare/contrast the formulas 1, 3, 4 found in the chart above. Write your observations below:

One of the most important differences in the formulas 1, 3, 4 is that formulas 3 & 4 use the Central Limit Theorem. Did you notice the difference in the denominators? The formulas for the standard deviation is treated differently in chapter 6 versus chapter 7. Additionally, chapter 7 includes another category we can consider which are proportions. It is also noteworthy that in chapter 7's formulas, we know n. This is an important clue when we read problems and decide what to do.

Formula #2 is a reworking of formula #1, simply solving for x. Problems that use this formula are tricky to spot. We will examine this more next.

Now let's shift our attention to the wording of the problems and note the differences and clues. This requires you to read, highlight or underline key phrases, and list out your knowns. There are plenty of clues to help you.

Here are four problems…

1. At a large university, the mean amount spent by students for cell phone service is $38.90 per month with a standard deviation of $3.64 per month. Consider a group of 44 randomly chosen university students. What is the probability that the mean amount of their monthly cell phone bills differs from the mean for the university by more than $1?
2. A machine that builds gas tanks operates in such a way that the capacity of each tank is a normal random variable with mean 16.0 gallons and standard deviation of 0.1 gallons. What is the probability that a randomly selected thank will hold at least 16.15 gallons?
3. A news report stated that 65% of vehicles sold nationally were SUVs. A random sample of 100 vehicles sold in the last month is taken. What is the probability that at least 70 of the vehicles in the sample were SUVs?
4. The heights of river birch trees are normally distributed with a mean of 92.3 inches with a standard deviation of 4.1 inches. What is the cutoff height for birch trees in the tallest 10%?

Let's compare some key phrases in the problems and see if we can make a decision about which chapter each is from, and which formulas are needed:

	Problem #1	**Problem #2**	**Problem #3**	**Problem #4**
First key phrase	the **mean** amount spent by students for cell phone service is **$38.90 per month**	**a normal random variable**	**65%** of vehicles sold nationally were SUVs	**Normally distributed**
Second key phrase	a **standard deviation** of **$3.64 per month**	**mean 16.0 gallons**	A **random sample of 100** vehicles sold in the last month is taken.	Mean of 92.3 inches
Third key phrase	Consider a group of **44 randomly chosen** university students	**standard deviation of 0.1 gallons**		Standard deviation of 4.1 inches
Question	What is the probability that the **mean amount** of their monthly cell phone bills **differs from the mean for the university by more than $1?**	What is the probability that a **randomly selected tank** will hold **at least 16.15 gallons**?	What is the probability that **at least 70 of the vehicles in the sample were SUVs**?	What is the cutoff height for birch trees in the tallest 10%?
Observations	• This problem deals with means. • We know n! • In the question, we want the probability of the mean amount which is NOT Chapter 6. • Differs by more than means area in the tails.	• Normal Random Variable means we can use our chart/table! • Did you notice no sample size was given…so Chapter 6!! • We want a probability of a randomly selected _____, very specific! • At least-area to right	• Percent is given and no mention of means, so it's about proportions. Chapter 7! • Sample size is given. • Probability of at least 70 in sample is not a specific amount. • At least area to right.	• Not asking for a probability. • Tallest 10% means area right…but this is given as an area. • No sample size given so not Chapter 7. • What is the cutoff suggests we need a height. Makes no sense to use formula #1, must be #2.

To summarize, problems from each chapter generally ask things in the following way:

Chapter 6: What is the probability that _____ (something specific) behaves in a certain way (at least, more than, differs by less than, etc. etc.)

Chapter 7: What is the probability that _____ (a sample mean or proportion) behaves in a certain way (see above)

Practice

Telling the difference between a Chapter 6 Problem and a Chapter 7 Problem

Part 1: [4] For each problem, decide whether it is from Chapter 6 or Chapter 7. Explain how you know (e.g. what clues are present in the problem?). Give at least two clues to support your decision. No need to formally solve each.

1. The local nursery is waiting for its spring annuals to be delivered, and 20% of the plants ordered are petunias. If the first truck contains 120 plants packed at random, what is the probability that no more than 30 plants are petunias?

2. Suppose the scores on a chemistry test were normally distributed with a mean of 78 and a standard deviation of 10. If a student who completed the test is chosen at random, find the probability that the student earned between 80 and 90 points.

3. A book publisher claims that its mean book length is 250 pages with a standard deviation of 70 pages. What is the probability that for a sample of 45 randomly selected books, the mean length of a book is less than 230 pages?

4. In one region of the Caribbean Sea, daily water temperatures are normally distributed with a mean of 77.9 and a standard deviation of 2.4. What is the third quartile for water temperatures in this region?

Part 2: Here are some from an old final exam. No need to explain which chapter these are from. Just highlight the key words that tell you and find each answer.

1. [4] Suppose that 50% of politicians are lawyers. Find the probability that of a random sample of 400 politicians, at least 47% are lawyers.

2. [4] The weights of adults (in kg) follows a normal distribution with a mean of 67 and a standard deviation of 11. For a random sample of 64 adults, find the probability that the mean weight of the sample is at most 63 kg.

3. [4] The daily mileage of delivery trucks follows a Normal Distribution with a mean of 120 and a standard deviation of 18. Find the probability that a randomly selected delivery truck has a daily mileage between 150 and 156.

4. [4] The lifetimes of light bulbs are normally distributed with a mean of 500 hours and a standard deviation of 25 hours. How long would a lightbulb need to last to be in the top 1% of lifetimes?