STATISTICS/BUSINESS STATISTICS
Sample Test 3

NOTE: While the types of questions on the actual test will be similar to these, there may be more problems of each type than you see here.

In this class we have discussed z-intervals and t-intervals as ways to estimate averages. Answer these questions:

_____1.	Which statistic (**z** or **t**) is most often used when a large sample is available?

_____2.	How large does a sample have to be to be considered a "large" sample in statistics?
A. 10	B.	30	C. 100	D.	300	E. 1000

The TI-83 input screens for interval estimation look like the screen illustrations below:

```
ZInterval              TInterval               1-PropZInt
 Inpt:Data Stats        Inpt:Data Stats         Inpt:Data Stats
 σ:                     x̄:                      x:
 x̄:                     Sx:                     n:
 n:                     n:                      C-Level:
 C-Level:               C-Level:                Calculate
 Calculate              Calculate
```

On these input screens …

_____3.	Which variable stands for the **total number** in a sample?

_____ and _____4.	Which two variables stand for **standard deviation**?

_____5.	Which variable stands for the **mean** (average) of the sample?

_____6.	If a problem refers to 95% confidence, what would you enter for "C-Level"?

_____7.	In a 1-proportion z-test, which is larger, "x" or "n"?

_____8.	Which of these confidence levels would mean you're estimate is right (that is, the actual parameter is in your interval estimate) most often?
A.	90%	B.	95%	C.	99%

_____9.	Which of these confidence levels would mean your estimate is wrong most often?
A.	90%	B.	95%	C.	99%

The results from a TI-83 interval estimate screen are shown at right:

_____10.	What is a **point estimate** for the average of the population?

_____11.	What is the **upper bound** of this interval?

_____12.	What is the **margin of error** in the t-interval problem shown here?

```
TInterval
 (6.1607,8.2393)
 x̄=7.2
 Sx=1.8
 n=14
```
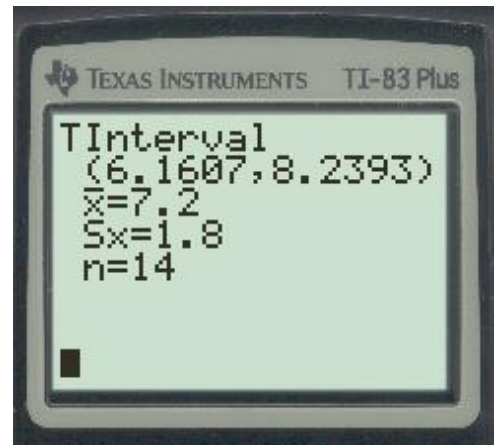
The results from a TI-83 interval estimate screen are shown at right:

_____13.	How large of a sample was used for this estimate?

_____14.	What percent of this sample had the characteristic being studied?

_____15.	What is the **margin of error** in the 1-proportion z-interval problem shown here?

```
1-PropZInt
 (.68775,.84269)
 p̂=.7652173913
 n=115
```
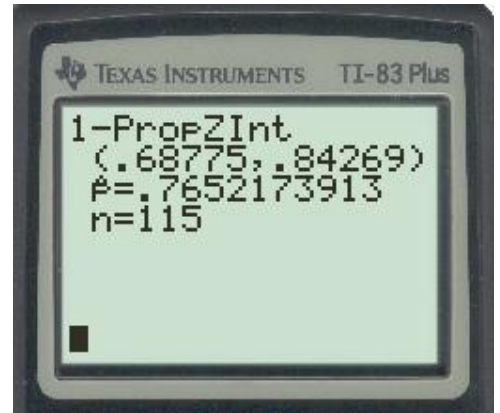
Solve these estimation problems.
You will most likely write your answers in the form { Min , Max }.

16.	Suppose Wal-Mart wants to find out the average time customers wait in check-out lines during the holiday season. To do this they track 284 customers and find the average wait time for those customers is 277 seconds, with a standard deviation of 52 seconds. Use this information to find a 95% confidence interval (**z-interval**) for the mean time μ Wal-Mart customers spend waiting in check-out lines.

Write the numbers you would enter in a graphing calculator to do this problem on that screen shot at right.

Answer:

_____

```
ZInterval
 Inpt:Data Stats
 σ:
 x̄:
 n:
 C-Level:
 Calculate
```
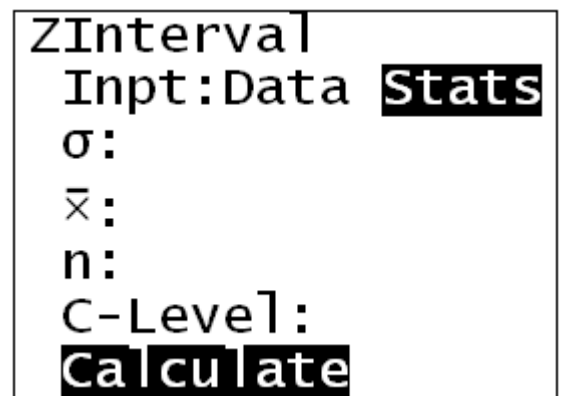
_____17.	The website *usatoday.com* traced the usage habits of 250 of its users. They found that users spent an average of 16.7 minutes each visiting the *usatoday.com* website, with a standard deviation of 7.9 minutes. Use this information to find an interval estimate (**z-interval**) of the population mean for length of visits to the website, with 95% confidence.

_____18. A poll of 27 voters asked them to rate themselves on a scale of 1 to 10, where "1" was "extremely conservative" and "10" was "extremely liberal". The average rating was 6.1, with a standard deviation of 1.5. Use this information to find an 85% confidence interval (**t-interval**) for the actual conservative/liberal rating of all voters

19. ACT tests each question with a selected group of high school juniors before any question actually appears on the nationwide ACT examination. Suppose in a test group of 60 juniors, 39 of them (65%) answered a certain question correctly. Use this information to find an interval estimate (**1-proportion z-interval**) of the overall percentage of high school juniors who should answer this question correctly, with 80% confidence.

Write the numbers you would enter in a graphing calculator to do this problem on the screen shot at right.

Answer:

_____

```
1-PropZInt
 Inpt:Data Stats
 X:
 n:
 C-Level:
Calculate
```
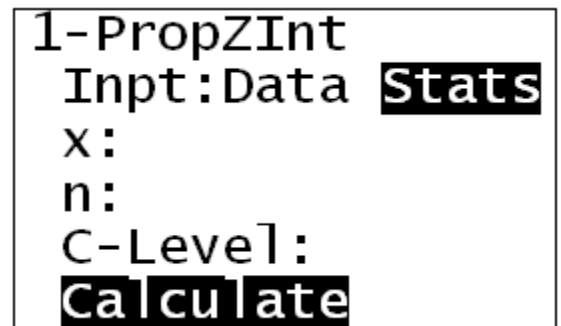
_____20. A Gallup survey of 1,250 high school students found that 675 (54%) of them felt that oral sex did not count as "sex". Use this information to find an interval estimate (**1-proportion z-interval**) with 99% confidence of the actual percentage of high school students who have this definition of "sex".

_____21. Ocean Spray wants to be sure its cranberry juice has the correct level of tartness. To test this, each hour they take a sample of 6 bottles of juice off the line and test the pH level of the juice in each bottle. One hour they find the average pH level in their sample is 3.72 with a standard deviation of 0.23 . Use this information to find a **t-interval** estimating the actual pH level of all juice produced that hour, with 99% confidence.

_____22. NewsWatch, Utah-based media lobbying group, sampled 52 network news broadcasts in a single year. They found that the "average" network news broadcast included 3.2 visual clips that the group felt were "unacceptable" for family viewing. The standard deviation was 1.4 clips. Use this information to find an interval estimate (**z-interval**) with 90% confidence for the actual average amount of "unacceptable" clips per broadcast.

_____23. Paul is a waiter at an elegant restaurant in New York. He counts his tips on 7 different nights. She finds she gets an average $213.40 in tips a night, with a standard deviation of 31.73. Use this information to find an 90% confidence interval (**t-interval**) for Paul's actual nightly tips.

_____24. A survey of 1300 Americans found that 924 of them said they use their cell phone "frequently". Use this information to find a 90% confidence interval (**1-proportion z-interval**) for the actual percentage of Americans who use their cell phone frequently.

You will use the formulas $n = \left(\frac{z_c \cdot s}{E}\right)^2$ and $n = \hat{p} \cdot \hat{q} \left(\frac{z_c}{E}\right)^2$ and the table at right for the following problems.

(b) Confidence Interval
Critical Values z_c

Level of Confidence c	Critical Value z_c
0.70, or 70%	1.04
0.75, or 75%	1.15
0.80, or 80%	1.28
0.85, or 85%	1.44
0.90, or 90%	1.645
0.95, or 95%	1.96
0.98, or 98%	2.33
0.99, or 99%	2.58

_____25. The Nielsen Company estimates the percentage of Americans who watch different TV shows. Suppose a new show comes on TV, and no one has any idea how many people would want to watch it. How many people would Nielsen have to sample to be 95% confident of their results and estimate the percentage of people who would watch the show with a margin of error of 2%?

_____26. Chad wants to estimate the average points scored in NBA games. If he wants to estimate with 90% confidence and with a margin of error of 1.5 points per game, how many games should he sample? (Assume the standard deviation is 12.5 points.)

_____27. According to Nielsen, 68% of all American households own more than one television. If you wanted to estimate the percentage of people in Palo Alto County who own more than one TV, how many people would you have to sample to be 85% confident of your results, with a margin of error of 5%?

_____28. A processor of carrots has found that the weight of the boxes they pack typically has a standard deviation of 0.5 pounds. They need to sample boxes each day to make sure they are within 0.2 pounds of their ideal weight. How many will they need to sample to be 85% confident of their results?

29.   The goal of a hypothesis test is to see if results are significant. What does the word **significant** mean in statistics?

30.   Explain in words what it means to say the "**level of significance**" is 5% (or .05).

_____31.   What variable is normally used to stand for **level of significance**?

_____32.   If you were doing important scientific research, which **level of significance** would be most appropriate?

A.   .01   B.   .05   C.   .10

Sate the hypotheses you would use for these significance tests.
(You do not actually have to perform the tests.)

33. Each serving of Sugar-Os cereal is supposed to provide 1250mg of riboflavin. In a sample of 12 bowls of cereal, an average of 1107mg was found, with a standard deviation of 71mg. According to this information, does Sugar-Os have significantly less riboflavin than claimed?

H_1 = _____

_____

H_0 = _____

34. The Greater Chicagoland Convention and Visitors Bureau did a survey to find the average income of people who visited the city for various reasons. They found the average family income of people who attended sports events was $87,900 with a standard deviation of $12,970 and that the average family income of people who attended the theatre was $127,400, with a standard deviation of $28,950. Do these results indicate that people who attend sports events earn significantly less than those who go to the theatre?

H_1 = _____

_____

H_0 = _____

If you did these tests on a TI-83 or TI-85 using the p-value method, should you choose ≠ , >, or < on the line that says μ: ≠μ0   >μ0   <μ0 or μ1: ≠μ2   >μ2   <μ2 ?

_____35.   Each serving of Sugar-Os cereal is supposed to provide 1250mg of riboflavin. In a sample of 12 bowls of cereal, an average of 1107mg was found, with a standard deviation of 71mg. According to this information, does Sugar-Os have significantly less riboflavin than claimed?

If you did these tests on a TI-83 or TI-85 using the p-value method, should you choose $\neq$, >, or < on the line that says $\boxed{\mu: \neq\mu0 \quad >\mu0 \quad <\mu0}$ or $\boxed{\mu1: \neq\mu2 \quad >\mu2 \quad <\mu2}$?

_____36. The Greater Chicagoland Convention and Visitors Bureau did a survey to find the average income of people who visited the city for various reasons. They found the average family income of people who attended sports events was $87,900 with a standard deviation of $12,970 and that the average family income of people who attended the theatre was $127,400, with a standard deviation of $28,950. Do these results indicate that people who attend sports events earn significantly less than those who go to the theatre?

37. Explain how you can tell, when doing a significance test, whether the result is significant or not.

Perform the following hypothesis tests.

38. *Fortune* magazine reported that 62% of Americans own some form of stocks or other securities. For her class project, Janelle surveyed 87 people, 43 of whom said they owned stocks or other securities. Do a ***1-proportion z-test*** with α = .01 to see if the percentage who owned stocks was less than expected.

_____Compute the p-value.

YES or NO: Is the result significant?

_____What was the percentage of Janelle's sample that owned stocks?

39. Nationwide 1.7% of all adult males have served at least 60 days of more in prison. A survey of 450 adults in Texas found that 12 of them had served at least 60 days in prison. Is the percentage of Texas men who have served time significantly higher than the national average? Use the 5% level of significance. (Do a **1-proportion z-test.**)

_____Compute the p-value.

YES or NO: Is the result significant?

40. According to the U.S. Census Bureau, the average American man marries at age 28. The standard deviation for marrying age is 3.3 years. A clerk at the courthouse keeps track of the data for people applying for marriage licenses. After she issues thirty licenses, she finds that the average age of men in those couples is 26.9 years. Is this significantly younger than the national average? (Do a 1-sample ***z-test***, at the 10% level of significance.)

_____   …   What is α in this problem?

_____   …   Compute the p-value.

YES — NO   (circle one)   Is the age of marriage in this county significantly younger than the national average?

41. A study at Indiana University looked at whether toy dolls present girls with an unhealthy body image. According to medical records, the average waist size for adult women in America is 27.5 inches. The study looked at 20 toy dolls and found that if the dolls were blown up to the size of actual women they would have waists that averaged 17.0 inches, with a standard deviation of 2.9 inches. Do a 1-sample **_t-test_** at the 1% level of significance to see if the dolls really do have significantly smaller waists than real women.

```
T-Test
  Inpt:Data Stats
  μ0:
  x̄:
  Sx:
  n:
  μ:≠μ0 <μ0 >μ0
  Calculate Draw
```

Fill out the screen shot showing what you would input for a T-Test on this problem.

_____ Compute the p-value.

YES — NO (circle one)   Do dolls have significantly smaller waists than real women?

42. On *Iron Chef*, different judges rate dishes prepared by celebrity chefs. Each judge can give a total of up to 20 points. Suppose the 3 judges give an average rating of 17.3 to one chef's food, with a standard deviation of 2.6. The same 3 judges give an average rating of 17.7 to a second chef's food, with a standard deviation of 4.3. Did the judges rate the first chef significantly lower than the second? Do a **_2-sample t-test_** at the 5% level of significant.

Find the value of these variables:

$\bar{x}_1=$ _____ $Sx_1=$ _____ $n_1=$_____

$\bar{x}_2=$ _____ $Sx_1=$ _____ $n_2=$_____

_____What is the p-value?

YES or NO: Did the judges give significantly different ratings to the two chefs?

43. In a sample of 750 students at a suburban Texas high school, 548 of them (73%) said they drank alcohol "frequently". In a similar survey at a rural high school in Idaho, only 39 out of 72 students (54%) said they drank frequently.   Do a **_2-proportion z-test_** to see if the proportion of students who drink frequently is higher in Texas than in Idaho. Use $\alpha = 5\%$.

Fill out the screen shot with the appropriate information for your calculator.

_____ Computer the p-value.

YES – NO   Is the rate of percentage of high school students who drink frequently significantly higher in suburban Texas than in rural Idaho?

```
2-PropZTest
  x1:
  n1:
  x2:
  n2:
  P1:≠P2 <P2 >P2
  Calculate Draw
```

44.   *Fortune* magazine reported that 62% of Americans own some form of stocks or other securities. For her class project, Janelle surveyed 87 people, 43 of whom said they owned stocks or other securities. Do a ***1-proportion z-test*** with α = .01 to see if the percentage who owned stocks was less than expected.

_____Compute the p-value.

YES or NO: Is the result significant?

_____What was the percentage of Janelle's sample that owned stocks?

45.   Nationwide 1.7% of all adult males have served at least 60 days of more in prison. A survey of 450 adults in Texas found that 12 of them had served at least 60 days in prison. Is the percentage of Texas men who have served time significantly higher than the national average? Use the 5% level of significance. (Do a **1-proportion z-test.**)

_____Compute the p-value.

YES or NO: Is the result significant?

46.   While professional football players earn large amounts of money, their careers as pro players are quite short. *Sports Illustrated* reported in 1990 that the average career length in professional football is 4.3 years. A recent survey of 40 NFL players found that the average career was 5.2 years. The standard deviation for football careers is 2.3 years.   Do a 1-sample **z-test** to see if this is sufficient to show that the average NFL career is now longer than it was in 1990? Use the 10% level of significance.

_____Compute the p-value.

YES or NO: Is the result significant?

47.   A publisher claims their new grammar textbook is better than the competition. To test this, they did an experiment in a high school. Half of the sophomore English classes (a total of 26 students) were taught using an old grammar book, while the other half (a total of 27 students) used the new book. At the end of the year, all the students were given a standardized test on grammar. The students using the old book had an average score of 42, with a standard deviation of 7, while the students using the new book had an average score of 50, with a standard deviation of 11. Do a **2-sample t-test**, using α = .01 .

_____What is the p-value?

YES or NO: Does the new book produce significantly higher scores than the old one?