DEPARTMENT OF MATHEMATICS AND STATISTICS
Term 132

STAT 319 Statistics for Engineers and Scientists

Second Major Exam   Monday April 7, 2014

Please check/circle your instructor's name

□ Anabosi   □ Jabbar   □ Malik   □ Al-Sabah   □ Saleh

Name: _____ ID #: _____Section# _____

☺Important Note:

Show all your work including formulas, intermediate steps and final answer.

Question No	Full Marks	Marks Obtained
1	22	
2	3	
3	4	
4	6	
Total	35	

$$\bar{x} \equiv \frac{1}{n}\sum x; \quad s_{xx} \equiv \sum (x-\bar{x})^2 = \sum x^2 - \frac{1}{n}\left(\sum x\right)^2; \quad s^2 \equiv \frac{s_{xx}}{n-1}.$$

$$\bar{x} \equiv \frac{1}{n}\sum xf; \quad s_{xx} \equiv \sum x^2 f - \frac{1}{n}\left(\sum xf\right)^2; \quad s^2 \equiv \frac{s_{xx}}{n-1}.$$

$$z(x) \equiv (x-\bar{x})/s. \qquad CV \equiv s/\bar{x}. \qquad CS \equiv \frac{3(\bar{x}-\tilde{x})}{s},$$

$$\frac{\sum X - n\mu}{\sqrt{n\sigma^2}} = \frac{\bar{X}-\mu}{\sqrt{\sigma^2/n}} = Z.$$

$$\bar{x} \mp z_{\alpha/2}\left(\frac{\sigma}{\sqrt{n}}\right). \qquad n = \frac{z_{\alpha/2}^2}{e^2}\sigma^2,$$

$$\bar{x} \mp z_{\alpha/2}\left(\frac{s}{\sqrt{n}}\right). \qquad n = \frac{z_{\alpha/2}^2}{e^2}s^2,$$

$$\bar{x} \mp t_{\alpha/2}\left(\frac{s}{\sqrt{n}}\right).$$

$$\hat{p} \mp z_{\alpha/2}\sqrt{\hat{p}\hat{q}/n}. \qquad n = \frac{z_{\alpha/2}^2}{e^2}\hat{p}\hat{q} \text{ or } n = \frac{z_{\alpha/2}^2}{4e^2}$$

1) Diameters of 20 rivet heads in 1/100 of an inch are given below:

6.62	6.66	6.70	6.74	6.77
6.62	6.66	6.72	6.74	6.78
6.64	6.70	6.72	6.74	6.81
6.66	6.70	6.72	6.75	6.82

Summary: $\left(\sum x = 134.27, \ \sum x^2 = 901.49 \right)$

a) Compute the mean and standard deviation of the rivets. *(2 pts.)*

b) Do the data satisfy the 2nd condition of the Empirical Rule? Why or why not?
(3 pts.)

c) Calculate the z-score of the largest observation in the sample. *(1pt.)*

d) Draw a box plot and comment on it. *(6 pts.)*

e) Find the 90th percentile and <u>interpret it</u> in the context of the rivet head diameters.

(4 pts.)

f) Create a grouped frequency distribution for the data where the first interval is [6.60, 6.65).

(3 pts.)

g) Using the frequency distribution above, approximate the mean diameter.

(3 pts.)

2) A survey is to be conducted of the percentage of home-owners who own at least two cars. If we wish to be 99% confident that the error in estimating this quantity is less than 0.017.

a) How many home-owners do you need to survey?

(2 pts.)

b) Interpret the number found in a) in view of the unavailability of an estimate of the proportion of interest.

(1 pt.)

3) If the distribution of the weights, of all men travelling by air between city A and city B, has a mean of 81 kg and a standard deviation of 9 kg, what is the probability that the combined gross weight of 36 men travelling on a plane between these two cities is more than 3000 kg? Justify your answer. *(4 pts.)*

4) A research engineer investigating tire life for a new rubber compound built 16 tires and tested them, giving a mean of 60,139.7 km and standard deviation of 3645.94 km.
   a) Find a 95% confidence interval on the mean tire life. *(3 pts.)*

   b) Did you make any assumptions? If yes, what? *(1 pt.)*

   c) How a large a sample is needed if you require the 95% confidence interval to be half the length of the interval found in a)? *(2 pts.)*