

Math 191: Probability & Statistics Exam #3A

Week #15

Name: _____

INSTRUCTIONS: You may use a calculator for this exam and a letter-sized study sheet with information written on a single side. You must show all of your work in order to receive full credit. Read each question carefully. Be certain that you have answered the question that was asked. Answers supplied as decimals must be accurate to *at least four significant digits*. You may use Excel, but you **MUST ALSO** write each answer in the space provided in this exam.

Problem	Points	Score
1	18	
2	18	
3	18	
4	18	
5	18	
6	18	
	2	2
Total	110	

- (1) The population mean annual salary μ for plumbers is \$40,500. A random sample of 42 plumbers is drawn from this population. Assume the population's standard deviation σ is \$5,600.
- (a) What is the probability that the sample's mean \bar{X} is less than \$39,000?

(b) There is a 89% probability that the sample's mean will be **above** what value?

- (2) A manufacturer of computer terminal fuses wants to establish a control chart to monitor the production process. Each hour, for a period of 25 hours, an engineer randomly selected and tested 100 fuses from the production line. The number of defective fuses found each hour is recorded in the table.

Sample #	1	2	3	4	5	6	7	8	9	10	11	12	13
Defects	6	4	9	3	0	6	4	2	1	2	1	3	2
Sample #	14	15	16	17	18	19	20	21	22	23	24	25	
Defects	1	1	0	3	4	5	5	7	9	2	8	3	

- (a) Collect the information necessary to construct an **np-chart**: p , n , s , LCL and UCL.

- (b) Use Excel to draw an **np-chart** and determine whether the process is under control.
Hint: Don't forget to check the number of consecutive values above or below the center line.

- (3) A corporation that manufactures field rifles for the Department of Defense operates a production line that turns out finished firing pins. To monitor the process, an inspector randomly selects five firing pins from the production line, measures their lengths (in inches), and repeats this process at 30-minute intervals over a 10-hour period. The results are shown below.

1	0.96	1.01	0.96	1.01	1.04	11	1.01	0.95	0.97	1.03	1.00
2	0.95	0.94	0.98	0.97	0.92	12	1.01	1.01	0.96	1.02	1.03
3	1.04	0.97	1.04	1.01	1.02	13	1.00	0.95	0.96	1.00	0.99
4	0.98	1.03	0.98	1.00	0.97	14	1.02	0.98	1.00	1.03	1.00
5	1.05	0.96	0.95	1.01	1.01	15	0.99	1.03	1.05	1.00	1.03
6	0.95	1.04	0.99	0.99	0.95	16	0.96	1.04	0.97	0.99	1.00
7	1.05	1.04	1.03	1.05	1.06	17	1.03	1.01	0.97	1.01	1.04
8	0.99	0.96	1.03	0.96	1.03	18	1.02	1.04	1.05	1.03	0.96
9	1.00	1.01	1.00	1.04	1.04	19	0.96	0.99	0.96	1.05	1.00
10	0.96	0.97	0.96	0.99	1.02	20	0.98	1.01	0.95	1.01	1.03

- (a) Use this data to determine the sample mean \bar{X} and standard deviation s for each sample of five firing pins.
- (b) Collect the information necessary to construct an **s-chart**: \bar{s} , control chart factors, LCL and UCL.
- (c) Use Excel to draw an s-chart and determine whether the standard deviation is under control.
- (d) Collect the information necessary to construct an **\bar{X} -chart**: $\bar{\bar{X}}$, control chart factor, LCL and UCL.
- (e) Use Excel to draw an \bar{X} -chart and determine whether the mean is under control.
Hint: Don't forget to check the number of consecutive values above or below the center line.

- (4) A random sample of airfare prices (in dollars) for a one-way ticket from New York to Houston are listed below.

Stem	Leaf
28	8
29	0,2,3,3,5,6,8
30	0,2,3,4,5,5,5,5,6,6,7,7
31	3,4,4,6
32	0,0,1,1,2,2,6,7

- (a) Use the data to determine \bar{X} , S and n .

- (b) Construct a 95% confidence interval for the population mean μ . *Provide answers rounded to the nearest cent.*

- (5) A random sample of students who took the SAT test twice found that 427 out of the 3160 respondents had taken a prep course to get ready for the test. Construct a 95% confidence interval for the population proportion p of coaching among students who retake the SAT. Supply your answers as percentages rounded to the nearest hundredth of a percent.

- (6) A coffee shop claims that its fresh-brewed drinks have a mean caffeine content of 80 milligrams per 5 ounces. You work for a city health agency and are asked to test this claim. You find that a random sample of 26 five-ounce servings has a mean caffeine content of 86 milligrams and a standard deviation of 20 milligrams.

(a) Clearly state the two hypotheses H_0 and H_a .

(b) At a significance level of $\alpha = 0.05$, do you have enough evidence to reject the shop's claim? You Must Show Your Work For Credit!