Practice Test 2 Math 215 Fall 2019 Jones

Name__________________________________

You may get help from me, classmates and the Math Lab to complete this Practice Test.

1) Sometimes probabilities derived by the relative frequency method differ from the probabilities expected from classical probability methods. How does the law of large numbers apply in this situation? Look up in book.

Find the indicated probability.

2) A class consists of 69 women and 68 men. If a student is randomly selected, what is the probability that the student is a woman?

3) If you pick a card at random from a well shuffled deck, what is the probability that you get a face card or a spade?

4) A sample of 100 wood and 100 graphite tennis rackets are taken from the warehouse. If 5 wood and 10 graphite are defective and one racket is randomly selected from the sample, find the probability that the racket is wood or defective.

5) A bag contains 7 red marbles, 4 blue marbles, and 1 green marble. Find P(not blue).

Find the indicated probability.

6) A restaurant offers 9 entrees and 11 desserts. In how many ways can a person order a two-course meal?

Find the indicated probability.

7) Describe an event whose probability of occurring is 1 and explain what that probability means. Describe an event whose probability of occurring is 0 and explain what that probability means.

Provide an appropriate response.

8) A computer company employs 100 software engineers and 100 hardware engineers. The personnel manager randomly selects 20 of the software engineers and 20 of the hardware engineers and questions them about career opportunities within the company. a) What sampling technique is being used? b) Does this sampling plan result in a random sample? c) Simple random sample? d) Explain.

Find the indicated probability.

9) Among the contestants in a competition are 42 women and 28 men. If 5 winners are randomly selected, what is the probability that they are all men? a) In how many ways can 5 people be selected from this group of 70? b) In how many ways can 5 men be selected from the 28 men? c) Find the probability that the selected group that will consist of all men.

10) A batch consists of 12 defective coils and 88 good ones.
a) Find the probability of getting three defective coils when three coils are randomly selected if each selection is replaced before the next is made. Show method used to get answer.

b) If X=the number of defective coils when 3 are selected. Make a probability distribution for the number of defective coils out of 3 when the selections are done with replacement.

x	P(x)

c) Find the probability of getting at least one defective coil. You get extra credit if you can find both methods for solving this problem.

Solve the problem.

11) 8 basketball players are to be selected to play in a special game. The players will be selected from a list of 27 players. If the players are selected randomly, what is the probability that the 8 tallest players will be selected?

12) There are 9 members on a board of directors. If they must elect a chairperson, a secretary, and a treasurer, how many different slates of candidates are possible?

Solve the problem involving probabilities with independent events.

13) A single die is rolled twice. Find the probability of getting a 2 the first time and a 2 the second time.

Find the indicated probability.

14) The following table contains data from a study of two airlines which fly to Small Town, USA.

	Number of flights which were on time	Number of flights which were late
Podunk Airlines	33	6
Upstate Airlines	43	5

a) If one of the flights is randomly selected, find the probability that the flight selected arrived on time given that it was an Upstate Airlines flight.
b) If one of the flights is randomly selected, find the probability that the flight selected arrived on time and was an Upstate Airlines flight.
c) If one of the flights is randomly selected, find the probability that the flight selected arrived on time or was an Upstate Airlines flight.
d) If one flight is randomly selected find the probability that it is on time.
e) If two flights were randomly selected find the probability that both flights were on time. Calculate this probability with and without replacement.
f) Is the probability of being on time independent of the airline chosen? Explain.

Then use the Binomial Theorem to find the probability exactly.

15) An engineer thinks that she had improved the quality of the circuit boards that she is designing. The defect rate has been 14%. But in the last sample of 50 parts she found that only 4 were defective. Is this conclusive proof that she improved her design or is this sample usual to see when the defect rate is 14% and more data needed to be sure that the defect rate really has decreased. Assume that many thousands of parts are being produced.

a) What is the mean and standard deviation of the binomial distribution used for this problem.

b) How many do we expect to be defective?

c) What is the proability that we see a sample with at most 4 when the defect rate is 14%?
Use the binomial Distribution.

d) Does this sample verify her claim that the defect rate has been lowered?

Answer the question.

16) Suppose that computer literacy among people ages 40 and older is being studied and that the accompanying tables describes the probability distribution for four randomly selected people, where x is the number that are computer literate.

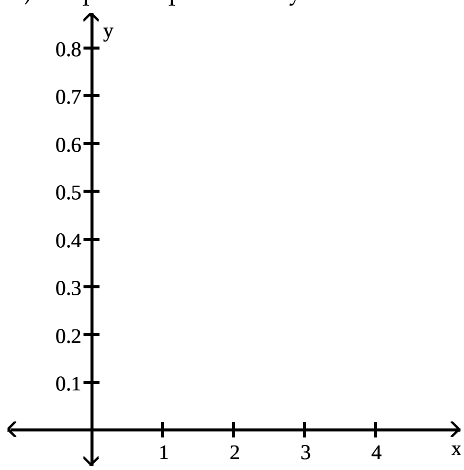
a) Is this a probability distribution________

x	P(x)
0	0.16
1	0.25
2	0.36
3	0.15
4	0.08

b) Is it unusual to find four computer literates among four randomly selected people? (WHY?)

c) What is the probability of getting 2 or fewer people out of the 4 who are computer literate?__________

d) Graph this probabillity distribution.



e) Find the mean of this probability distribution.

f) Find the Standard deviation of this distribution.

17) Suppose you buy 1 ticket for $1 out of a lottery of 1,000 tickets where the prize for the one winning ticket is to be $500. What is your expected value?

Solve the problem.

18) Suppose that replacement times for washing machines are normally distributed with a mean of 9.3 years and a standard deviation of 2 years.

a) Draw this distribution showing an axes for the age of the machine and a z –axes.

b) What proportion of washing machines last more than 10 years?

c) If a store sells 100 washers how many do they expect to last more than 5 years?

d) Find the replacement time that separates the top 18% from the bottom 82%.

e) If you sell 9 washing machines and insure them for 10 years. Wht is the probability that the mean life ot the 9 machines is more than 10 years? Find Mean and standard deviation of sampling distribution. Draw Sampling distribution.

Find the indicated probability. Show graphs with both x and z axis.

19) A bank's loan officer rates applicants for credit. The ratings are normally distributed with a mean of 200 and a standard deviation of 50.

a) If an applicant is randomly selected, find the probability of a rating that is between 200 and 275.

b) In todays market the loan officer is only giving loans to the top 30% of applicates. What rating will separate the top 30% of applicants from the bottom 70%.

Solve the problem. Graph of the distribution of sample means is required.

20) A bank's loan officer rates applicants for credit. The ratings are normally distributed with a mean of 200 and a standard deviation of 50.
If 40 different applicants are randomly selected, find the probability that their mean score is above 215.

21) The diameters of pencils produced by a certain machine are normally distributed with a mean of 0.30 inches and a standard deviation of 0.01 inches. In a random sample of 450 pencils, approximately HOW MANY would you expect to have a diameter less than 0.293 inches? (Hint: Find a proportion first.)

Provide an appropriate response.

22) Sampling without replacement involves dependent events, so this would not be considered a binomial experiment. Explain the circumstances under which sampling without replacement could be considered independent and, thus, binomial.

23) Under what conditions can we apply the results of the central limit theorem?

24) Which of the following notations represents the standard deviation of the population consisting of all sample means?

A) μ B) $\sigma_{\bar{x}}$ C) $\sqrt{npq}$ D) s

Find the indicated value.

25) $z_{0.005}$

Provide an appropriate response.

26) The typical computer random–number generator yields numbers in a uniform distribution between 0 and 1 with a mean of 0.500 and a standard deviation of 0.289. (a) Suppose a sample of size 50 is randomly generated. Find the probability that the mean is below 0.300. (b) Suppose a sample size of 15 is randomly generated. Find the probability that the mean is below 0.300. These two problems appear to be very similar. Only one can be solved by the central limit theorem. Which one and why?

27) SAT verbal scores are normally distributed with a mean of 430 and a standard deviation of 120 (based on the data from the College Board ATP). If a sample of 15 students is selected randomly, find the probability that the sample mean is above 500. Does the central limit theorem apply for this problem?

28) A poll of 1100 randomly selected students in grades 6 through 8 was conducted and found that 54% enjoy playing sports.
Is the 54% result a statistic or a parameter? Explain.
Does the 54% refer to sample mean or a sample proportion?

29) Apply the Central Limit Theorem. Samples of size $n = 800$ are randomly selected from the population of numbers (0 through 9) produced by a random–number generator.
a) If the proportion of odd numbers is found for each sample what type of distribution is the distribution of the sample proportions? What is it's mean and what is it's standard deviation?

b) If the mean of the 800 values is found for each of the samples what type of distribution is the distribution of sample mean? What is the mean and what is the standard deviation of the distribution of sample means? (please use correct notation.)

30) Tell whether the following statistic is a biased or unbiased estimator of a population parameter:
Sample proportion used to estimate a population proportion.
Sample mean used to estimate a population mean.
Sample standard deviation used to estimate a population standard deviation.
Sample varience used to estimate a population varience.

31) (21 Points) A machine in a saw mill cuts pieces of lumber to an average width of $\mu = 4$ inches with a standard deviation $\sigma = .05$ inches

a) (3 Points) Graph the distribution with both an x–axes and a z–axes. Show mean and standard deviation. Calculate the z–score of a 4.08 width for a piece of lumber and label on your graph.

b) (3 Points) What is the probability that width is at least 4.08 for a piece of lumber? Show all work. Use proper probability notation, calculator inputs and shade region with equal area on the graph above.

c) (3 Points) What width separates the widest 10% of cuts? Show on a new graph.

d) (3 Points) On a given day the inspector samples 16 boards, and finds the sample mean. Find the mean $\mu_{\bar{x}}$ and standard deviation $\sigma_{\bar{x}}$ of the population of sample means for samples of size $n = 16$.

e) (3 Points) Find the z–score of a sample mean that is at least $\bar{x} = 4.08$ inches in the distribution of sample means.

f) (6 Points) For a sample of size 16, what is the probability that the **mean** at least $\bar{x} = 4.08$ inches in the distribution of sample means? Graph the distribution of sample means when the sample size is 16 with both an $\bar{x}$–axes and a z–axes. Does the data indicate that the machine is working properly.