EEM209 Probability Theory & Statistical Analysis

Exercises for the Final Exam

Find the probability.

1) Suppose x is a random variable best described by a uniform probability distribution with c = 20 and d = 40. Find P(x > 40).

A) 0.5 B) 0.2 C) 1 D) 0

Solve the problem.

2) Suppose x is a uniform random variable with $c = 20$ and $d = 80$. Find the standard deviation of x.

A) $\sigma = 28.87$ B) $\sigma = 17.32$ C) $\sigma = 2.24$ D) $\sigma = 2.89$

3) Use the standard normal distribution to find P(z < -2.33 or z > 2.33).

A) .7888 B) .0606 C) .0198 D) .9809

4) The volume of soda a dispensing machine pours into a 12-ounce can of soda follows a normal distribution with a mean of 12.45 ounces and a standard deviation of 0.30 ounce. The company receives complaints from consumers who actually measure the amount of soda in the cans and claim that the volume is less than the advertised 12 ounces. What proportion of the soda cans contain less than the advertised 12 ounces of soda?

A) .4332 B) .9332 C) .0668 D) .5668

5) Which of the following is not a method used for determining whether data are from an approximately normal distribution?

A) Compute the intervals $\bar{x} \pm s$, $\bar{x} \pm 2s$, and $\bar{x} \pm 3s$. The percentages of measurements falling in each should be approximately 68%, 95%, and 100% respectively.

B) Construct a histogram or stem-and-leaf display. The shape of the graph or display should be uniform (evenly distributed).

C) Find the interquartile range, IQR, and standard deviation, s, for the sample. Then $\frac{IQR}{s} \approx 1.3$.

D) Construct a normal probability plot. The points should fall approximately on a straight line.

6) Which of the following describes what the property of minimum variance means?

A) The center of the sampling distribution is found at the population standard deviation.

B) The sampling distribution in question has the smallest variation of all possible unbiased sampling distributions.

C) The center of the sampling distribution is found at the population parameter that is being estimated.

D) The shape of the sampling distribution is approximately normally distributed.

7) A physical fitness association is including the mile run in its secondary-school fitness test. The time for this event for boys in secondary school is known to possess a normal distribution with a mean of 440 seconds and a standard deviation of 60 seconds. Find the probability that a randomly selected boy in secondary school can run the mile in less than 302 seconds.

A) .5107 B) .9893 C) .0107 D) .4893

8) The Central Limit Theorem is important in statistics because _____.

A) for a large n, it says the population is approximately normal

B) for a large n, it says the sampling distribution of the sample mean is approximately normal, regardless of the population

C) for any population, it says the sampling distribution of the sample mean is approximately normal, regardless of the sample size

D) for any size sample, it says the sampling distribution of the sample mean is approximately normal

9) The daily revenue at a university snack bar has been recorded for the past five years. Records indicate that the mean daily revenue is $3450 and the standard deviation is $300. The distribution is skewed to the right due to several high volume days (football game days). Suppose that 100 days are randomly selected and the average daily revenue computed. Which of the following describes the sampling distribution of the sample mean?

A) skewed to the right with a mean of $3450 and a standard deviation of $300
B) normally distributed with a mean of $3450 and a standard deviation of $30
C) normally distributed with a mean of $3450 and a standard deviation of $300
D) normally distributed with a mean of $345 and a standard deviation of $30

10) The weight of corn chips dispensed into a 16-ounce bag by the dispensing machine has been identified as possessing a normal distribution with a mean of 16.5 ounces and a standard deviation of 0.2 ounce. Suppose 100 bags of chips are randomly selected. Find the probability that the mean weight of these 100 bags exceeds 16.6 ounces.

A) .1915 B) .3085 C) .6915 D) approximately 0

11) A random sample of n = 600 measurements is drawn from a binomial population with probability of success .08. Give the mean and the standard deviation of the sampling distribution of the sample proportion, $\hat{p}$.

A) .92; .003 B) .08; .011 C) .08; .003 D) .92; .011

12) The probability distribution shown below describes a population of measurements.

x	0	2	4
p(x)	1/3	1/3	1/3

Suppose that we took repeated random samples of n = 2 observations from the population described above. Which of the following would represent the sampling distribution of the sample mean?

A)

$\bar{x}$	0	1	2	3	4
$p(\bar{x})$	2/9	2/9	1/9	2/9	2/9

B)

$\bar{x}$	0	1	2	3	4
$p(\bar{x})$	1/9	2/9	3/9	2/9	1/9

C)

$\bar{x}$	0	1	2	3	4
$p(\bar{x})$	1/5	1/5	1/5	1/5	1/5

D)

$\bar{x}$	0	2	4
$p(\bar{x})$	1/3	1/3	1/3

13) The probability distribution shown below describes a population of measurements.

x	0	2	4
p(x)	1/3	1/3	1/3

Suppose that we took repeated random samples of n = 2 observations from the population described above. Find the expected value of the sampling distribution of the sample mean.

A) 2 B) 4 C) 1 D) 3 E) 0

14) Parking at a large university can be extremely difficult at times. One particular university is trying to determine the location of a new parking garage. As part of their research, officials are interested in estimating the average parking time of students from within the various colleges on campus. Which of the following would represent the target parameter of interest?

A) p B) μ

15) What is the confidence level of the following confidence interval for μ?

$$\bar{x} \pm 1.645\left(\frac{\sigma}{\sqrt{n}}\right)$$

A) 95% B) 165% C) 90% D) 98%

16) A 90% confidence interval for the average salary of all CEOs in the electronics industry was constructed using the results of a random survey of 45 CEOs. The interval was ($146,132, $156,381). Give a practical interpretation of the interval.

A) We are 90% confident that the mean salary of the sampled CEOs falls in the interval $146,132 to $156,381.

B) We are 90% confident that the mean salary of all CEOs in the electronics industry falls in the interval $146,132 to $156,381.

C) 90% of all CEOs in the electronics industry have salaries that fall between $146,132 to $156,381.

D) 90% of the sampled CEOs have salaries that fell in the interval $146,132 to $156,381.

17) A random sample of 250 students at a university finds that these students take a mean of 15.8 credit hours per quarter with a standard deviation of 2.3 credit hours. Estimate the mean credit hours taken by a student each quarter using a 90% confidence interval. Round to the nearest thousandth.

A) $15.8 \pm .239$ B) $15.8 \pm .158$ C) $15.8 \pm .010$ D) $15.8 \pm .015$

18) The average score of all golfers for a particular course has a mean of 61 and a standard deviation of 3.5. Suppose 49 golfers played the course today. Find the probability that the average score of the 49 golfers exceeded 62.

A) .4772 B) .0228 C) .3707 D) .1293

19) A random sample of n measurements was selected from a population with unknown mean μ and known standard deviation σ. Calculate a 95% confidence interval for μ for the given situation. Round to the nearest hundredth when necessary.

$n = 125$, $\bar{x} = 91$, $\sigma = 20$

A) 91 ± 0.31 B) 91 ± 3.51 C) 91 ± 39.2 D) 91 ± 2.94

20) Let t_0 be a specific value of t. Find t_0 such that the following statement is true:

$P(t \le t_0) = .005$ where df = 20.

A) 2.861 B) -2.845 C) -2.861 D) 2.845

21) Find the value of t_0 such that the following statement is true: $P(-t_0 \le t \le t_0) = .99$ where df = 9.

A) 2.2821 B) 1.833 C) 2.262 D) 3.250

22) You are interested in purchasing a new car. One of the many points you wish to consider is the resale value of the car after 5 years. Since you are particularly interested in a certain foreign sedan, you decide to estimate the resale value of this car with a 90% confidence interval. You manage to obtain data on 17 recently resold 5-year-old foreign sedans of the same model. These 17 cars were resold at an average price of $12,580 with a standard deviation of $700. What is the 90% confidence interval for the true mean resale value of a 5- year-old car of this model?

A) $12{,}580 \pm 1.740(700/\sqrt{17})$ B) $12{,}580 \pm 1.746(700/\sqrt{16})$

C) $12{,}580 \pm 1.746(700/\sqrt{17})$ D) $12{,}580 \pm 1.645(700/\sqrt{17})$

23) What is $z_{\alpha/2}$ when $\alpha = 0.06$?

A) 1.88 B) 1.96 C) 2.33 D) 1.645

24) A random sample of 250 students at a university finds that these students take a mean of 15.4 credit hours per quarter with a standard deviation of 1.7 credit hours. The 90% confidence interval for the mean is 15.4 ± 0.177. Interpret the interval.

A) We are 90% confident that the average number of credit hours per quarter of students at the university falls in the interval 15.223 to 15.577 hours.
B) The probability that a student takes 15.223 to 15.577 credit hours in a quarter is 0.90.
C) 90% of the students take between 15.223 to 15.577 credit hours per quarter.
D) We are 90% confident that the average number of credit hours per quarter of the sampled students falls in the interval 15.223 to 15.577 hours.

25) A marketing research company is estimating which of two soft drinks college students prefer. A random sample of 148 college students produced the following confidence interval for the proportion of college students who prefer drink A: (.344, .494). Is this a large enough sample for this analysis to work?

A) Yes, since $n = 148$ (which is 30 or more).
B) Yes, since both $n\hat{p} \geq 15$ and $n\hat{q} \geq 15$.
C) No.
D) It is impossible to say with the given information.

26) A confidence interval was used to estimate the proportion of statistics students who are female. A random sample of 72 statistics students generated the following confidence interval: (.438, .642). Using the information above, what sample size would be necessary if we wanted to estimate the true proportion to within 3% using 99% reliability?

A) 1769 B) 1916 C) 1831 D) 1842

27) Let t_0 be a specific value of t. Find t_0 such that the following statement is true:

$P(t \geq t_0) = .025$ where df = 20.

A) -2.093 B) C) -2.086 D)

28) A previous random sample of 4000 U.S. citizens yielded 2250 who are in favor of gun control legislation. How many citizens would need to be sampled for a 99% confidence interval to estimate the true proportion within 3%?

A) 1814 B) 1695 C) 1842 D) 1916

29) After elections were held, it was desired to estimate the proportion of voters who regretted that they did not vote. How many voters must be sampled in order to estimate the true proportion to within 2% (e.g., $\pm$ 0.02) at the 90% confidence level? Assume that we believe this proportion lies close to 30%.

A) n = 2017
B) n = 1421
C) Cannot determine because no estimate of p or q exists in this problem.
D) n = 2401
E) n = 1692

30) We intend to estimate the average driving time of a group of commuters. From a previous study, we believe that the average time is 42 minutes with a standard deviation of 7 minutes. We want our 90 percent confidence interval to have a margin of error of no more than plus or minus 4 minutes. What is the smallest sample size that we should consider?

A) 34 B) 9 C) 3 D) 2