

Cumulative For Entire Course

1) Which of the following statements about a linear regression model is true?

I. The sum of the residuals is always zero.

II. If $r^2 = 0$, the regression line is a horizontal line.

III. No pattern in the residual plot is an indication that a nonlinear model will show a better fit to the data than a straight-line regression model.

A) I Only

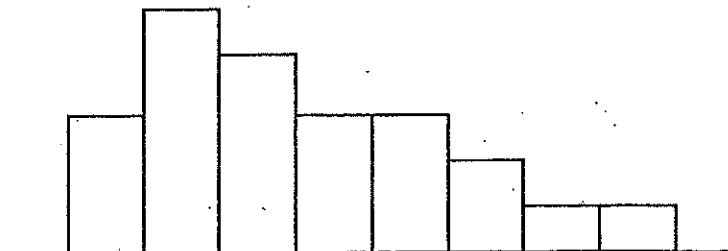
B) I and II

C) I and III

D) II and III

E) I, II, and III

2) Which of the following is most likely to be true of this distribution?



A) Mean = 3, Median = 3, Mode = 3

B) Mean = 3.5, Median = 4, Mode = 3

C) Mean = 4, Median = 3.5, Mode = 3

D) Mean = 3.5, Median = 3.5, Mode = 5

E) Mean = 3, Median = 2, Mode = 5

3) In a statistics course, a linear regression equation was computed to predict the final exam score based on the score on the first test of the term. The equation was:

$$\text{predicted final exam score} = 25 + 0.7(\text{first exam score}).$$

George scored an 80 on the first test and an 85 on the final exam. What is the value of his residual?

A) -4

B) 4

C) -5

D) 5

E) 81

4) Suppose the regression line for a set of data, $y = 3x + b$, passes through the point (2, 5).

If \bar{x} and \bar{y} are the sample means of the x and y values respectively, then $\bar{y} =$

A) \bar{x}

B) $\bar{x} - 2$

C) $\bar{x} + 5$

D) $3\bar{x}$

E) $3\bar{x} - 1$

5) An inspection procedure at a manufacturing plant involves picking three items at random and then accepting the whole lot if at least two of the three items are in perfect condition. If in reality 80% of all items are perfect, what is the probability that the lot will be accepted?

A) 0.512

B) 0.560

C) 0.640

D) 0.896

E) 0.992

6) You have sampled 25 students to find the mean SAT scores at Morris High School. A 95% confidence interval for the mean SAT score is 900 to 1100. Which of the following statements gives a valid interpretation of this interval?

- A) 95% of the 25 students have a mean score between 900 and 1100.
- B) 95% of the population of all students at Morris High School have a score between 900 and 1100.
- C) If this procedure was repeated many times, 95% of the resulting confidence intervals would contain the true mean SAT score at Morris High School.
- D) If this procedure was repeated many times, 95% of the resulting confidence intervals would be between 900 and 1100.
- E) If 100 samples were taken and a 95% confidence interval was computed, 5 of them would be in the interval from 900 to 1100.

7) Multiplying each element of the data set by an integer a will have which effect on the mean and variance?

- A) There is no change in the mean and the variance is multiplied by a .
- B) The variance is divided by \sqrt{a} and the mean is multiplied by a .
- C) The mean is multiplied by a and the variance is multiplied by a^2 .
- D) The mean is multiplied by a and the variance is multiplied by \sqrt{a} .
- E) Since mean and variance are dependent on sample size, one cannot determine the effect of multiplying by a .

8) Which of the following are true regarding the sampling distribution of \bar{x} ?

- I. The larger the sample, the smaller the spread in the sampling distribution.
- II. Sampling distributions from non-normal populations are approximately normal provided n is large.
- III. The center of the sampling distribution of \bar{x} is μ .

- A) II Only B) III Only C) I and II D) I and III E) I, II, and III

9) Given the data below, in conducting a test of association (independence) between gender and grade, what is the expected count for the number of males who earned a grade of a B?

	A	B	C	D
Male	10	32	25	6
Female	5	41	14	12

- A) 32.3 B) 35.5 C) 36.8 D) 41.0 E) Cannot be determined.

10) The level of significance is always

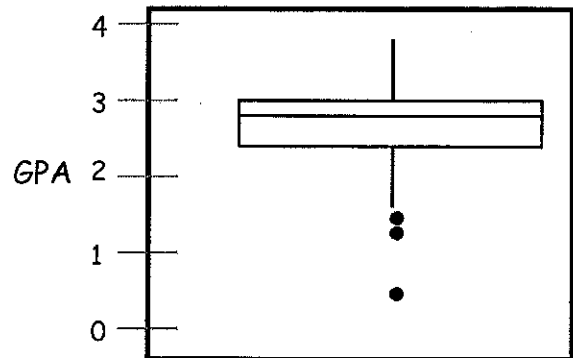
- A) the maximum allowable probability of a Type II error.
- B) the maximum allowable probability of a Type I error.
- C) the same as the confidence.
- D) the same as the p -value.
- E) $1 - P(\text{Type II Error})$

11) Which of the following are true?

- I. A simple random sample is any sampling technique where each element of the population has the same chance of being selected.
- II. A simple random sample is a sample where every set of n elements in the population has the same chance of being selected.
- III. From a population of 10, there are 90 equally likely possible samples of size 2 if we are sampling without replacement.

A) I Only B) II Only C) III Only D) I and II E) I, II, and III

12) Which statements are true about the boxplot?



- I. It is a left skewed distribution which has outliers.
- II. It is roughly symmetric with outliers.
- III. The interquartile range is less than 1.
- IV. Approximately 75% of the observations have a GPA less than 3.

A) I Only B) II Only C) II, III, and IV D) III and IV E) I, III, and IV

13) A statistics student wishes to test the strength of various brands of paper towel. He chooses 5 brands and selects 6 towels from each brand. He numbers them 1-30. He randomly selects a towel and places it in an embroidery hoop. Exactly 10ml of water and a large weight are placed in the center of the towel. The time it takes for the towel to break is recorded. In this case the explanatory variable is the

- A) amount of time it takes for the towel to break.
 - B) 10ml of water and the large weight.
 - C) brand of paper towel.
 - D) large weight.
 - E) number of paper towels used in the experiment.
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14) A researcher interested in the age at which women are having their first child surveyed a simple random sample of 250 women having at least one child and found an approximately normal distribution with a mean age of 27.3 and a standard deviation of 5.4. According to the Empirical Rule, approximately 95% of women had their first child between the ages of

- A) 11.1 and 43.5 years
 - B) 16.5 and 38.1 years
 - C) 21.9 and 32.7 years
 - D) 21.9 and 38.1 years
 - E) 25.0 and 29.6 years
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15) You want to estimate the mean SAT score for a population of students with a 90% confidence interval. Assume that the population standard deviation is $\sigma = 100$. If you want the margin of error to be approximately 10, which of the following would be the desired minimal sample size?

- A) 16
- B) 38
- C) 100
- D) 271
- E) 1476

16) The scores of a standardized test designed to measure math anxiety are normally distributed with a mean of 100 and a standard deviation of 10 for a population of first year college students. Which of the following observations would you suspect is an outlier?

- A) 90 B) 100 C) 150
D) 90, 100, and 150 are all outliers. E) None of 90, 100, and 150 are outliers.
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17) At a certain high school, all students who take AP Psychology also take AP Statistics. From past records, the probability that a student gets a 5 on the AP Psych exam is $\frac{1}{4}$. The probability that a student gets a 5 on the AP Stat exam is $\frac{1}{7}$. What is the probability that a student will get at least one 5 when taking both exams

I. If the two events are independent?

II. If the students getting a 5 on the AP Stat exam are a subset of those students getting a 5 on the AP Psych exam?

- A) $\frac{11}{28}, \frac{1}{4}$ B) $\frac{11}{28}, \frac{1}{7}$ C) $\frac{5}{14}, \frac{1}{4}$
D) $\frac{9}{28}, \frac{1}{4}$ E) $\frac{9}{28}, \frac{1}{7}$
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18) When two fair dice are rolled, what is the probability of getting a sum of 7 given that the first die rolled is an odd number?

- A) $\frac{1}{12}$ B) $\frac{1}{9}$ C) $\frac{1}{6}$
D) $\frac{1}{4}$ E) $\frac{1}{2}$
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19) Which of the following statements are true?

I. If the sample size is constant, then reducing the probability of a type I error will reduce the probability of a type II error.

II. Increased power can be achieved by reducing the probability of a type II error.

III. If the p-value of a test is 0.015, the probability that the null hypothesis is true is 0.015.

- A) I Only B) II Only C) I and III D) II and III E) I, II, and III
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20) The heights of American men aged 18 to 24 are approximately normal with a mean of 68 inches and standard deviation of 2.5 inches. About 20% of these men are taller than

- A) 66 inches B) 68 inches C) 70 inches D) 72 inches E) 74 inches

21) Which of the following will most likely approximate a uniform distribution?

- A) heights of students at a particular high school B) weights of students at a particular high school
C) SAT scores of seniors at a particular high school
D) IQ scores of students at a particular high school E) ages of students at a particular high school

22) Polly takes three standardized tests. She scores 600 on all three. Rank her performance on the three tests from best to worst if the means and standard deviations for the tests are as follows:

	Mean	Standard Deviation
Test I	500	80
Test II	470	120
Test III	560	30

- A) I, II, and III B) III, II, and I
C) I, III, and II D) III, I, and II
E) II, I, and III

23) At a certain high school a simple random sample was taken asking fifty-two 11th and 12th graders their political affiliation. The following two-way table was established. If a χ^2 test of independence were performed on these data, what would be the corresponding degrees of freedom?

	11 th	12 th
Republican	11	5
Democrat	10	15
Independent	5	6

- A) 1 B) 2 C) 3 D) 6 E) 25

24) A student is interested in the effects of different walking styles on heart rate. He decides to use 30 volunteers from high school for his experiment. All 30 participants find their at-rest pulse rates. Each participant will walk twice for 10 minutes, once using a fast pace but with no arm movement and again using a fast pace, but with an exaggerated arm movement style. The experimenter throws a coin to determine which style each participant will walk first. All participants get sufficient rest between walks to let their pulse rates return to normal. The student then compares increased pulse rate based on the walk with no arm movement to increased pulse rate based on the walk with exaggerated arm movement for each student. Which of the following statements is true?

- A) This is an observational study, and not an experiment, therefore no conclusion can be reached regarding walking style and pulse rate.
B) Observations in this study are independent.
C) Blocking is used in this study to reduce difference in increased pulse rates among individual students.
D) Because subjects were not assigned randomly to a control group or an experimental group, the design of the experiment was flawed.
E) This is an example of a completely randomized comparative experiment without blocking.

25) An airline claims that its planes are, on average, less than 8 minutes late in landing. The appropriate hypotheses for examining the claim are

- A) $H_0: \mu < 8$ B) $H_0: \mu = 8$ C) $H_0: \mu = 8$ D) $H_0: \mu = 8$ E) $H_0: \mu = 7$
 $H_A: \mu \geq 8$ $H_A: \mu \neq 8$ $H_A: \mu < 8$ $H_A: \mu > 8$ $H_A: \mu < 7$

26) A cup of coffee at a Mini Mart is usually 50 cents. The manager of the store decides to let the customer roll a die to determine the price. If the die is a 6, the customer gets the cup of coffee for free. If the die lands on 1, 2, 3, 4, or 5, the coffee is \$1. A customer buys a cup of coffee at the mart once a day for five days in a row. A statistics class wishes to know the number of cups of coffee which were free to the customer using a simulation. There were 25 students in the class and each student ran 4 simulations for a total of 100 simulations. Which frequency table below is most likely to contain the results from these 100 trials?

A	
Number of Free Cups of Coffee	Frequency
0	14
1	18
2	17
3	21
4	14
5	16

B	
Number of Free Cups of Coffee	Frequency
0	0
1	3
2	5
3	14
4	41
5	37

C	
Number of Free Cups of Coffee	Frequency
0	41
1	0
2	3
3	17
4	39
5	0

D	
Number of Free Cups of Coffee	Frequency
0	39
1	42
2	14
3	4
4	1
5	0

E	
Number of Free Cups of Coffee	Frequency
0	3
1	17
2	36
3	30
4	13
5	1

27) For the owner of the Mini Mart in question 26, assume it costs 35 cents to make one cup of coffee. Using a process of charging customers \$1 if they get a 1, 2, 3, 4, or 5 on a die and no charge if the die is a 6, what is the approximate expected profit per cup to the owner?

- A) 0.33 B) 0.48 C) 0.50 D) 0.65 E) 0.83

28) Creating a sample of students by starting with the second name in the student directory and selecting every 15th name describes

- A) random sampling B) cluster sampling C) stratified sampling
 D) systematic sampling E) convenience sampling

29) A random sample of size 16 is taken from a normal population with mean 100 and variance 4 to create a sampling distribution. What is the 90th percentile of the distribution of \bar{x} ?

- A) 97.44 B) 100.08 C) 100.32 D) 100.64 E) 102.56

30) Failing to reject a null hypothesis that is false can be characterized as

- A) a Type I Error B) a Type II Error C) both a Type I and Type II Error
 D) a standard error of the mean E) no error

31) Suppose A and B are events with the following probabilities: $P(A) = 0.62$, $P(B) = 0.44$ and $P(A \text{ and } B) = 0.31$. Which of the following conclusions can be drawn from the data?

- A) $P(A \text{ or } B) = 0.75$ B) A and B are mutually exclusive events.
C) A and B are independent events. D) $P(A|B)$ cannot be determined.
E) $P(B|A)$ cannot be determined.
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32) If a 95% confidence interval is given by (86.52, 89.48), which of the following could be a 99% confidence interval for the same data?

- I. (86.98, 89.02) A) I Only B) II Only C) III Only
II. (86.37, 89.63)
III. (87, 89) D) I and III E) II and III
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33) In each of the following, the p-value and significance level α are given for a hypothesis test. Which pair of values warrants rejection of the null hypothesis?

- A) p-value = 0.0312, $\alpha = 0.01$
B) p-value = 0.0411, $\alpha = 0.05$
C) p-value = 0.0529, $\alpha = 0.05$
D) p-value = 0.0674, $\alpha = 0.05$
E) p-value = 0.1328, $\alpha = 0.10$
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34) Which of the following are characteristics of a t-distribution curve?

- I. The graph of a t-distribution extends infinitely to the left and to the right and approaches the x-axis asymptotically as x increases in absolute value.
II. There are an infinite number of different t-curves, each determined by a value called degrees of freedom.
III. The maximum point on the graph of a t-distribution occurs at its mean which is always 0.

- A) I Only B) II Only C) III Only D) I and III E) I, II, and III
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35) A teacher raised each student's grade by 10 points on an algebra exam. Which of the following describes the correlation between students' original grades and their adjusted grades?

- A) Slightly positive B) Slightly negative C) Close to zero
D) -1 E) 1

36) A company negotiator claims that only 35% of union members will support a strike, but a union representative believes the true percentage is greater and runs a hypothesis test at the 5 percent significance level. If 57 out of an SRS of 150 union members say they are willing to strike, what is the test statistic?

A) $Z = \frac{0.38 - 0.35}{\sqrt{150(0.35)(1 - 0.35)}}$

B) $Z = \frac{0.38 - 0.35}{\sqrt{\frac{(0.38)(1 - 0.38)}{150}}}$

C) $Z = \frac{0.38 - 0.35}{\sqrt{150(0.38)(1 - 0.38)}}$

D) $Z = 1.96 \frac{0.38 - 0.35}{\sqrt{150(0.35)(1 - 0.35)}}$

E) $Z = \frac{0.38 - 0.35}{\sqrt{\frac{(0.35)(1 - 0.35)}{150}}}$

37) Two pain relief medicines are tested on random samples of post-operative patients at the 5 percent significance level as to whether or not mean durations of relief are different. The data give:

Brand	Sample Size	Mean Relief (min)	Standard Deviation (min)
A	20	131	12
B	15	140	15

What is the conclusion of this two-sample t-test?

A) P-Value < 0.05, so reject H_0

B) P-Value > 0.05, so reject H_0

C) P-Value < 0.05, so fail to reject H_0

D) P-Value > 0.05, so fail to reject H_0

E) The 5% significance level is inappropriate for medical decisions.

38) Using the same data, one student performs a test $H_0: p = 0.85$ with $H_A: p \neq 0.85$; a second student performs a test $H_0: p = 0.85$ with $H_A: p < 0.85$. Even though both use the $\alpha = 0.05$ level of significance, the first student claims there is not enough evidence to reject H_0 and the second student says there is enough evidence to reject H_0 . Assuming each student was correct, which of the following could have been the value for the test statistic?

A) $z = -2.3$ B) $z = -1.8$ C) $z = -1.3$ D) $z = 1.3$ E) $z = 1.8$

39) Which of the following is the proper use of a χ^2 test of independence?

A) To test whether the distribution of counts on a categorical variable matches a claimed distribution.

B) To test whether the distribution of counts on a numerical variable matches a claimed distribution.

C) To test whether the distribution of two different groups on the same categorical variables matches.

D) To test whether two categorical variables on the same subjects are related.

E) To test whether two numerical variables on the same subjects are related.

40) Changing from a 95% confidence interval estimate for a population proportion to a 99% confidence interval estimate, with all other things being equal,

A) Increases the interval size by 4% B) Decreases the interval size by 4%

C) Increases the interval size by 31% D) Decreases the interval size by 31%.

E) The question cannot be answered without knowing the sample size.