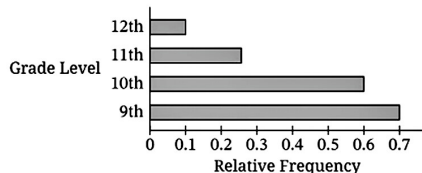


Students from a high school with a large student population were asked whether they regularly ride the bus to school. The bar chart provided shows the relative frequency of students in each grade level (9th, 10th, 11th, and 12th) who indicated that they regularly rode the bus to school.

Relative Frequency of Students Who Regularly Rode the Bus to School, by Grade Level



1

Mark for Review



Based on the bar chart, which of the following statements must be true?

- (A) Less than half of the students in the 10th grade indicated that they regularly rode the bus to school.
- (B) At least 20% of students from each grade level indicated that they regularly rode the bus to school.
- (C) The number of students from the 9th grade who indicated that they regularly rode the bus to school is greater than the number of students from the 10th grade who indicated that they regularly rode the bus to school.
- (D) The 12th graders had the least number of students who indicated that they regularly rode the bus to school.
- (E) The 9th graders had the greatest percentage of students who indicated that they regularly rode the bus to school.

A study of the effect of note-taking on student learning used two groups, each consisting of 100 biology students.

- Group 1: On day one of the study, these 100 students were given an hour-long class on how to take notes in outline form.
- Group 2: On day one of the study, these 100 students were not given any training on note-taking.

On day two of the study, both groups were placed in a classroom and were taught a lesson on biology. After the lesson, the students were given an hour to review their notes and then took an assessment on the content of the lesson. The students in Group 1 performed significantly better on the assessment than the students in Group 2 did.

2

Mark for Review

ABC

Which of the following statements about the study is true?

- (A) The explanatory variable is the performance on the assessment.
- (B) The response variable is whether training was received on taking outline notes.
- (C) The experimental unit is the assessment.
- (D) The treatment is the lesson on biology.
- (E) A confounding variable could be whether students are good at taking assessments.

From a sample of 52 people, data were collected on each person's age and film genre preference. The responses are shown in the table, classified by age-group.

Film Genre Preference by Age-Group

	13 to 25 years	26 to 49 years	50 years or older	Total
Action	7	3	3	13
Drama	3	9	8	20
Comedy	1	0	0	1
Romance	5	3	4	12
Musical	2	1	3	6
Total	18	16	18	52

3

Mark for Review

What proportion of people in the sample preferred romance?

(A)

 $\frac{5}{12}$

(B)

 $\frac{5}{18}$

(C)

 $\frac{5}{52}$

(D)

 $\frac{12}{52}$

(E)

 $\frac{40}{52}$

4

 Mark for Review

The distribution of the sale price of a certain car model is approximately normal with a mean of \$65,500 and a standard deviation of \$3,100. Based on the distribution, which of the following is an appropriate conclusion?

- (A) Approximately 95% of the cars of this model have a sale price of less than \$66,700.
- (B) Approximately 99% of the cars of this model have a sale price between \$57,500 and \$73,500.
- (C) The interquartile range of the car model's sale price is approximately \$6,200.
- (D) The maximum of the car model's sale price is \$69,800.
- (E) Approximately 84% of the cars of this model have a sale price greater than \$57,400.

A scam call is a call made to deceive the person receiving the call. A report claims that 45 percent of all calls received on mobile phones can be classified as scam calls. A mobile phone service believes that the percent of scam calls is different than the 45 percent claimed in the report. Let p represent the population proportion of mobile phone calls that can be classified as scam calls.

A random sample of calls received on mobile phone devices was selected in order to construct a 95 percent confidence interval for estimating p .

5

Mark for Review

Assuming the conditions of inference were met, at a 0.05 level of significance, which of the following would provide evidence to reject the report's claim?

- (A) The interval contains 0.45.
- (B) The interval does not contain 0.45.
- (C) The interval contains 0.
- (D) The interval does not contain 0.
- (E) The interval contains the sample proportion.

A researcher at a company with a large number of employees wanted to investigate whether a training course would improve employees' understanding of the company policies. The researcher selected a random sample of 9 employees from the company and gave each selected employee an exam prior to the training to identify their understanding of the company policies. Each selected employee was given a score on the exam from 0 (no understanding) to 100 (excellent understanding). After the employees completed the training course, they were given the same exam. The results are summarized in the table.

Results of the Exams

	Sample Size	Mean	Standard Deviation
Score before training course	9	32.2	17.6
Score after training course	9	62.1	14.6
Difference (after minus before) of score	9	29.9	15.7

6

Mark for Review

ABC

Assume the conditions for inference have been met. Which of the following is closest to the value of the test statistic of the appropriate test for investigating whether there is a mean difference in exam score (after minus before) for all employees of the company?

(A) $t = 1.90$

(B) $t = 3.92$

(C) $t = 4.95$

(D) $t = 5.71$

(E) $t = 12.76$

Franklin will conduct a simulation by using a fair twelve-sided die that is used for a certain board game. For each roll of the die, there are 12 possible outcomes—the integers 1 through 12. For each of the first three trials of the simulation, Franklin rolled the twelve-sided die and each outcome of the roll was the number 7.

7

Mark for Review

Based on the first three trials of the simulation, which of the following statements is true?

- (A) On Franklin's next roll of the die, the probability that the outcome of the roll will be the number 7 is greater than that of any of the other 11 possible outcomes.
- (B) On Franklin's next roll of the die, the probability that the outcome of the roll will be the number 7 is less than that of any of the other 11 possible outcomes.
- (C) On Franklin's next roll of the die, the probability that the outcome of the roll will be the number 7 is $\frac{1}{12}$.
- (D) On Franklin's next roll of the die, the probability that the outcome of the roll will be the number 7 is $\frac{3}{12}$.
- (E) On Franklin's next roll of the die, the probability that the outcome of the roll will be the number 7 is $\frac{7}{12}$.

The staff at a large farm collected data on the species and sex of animals that they sold last year. The data are displayed in the table.

Animals Sold Last Year

	Male	Female	Total
Horses	17	28	45
Cattle	23	54	77
Total	40	82	122

8 Mark for Review

One of the animals sold last year from the farm will be selected at random. Which of the following is closest to the probability that the animal selected is male given that the animal is a horse?

(A) 0.139

(B) 0.328

(C) 0.378

(D) 0.425

(E) 0.622

For an elementary school science project, each student in a class of 25 students planted 7 seeds of a certain flower and recorded the number of seeds that sprouted. The frequency table summarizes the recorded data.

Results of the Science Project

Number of Sprouted Seeds	Frequency
0	1
1	1
2	0
3	2
4	4
5	11
6	5
7	1

9

Mark for Review

ABC

Based on the frequency table for the class of 25 students, which of the following best describes the distribution of the number of seeds that sprouted?

- (A) The distribution is skewed to the left, and the median number of seeds that sprouted is 3.5.
- (B) The distribution is skewed to the left, and the median number of seeds that sprouted is 5.
- (C) The distribution is symmetric, and the median number of seeds that sprouted is 5.
- (D) The distribution is skewed to the right, and the median number of seeds that sprouted is 3.5.
- (E) The distribution is skewed to the right, and the median number of seeds that sprouted is 5.

A researcher uses a handheld radar device to measure the speed of cars along a certain stretch of highway and records the speed of all cars for one week. Calibration of the device reveals that the device was measuring speeds at 4 miles per hour less than the actual speed.

10

 Mark for Review

Which of the following statistics would have a different numerical value for the actual speeds than for the recorded speeds before the calibration?

- (A) The range
- (B) The median
- (C) The variance
- (D) The standard deviation
- (E) The interquartile range

A total of 18 different teams participated in a bowling tournament. Each team had the same number of team members. To investigate the satisfaction of the team members with the tournament, the tournament director conducted a survey. For each team participating in the tournament, the director randomly selected two members of the team to take the survey.

11

 Mark for Review

Which statement best describes the sampling method used by the director?

- ☐ (A) It was cluster sampling because the director used the teams as clusters.
- ☐ (B) It was convenience sampling because members of each team were easy to contact.
- ☐ (C) It was simple random sampling because each participant had the same probability of being selected.
- ☐ (D) It was stratified random sampling because the director ensured that members from each team were randomly selected.
- ☐ (E) It was systematic random sampling because exactly two members from each team were randomly selected.

A research group conducted a study to investigate whether there is an association between age-group and electronic device preference for sending e-mails. A random sample of 216 adults was selected. The table shows the results of the study.

Preferred Way to Send E-mails by Age-Group

	19 to 38 years	39 to 58 years	59 to 78 years	Total
Cell phone	47	24	18	89
Laptop	22	30	7	59
Tablet	12	34	22	68
Total	81	88	47	216

12

Mark for Review



Assume the conditions for inference have been met. If a chi-square test of independence is conducted, which of the following will be closest to the expected number of adults ages 39 to 58 years old who prefer using a tablet for sending e-mails?

(A) 1.4

(B) 24

(C) 27.7

(D) 29.3

(E) 34

13

Mark for Review



In a certain county, 84 percent of high school graduates obtained a driver's license before graduation. Which of the following samples is more likely to have more than 90 percent of high school graduates who obtained a driver's license before graduation?

- Sample A: A random sample of 200 high school graduates from the county
- Sample B: A random sample of 400 high school graduates from the county

- (A) Sample A, because there is less sampling variability in the sampling distribution for samples of size 200 than samples of size 400
- (B) Sample A, because there is more sampling variability in the sampling distribution for samples of size 200 than samples of size 400
- (C) Sample B, because there is more sampling variability in the sampling distribution for samples of size 400 than samples of size 200
- (D) Sample B, because there is less sampling variability in the sampling distribution for samples of size 400 than samples of size 200
- (E) Neither, because the mean of the sampling distribution is the same for both samples

According to a report, the mean number of rolls of toilet paper used each year by residents of a certain city is 100. To investigate this claim, researchers surveyed a random sample of residents from the city and recorded the number of rolls of toilet paper they used each year. They used the data to test the hypotheses $H_0 : \mu = 100$ versus $H_a : \mu \neq 100$, where μ is the mean number of rolls of toilet paper used each year by all residents of the city.

14

Mark for Review

The conditions for inference were met and the p -value of the test is 0.058. At the significance level of $\alpha = 0.05$, which of the following statements is true?

- (A) There is convincing statistical evidence that the mean number of rolls of toilet paper used each year by all residents of the city is 100.
- (B) There is convincing statistical evidence that the mean number of rolls of toilet paper used each year by all residents of the city is different than 100.
- (C) The researchers should reject that the mean number of rolls of toilet paper used each year by all residents of the city is 100.
- (D) There is not convincing statistical evidence that the mean number of rolls of toilet paper used each year by all residents of the city is different than 100.
- (E) The researchers failed to obtain any evidence that the mean number of rolls of toilet paper used each year by all residents of the city is different than 100.

A researcher will investigate the following question by selecting 50 people with pain in their knees.

“For people with pain in their knees, is there a difference in the mean level of pain between people who use a supplement daily and people who use a placebo pill daily?”

The researcher's assistant will randomly assign half of the participants to receive the supplement in the form of a daily pill and the other half to receive a daily placebo pill. Neither the researcher nor the participants will know which type of pill each participant will receive. At the end of one week, the participants will record their level of pain on a scale from 1 to 10, where 1 represents no pain and 10 represents extreme pain.

15

Mark for Review

Which of the following confidence intervals should the researcher use for the investigation?

- (A) A one-sample t -interval for estimating a sample mean
- (B) A one-sample t -interval for estimating a population mean
- (C) A matched-pairs t -interval for estimating a mean difference
- (D) A two-sample t -interval for estimating a difference between sample means
- (E) A two-sample t -interval for estimating a difference between population means

After reading a report that indicates that 67 percent of people in a country use a certain social media platform, David decides to investigate whether the percent is greater for people in the city where he lives. From a random sample of 500 people from the city, 72 percent indicated they use the social media platform. David then tests the following hypotheses for the proportion p of all people in the city who use the social media platform.

$$H_0 : p = 0.67$$

$$H_a : p > 0.67$$

David's one-sample z -test for a population proportion produced a test statistic of 2.38 and a p -value of 0.009.

16

Mark for Review



Which of the following statements is true?

- (A) The probability of obtaining a test statistic equal to 2.38 from a random sample of 500 people in the city is 0.009, if the actual percent is 67%.
- (B) The probability of obtaining a test statistic of 2.38 or greater from a random sample of 500 people in the city is 0.009, if the actual percent is 67%.
- (C) The probability is 0.009 that the percent of people in the city who use the social media platform is greater than 67%.
- (D) The probability is 0.009 that the percent of people in the city who use the social media platform is equal to 67%.
- (E) The probability is 0.009 that the percent of people in the city who use the social media platform is at most 67%.

A certain state has many mountains, and the heights of those mountains are approximately normally distributed with a mean of 10,500 feet and a standard deviation of 900 feet. Four of the mountains in the state are Trapper Peak, Granite Peak, Crazy Peak, and McDonald Peak. Trapper Peak has a height of 10,157 feet, Granite Peak's height has a z-score of 2.56, Crazy Peak has a height of 11,214 feet, and McDonald Peak's height has a z-score of -0.76 .

17

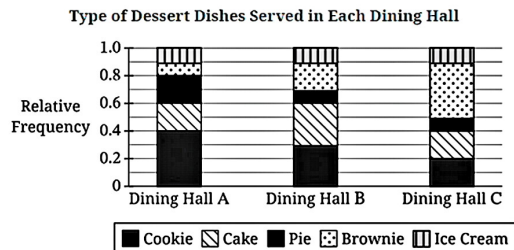
Mark for Review



Which of the following orders the mountains from the peak with the lowest height to the peak with the highest height?

- (A) Trapper Peak, McDonald Peak, Crazy Peak, Granite Peak
- (B) Granite Peak, Crazy Peak, Trapper Peak, McDonald Peak
- (C) McDonald Peak, Granite Peak, Trapper Peak, Crazy Peak
- (D) McDonald Peak, Trapper Peak, Crazy Peak, Granite Peak
- (E) Trapper Peak, McDonald Peak, Granite Peak, Crazy Peak

A certain university has three dining halls—A, B, and C—that serve a variety of dessert dishes. Steven went to each dining hall on a specific day and counted the number of dessert dishes that were being served and classified them as cookie, cake, pie, brownie, or ice cream. The graph shows the relative frequency distribution of the type of dessert dishes being served at each dining hall.



18

Mark for Review

ABC

Which of the following statements must be true?

- (A) At Dining Hall C, there were more ice cream dishes served than cookie dishes.
- (B) There were fewer cake dishes served at Dining Hall B than at Dining Hall A.
- (C) There were the same number of pie dishes served at Dining Hall B as there were at Dining Hall C.
- (D) At Dining Hall A, there were more cake dishes served than brownie dishes.
- (E) The total number of dessert dishes served at all three dining halls is the same.

A club at a high school will sell candy bars for a school fund-raiser. In past school years, the club has been able to sell thousands of candy bars. Some candy bars have tickets under the wrapper that can be redeemed for a prize, and others do not. The probability of a randomly selected candy bar containing a ticket is 0.11. Kendra will purchase and unwrap one candy bar at a time until she finds a ticket.

19

Mark for Review

ABC

Which of the following is closest to the probability that Kendra will purchase four or fewer candy bars?

(A) 0.0001

(B) 0.0012

(C) 0.0775

(D) 0.3726

(E) 0.6274

A college offers both two-year and four-year programs of study. An administrator at the college is investigating whether there is an association between the program of study and the length of the program. A random sample of students in all programs offered by the college was selected. All randomly selected students indicated their program of study and the length of the program. The results obtained are shown in the table.

Program of Study by Length of the Program

Program of Study	Two-Year	Four-Year	Total
Liberal arts	123	87	210
Business	315	145	460
Health	156	65	221
Social sciences	214	143	357
Total	808	440	1,248

The administrator wants to test the following hypotheses.

H_0 : There is no association between the program of study and length of the program.

H_a : There is an association between the program of study and length of the program.

Assuming the conditions for inference have been met, the resulting test statistic was 13.23.

20

Mark for Review

abc

At the 1 percent level of significance, which of the following is an appropriate conclusion of the test?

- (A) The null hypothesis should not be rejected, and there is convincing statistical evidence of no association between the program of study and length of the program.
- (B) The null hypothesis should not be rejected, and there is convincing statistical evidence of an association between the program of study and length of the program.
- (C) The null hypothesis should not be rejected, and there is not convincing statistical evidence of an association between the program of study and length of the program.
- (D) The null hypothesis should be rejected, and there is convincing statistical evidence of no association between the program of study and length of the program.
- (E) The null hypothesis should be rejected, and there is convincing statistical evidence of an association between the program of study and length of the program.

A wildlife scientist is investigating the percentage of baby elephants in a certain country that can stand on their hind legs to reach food. Previous wildlife studies have found that 20 percent of baby elephants from the country can stand on their hind legs. Let G represent the number of baby elephants from a random sample of 60 baby elephants in the country that can stand on their hind legs.

21

Mark for Review



Which of the following is the best interpretation of the expression $P(G = 12)$?

- (A) The expression represents the expected number of baby elephants in a random sample of 60 baby elephants in the country that can stand on their hind legs.
- (B) The expression represents the probability that 12 or fewer baby elephants from all baby elephants in the country can stand on their hind legs.
- (C) The expression represents the probability that 12 or fewer baby elephants from a random sample of 60 baby elephants in the country can stand on their hind legs.
- (D) The expression represents the probability that exactly 12 baby elephants from all baby elephants in the country can stand on their hind legs.
- (E) The expression represents the probability that exactly 12 baby elephants from a random sample of 60 baby elephants in the country can stand on their hind legs.

A health magazine indicated that a new supplement may reduce heartburn better than the current supplement. To investigate the claim, researchers obtained a random sample of 100 people who suffer from heartburn. After randomly assigning each person to one of two groups, the researchers gave one group the new supplement and the other group the current supplement. Of those who received the new supplement, 25 reported experiencing heartburn, and of those who received the current supplement, 35 reported experiencing heartburn.

22

Mark for Review

ABC

Which of the following best describes the investigation?

- (A) It was an experiment in which a treatment group was given the new supplement and a control group was given the current supplement.
- (B) It was an experiment that used a matched pairs design in which one treatment was the new supplement and the other treatment was the current supplement.
- (C) It was an observational study in which the current supplement was used as a placebo to determine the effect of the new supplement at reducing heartburn.
- (D) It was an observational study in which the people were observed receiving the current supplement or the new supplement.
- (E) It was a census in which all 100 people participated and the number of those who experienced heartburn was recorded.

A candidate running for mayor of a city claims that more than 60 percent of the registered voters of the city favor building a new park. From a survey of 500 registered voters, a newspaper reporter found that 316 favored building a new park.

23

Mark for Review

Which of the following is most appropriate for testing the claim of the candidate running for mayor?

- (A) A one-sample z -test for a sample proportion
- (B) A one-sample z -test for a population proportion
- (C) A one-sample t -test for a population proportion
- (D) A one-sample t -test for a population mean
- (E) A chi-square test for independence

A simple random sample of 50 gymnasts of a similar skill level were asked to participate in a study that would take place during a regional gymnastics clinic. Gymnasts often use chalk to reduce moisture on their hands when gripping gymnastics equipment. At the clinic, the gymnasts were allowed to pick one of two types of chalk to use: 27 gymnasts chose to use chalk A, while the remaining 23 gymnasts chose to use chalk B. At the completion of the clinic, gymnasts rated the quality of the chalk they chose from 1 to 10, with 10 being the highest quality. The results of those ratings suggested that gymnasts rated chalk B as better to use than chalk A for gripping gymnastics equipment.

24

Mark for Review

Which of the following is absent from the experiment and must be included in order to have a well-designed experiment?

- (A) A matched pairs design
- (B) Comparisons of at least two treatment groups
- (C) Random assignment of treatments to experimental units
- (D) Replication within each treatment group
- (E) The same number of experimental units in each treatment group

The back-to-back stemplot shows the list prices for a random sample of 26 new math textbooks and another random sample of 26 new science textbooks at a major university.

List Prices Based on Type of Book

Math Textbook Prices		Science Textbook Prices
4 3 2	0	3 3 4
9 9	0	5 5 5 7 7 8 9
3 3 3 3 3 3 3 1 1 0	1	0 3 3 4 4
7 7 7 5 5 5 5 5	1	5 7 7 8 9 9 9
8 4	2	0 0 4

Key: 1 | 3 = \$130

25

Mark for Review

Based on the back-to-back stemplot, which of the following statements about the textbook prices must be true?

- (A) Both math and science textbooks have the same minimum price.
- (B) Both math and science textbooks have the same maximum price.
- (C) The median of the price of math textbooks is less than that of science textbooks.
- (D) The interquartile range of the price of math textbooks is less than that of science textbooks.
- (E) The range of the price of math textbooks is less than that of science textbooks.



A researcher selected a random sample of individuals with a certain disease to estimate the proportion of all individuals with the disease who have a certain gene mutation. Data from the random sample were used to construct a 95 percent confidence interval for the proportion of all individuals with the disease who have the gene mutation. The 95 percent confidence interval was $(0.12, 0.36)$.

26

Mark for Review



Which of the following could have been a 90 percent confidence interval based on the same sample data?

(A) $(-0.02, 0.24)$

(B) $(0.08, 0.40)$

(C) $(0.14, 0.34)$

(D) $(0.16, 0.40)$

(E) $(0.20, 0.36)$

According to a certain pet association, 67 percent of households own a pet. Jameel, a student in a statistics class, wants to investigate whether a greater percentage of households with students from his school own a pet. Jameel will conduct a study by surveying a simple random sample of households with students from his school. Let p represent the proportion of all households with students from Jameel's school who own a pet.

27

 Mark for Review

Which of the following is an appropriate alternative hypothesis for Jameel's investigation?

(A) $H_a : p > 0.67$

(B) $H_a : p = 0.67$

(C) $H_a : p < 0.67$

(D) $H_a : \hat{p} > 0.67$

(E) $H_a : \hat{p} = 0.67$

A large movie theater franchise rewards Movie Club members who attend a show during the month of their birthday with a discount on items purchased from the theater's snack bar. Assume that 52.5 percent of all Movie Club members will use the birthday reward.

Suppose a manager at the franchise will survey a random sample of 40 Movie Club members who are celebrating a birthday next month. The manager will ask each member whether they will take advantage of the birthday reward. Let $\hat{p}$ be the proportion of members in the sample who say they will take advantage of the birthday reward during the month of their birthday. The franchise wants to verify the normality of the sampling distribution of $\hat{p}$.

28

Mark for Review



Which of the following statements provides the most appropriate justification for the approximate normality of the sampling distribution of $\hat{p}$?

- (A) The sample size of 40 Movie Club members is less than $\frac{1}{10}$ of the assumed minimum population size of more than 400 Movie Club members.
- (B) The sample size of Movie Club members is greater than 30, so the central limit theorem applies.
- (C) The Movie Club members who participated in the survey were chosen from a random sample.
- (D) In the random sample of 40 Movie Club members, 21 are expected to use the birthday reward and 19 are expected to not use the birthday reward. Both expected counts are greater than 10.
- (E) The parameter 52.5% is close to 50%, resulting in a near-symmetric sampling distribution.

The delivery times for a local food-delivery service are approximately normally distributed with a mean of 50 minutes and a standard deviation of 10 minutes. Any customer who must wait more than 60 minutes for their delivery will receive a coupon for 50 percent off their next order.

29

 Mark for Review

If 30 customers are randomly selected from all customers who purchased food from the delivery service, then the probability that at least 2 of the customers will have to wait more than 60 minutes and receive a coupon is closest to which of the following?

(A) $\binom{30}{2}(0.16)^2(0.84)^{28}$

(B) $1 - \left[\binom{30}{0}(0.84)^0(0.16)^{30} + \binom{30}{1}(0.84)^1(0.16)^{29} \right]$

(C) $1 - \left[\binom{30}{0}(0.84)^0(0.16)^{30} + \binom{30}{1}(0.84)^1(0.16)^{29} + \binom{30}{2}(0.84)^2(0.16)^{28} \right]$

(D) $1 - \left[\binom{30}{0}(0.16)^0(0.84)^{30} + \binom{30}{1}(0.16)^1(0.84)^{29} \right]$

(E) $1 - \left[\binom{30}{0}(0.16)^0(0.84)^{30} + \binom{30}{1}(0.16)^1(0.84)^{29} + \binom{30}{2}(0.16)^2(0.84)^{28} \right]$

A study about robins, a type of bird, was conducted to compare the mean number of eggs laid by robins in metal nest boxes to the mean number of eggs laid by robins in wood nest boxes. The results of the study are summarized in the table.

Summary Statistics for Each Type of Nest

	Metal Nest Boxes	Wood Nest Boxes
Sample Size	60	45
Mean Number of Eggs	4.96	4.61
Standard Deviation of Number of Eggs	1.01	0.89

Let μ_M represent the mean number of eggs laid by robins in metal nest boxes for robins similar to those in the study. Let μ_W represent the mean number of eggs laid by robins in wood nest boxes for robins similar to those in the study. A two-sample t -test for a difference of population means was conducted for the hypotheses $H_0 : \mu_M = \mu_W$ versus $H_a : \mu_M \neq \mu_W$.

30

 Mark for Review

Assume the conditions for inference have been met. At the 10 percent level of significance, which of the following can be concluded?

- (A) The p -value is less than 0.10, and H_0 should be rejected.
- (B) The p -value is less than 0.10, and H_0 should not be rejected.
- (C) The p -value is greater than 0.10, and H_0 should be rejected.
- (D) The p -value is greater than 0.10, and H_0 should not be rejected.
- (E) The p -value cannot be determined from the given information.

According to a report, 44 percent of adults indicate that they wash their bedsheets at least once per week. A random sample of 1,000 adults will be selected.

31

Mark for Review



Assuming the report is correct, what is the probability that at least 650 adults from the sample will indicate that they wash their bedsheets at least once per week?

(A) $P\left(z > \frac{0.65 - 0.44}{\sqrt{\frac{0.44(1 - 0.44)}{1,000}}}\right)$

(B) $P\left(z > \frac{0.65 - 0.44}{\sqrt{\frac{0.65(1 - 0.65)}{1,000}}}\right)$

(C) $P\left(z > \frac{650 - 440}{\sqrt{\frac{650(1 - 650)}{1,000}}}\right)$

(D) $1 - P\left(z > \frac{0.65 - 0.44}{\sqrt{\frac{0.44(1 - 0.44)}{1,000}}}\right)$

(E) $1 - P\left(z > \frac{0.65 - 0.44}{\sqrt{\frac{0.65(1 - 0.65)}{1,000}}}\right)$

A local park has a trail where hawks, large predatory birds, are regularly spotted. Let random variable X represent the number of hawks spotted in a randomly selected day from the trail. The probability distribution for X , based on data collected over several years, is shown in the table.

Probability Distribution of the Number of
Hawks Spotted in a Day

x	0	1	2	3	4	5
$P(X = x)$	$\frac{1}{20}$	$\frac{12}{20}$	$\frac{4}{20}$	$\frac{1}{20}$	$\frac{1}{20}$	$\frac{1}{20}$

Based on this probability distribution, the expected number of hawks spotted in a day from the trail is 1.6 hawks.

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Mark for Review

ABC

Which of the following is closest to the standard deviation for the number of hawks spotted in a day from the trail?

(A) $\sigma_X = 0.20$

(B) $\sigma_X = 1.08$

(C) $\sigma_X = 1.16$

(D) $\sigma_X = 1.34$

(E) $\sigma_X = 1.70$

A veterinary student is conducting an experiment to see whether using a certain medication can reduce symptoms of arthritis in rabbits. Arthritis is a condition that makes it difficult for rabbits to use one or more of their limbs. The severity of the arthritis will be based on an evaluation of each rabbit by a veterinarian who does not know whether the rabbits received medicine. Twenty rabbits of different sizes, each with arthritis in one or more limbs, will be randomly assigned to receive medicine or no medicine. The veterinary student believes larger rabbits may respond better to the medicine than smaller rabbits will.

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Mark for Review



Of the following, which experimental design would be best for the veterinary student to use?

- (A) A matched pairs design using randomly paired rabbits
- (B) A matched pairs design pairing rabbits of similar size
- (C) A design in which the ten largest rabbits are assigned to receive the medicine and the remaining rabbits are assigned to not receive the medicine
- (D) A design in which the five largest rabbits and the five smallest rabbits are assigned to receive the medicine and the remaining rabbits are assigned to not receive the medicine
- (E) A completely randomized design in which ten rabbits are randomly assigned for each treatment

A film student was interested in whether there was a difference in the mean file sizes of all movie downloads from a popular streaming service for two genres—comedy and drama. The film student selected a random sample of comedy movies and a random sample of drama movies from the streaming service. The summary statistics are shown in the table.

	Number in Sample	Mean (in megabytes)	Standard Deviation (in megabytes)
Comedy	32	468	113
Drama	41	508	141

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Mark for Review

In a 95 percent confidence interval, which of the following is the standard error of the difference of the two sample means between all comedy movie downloads and all drama movie downloads from the streaming service?

(A) $\sqrt{\frac{113^2}{32} + \frac{141^2}{41}}$

(B) $\sqrt{\frac{113^2}{32} - \frac{141^2}{41}}$

(C) $\sqrt{\frac{113^2 + 141^2}{32 + 41}}$

(D) $\sqrt{\frac{113^2 - 141^2}{32 + 41}}$

(E) $\frac{113}{\sqrt{32}} + \frac{141}{\sqrt{41}}$

In a certain restaurant, 70 percent of the customers order a drink other than water and 44 percent of the customers order dessert. Of the customers who order a drink other than water, 58 percent order dessert.

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Mark for Review

If one customer from the restaurant is selected at random, which of the following is closest to the probability that the customer ordered a drink other than water and did not order dessert?

(A) 0.034

(B) 0.266

(C) 0.294

(D) 0.406

(E) 0.560

Ashton will construct a 95 percent confidence interval to estimate the proportion of all drivers in his community who would indicate that they find it unacceptable that other drivers talk on a phone at any time while driving.

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Mark for Review



Of the following, which is the least number of drivers in the community who should be surveyed such that the margin of error of the 95 percent confidence interval will be no greater than 5 percentage points?

(A) 30

(B) 300

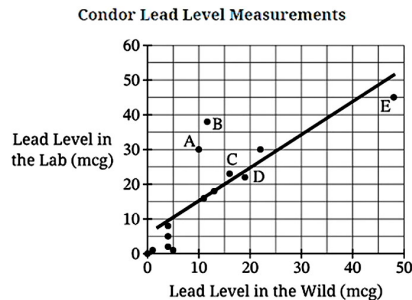
(C) 400

(D) 500

(E) 600

The California condor is an endangered bird species. One reason the species is endangered is because of lead poisoning. It is costly and time-consuming to use lab testing to measure lead levels of condors. However, lab testing is not necessary if testing for lead in the wild is accurate. A biologist is interested in investigating the accuracy of lead level measurements taken in the wild. The biologist measured the lead level, in micrograms (mcg), for 14 California condors both in the wild and in the lab.

The scatterplot and least-squares regression line for predicting the lead level in the lab based on the lead level in the wild are shown. Five points are labeled.



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Mark for Review



Which of the labeled points has a predicted lead level in the lab that is between 20 mcg and 40 mcg and has a positive residual?

(A) A

(B) B

(C) C

(D) D

(E) E

An Internet service provider wants to know whether its customers would upgrade to a new Internet service. The Internet service provider collected data from a random sample of its customers. The customers in the sample indicated whether they were interested in the upgrade. Based on the sample data, a hypothesis test found convincing statistical evidence at the 5 percent level of significance that the proportion of customers who would upgrade to the new Internet service is less than 0.40.

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Mark for Review

Which of the following must be true for an inference procedure that uses the same sample data?

- (A) A two-sided hypothesis test conducted at the 5% level of significance would find convincing statistical evidence that the proportion of customers who would upgrade to the new Internet service is different than 0.40.
- (B) A one-sided hypothesis test conducted at the 10% level of significance would find convincing statistical evidence that the proportion of customers who would upgrade to the new Internet service is less than 0.40.
- (C) A one-sided hypothesis test conducted at the 1% level of significance would find convincing statistical evidence that the proportion of customers who would upgrade to the new Internet service is less than 0.40.
- (D) A 95% confidence interval for the proportion of customers who would upgrade to the new Internet service would include 0.40.
- (E) A 90% confidence interval for the proportion of customers who would upgrade to the new Internet service would include 0.40.

The weights of 100 cats at a veterinary clinic were recorded. Summary statistics for the weights of the 100 cats, in pounds, are shown in the table.

Summary Statistics for Weights of the Cats (in pounds)

Mean	Median	StDev	Min	Max	Q1	Q3
8.54	8.53	1.49	6.06	10.96	7.10	9.75

The weights of the 100 cats were converted from pounds to kilograms, and 1 pound is approximately equal to 0.45 kilogram.

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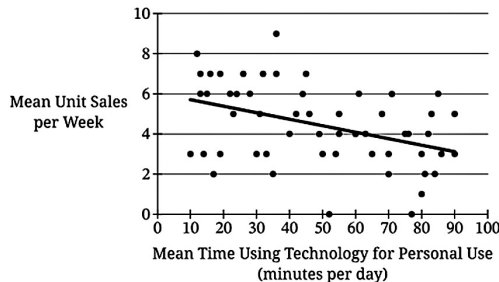
Mark for Review

Which of the following statistics would not have a different numerical value for the weights in kilograms?

- ☐ (A) The mean
- ☐ (B) The median
- ☐ (C) The standard deviation
- ☐ (D) The interquartile range
- ☐ (E) The standardized score (z-score) for a cat at the veterinary clinic

An owner of a large number of car dealerships is concerned that salespeople's time using technology (cell phones and computers) for personal use during work hours is negatively affecting car sales. The owner collected data for 54 randomly selected salespeople. The scatterplot for the linear regression analysis predicting mean unit sales per week from mean time using technology for personal use during work hours, in minutes per day, is shown.

Scatterplot of Data Collected for Each Salesperson



Assuming the conditions for inference have been met, a 95 percent confidence interval for the slope of the population regression line was found to be $(-0.0525, -0.0124)$.

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Mark for Review

ABC

Which of the following conclusions is supported by the interval?

- (A) The mean unit sales per week for all salespeople at the car dealerships is between 0.0124 and 0.0525.
- (B) Because the interval does not contain 0, there is not convincing statistical evidence of a linear relationship between mean time using technology for personal use and mean unit sales per week for all salespeople at the dealerships.
- (C) Because the interval does not contain 0, there is convincing statistical evidence that there is no linear relationship between mean time using technology for personal use and mean unit sales per week for all salespeople at the dealerships.
- (D) Because the interval does not contain -1 , there is convincing statistical evidence that there is no linear relationship between mean time using technology for personal use and mean unit sales per week for all salespeople at the dealerships.
- (E) Because the values in the interval are negative, there is convincing statistical evidence of a decrease, on average, in mean unit sales per week for each 1-minute increase in mean time using technology for personal use for all salespeople at the dealerships.