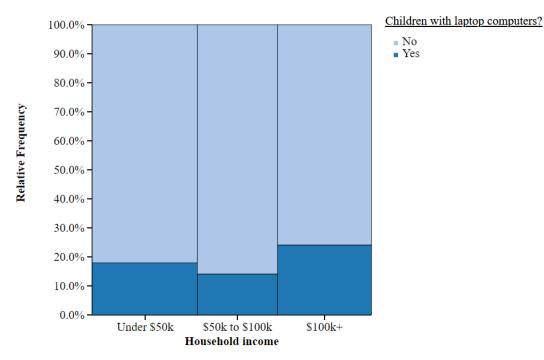10. One way to measure the width of a piece of paper is with a ruler. The distribution of measurement error (measured width – actual width) using this method is approximately normal with mean 0 millimeters and standard deviation 1.2 millimeters. About what proportion of all measurements of this piece of paper are within 0.3 millimeters of the actual width?

   (A) 0.0987
   (B) 0.1974
   (C) 0.2500
   (D) 0.7500
   (E) 0.8026

11. To study the effect of temperature on the tendency for vehicle tires to puncture, 1000 drivers in a large city were recruited and provided with two types of tires for their vehicles. For the three winter months during the year-long study, the drivers used Brand A winter tires on their vehicles. For the other nine months, the drivers used Brand B all-season tires on their vehicles. At the end of the year, the proportion of Brand A tires that punctured was compared to the proportion of Brand B tires that punctured. Is this a good experimental design?

   (A) No, because more than two tire brands should be used
   (B) No, because there might not be enough tires that puncture during the experiment
   (C) No, because of the presence of confounding
   (D) No, because proportions are not appropriate statistics to compare
   (E) Yes

12. A member of the campaign of a candidate for Governor in Tennessee regularly conducts polls leading up to the election to estimate the proportion of people in the state who are planning to vote for this candidate. What would be the main purpose of greatly increasing the sample size in the final poll before the election?

   (A) Decrease the variability in the population of all people in the state
   (B) Decrease the variability of the sampling distribution of the sample proportion
   (C) Reduce undercoverage bias
   (D) Reduce nonresponse bias
   (E) Reduce the effects of confounding variables

13. In a general interest survey, 1162 U.S. parents of adolescent children were asked to report household income and whether their children had their own laptop computers. The results are summarized in the graph below.
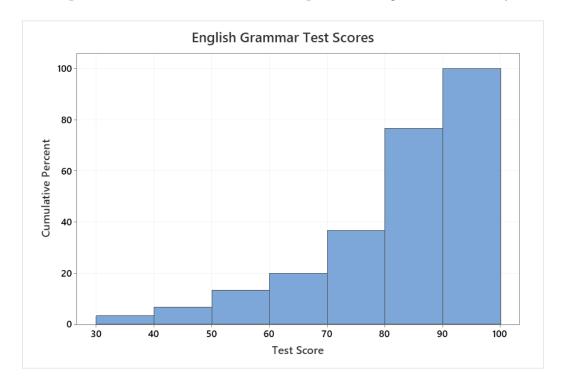


Which of the following statements is supported by the graph?

(A) The distribution of household income and adolescent laptop ownership is skewed to the left.

(B) There is not an association between household income and adolescent laptop ownership.

(C) The average household income of the respondents is between $50k and $100k.

(D) The household income category with the fewest respondents was in the income category $50k to $100k.

(E) The relationship between adolescent laptop ownership and household income is bimodal.

24. The distribution of English grammar test scores earned by 30 high school students is displayed in the cumulative relative frequency histogram below. The height of each bar represents the cumulative percent of test scores less than or equal to the rightmost boundary of that bar.



English Grammar Test Scores

Which of the following statements about the graph is <u>false</u>?

(A) The median test score is greater than 70.
(B) None of the students scored less than 30 on the grammar test.
(C) There is greater variability in the highest 15 test scores than in the lowest 15 test scores.
(D) If the passing score is 70, the majority of the students passed the grammar test.
(E) The mean test score is less than the median test score.

32. Apples, oranges, and pears are sourced by a company that assembles gift baskets for its customers. The weights of the pieces of fruit in individual gift baskets can be considered independent. The distributions of weight for each of the fruits have means and standard deviations as shown in the table below.

| Fruit | Mean | Standard Deviation |
|-------|------|--------------------|
| Apple | 195 grams | 18 grams |
| Orange | 130 grams | 12 grams |
| Pear | 180 grams | 15 grams |

Let $T$ = the total weight of fruit in a randomly selected gift basket with 4 apples, 3 oranges, and 2 pears. Which of the following is closest to the standard deviation of $T$?

(A) 15 grams

(B) 26.3 grams

(C) 45 grams

(D) 46.7 grams

(E) 138 grams

**Use the following information to answer questions 33 and 34.**

Data from a large orthopedic clinic were gathered on a random sample of ten professional athletes who recently recovered from minor arthroscopic knee surgery. For each patient in the sample, recovery time after surgery (in days) and age (in years) were recorded. Computer output for the least-squares regression model for predicting recovery time from age is given below. Assume all conditions for inference were met.

| Term | Coef | SE Coef |
|------|------|---------|
| Constant | -23.9 | 15.5 |
| Age (years) | 1.696 | 0.509 |

| S | R-sq | R-sq(adj) |
|---|------|-----------|
| 4.38798 | 58.15% | 52.92% |

37. When you toss a standard four-sided die, the result of your roll (1, 2, 3, or 4) is the number facing downward. Suppose you toss two fair four-sided dice and calculate $\overline{X}$ = the average of the two numbers facing downwards. Which of the following is the sampling distribution of $\overline{X}$?

(A)

| $\overline{X}$ | 1 | 1.5 | 2 | 2.5 | 3 | 3.5 | 4 |
|---|---|---|---|---|---|---|---|
| Probability | 0.05 | 0.10 | 0.20 | 0.30 | 0.20 | 0.10 | 0.05 |

(B)

| $\overline{X}$ | 1 | 1.5 | 2 | 2.5 | 3 | 3.5 | 4 |
|---|---|---|---|---|---|---|---|
| Probability | 1/16 | 1/8 | 3/16 | 1/4 | 3/16 | 1/8 | 1/16 |

(C)

| $\overline{X}$ | 1 | 1.5 | 2 | 2.5 | 3 | 3.5 | 4 |
|---|---|---|---|---|---|---|---|
| Probability | 1/7 | 1/7 | 1/7 | 1/7 | 1/7 | 1/7 | 1/7 |

(D)

| $\overline{X}$ | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
|---|---|---|---|---|---|---|---|
| Probability | 1/7 | 1/7 | 1/7 | 1/7 | 1/7 | 1/7 | 1/7 |

(E)  It cannot be determined from the information given.

38. In August 2006, Pluto was declassified as a planet since it had not cleared its neighboring regions of other objects by either merging with them or slinging them away. In an astronomy lab, students used data from the eight remaining planets in our solar system to create a model to predict $y$ = the period of revolution around the sun (in Earth years) from $x$ = the distance from the sun (in astronomical units). An astronomical unit is the average distance from the center of the earth to the center of the sun. The resulting model was $\hat{y} = x^{1.5}$, and a residual plot showed a random scatter. Which of the following relationships, represented in a scatterplot, would be linear?

(A) $\ln(y)$ and $\ln(x)$
(B) $\ln(y)$ and $x$
(C) $y$ and $\ln(x)$
(D) $y$ and $x$
(E)  None of these relationships would be linear