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Written by Jaehoon Song (Lecturer)

1. **Median Calculation** (10 points)
   What is the median of the seven data values shown?

$$2, 2, 2, 3, 4, 4, 11$$
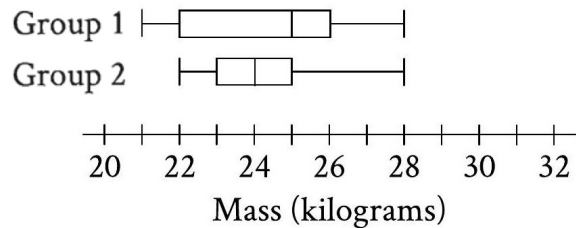
   (A) 2

   (B) 3

   (C) 4

   (D) 9

   Answer:

   ☐

2. **Box Plot Analysis** (10 points)
   The box plots summarize the masses, in kilograms, of two groups of gazelles. Based on the box plots, which

   of the following statements must be true?

   (A) The mean mass of group 1 is greater than the mean mass of group 2.

   (B) The mean mass of group 1 is less than the mean mass of group 2.

   (C) The median mass of group 1 is greater than the median mass of group 2.

   (D) The median mass of group 1 is less than the median mass of group 2.

   Answer:

   ☐

3. **Frequency Table Analysis** (10 points)

    Ages of 20 Students Enrolled in a College Class The table above shows the distribution of ages of the 20

Ages of 20 Students Enrolled in a College Class

Age	Frequency
18	6
19	5
20	4
21	2
22	1
23	1
30	1

students enrolled in a college class. Which of the following gives the correct order of the mean, median, and mode of the ages?

(A) mode < median < mean

(B) mode < mean < median

(C) median < mode < mean

(D) mean < mode < median

Answer:

☐

4. **Frequency Table Construction** (10 points)

    Which frequency table correctly represents the data listed?

$$4, 4, 4, 4, 8, 8, 8, 13, 13$$

(A)

Number	Frequency
4	4
8	3
13	2

(B)

Number	Frequency
4	4
3	8
2	13

(C)

Number	Frequency
4	16
8	24
13	26

(D)

Number	Frequency
16	4
24	8
26	13

Answer:

☐

5. **Maximum Data Value** (10 points)

The frequency table summarizes the 57 data values in a data set. What is the maximum data value in the

Frequency Table

Data value	Frequency
6	3
7	3
8	8
9	8
10	9
11	11
12	9
13	0
14	6

data set?

Answer:

☐

6. **Mean Equality** (10 points)

Data set A and data set B each contain 5 numbers.

$$\text{Data set A: } 72, 73, 73, 76, 76$$

$$\text{Data set B: } 61, 64, 74, 85, x$$

If the mean of data set A is equal to the mean of data set B, what is the value of x?

(A) 77

(B) 85

(C) 86

(D) 95

Answer:

☐

7. **Statistical Calculations** (10 points)

For a school fund-raiser, 10 students sold a total of 90 boxes of cookies. Which of the following can be calculated from this information?

(A) The average number of boxes sold per student

(B) The median number of boxes sold per student

(C) The greatest number of boxes sold by one student

(D) The least number of boxes sold by one student

Answer:

☐

8. **Standard Deviation Comparison** (10 points)
   The results of two independent surveys are shown in the table below. Which statement is true based on the

Men's Height Survey Results

Group	Sample Size	Mean (cm)	Std. Dev. (cm)
A	2,500	186	12.5
B	2,500	186	19.1

   table?

   (A) The Group A data set was identical to the Group B data set.
   (B) Group B contained the tallest participant.
   (C) The heights of the men in Group B had a larger spread than the heights of the men in Group A.
   (D) The median height of Group B is larger than the median height of Group A.

   Answer:

☐

9. **Mean and Median Equality** (10 points)
   The mean and the median of the five numbers above are equal.

   $$15, 14, 18, 17, x$$

   Which of the following is NOT a possible value of x?

   (A) 6
   (B) 11
   (C) 16
   (D) 21

   Answer:

☐

10. **Missing Data Value** (10 points)
    Data set A consists of 10 positive integers less than 60. The list shown gives 9 of the integers from data set A.

    $$43, 45, 44, 43, 38, 39, 40, 46, 40$$

    The mean of these 9 integers is 42. If the mean of data set A is an integer that is greater than 42, what is the value of the largest integer from data set A?

    Answer:

☐

11. **Scatterplot Analysis** (10 points)
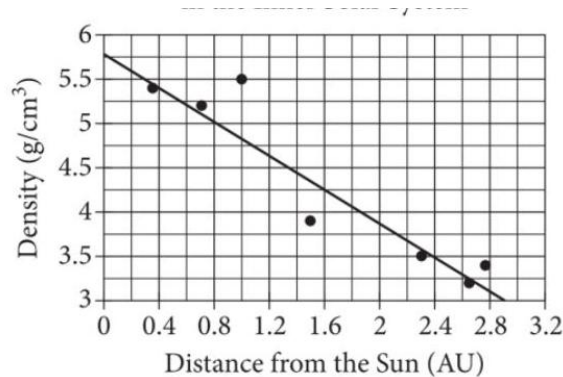   Distance and Density of Planetoids in the Inner Solar System

Figure 1: reference attached

The scatterplot above shows the densities of 7 planetoids, in grams per cubic centimeter, with respect to their average distances from the Sun in astronomical units (AU). The line of best fit is also shown. An astronomer has discovered a new planetoid about 1.2 AU from the Sun. According to the line of best fit, which of the following best approximates the density of the planetoid, in grams per cubic centimeter?

(A) 3.6

(B) 4.1

(C) 4.6

(D) 5.5

Answer:

☐

12. **Investment Growth Model** (10 points)
    Each year, the value of an investment increases by 0.49% of its value the previous year. Which of the following functions best models how the value of the investment changes over time?

(A) Decreasing exponential

(B) Decreasing linear

(C) Increasing exponential

(D) Increasing linear

Answer:

☐

13. **Line of Best Fit Slope** (10 points)

The scatterplot shows the relationship between x and y. A line of best fit is also shown.

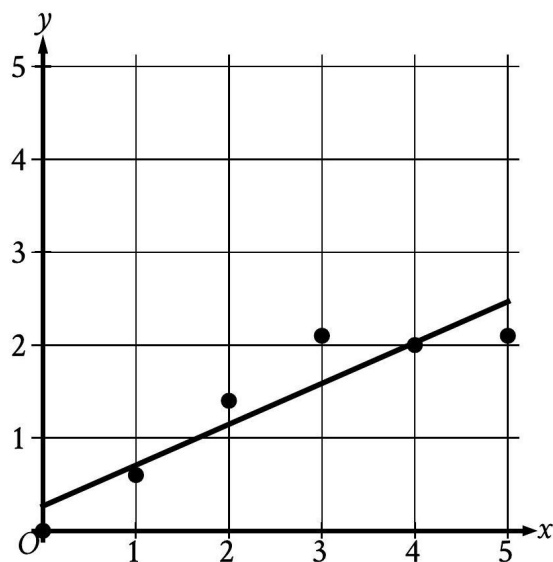Figure 2: reference attached

Which of the following is closest to the slope of the line of best fit shown?

(A) -2.27

(B) -0.44

(C) 0.44

(D) 2.27

Answer:

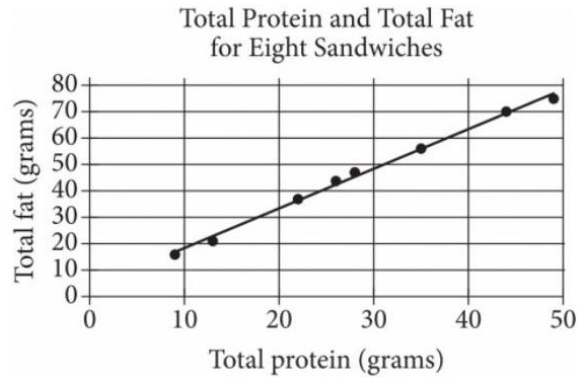14. **Protein and Fat Correlation** (10 points)

Figure 3: reference attached

The scatterplot above shows the numbers of grams of both total protein and total fat for eight sandwiches on a restaurant menu. The line of best fit for the data is also shown. According to the line of best fit, which of the following is closest to the predicted increase in total fat, in grams, for every increase of 1 gram in total protein?

(A) 2.5

(B) 2.0

(C) 1.5

(D) 1.0

Answer:

☐

15. **Linear Model Selection** (10 points)

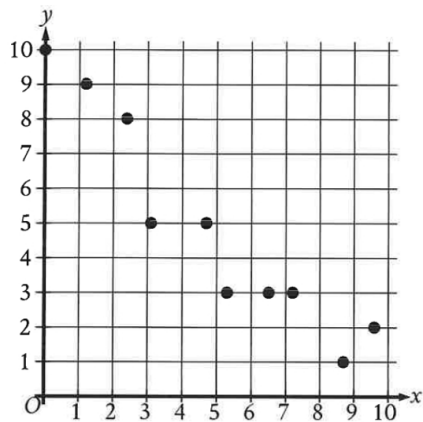The scatterplot shows the relationship between two variables, x and y.

Figure 4: reference attached

Which of the following equations is the most appropriate linear model for the data shown?

(A) $y = 0.9 + 9.4x$

(B) $y = 0.9 - 9.4x$

(C) $y = 9.4 + 0.9x$

(D) $y = 9.4 - 0.9x$

Answer:

☐

16. **Investment Comparison** (10 points)

Two investments were made as shown in the table above. The interest in Account A is compounded once

Investment Comparison

	Amount invested	Balance increase
Account A	$500	6% annual interest
Account B	$1,000	$25 per year

per year. Which of the following is true about the investments?

(A) Account A always earns more money per year than Account B.

(B) Account A always earns less money per year than Account B.

(C) Account A earns more money per year than Account B at first but eventually earns less money per year.

(D) Account A earns less money per year than Account B at first but eventually earns more money per year.

Answer:

☐

17. **Function Classification** (10 points)

For $x > 0$, the function f is defined as follows:

$$f(x) \text{ equals } 201\% \text{ of } x$$

Which of the following could describe this function?

(A) Decreasing exponential

(B) Decreasing linear

(C) Increasing exponential

(D) Increasing linear

Answer:

☐

18. **Prediction from Line of Best Fit** (10 points)

The scatterplot shows the relationship between two variables, x and y. A line of best fit for the data is also shown.
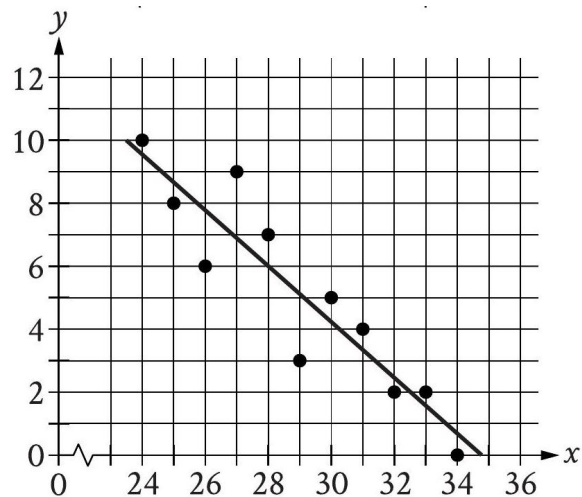

Figure 5: reference attached

At $x = 32$, which of the following is closest to the y-value predicted by the line of best fit?

(A) 0.4

(B) 1.5

(C) 2.4

(D) 3.3

Answer:
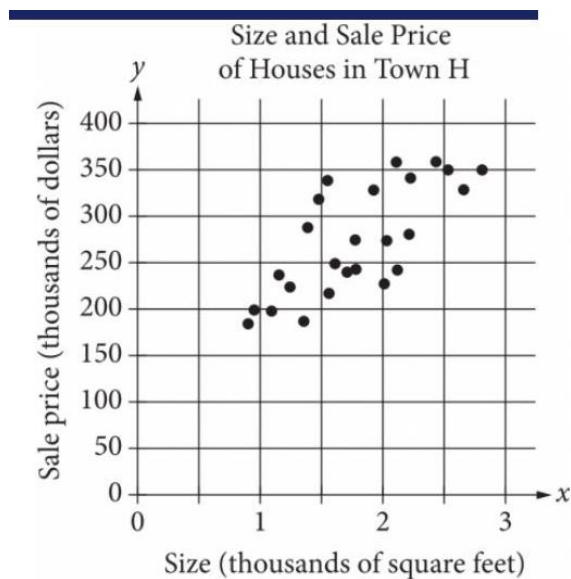
☐

19. **House Price Model** (10 points)

Figure 6: reference attached

The scatterplot above shows the size x and the sale price y of 25 houses for sale in Town H. Which of the following could be an equation for a line of best fit for the data?

(A) $y = 200x + 100$

(B) $y = 100x + 100$

(C) $y = 50x + 100$

(D) $y = 100x$

Answer:

□

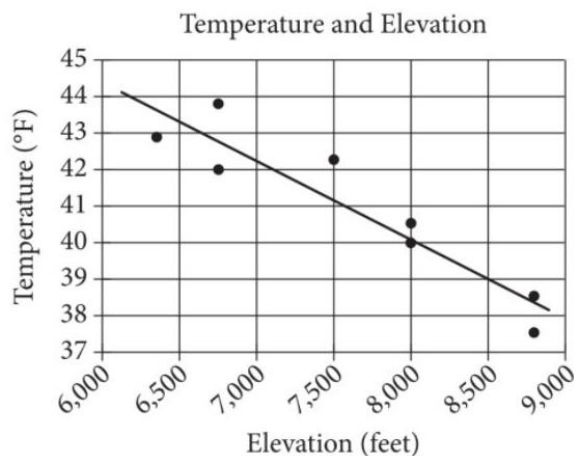20. **Elevation and Temperature Association** (10 points)

Figure 7: reference attached

The scatterplot above shows the high temperature on a certain day and the elevation of 8 different locations in the Lake Tahoe Basin. A line of best fit for the data is also shown. Which of the following statements best describes the association between the elevation and the temperature of locations in the Lake Tahoe Basin?

(A) As the elevation increases, the temperature tends to increase.

(B) As the elevation increases, the temperature tends to decrease.

(C) As the elevation decreases, the temperature tends to decrease.

(D) There is no association between the elevation and the temperature.

Answer:

☐

21. **Printer Rate Conversion** (10 points)
A printer produces posters at a constant rate of 42 posters per minute. At what rate, in posters per hour, does the printer produce the posters?

Answer:

☐

22. **Speed Conversion** (10 points)
   The International Space Station orbits Earth at an average speed of 4.76 miles per second. What is the space station's average speed in miles per hour?

   (A) 285.6

   (B) 571.2

   (C) 856.8

   (D) 17136.0

   Answer:

   ☐

23. **Lightning Distance Calculation** (10 points)
   For a person m miles from a flash of lightning, the length of the time interval from the moment the person sees the lightning to the moment the person hears the thunder is k seconds. The ratio of m to k can be estimated to be 1 to 5. According to this estimate, the person is how many miles from a flash of lightning if the time interval is 25 seconds?

   (A) 10

   (B) 9

   (C) 6

   (D) 5

   Answer:

   ☐

24. **Population Increase Calculation** (10 points)
   The population density of Iceland, in people per square kilometer of land area, increased from 2.5 in 1990 to 3.3 in 2014. During this time period, the land area of Iceland was 100,250 square kilometers. By how many people did Iceland's population increase from 1990 to 2014?

   (A) 330,825

   (B) 132,330

   (C) 125,312

   (D) 80,200

   Answer:

   ☐

25. **Orange Purchase Calculation** (10 points)
   A customer spent $27 to purchase oranges at $3 per pound. How many pounds of oranges did the customer purchase?

   Answer:

   ☐

26. **Butterfly Migration Rate** (10 points)

A group of monarch butterflies migrated from Chicago, Illinois, to Michoacán, Mexico, flying a total of 2,100 miles. It took a single butterfly in the group 120 days to travel this route one way. On average, how many miles did the butterfly travel per day?

(A) 0.057

(B) 0.729

(C) 17.5

(D) 24

Answer:

☐

27. **Proportional Relationship** (10 points)

If $\frac{x}{y} = 4$ and $\frac{24x}{ny} = 4$, what is the value of n?

Answer:

☐

28. **Ratio Problem** (10 points)

In a box of pens, the ratio of black pens to red pens is 8 to 1. There are 40 black pens in the box. How many red pens are in the box?

(A) 5

(B) 8

(C) 40

(D) 320

Answer:

☐

29. **Density and Price Calculation** (10 points)

Pure beeswax has a density of 0.555 ounce per cubic inch. An online company sells pure beeswax at a price of $8.00 per ounce. What is the selling price, in dollars per cubic inch, for pure beeswax purchased from this company?

Answer:

☐

30. **Area Calculation** (10 points)
    The population density of Worthington is 290 people per square mile. Worthington has a population of 92,800 people. What is the area, in square miles, of Worthington?

    (A) 102,400

    (B) 93,090

    (C) 320

    (D) 32

    Answer:

    □

31. **Percentage Expression** (10 points)
    Jennifer bought a box of Crunchy Grain cereal. The nutrition facts on the box state that a serving size of the cereal is $\frac{3}{4}$ cup and provides 210 calories, 50 of which are calories from fat. In addition, each serving of the cereal provides 180 milligrams of potassium, which is 5% of the daily allowance for adults. If p percent of an adult's daily allowance of potassium is provided by x servings of Crunchy Grain cereal per day, which of the following expresses p in terms of x?

    (A) $p = 0.5x$

    (B) $p = 5x$

    (C) $p = (0.05)^x$

    (D) $p = (1.05)^x$

    Answer:

    □

32. **Committee Composition** (10 points)
    A school district is forming a committee to discuss plans for the construction of a new high school. Of those invited to join the committee, 15% are parents of students, 45% are teachers from the current high school, 25% are school and district administrators, and the remaining 6 individuals are students. How many more teachers were invited to join the committee than school and district administrators?

    Answer:

    □

33. **Percent Increase Calculation** (10 points)
    A table of the US minimum wage for 6 different years is shown below. What was the percent increase of the

US Minimum Wage by Year

Year	US Minimum Wage (dollars per hour)
1960	$1.00
1970	$1.60
1980	$3.10
1990	$3.80
2000	$5.15
2010	$7.25

minimum wage from 1960 to 1970?

(A) 30%

(B) 60%

(C) 62.5%

(D) 120%

Answer:

☐

34. **Subscription Growth** (10 points)
    The manager of an online news service received the report above on the number of subscriptions sold by the

Subscription Sales

Year	Subscriptions sold
2012	5,600
2013	5,880

service. The manager estimated that the percent increase from 2012 to 2013 would be double the percent increase from 2013 to 2014. How many subscriptions did the manager expect would be sold in 2014?

(A) 6,020

(B) 6,027

(C) 6,440

(D) 6,468

Answer:
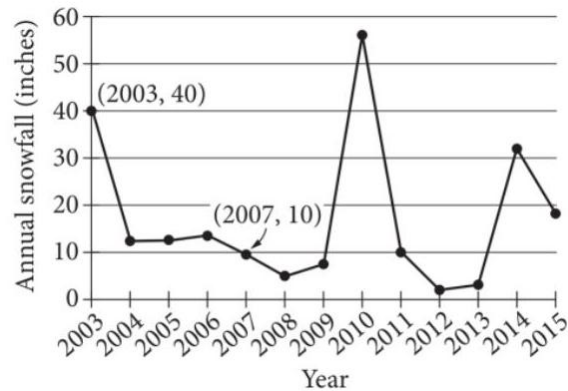
☐

35. **Snowfall Decrease** (10 points)

Figure 8: reference attached

The line graph shows the total amount of snow, in inches, recorded each year in Washington, DC, from 2003 to 2015. If $p\%$ is the percent decrease in the annual snowfall from 2003 to 2007, what is the value of p?

Answer:

36. **Percentage Calculation** (10 points)
What percentage of 300 is 75?

(A) 25%

(B) 50%

(C) 75%

(D) 225%

Answer:

37. **Sales Tax Calculation** (10 points)
The cost of a certain shirt is $20 before a 5% sales tax is added. What is the total cost, including sales tax, to purchase the shirt?

(A) $20.05

(B) $20.50

(C) $21.00

(D) $25.00

Answer:

38. **Voting Analysis** (10 points)
For the finale of a TV show, viewers could use either social media or a text message to vote for their favorite of two contestants. The contestant receiving more than 50% of the vote won. An estimated 10% of the viewers voted, and 30% of the votes were cast on social media. Contestant 2 earned 70% of the votes cast using social media and 40% of the votes cast using a text message. Based on this information, which of the following is an accurate conclusion?

(A) If all viewers had voted, Contestant 2 would have won.

(B) Viewers voting by social media were likely to be younger than viewers voting by text message.

(C) If all viewers who voted had voted by social media instead of by text message, Contestant 2 would have won.

(D) Viewers voting by social media were more likely to prefer Contestant 2 than were viewers voting by text message.

Answer:

☐

39. **Return Rate Calculation** (10 points)
During the first month of sales, a company sold 1,300,000 units of a certain type of smartphone. During the same month, 15% of the units sold were returned. If sales and the return rate remain the same for each of the next 5 months, about how many units of this smartphone will be returned to the company during this 6-month period?

(A) 195,000

(B) 975,000

(C) $1,170,000$

(D) $6,630,000$

Answer:

☐

40. **Enrollment Increase** (10 points)
Last year, 200 students enrolled in an interior design program. This year, the number of students enrolled is 147% of last year's number. How many students are enrolled in the interior design program this year?

(A) 247

(B) 294

(C) 347

(D) 394

Answer:

☐

41. **Cell Phone Study Analysis** (10 points)

In a study of cell phone use, 799 randomly selected US teens were asked how often they talked on a cell

Cell Phone Use Study

Texting behavior	Talks on cell phone daily	Does not talk on cell phone daily	Total
Light	110	146	256
Medium	139	164	303
Heavy	166	74	240
Total	415	384	799

phone and about their texting behavior. The data are summarized in the table above. Based on the data from the study, an estimate of the percent of US teens who are heavy texters is 30% and the associated margin of error is 3%. Which of the following is a correct statement based on the given margin of error?

(A) Approximately 3% of the teens in the study who are classified as heavy texters are not really heavy texters.

(B) It is not possible that the percent of all US teens who are heavy texters is less than 27%.

(C) The percent of all US teens who are heavy texters is 33%.

(D) It is doubtful that the percent of all US teens who are heavy texters is 35%.

Answer:

☐

42. **Survey Estimation** (10 points)

There are 55 students in Spanish club. A sample of the Spanish club students was selected at random and asked whether they intend to enroll in a new study program. Of those surveyed, 20% responded that they intend to enroll in the study program. Based on this survey, which of the following is the best estimate of the total number of Spanish club students who intend to enroll in the study program?

(A) 11

(B) 20

(C) 44

(D) 55

Answer:

☐

43. **Nuclear Energy Survey** (10 points)

A researcher interviewed 411 randomly selected US residents and asked about their views on the use of

Views on Nuclear Energy

Response	Frequency
Strongly favor	56
Somewhat favor	214
Somewhat oppose	104
Strongly oppose	37

nuclear energy. The table above summarizes the responses of the interviewees. If the population of the United States was 300 million when the survey was given, based on the sample data for the 411 US residents, what is the best estimate, in millions, of the difference between the number of US residents who somewhat favor or strongly favor the use of nuclear energy and the number of those who somewhat oppose or strongly oppose it? (Round your answer to the nearest whole number.)

Answer:

☐

44. **Contest Probability** (10 points)

The same 20 contestants, on each of 3 days, answered 5 questions in order to win a prize. Each contestant

Number of Contestants by Score and Day

	5 out of 5	4 out of 5	3 out of 5	2 out of 5	1 out of 5	0 out of 5	Total
Day 1	2	3	4	6	2	3	20
Day 2	2	3	5	5	4	1	20
Day 3	3	3	4	5	3	2	20
Total	7	9	13	16	9	6	60

received 1 point for each correct answer. The number of contestants receiving a given score on each day is shown in the table above. No contestant received the same score on two different days. If a contestant is selected at random, what is the probability that the selected contestant received a score of 5 on Day 2 or Day 3, given that the contestant received a score of 5 on one of the three days?

Answer:

☐

45. **Dice Probability** (10 points)

Each face of a fair 14-sided die is labeled with a number from 1 through 14, with a different number appearing on each face. If the die is rolled one time, what is the probability of rolling a 2?

(A) $\frac{1}{14}$

(B) $\frac{2}{14}$

(C) $\frac{12}{14}$

(D) $\frac{13}{14}$

Answer:

□

46. **Car Selection Probability** (10 points)

The table above shows information about 14 cars listed for sale on an auto dealership's website. If one of

Prices of 14 Different Cars

Type of car	Priced at no more than $25,000	Priced greater than $25,000	Total
Nonhybrid	5	3	8
Hybrid	2	4	6
Total	7	7	14

the cars listed for sale is selected at random, what is the probability that the car selected will be a hybrid car priced at no more than $25,000$?

(A) $\frac{1}{7}$

(B) $\frac{2}{7}$

(C) $\frac{1}{3}$

(D) $\frac{4}{7}$

Answer:

□

47. **Marble Probability** (10 points)
    Colors of Marbles in a Bag The table shows the number of different colors of marbles in a bag. If a marble

Colors of Marbles in a Bag

Color	Number
Red	8
Blue	10
Green	22
Total	40

is chosen at random from the bag, what is the probability that the marble will be blue?

(A) $\frac{30}{40}$

(B) $\frac{22}{40}$

(C) $\frac{18}{40}$

(D) $\frac{10}{40}$

Answer:

☐

48. **Gas Station Probability** (10 points)
    Customer Purchases at a Gas Station On Tuesday, a local gas station had 135 customers. The table above

Customer Purchases at a Gas Station

	Beverage purchased	Beverage not purchased	Total
Gasoline purchased	60	25	85
Gasoline not purchased	35	15	50
Total	90	40	135

summarizes whether or not the customers on Tuesday purchased gasoline, a beverage, both, or neither. Based on the data in the table, what is the probability that a gas station customer selected at random on that day did not purchase gasoline?

(A) $\frac{15}{50}$

(B) $\frac{15}{40}$

(C) $\frac{35}{50}$

(D) $\frac{50}{135}$

Answer:

☐

49. **Survey Population** (10 points)

A sample of 40 fourth-grade students was selected at random from a certain school. The 40 students completed a survey about the morning announcements, and 32 thought the announcements were helpful. Which of the following is the largest population to which the results of the survey can be applied?

(A) The 40 students who were surveyed

(B) All fourth-grade students at the school

(C) All students at the school

(D) All fourth-grade students in the county in which the school is located

Answer:

☐

50. **Satisfaction Survey** (10 points)

Residents of a town were surveyed to determine whether they are satisfied with the concession stand at the local park. A random sample of 200 residents was selected. All 200 responded, and 87% said they are satisfied. Based on this information, which of the following statements must be true?

(I) Of all the town residents, 87% would say they are satisfied with the concession stand at the local park.

(II) If another random sample of 200 residents were surveyed, 87% would say they are satisfied.

(A) Neither

(B) I only

(C) II only

(D) I and II

Answer:

☐