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Drill Problems: Week 03-5

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COLUMBIA ACADEMY

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Written by Jaehoon Song (Lecturer)

1. **Data Set Comparison** (10 points)

Value	Data set A frequency	Data set B frequency
30	2	9
34	4	7
38	5	5
42	7	4
46	9	2

Data set A and data set B each consist of 27 values. The table shows the frequencies of the values for each data set. Which of the following statements best compares the means of the two data sets?

(A) The mean of data set A is greater than the mean of data set B.

(B) The mean of data set A is less than the mean of data set B.

(C) The mean of data set A is equal to the mean of data set B.

(D) There is not enough information to compare the means of the data sets.

Answer:

□

2. **Data Set Transformation** (10 points)
A data set of 27 different numbers has a mean of 33 and a median of 33. A new data set is created by adding 7 to each number in the original data set that is greater than the median and subtracting 7 from each number in the original data set that is less than the median. Which of the following measures does NOT have the same value in both the original and new data sets?

(A) Median

(B) Mean

(C) Sum of the numbers

(D) Standard deviation

Answer:

□

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

$$73, 74, 75, 77, 79, 82, 84, 85, 91$$

Answer:

□

4. **International Tourist Arrivals** (10 points)

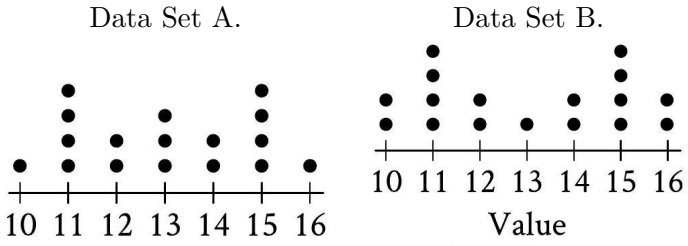
International Tourist Arrivals, in millions		
Country	**2012**	**2013**
France	83.0	84.7
United States	66.7	69.8
Spain	57.5	60.7
China	57.7	55.7
Italy	46.4	47.7
Turkey	35.7	37.8
Germany	30.4	31.5
United Kingdom	26.3	32.2
Russia	24.7	28.4

The table above shows the number of international tourist arrivals, rounded to the nearest tenth of a million, to the top nine tourist destinations in both 2012 and 2013. Based on the information given in the table, how much greater, in millions, was the median number of international tourist arrivals to the top nine tourist destinations in 2013 than the median number in 2012, to the nearest tenth of a million?

Answer:

□

5. **Dot Plot Analysis** (10 points)
The dot plots represent the distributions of values in data sets A and B.



Which of the following statements must be true?

(I) The median of data set A is equal to the median of data set B.

(II) The standard deviation of data set A is equal to the standard deviation of data set B.

(A) I only

(B) II only

(C) I and II

(D) Neither I nor II

Answer:

6. **Histogram Analysis** (10 points)

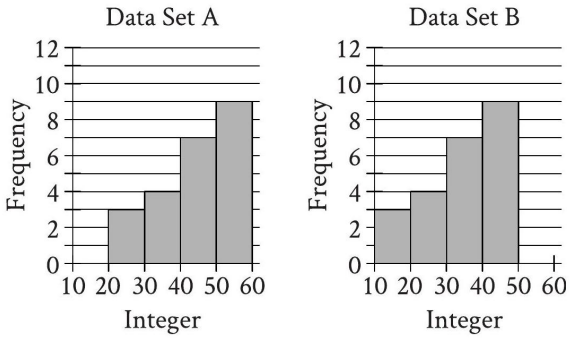


Figure 1: reference attached

Two data sets of 23 integers each are summarized in the histograms shown. For each of the histograms, the first interval represents the frequency of integers greater than or equal to 10, but less than 20. The second interval represents the frequency of integers greater than or equal to 20, but less than 30, and so on. What is the smallest possible difference between the mean of data set A and the mean of data set B?

(A) 0
(B) 1
(C) 10
(D) 23

Answer:

□

7. **Mean Calculation** (10 points)
What is the mean of the data shown?

$$2, 9, 14, 23, 32$$

(A) 14
(B) 16
(C) 17
(D) 32

Answer:

□

8. **Frequency Distribution** (10 points)

Value	Frequency (probability)
1	a
2	$2a$
3	$3a$
4	$2a$
5	a

The frequency distribution above summarizes a set of data, where a is a positive integer. How much greater is the mean of the set of data than the median?

(A) 0

(B) 1

(C) 2

(D) 3

Answer:

□

9. **Team Race Times** (10 points)
Two different teams consisting of 10 members each ran in a race. Each member's completion time of the race was recorded. The mean of the completion times for each team was calculated and is shown below.
Team A: 3.41 minutes
Team B: 3.79 minutes
Which of the following MUST be true?

(I) Every member of team A completed the race in less time than any member of team B.

(II) The median time it took the members of team B to complete the race is greater than the median time it took the members of team A to complete the race.

(III) There is at least one member of team B who took more time to complete the race than some member of team A.

(A) III only

(B) I and III only

(C) II and III only

(D) I, II, and III

Answer:

□

WEEK3.5

10. **Basketball Score** (10 points)
The mean score of 8 players in a basketball game was 14.5 points. If the highest individual score is removed, the mean score of the remaining 7 players becomes 12 points. What was the highest score?

(A) 20
(B) 24
(C) 32
(D) 36

Answer:

□

11. **Linear Model** (10 points)

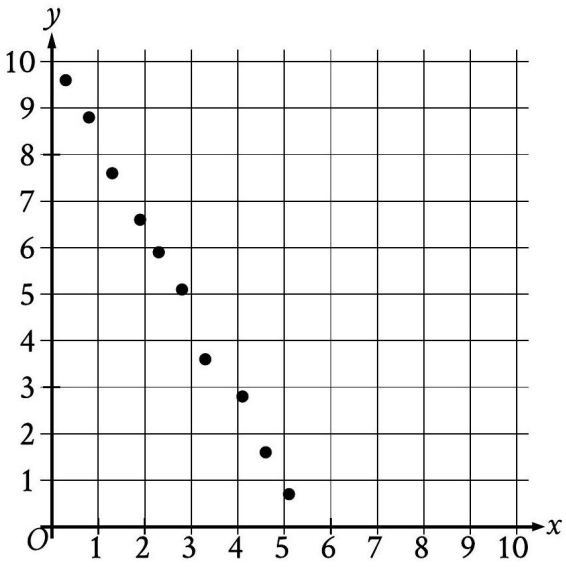


Figure 2: reference attached

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

(A) $y = -1.9x - 10.1$
(B) $y = -1.9x + 10.1$
(C) $y = 1.9x - 10.1$
(D) $y = 1.9x + 10.1$

Answer:

□

12. **Stopping Distance** (10 points)
A study was done to determine a new car's stopping distance when it was traveling at different speeds. The study was done on a dry road with good surface conditions. The results are shown below, along with the graph of a quadratic function that models the data.

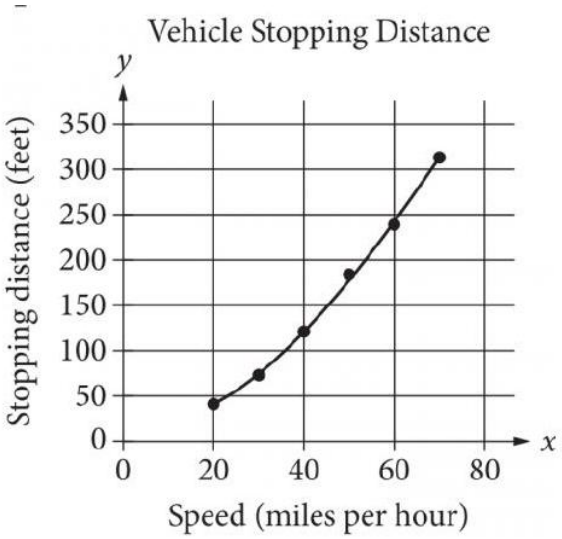


Figure 3: reference attached

According to the model, which of the following is the best estimate for the stopping distance, in feet, if the vehicle was traveling 55 miles per hour?

(A) 25
(B) 30
(C) 210
(D) 250

Answer:

13. **Temperature Change** (10 points)
The scatterplot shows the temperature y, in °F, recorded by a meteorologist at various times x, in days since June 1.

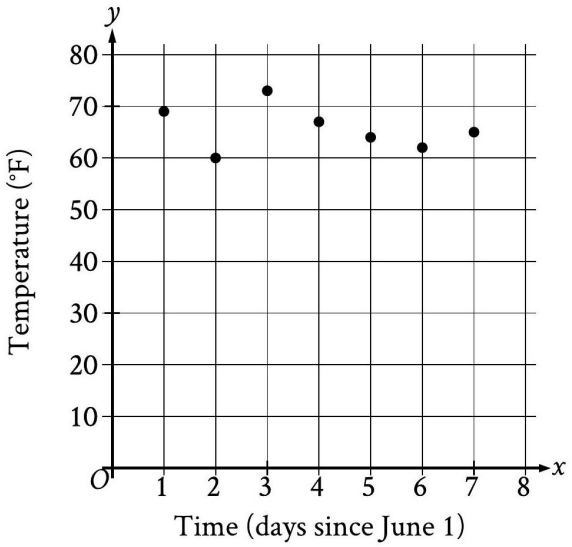


Figure 4: reference attached

During which of the following time periods did the greatest increase in recorded temperature take place?

(A) From $x = 6$ to $x = 7$
(B) From $x = 5$ to $x = 6$
(C) From $x = 2$ to $x = 3$
(D) From $x = 1$ to $x = 2$

Answer:

14. **Line of Best Fit** (10 points)

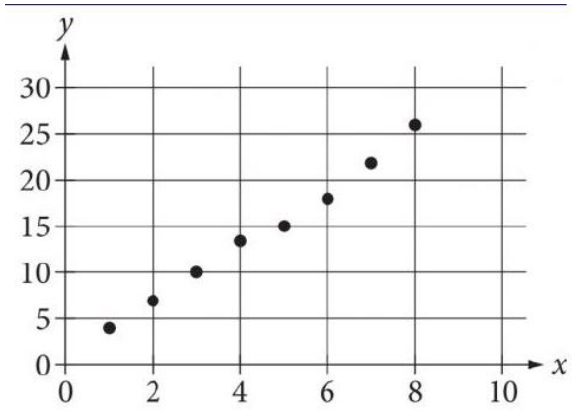


Figure 5: reference attached

Which of the following could be the equation for a line of best fit for the data shown in the scatterplot above?

(A) $y = 3x + 0.8$
(B) $y = 0.8x + 3$
(C) $y = -0.8x + 3$
(D) $y = -3x + 0.8$

Answer:

□

15. **Energy Generation** (10 points)
The scatterplot below shows the amount of electric energy generated, in millions of megawatt-hours, by nuclear sources over a 10-year period.

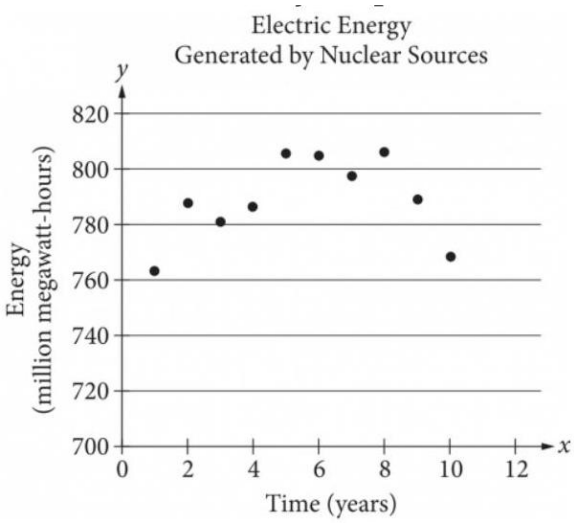


Figure 6: reference attached

Of the following equations, which best models the data in the scatterplot?

(A) $y = 1.674x^2 + 19.76x - 745.73$
(B) $y = -1.674x^2 - 19.76x - 745.73$
(C) $y = 1.674x^2 + 19.76x + 745.73$
(D) $y = -1.674x^2 + 19.76x + 745.73$

Answer:

16. **Beach Visitors** (10 points)

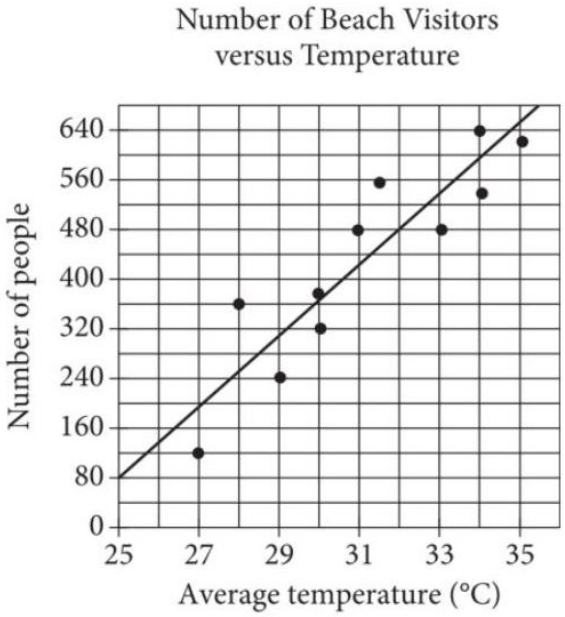


Figure 7: reference attached

Each dot in the scatterplot above represents the temperature and the number of people who visited a beach in Lagos, Nigeria, on one of eleven different days. The line of best fit for the data is also shown. According to the line of best fit, what is the number of people, rounded to the nearest 10, predicted to visit this beach on a day with an average temperature of 32°C?

(A) 440

(B) 460

(C) 480

(D) 500

Answer:

17. **Chipmunk Population** (10 points)
The line graph shows the estimated number of chipmunks in a state park on April 1 of each year from 1989 to 1999.

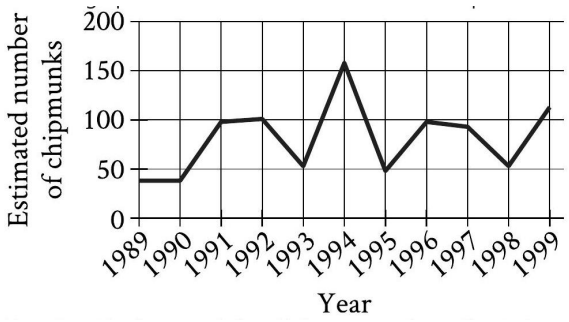


Figure 8: reference attached

Based on the line graph, in which year was the estimated number of chipmunks in the state park the greatest?

(A) 1989
(B) 1994
(C) 1995
(D) 1998

Answer:

□

18. **Nonlinear Relationship** (10 points)
In which of the following tables is the relationship between the values of x and their corresponding y-values nonlinear?

(A)

x	1	2	3	4
y	8	11	14	17

(B)

x	1	2	3	4
y	4	8	12	16

(C)

x	1	2	3	4
y	8	13	18	23

(D)

x	1	2	3	4
y	6	12	24	48

Answer:

□

19. **Braking Distance** (10 points)

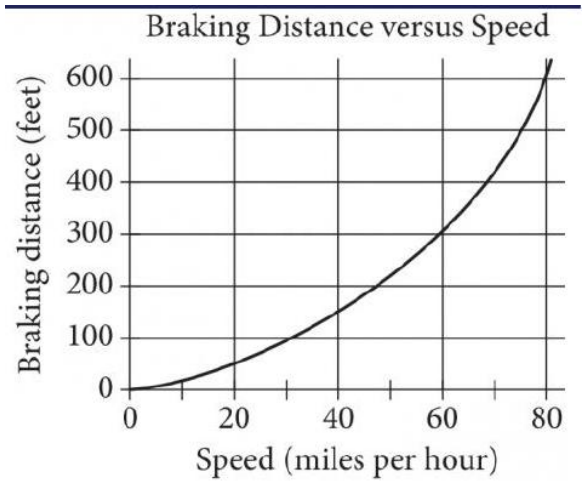


Figure 9: reference attached

The graph above shows the relationship between the speed of a particular car, in miles per hour, and its corresponding braking distance, in feet. Approximately how many feet greater will the car's braking distance be when the car is traveling at 50 miles per hour than when the car is traveling at 30 miles per hour?

(A) 75

(B) 125

(C) 175

(D) 250

Answer:

20. **Line of Best Fit** (10 points)

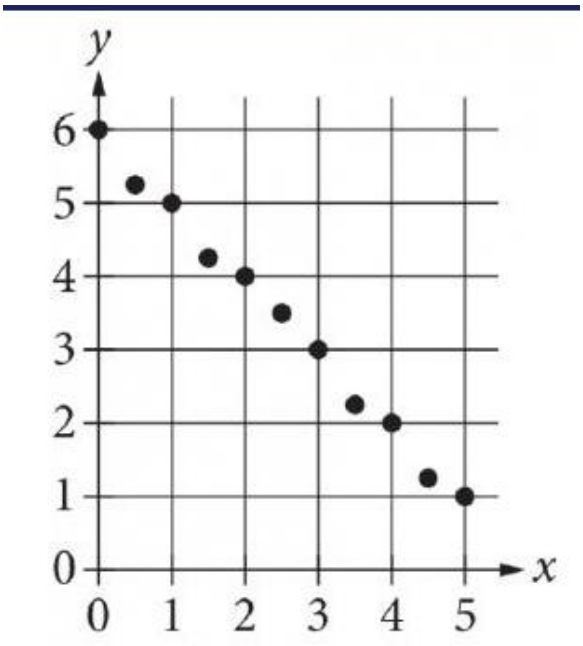


Figure 10: reference attached

Which of the following could be an equation for a line of best fit for the data in the scatterplot?

(A) $y = -x + 6$
(B) $y = -x - 6$
(C) $y = 6x + 1$
(D) $y = 6x - 1$

Answer:

21. **Wind Turbine** (10 points)
A wind turbine completes 900 revolutions in 50 minutes. At this rate, how many revolutions per minute does this turbine complete?

(A) 18
(B) 850
(C) 950
(D) 1,400

Answer:

22. **Constant Ratio** (10 points)

x	y
1	4
3	12
5	20
40	k

In the table above, the ratio of y to x for each ordered pair is constant. What is the value of k?

(A) 28
(B) 36
(C) 80
(D) 160

Answer:

□

23. **Tree Growth** (10 points)

Species of tree	Growth factor
Red maple	4.5
River birch	3.5
Cottonwood	2.0
Black walnut	4.5
White birch	5.0
American elm	4.0
Pin oak	3.0
Shagbark hickory	7.5

One method of calculating the approximate age, in years, of a tree of a particular species is to multiply the diameter of the tree, in inches, by a constant called the growth factor for that species. The table above gives the growth factors for eight species of trees. If a white birch tree and a pin oak tree each now have a diameter of 1 foot, which of the following will be closest to the difference, in inches, of their diameters 10 years from now? (1 foot = 12 inches)

(A) 1.0
(B) 1.2
(C) 1.3
(D) 1.4

Answer:

□

24. **Ratio** (10 points)
The ratio of t to u is 1 to 2, and $t = 10$.
What is the value of u?

(A) 2
(B) 5
(C) 10
(D) 20

Answer:

25. **Depth Conversion** (10 points)
A special camera is used for underwater ocean research. When the camera is at a depth of 58 fathoms, what is the camera's depth in feet? (1 fathom = 6 feet)

Answer:

26. **Oak Density** (10 points)
A sample of oak has a density of 807 kilograms per cubic meter. The sample is in the shape of a cube, where each edge has a length of 0.90 meters. To the nearest whole number, what is the mass, in kilograms, of this sample?

(A) 588
(B) 726
(C) 897
(D) 1,107

Answer:

27. **Average Speed** (10 points)
On April 18, 1775, Paul Revere set off on his midnight ride from Charlestown to Lexington. If he had ridden straight to Lexington without stopping, he would have traveled 11 miles in 26 minutes. In such a ride, what would the average speed of his horse have been, to the nearest tenth of a mile per hour?

Answer:

28. **Length Conversion** (10 points)
How many yards are equivalent to 612 inches? (1 yard = 36 inches)

(A) 0.059
(B) 17
(C) 576
(D) 22,032

Answer:

□

29. **Rectangle Ratio** (10 points)
Rectangle A has length 15 and width w. Rectangle B has length 20 and the same length-to-width ratio as rectangle A. What is the width of rectangle B in terms of w?

(A) $\frac{4}{3}w$
(B) $w + 5$
(C) $\frac{3}{4}w$
(D) $w - 5$

Answer:

□

30. **Card Ratio** (10 points)
Shaquan has 7 red cards and 28 blue cards. What is the ratio of red cards to blue cards that Shaquan has?

(A) 1 to 4
(B) 4 to 1
(C) 1 to 7
(D) 7 to 1

Answer:

□

31. **Plant Growth** (10 points)
Last year, Cedric had 35 plants in his garden. This year, the number of plants in Cedric's garden is 60% greater than the number of plants in his garden last year. How many plants does Cedric have in his garden this year?

Answer:

□

32. **Percentage** (10 points)
What is 23% of 100?

(A) 23
(B) 46
(C) 77
(D) 123

Answer:

□

33. **Percentage Increase** (10 points)
Which expression represents the result of increasing a positive quantity w by 43%?

(A) $1.43w$
(B) $0.57w$
(C) $43w$
(D) $0.43w$

Answer:

□

34. **Population Growth** (10 points)
The population of City A increased by 7% from 2015 to 2016. If the 2016 population is k times the 2015 population, what is the value of k?

(A) 0.07
(B) 0.7
(C) 1.07
(D) 1.7

Answer:

□

35. **Percentage** (10 points)
What is 10% of 470?

(A) 37
(B) 47
(C) 423
(D) 460

Answer:

□

36. **Percentage Increase** (10 points)
Which of the following represents the result of increasing the quantity x by 9%, where $x > 0$?

(A) $1.09x$
(B) $0.09x$
(C) $x + 9$
(D) $x + 0.09$

Answer:

□

37. **Percentage Greater** (10 points)
The number k is 36% greater than 50. If k is the product of 50 and r, what is the value of r?

(A) 36
(B) 3.6
(C) 1.36
(D) 0.36

Answer:

□

38. **Percentage Comparison** (10 points)
The number a is 70% less than the positive number b. The number c is 80% greater than a. The number c is how many times b?

Answer:

□

39. **Percentage Greater** (10 points)
210 is p% greater than 30. What is the value of p?

Answer:

□

40. **Percentage Greater** (10 points)
The value of z is 1.13 times 100. The value of z is what percent greater than 100?

(A) 11.3
(B) 13
(C) 130
(D) 213

Answer:

□

41. **Survey Analysis** (10 points)
A city has 50 city council members. A reporter polled a random sample of 20 city council members and found that 6 of those polled supported a specific bill. Based on the sample, which of the following is the best estimate of the number of city council members in the city who support the bill?

(A) 6
(B) 9
(C) 15
(D) 30

Answer:

□

42. **Fish Weight Study** (10 points)
A study was done on the weights of different types of fish in a pond. A random sample of fish were caught and marked in order to ensure that none were weighed more than once. The sample contained 150 largemouth bass, of which 30% weighed more than 2 pounds. Which of the following conclusions is best supported by the sample data?

(A) The majority of all fish in the pond weigh less than 2 pounds.
(B) The average weight of all fish in the pond is approximately 2 pounds.
(C) Approximately 30% of all fish in the pond weigh more than 2 pounds.
(D) Approximately 30% of all largemouth bass in the pond weigh more than 2 pounds.

Answer:

□

43. **Hiking Survey** (10 points)
A park ranger asked a random sample of visitors how far they hiked during their visit. Based on the responses, the estimated mean was found to be 4.5 miles, with an associated margin of error of 0.5 miles. Which of the following is the best conclusion from these data?

(A) It is likely that all visitors hiked between 4 and 5 miles.
(B) It is likely that most visitors hiked exactly 4.5 miles.
(C) It is not possible that any visitor hiked less than 3 miles.
(D) It is plausible that the mean distance hiked for all visitors is between 4 and 5 miles.

Answer:

□

44. **Kitten Characteristics** (10 points)

Coat color	Eye color		
	Deep blue	Light brown	Total
Cream-tortoiseshell	16	16	32
Chocolate	12	4	16
Total	28	20	48

The data on the coat color and eye color for 48 Himalayan kittens available for adoption were collected and summarized in the table above. What fraction of the chocolate-colored kittens has deep blue eyes?

(A) $\frac{12}{48}$
(B) $\frac{12}{28}$
(C) $\frac{16}{32}$
(D) $\frac{12}{16}$

Answer:

□

45. **Internship Data** (10 points)

High school	Year				
	2008	2009	2010	2011	2012
Foothill	87	80	75	76	70
Valley	44	54	65	76	82
Total	131	134	140	152	152

The table above shows the number of students from two different high schools who completed summer internships in each of five years. No student attended both schools. Of the students who completed a summer internship in 2010, which of the following represents the fraction of students who were from Valley High School?

(A) $\frac{10}{140}$
(B) $\frac{65}{140}$
(C) $\frac{75}{140}$
(D) $\frac{65}{75}$

Answer:

□

46. **Singing Lessons** (10 points)

Voice type	Number of singers
Countertenor	4
Tenor	6
Baritone	10
Bass	5

A total of 25 men registered for singing lessons. The frequency table shows how many of these singers have certain voice types. If one of these singers is selected at random, what is the probability he is a baritone?

(A) 0.10
(B) 0.40
(C) 0.60
(D) 0.67

Answer:

□

47. **Sports Survey** (10 points)
A survey taken by 1,000 students at a school asked whether they played school sports. The table below summarizes all 1,000 responses from the students surveyed.

	Males	Females
Play a school sport	312	220
Do not play a school sport	?	216

How many of the males surveyed responded that they do not play a school sport?

(A) 109
(B) 252
(C) 468
(D) 688

Answer:

□

48. **Blood Type Distribution** (10 points)

	Blood type			
Rhesus factor	A	B	AB	O
+	33	9	3	37
-	7	2	1	x

Human blood can be classified into four common blood types-A, B, AB, and O. It is also characterized by the presence $(+)$ or absence $(-)$ of the rhesus factor. The table above shows the distribution of blood type and rhesus factor for a group of people. If one of these people who is rhesus negative $(-)$ is chosen at random, the probability that the person has blood type B is $\frac{1}{9}$. What is the value of x?

Answer:

□

49. **Survey Generalization** (10 points)
A survey was conducted using a sample of history professors selected at random from the California State Universities. The professors surveyed were asked to name the publishers of their current texts. What is the largest population to which the results of the survey can be generalized?

(A) All professors in the United States

(B) All history professors in the United States

(C) All history professors at all California State Universities

(D) All professors at all California State Universities

Answer:

□

50. **Dog Park Survey** (10 points)
The members of a city council wanted to assess the opinions of all city residents about converting an open field into a dog park. The council surveyed a sample of 500 city residents who own dogs. The survey showed that the majority of those sampled were in favor of the dog park. Which of the following is true about the city council's survey?

(A) It shows that the majority of city residents are in favor of the dog park.

(B) The survey sample should have included more residents who are dog owners.

(C) The survey sample should have consisted entirely of residents who do not own dogs.

(D) The survey sample is biased because it is not representative of all city residents.

Answer:

□