MAT121 Midterm Exam 01

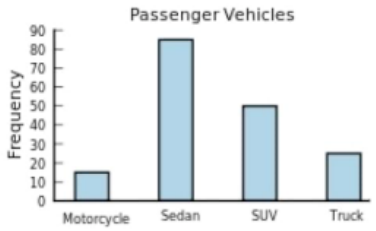
Problem 1

The following frequency distribution presents the frequency of passenger vehicles that pass through a certain intersection from 8:00 AM to 9:00 AM on a particular day.

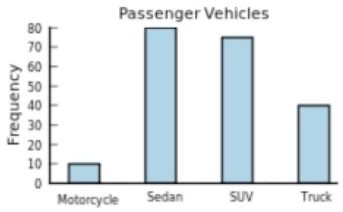
Vehicle Type	Frequency
Motorcycle	5
Sedan	95
SUV	65
Truck	30

Construct a frequency bar graph for the data.

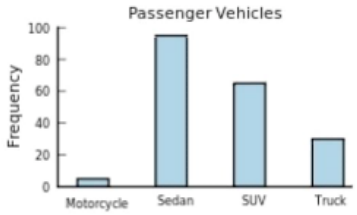
A)



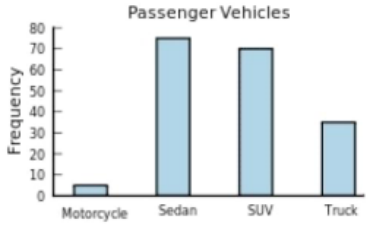
B)



C)



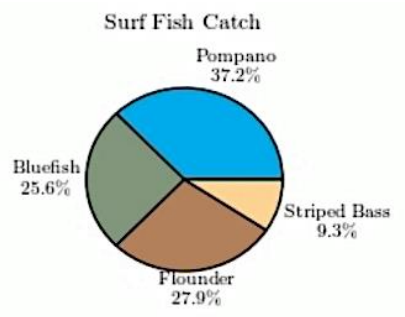
D)



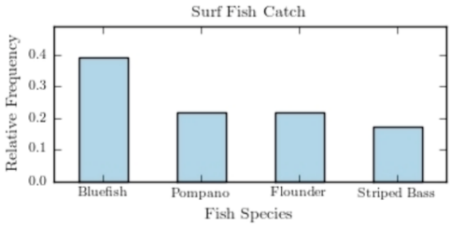
Answer: C

Problem 2.

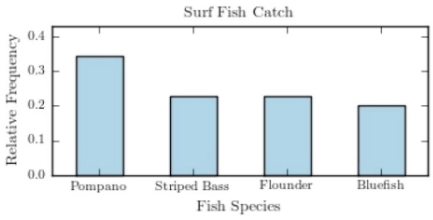
The following pie chart presents the percentages of fish caught in each of four ratings categories. Match this pie chart with its corresponding Pare-to chart.

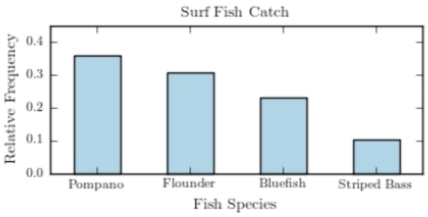


A

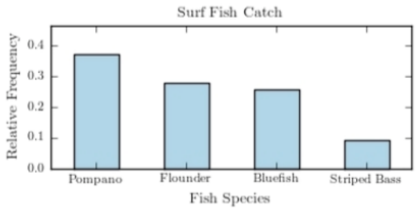


B.





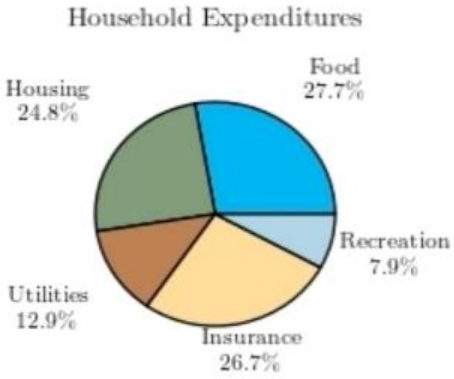
D



Answer: D.

Problem 3

Following is a pie chart that presents the percentages spent by a certain household on its five largest annual expenditures. What percentage of the money spent was spent on food, housing, and utilities?



A) 60.4%

B) 65.4%

C) 52.5%

D) 47%

Answer: B

Problem 4.

The following data shows prices of meal options at Bob's Burgers. Prices of Meal Options at Bob's Burgers

6 7 7 8 9 14 14 14 15 15 15 15 16 16 17

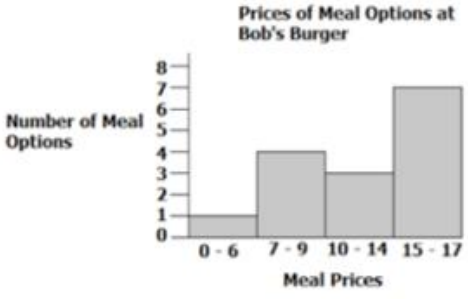
Which histogram correctly displays the information above?

A

B

C

D



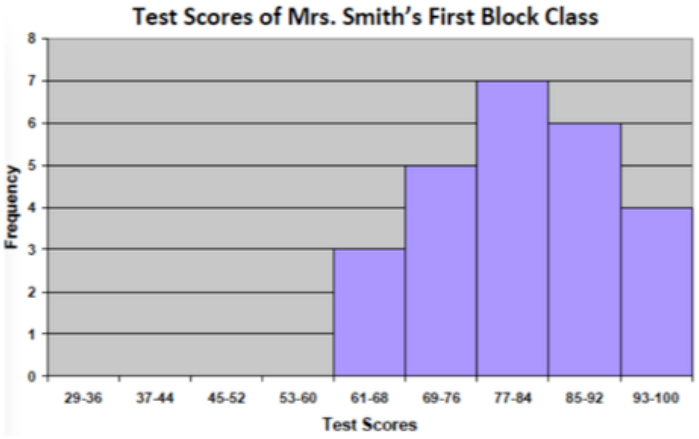
Answer: B.

A is incorrect because 0-5 does not have data values, **C** is incorrect because it skipped 9-14,

D is incorrect because its widths are not equal.

Problem 5.

The histogram below shows the scores for Mrs. Smith's first block class at Red Rock Middle School.



If an 85 is the lowest score a student can earn to receive a B, how many students received at least a B?

A) 4

B) 6

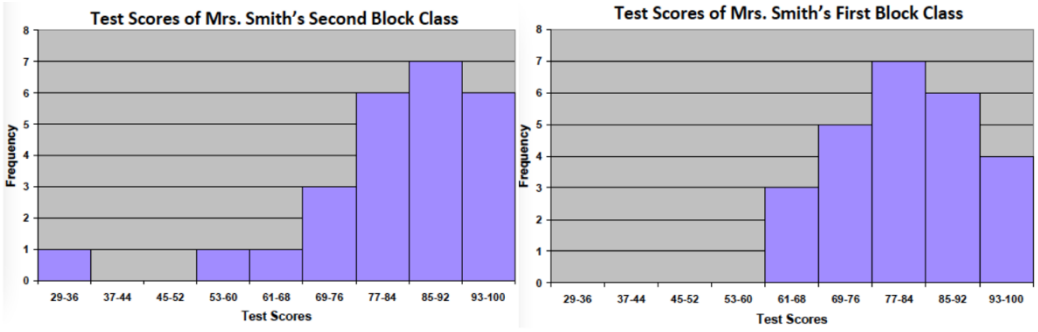
C) 10

D) 15

Answer: C

Problem 6.

The histograms below show the scores for Mrs. Smith's first and second block classes at Red Rock Middle School.



Compare the histograms using the following information:

• 69 and above is passing

• 68 or below is failing

Which of the following statements is true?

A) The number of students that passed the test is the same in both classes.
B) More students passed in the first block than in the second block.
C) More students passed in the second block than in the first block.
D) Cannot be determined based on the graphs given.

Answer: A

Problem 7

A study of 1106 college students asked about their preference for online resources. The following relative frequency distribution was determined as a result of the survey.

Resource	Relative Frequency
Google or Google Scholar	0.736
Library database or website	0.136
Wikipedia or online encyclopedia	0.094
Other	0.034

Of the 1106 students who participated in the survey, approximately how many chose Google or Google Scholar?

A. 34
B. 292
C. 736
D. 814

Answer: D

Problem 8.

A recent statistics exam yielded the following 25 scores. Construct a frequency table with the class limits shown below.

44 45 51 55 59 63 63 67 68 74 77 77 77 79 80 81 82 86 87 87 89 90 91 96 97

A

Class Limits	Frequency
41-50	2
51-60	2
61-70	5
71-80	6
81-90	7
91-100	3

B

Class Limits	Frequency
41-50	3
51-60	2
61-70	4
71-80	7
81-90	6
91-100	3

C

Class Limits	Frequency
41-50	2
51-60	3
61-70	4
71-80	6
81-90	7
91-100	3

D

Class Limits	Frequency
41-50	2
51-60	3
61-70	5
71-80	5
81-90	6
91-100	4

Answer C.

Problem 9

The following table presents the purchase totals (in dollars) of a random sample of gasoline purchases at a convenience store. Construct a frequency distribution using a class width of 10 and using 0 as the lower-class limit for the first class.

76.59	48.55	93.66	60.17	39.10
93.28	65.43	34.12	80.41	77.16
80.07	93.46	39.19	43.84	44.70
68.74	89.98	6.97	52.86	68.93

A.

Convenience Store Gas Purchases	
Amount (dollars)	Frequency
0.00-9.99	1
10.00-19.99	0
20.00-29.99	0
30.00-39.99	3
40.00-49.99	3
50.00-59.99	1
60.00-69.99	4
70.00-79.99	2
80.00-89.99	4
90.00-99.99	2

B.

Convenience Store Gas Purchases	
Amount (dollars)	Frequency
0.00-9.99	1
10.00-19.99	0
20.00-29.99	0
30.00-39.99	4
40.00-49.99	2
50.00-59.99	1
60.00-69.99	4
70.00-79.99	2
80.00-89.99	3
90.00-99.99	3

C.

Convenience Store Gas Purchases	
Amount (dollars)	Frequency
0.00-9.99	1
10.00-19.99	0
20.00-29.99	0
30.00-39.99	3
40.00-49.99	3
50.00-59.99	1
60.00-69.99	4
70.00-79.99	2
80.00-89.99	3
90.00-99.99	3

D.

Convenience Store Gas Purchases	
Amount (dollars)	Frequency
0.00-9.99	1
10.00-19.99	0
20.00-29.99	1
30.00-39.99	2
40.00-49.99	3
50.00-59.99	1
60.00-69.99	4
70.00-79.99	2
80.00-89.99	3
90.00-99.99	3

Answer: C.

Problem 10

What do we call a part of a population used to describe the whole group?

a. Population

b. Sample

c. Statistic

d. Parameter

Answer: B.

Problem 11.

Elizabeth asks her friends how many brothers and/or sisters they have at home. What type of data is she collecting?

a. Numerical
b. Categorical
c. None of these answers are correct
d. Statistical

Answer: A.

Problem 12.

A list of 5 pulse rates is 70, 64, 80, 74, 92. What is the median for this list?

a. 74

b. 76

c. 77

d. 80

Answer A.

The middle value of the sorted data: 64, 70, 74, 80, 92

Problem 13.

If the variance of a data set is correctly computed with the formula using n - 1 in the denominator, which of the following is true?

a. the data set is a sample
b. the data set is a population
c. the data set could be either a sample or a population
d. the data set is from a census
e. None of the above answers is correct.

Answer: A

Use the definition of sample variance.

Problem 14

Based on the following sample of ages (in months) of 18 children at a daycare:

18 19 22 22 24 24 25 26 28 29 29 30 31 32 35 36 36 42

The 25th percentile, 75th percentile and the interquartile range for this data set are:

a) 23.5 , 34, 11.5

b) 24.5, 33.5 , 9

c) 24, 32, 8

d) 24, 32.5 8.5

e) 23, 32, 9,

Answer: C

Calculate the two quartiles. The range = maximum - minimum

Problem 15.

A national random sample of 20 ACT scores from 2010 is listed below. Calculate the sample mean and standard deviation.

12 12 13 14 17 17 17 18 18 19 22 23 23 25 26 26 26 29 30 30

a. 20.50, 5.79
b. 20.50, 5.94
c. 20.85, 5.79
d. 20.85, 5.94

Answer D. You can use IntroStatsApps (descriptive statistics) to get his answer.

Problem 16.

Calculate the mean number of children per family for the sample from the following table.

Number of children	Number of families
0	8
1	16
2	22
3	14
4	6
5	4
6	2

a. 1.91

b. 2.47

c. 3.14

d. 2.19

Answer D.

You need to understand the frequency table to find the mean. For example, 8 families have no child, 16 families have one child, and 22 families have 2 children, following this pattern, you can find the total number of children and the total number of families.

(8x0 + 16x1 + 22x2 + 14x3 + 6x4 + 4x5 + 2x6)/ (8+16+22+14+6+4+2) = 2.19.

Problem 17.

A list of 5 pulse rates is 70, 64, 80, 74, and 92. What is the median for this list?

a. 74

b. 76

c. 77

d. 80

Answer A. Using the definition of the median.

Problem 18

What measure of the center was most affected by the outlier?

mean

A. median
B. mode
C. IQR

Answer: A. Understand the definition of mean and other measures

Problem 19.

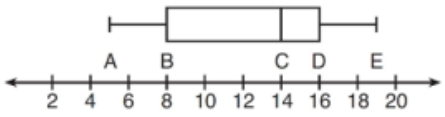
Which of the following lists all parts of the five-number summary?

A. Mean, Median, Mode, Range, and Total
B. Minimum, Quartile 1, Median, Quartile 3, and Maximum
C. Smallest, Q1, Q2, Q3, and Q4
D. Minimum, Maximum, Range, Mean, and Median

Answer B. Based on the definition of 5-number-summary.

Problem 20

The box-and-whisker plot shown below represents the number of magazine subscriptions sold by members of a club.



Which statistical measures do points B, D, and E represent, respectively?

A. minimum, median, maximum

B. first quartile, median, third quartile

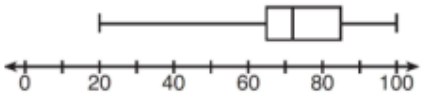
C. first quartile, third quartile, maximum

D. median, third quartile, maximum

Answer: C. Understand the structure of the box-plot.

Problem 21

The box-and-whisker plot below represents the results of test scores in a math class.



What do the scores 65, 85, and 100 represent?

A. Q1 , median, Q3

B. Q1 , Q3 , maximum

C. median, Q1 , maximum

D. minimum, median, maximum

Answer: B. Understand the structure of the box-plot.

Problem 22

On an intelligence test with a mean of 100 and a standard deviation of 15, Jamie scored 85. What is Jamie's z-score?

a. -2
b. -1
c. 1
d. 2

Answer: B. Using the definition of z-score

Problem 23

Which of the following is not a measure of variability in a data set?

- **A.** IQR (Inter Quartile range)
- **B.** Variance
- **C.** Upper quartile
- **D.** Standard deviation

Answer: C. Understand the definition of variability measures.

Problem 24

If the mean is larger than the median when

- **A.** The distribution is symmetric (bell-shaped)
- **B.** The distribution is skewed to the right (positively skewed)
- **C.** The distribution is skewed to the left (negatively skewed)
- **D.** The distribution is approximately normal.

Answer: B. Understanding the definition of the three central tendency measures.

Problem 25.

Three unbiased coins are tossed. What is the probability of getting *at least* two heads?

A) 6/8
B) 4/8
C) 7/8
D) 3/8

Answer: B.

Hint: list all possible outcomes in the sample space. This is essentially the same as the example of the "three-kid" problem we worked on in class.

Problem 26

You decide to conduct a survey of families with two children. You are interested in counting the number of boys (out of 2 children) in each family. Is this a random variable, and if it is, what are all its possible values?

A. Yes, it is a random variable, and its values can be 1 and 2.
B. Yes, it is a random variable, and its values are 0, 1, or 2.
C. Yes, it is a random variable, and its values can be 2 or 4.
D. No, it is not a random variable since it is not random.

Answer: B. Use the definition of the random variable.

Problem 27

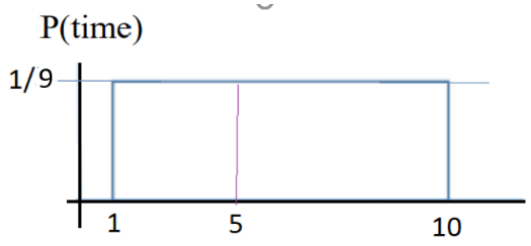
Which of the following is **NOT** a property of a random variable?

A. The sum of the probabilities of a discrete random variable is equal to 1.
B. The distribution function of a random variable cannot be negative.
C. A random variable must be less than or equal to 1 and greater than or equal to 0.
D. A random variable can be discrete or continuous.

Answer: C . Use the definition of the random variable.

Problem 28.

The following uniform distribution describes the wait time (in minutes) for passengers of the bus at a stop at the airport. What is the probability that a randomly selected passenger will wait between 5 and 10 minutes?



A. 5/10
B. 5/9
C. 4/9
D. 4/10

Answer: B

Calculate the area of the region between 5 and 10. It is a rectangle: (10-5)x(1/9) = 5/9.

Problem 29

Suppose the time to wait for placing an order at a drive-through window has a uniform distribution between 0 and 8 minutes. What is the probability that a randomly selected customer will wait for exactly 5 minutes?

A. 5/8
B. 3/8
C. 0
D. 1/8

Answer: C

This is a uniform distribution. It is a continuous random variable. The probability of taking a single value is always 0.

Problem 30

Which of the following random variables should be considered continuous?

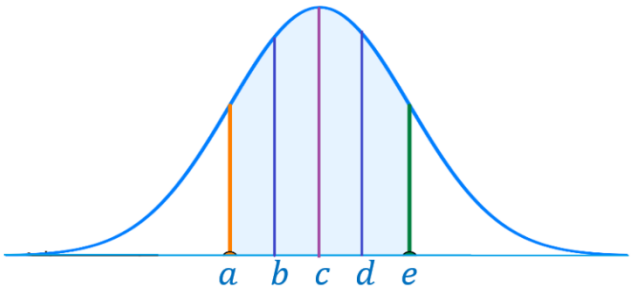
A. The time it takes for a randomly chosen woman to run 100 meters.
B. The number of brothers a randomly chosen person has.
C. The number of cars owned by a randomly chosen adult male.
D. The number of orders received by a mail-order company in a randomly chosen week.

Answer: A

Time is a typical continuous variable. B-C are counts (number of ....).

Problem 31

Assume the density curve of a continuous random variable is given below. A, b, c, d, and e are four distinct values of the random variable. Let E = {a, b, c, d, e}.



Find the probability P(E).

A. 1/5
B. 1/3
C. 0
D. 1/(a+b+c+d+e)

Answer: C.

The density curve indicates the continuity of the random variable. The probability of observing individual values is always 0. P(a) = P(b) = P(c) = P(d) = P(e) = 0. Therefore, the sum of these probabilities is also 0.

Problem 32.

Assume that the time required to receive confirmation that an electronic transfer has occurred is **uniformly** distributed between 30 and 90 seconds. What is the probability that a randomly selected transfer will take less than 75 seconds?

A. 15/60
B. 15/90
C. 30/90
D. 45/60

Answer: D

Use the area formula of the rectangle to find the probability: height = 1/(90-30) = 1/60, width = (75 – 30) = 45 (“less than”). The probability = 45/60.

Problem 33

The table below reflects the student population at a fictional high school, where lower classmen refer to freshmen and sophomores and upperclassmen refer to juniors and seniors.

	Lower Classman	Upper Classman	Row Totals
Male	241	197	438
Female	189	213	402
Column Totals	430	410	840

Randomly select a student, what is the probability that the student is an upper-classman student?

A. 430/840

B. 410/840

C. 213/410

D. 197/840

Answer: B. Randomly select a student from the population (all students).

Problem 34

The table below reflects the student population at a fictional high school, where lower classmen refer to freshmen and sophomores and upperclassmen refer to juniors and seniors.

	Lower Classman	Upper Classman	Row Totals
Male	241	197	438
Female	189	213	402
Column Totals	430	410	840

Randomly select a male student, what is the probability that the student is an upperclassman?

a. 197/438

b. 213/402

c. 197/410

d. 197/840

Answer: A. note that the selected student is restricted to male students.

Problem 35

What is the sample space for flipping a fair coin 3 times?

A. HHH HTH THT TTT

B. HHH HHT HTH THH TTH THT HTT TTT

C. HHH HHT HTH THH TTT

D. HHT HTH THH TTH THT HTT

Answer. B

Problem 36

A discrete random variable has the probability distribution seen below. What is the probability that x is greater than 2?

x	0	1	2	3	4	5
P (X = x)	0.05	0.15	0.10	0.25	0.30	0.15

A. 0.10

B. 0.20

C. 0.80

D. 0.70

Answer: D. $P(x>2) = P(x=3) + P(x=4) + P(x=5) = 0.25 + 0.3 + 0.15 = 0.7$