2 Marks Questions

1. What is a Statistics? Mention it types.

Statistics is a branch of mathematics that involves the collection, analysis, interpretation, presentation, and organization of data. It can be categorized into two main types:

- **Descriptive Statistics:** Descriptive statistics involve methods for summarizing and presenting data. It includes measures such as mean, median, mode, range, and standard deviation.
- **Inferential Statistics:** Inferential statistics involve making inferences or predictions about a population based on a sample of data. It includes techniques like hypothesis testing, confidence intervals, and regression analysis.

2. Compare Descriptive Statistics and *Inferential statistics.*

- **Descriptive Statistics:** Descriptive statistics summarize and present data in a meaningful way. It includes measures of central tendency (mean, median, mode) and measures of variability (range, standard deviation).
- **Inferential Statistics:** Inferential statistics involve making predictions or inferences about a population based on a sample of data. It includes hypothesis testing, estimating parameters, and making predictions using regression analysis.

3. What are the four Types of Data & Measurement Scales?

The four types of data are based on measurement scales:

- Nominal Data: Categorical data without any inherent order or ranking.

- Ordinal Data: Categorical data with a meaningful order or ranking.
- Interval Data: Numeric data with a consistent interval between values but no true zero point.
- Ratio Data: Numeric data with a consistent interval between values and a true zero point.

4. What are nominal data and ordinal data? Give an example.

- **Nominal Data:** Nominal data are categories without any inherent order. Example: Colors (Red, Blue, Green).
- **Ordinal Data:** Ordinal data are categories with a meaningful order. Example: Education levels (High School, Bachelor's, Master's).

5. What are interval data and ratio data? Give an example.

- **Interval Data:** Interval data have a consistent interval between values but no true zero point. Example: Temperature in Celsius.
- **Ratio Data:** Ratio data have a consistent interval between values and a true zero point. Example: Height in centimeters.

6. Define Measure of Central Tendency. List its types.

Measure of Central Tendency: A measure that describes the center of a data set. Types include:

- Mean: The arithmetic average of a set of values.
- Median: The middle value when data is ordered.
- Mode: The most frequently occurring value.

7. Define Mode. Determine the mode for the following numbers.

2,4,8,4,6,2,7,8,

Mode: The mode is the value that appears most frequently in a dataset.

Example: For the numbers 2, 4, 8, 4, 6, 2, 7, 8, the mode is 4.

8. Define Median.Write the steps to calculate Median.

Median: The median is the middle value when data is ordered. Steps to calculate the median:

1. Arrange the data in ascending order.
2. If the number of observations (n) is odd, the median is the middle value.
3. If n is even, the median is the average of the two middle values.

9. Define Median. Determine the median for the numbers 2,4,8,4,6,2,7,8,4,3,8,9,4,3,5

Median Calculation:

1. Arrange the data: 2, 2, 3, 4, 4, 4, 4, 5, 6, 7, 8, 8, 8, 9.
2. Since there are 14 observations (even), the median is the average of the 7th and 8th values.
3. Median = (4 + 4) / 2 = 4.

10.Determine the mode and median for the following numbers.

213,345,609,073,167,243,444,524,199,682

Determine the mode and median for the following numbers: 213, 345, 609, 073, 167, 243, 444, 524, 199, 682:

Mode: There is no mode as no value repeats.

Median Calculation:

1. Arrange the data: 167, 199, 213, 243, 345, 444, 524, 609, 682, 073.
2. Since there are 10 observations (even), the median is the average of the 5th and 6th values.

3. Median = (345 + 444) / 2 = 394.5.

11.Compute the mean for the following numbers.
17.3,44.5,31.6,40.0,52.8,38.8,30.1,78.5

Mean Calculation:

Mean=17.3+44.5+31.6+40.0+52.8+38.8+30.1+78.58/8

Mean=41.825

12.Define Percentiles. Write the steps to calculate location of Percentiles.

1. order the data from smallest to largest.
2. Calculate the rank of the percentile using the formula: Rank=Percentile×(n+1)/100 where n is the number of observations.
3. If the rank is an integer, the percentile is the value at that rank.
4. If the rank is not an integer, interpolate between the two nearest values.

13.What is Quartiles? Determine Q3 for 14, 12, 19, 23, 5, 13, 28, 17.

Quartiles: Quartiles divide a dataset into four equal parts. Q3 is the third quartile, representing the 75th percentile.

Steps to Determine Q3:

Order the data: 5, 12, 13, 14, 17, 19, 23, 28.

Calculate the rank of Q3: Rank=3×(8+1)/4=6.75

Q3 is between the 6th and 7th values. Interpolate:

Q3=19+0.75×(23−19)=19+3=22

14.Determine the 30th percentile of the following eight numbers: 14, 12, 19, 23, 5, 13, 28, 17.

Order the data: 5, 12, 13, 14, 17, 19, 23, 28.

Calculate the rank of the 30th percentile:
Rank=30×(8+1)/100=2.7
The 30th percentile is between the 2nd and 3rd values.
Interpolate: 30th percentile=12+0.7×(13−12)=12.7

15.Define Range. Write the range of following numbers.
16,28,29,13,17,20,11,34,32,27,25,30,19,18,33

Range: The range is the difference between the maximum and minimum values in a dataset.
Range Calculation: Range=Max−Min=34−11=23

16.Define Interquartile Range. Write its formula.

Interquartile Range (IQR): The IQR is the range of the middle 50% of a dataset, calculated as Q3 - Q1.
IQR=Q3−Q1

17.Define Mean Absolute Deviation. Write its formula.

Mean Absolute Deviation (MAD): MAD measures the average absolute deviation of each data point from the mean.
MAD=$\sum|Xi-\text{Mean}|/n$

18.Define Variance. Write its formula.
Variance: Variance measures the average squared deviation of each data point from the mean.
Variance=sqrt($\sum$(Xi−Mean)/N)
19.Define Standard Deviation. Write its formula
Standard Deviation: The standard deviation is the square root of the variance.

Standard Deviation=sqrt(Variance)

20.Write the formulae for sample Variance and sample Standard Deviation..

Sample Variance:

Sample Variance=$\sum(Xi-\bar{X})2/n-1$
Sample Standard Deviation=Sqrt(SV)

21.Define Z score. Write itsformula

Z Score: The Z score (or standard score) measures how many standard deviations a data point is from the mean.
Formula:
$Z = X-$Mean/ Standard Deviation

22.State Empirical Rule.List the condition.

Empirical Rule: Also known as the 68-95-99.7 rule, it states that for a normal distribution:

- About 68% of the data falls within one standard deviation of the mean.
- About 95% falls within two standard deviations.
- About 99.7% falls within three standard deviations.

Condition: The Empirical Rule applies to approximately symmetric, bell-shaped distributions.

23.Define Coefficient of Variation. Write itsformuala.

Coefficient of Variation (CV): CV measures the relative variability of a dataset.

Formula: CV=(Standard Deviation)/Mean×100%

24.Define Measures of Shape.Mention its types.

Measures of Shape: These describe the distribution's form. Types include:

- Skewness: Measures asymmetry.

- Kurtosis: Measures the tail's thickness or thinness.

25. What is Skewness? Draw its types.

Skewness: Skewness measures the asymmetry of a distribution.

- Positive Skewness (Right-skewed): Tail is on the right.
- Negative Skewness (Left-skewed): Tail is on the left.
- Zero Skewness: Perfectly symmetrical.

26. Write the formulae to calculate Coefficient of Skewness using Karl Pearson.

Skewness=3(Mean−Median)/ Standard Deviation

27. Write the formulae to calculate Coefficient of Skewness using Bowel's.

Skewness= (Q3 + Q1 - 2×Median)/(Q3 - Q1)

28. Write the relationship between mean, median and mode in various skewness.

- Negatively Skewed (Left): Mean < Median < Mode
- Positively Skewed (Right): Mode < Median < Mean
- Symmetrical: Mean = Median = Mode

29. What is Kurtosis? Mention its types.

Kurtosis: Kurtosis measures the tail's thickness or thinness.

- Leptokurtic: Tails are heavier (more data in the tails).
- Mesokurtic: Normal distribution.
- Platykurtic: Tails are lighter (less data in the tails).

30. What are the components of Box-and-Whisker Plots?

- Minimum: The smallest data point within the lower fence.
- Maximum: The largest data point within the upper fence.

- Q1 (First Quartile): Median of the lower half of the data.
- Q3 (Third Quartile): Median of the upper half of the data.
- Median (Q2): The middle value of the dataset.
- Outliers: Data points beyond the fences (1.5 times the interquartile range).

31.What are Histogram, Pie charts, frequency polygons and Bar charts?

- Histogram: A histogram is a graphical representation of the distribution of a dataset. It consists of bars where the length of each bar corresponds to the frequency of data within a certain range.
- Pie Chart: A pie chart is a circular statistical graphic divided into slices to illustrate numerical proportions. The size of each slice represents the proportion of data it represents.
- Frequency Polygon: A frequency polygon is a line graph that represents the frequencies of different values in a dataset. It is created by connecting the midpoints of the tops of the bars in a histogram.
- Bar Chart: A bar chart is a graphical representation of data where individual bars represent different categories. The length of each bar corresponds to the quantity it represents.

32.What are Stem and Leaf plot?

Stem and Leaf Plot: A stem and leaf plot is a way of organizing and displaying data. The "stem" consists of the leading digits, and the "leaves" are the trailing digits. It provides a quick way to see the distribution of a dataset.

33.What is a Probability? Mention it types.

- Probability: Probability is a measure of the likelihood that a given event will occur. It is expressed as a number between 0 and 1.
- Types of Probability:
  - Classical Probability: Based on the assumption of equally likely outcomes.
  - Empirical (Relative Frequency) Probability: Based on observed frequencies.
  - Subjective Probability: Based on personal judgment or intuition.

34.What is an Experiment and Event? Give Example.

- Experiment: An experiment is a process that produces an outcome with uncertainty. For example, rolling a die is an experiment.
- Event: An event is an outcome or a set of outcomes of an experiment. For example, getting a 3 when rolling a die is an event.

35.What is the classical method of assigning of a Probability? Give Example.

- Classical Probability: Probability is determined by the number of favorable outcomes divided by the total number of possible outcomes, assuming all outcomes are equally likely.
- Example: The probability of rolling a 3 on a fair six-sided die is 1/6.

36.What is the relative frequency of occurrence method assigning of a Probability? Give Example.

- Relative Frequency Probability: Probability is estimated based on the observed frequency of an event in a large number of trials.

- Example: If a coin is flipped 100 times and it lands on heads 60 times, the relative frequency of getting heads is 60/100=0.6

37.What are the subjective probabilities? Give Example.

- Subjective Probability: Probability assigned based on personal judgment or experience.
- Example: A weather forecaster predicting a 70% chance of rain based on their knowledge of weather patterns.

38.Define Elementary Events. Give an example.

- Elementary Events: The most basic outcomes of an experiment.
- Example: In rolling a six-sided die, the elementary events are getting a 1, 2, 3, 4, 5, or 6.

39.Define Sample Space. Give an example.

- Sample Space: The set of all possible outcomes of an experiment.
- Example: In flipping a coin, the sample space is {Heads, Tails}.

40.Give an example for Unions and Intersections.

- Unions and Intersections: In probability, unions (∪) and intersections (∩) of events are important concepts.
- Example: Let A be the event of rolling an even number (A = {2, 4, 6}) and B be the event of rolling a number greater than 4 (B = {5, 6}). The union of A and B (A ∪ B) is {2, 4, 5, 6}, and the intersection of A and B (A ∩ B) is {6}.

41.Define Mutually Exclusive Events and Independent Events. Give an example.

- Mutually Exclusive Events: Mutually exclusive events cannot occur at the same time. If one event happens, the other cannot. Example: Rolling a die and getting a 1 or 2 are mutually exclusive events.
- Independent Events: Independent events are events where the occurrence of one event does not affect the occurrence of the other. Example: Flipping a coin twice, where the outcomes are independent.

42.Define Collectively Exhaustive Events. Give an example.

Collectively Exhaustive Events: A set of events is collectively exhaustive if at least one of them must occur. Example: When rolling a six-sided die, the events of getting a 1, 2, 3, 4, 5, or 6 are collectively exhaustive.

43.Define Complementary Events. Give an example.

Complementary Events: The complement of an event A (denoted as A') is the set of all outcomes not in A. Example: If event A is getting a head when flipping a coin, then A' is getting a tail.

44.If a population consists of the positive even numbers through 30 and if A = {2, 6, 12, 24}, what is A' ?

A′ (the complement of A) would be the set of positive even numbers through 30 that are not in A. Therefore, $A'=\{4,8,10,14,16,18,20,22,26,28,30\}$.

45.What are the three types of Counting the Possibilities The three types are:

1. Permutation: Arrangements of objects in a specific order.
2. Combination: Selections of objects without considering the order.

3. Multiplication Rule: Counting possibilities for multiple events.

46. Write the general Addition and Special Addition Laws.
General Addition Law: $P(A \cup B) = P(A) + P(B) - P(A \cap B)$
Special Addition Law (for mutually exclusive events): $P(A \cup B) = P(A) + P(B)$

47. Write the General Law of Multiplication and Special Law of Multiplication.

- General Multiplication Law: $P(A \cap B) = P(A) \times P(B|A)$
- Special Multiplication Law (for independent events): $P(A \cap B) = P(A) \times P(B)$

48. Write the Conditional Probability
Conditional Probability: The probability of an event B occurring given that event A has occurred is denoted as $P(B|A)$ and is given by $P(B|A) = P(A \cap B)/\mathrm{P(A)}$

49. What are discrete random variables? Give an example.
Discrete Random Variables: These are random variables that can take on a countable number of distinct values. Example: The number of heads obtained when flipping a coin multiple times.

50. What are Continuous random variables? Give an example.
Continuous Random Variables: These are random variables that can take on any value within a given range. Example: The height of a person can be considered a continuous random variable.

51. Write the formulae for Mean, Variance, and Standard Deviation of Discrete Distributions.

- **Mean (Expected Value):** $\mu = \sum_i x_i P(X = x_i)$
- **Variance:** $\sigma^2 = \sum_i (x_i - \mu)^2 P(X = x_i)$
- **Standard Deviation:** $\sigma = \sqrt{\sigma^2}$

52.List the assumptions of Binomial Distribution.

- The experiment consists of a fixed number of trials.
- Each trial results in a success or failure.
- The probability of success (p) is constant for each trial.
- The trials are independent.

53.Write the formulae of binomial distribution.

- $P(X = k) = \binom{n}{k} p^k (1-p)^{n-k}$

54.A company places a seven-digit serial number on each part that is made. Each digit of the serial number can be any number from 0 through 9. Digits can be repeated in the serial number. How many different serial numbers are possible?

There are 10 options (0 through 9) for each of the seven digits. Therefore, the total number of possible serial numbers is 10^7

55.A small company has 20 employees. Six of these employees will be selected randomly to be interviewed as part of an employee satisfaction program. How many different groups of six can be selected?

- The number of ways to choose 6 employees out of 20 is given by the combination formula: $\binom{20}{6} = \frac{20!}{6!(20-6)!}$.

56.What are Poisson distribution? Give an example.

- Poisson Distribution: A discrete probability distribution that describes the number of events occurring in a fixed interval of time or space.
- Example: The number of phone calls received at a call center in one hour.

57.List the characteristics ofPoisson distribution.

- Deals with the number of events occurring in a fixed interval.
- Events are rare and random.
- Events are independent.
- The probability of more than one event occurring in an infinitesimally small time interval is negligible.

58.Write the formulae of Poisson distribution.

- $P(X = k) = \frac{e^{-\lambda}\lambda^k}{k!}$

59.What are uniform distributions? Write the probability density function of uniform distribution.

- **Uniform Distributions:** Continuous probability distributions where all outcomes have equal probability.
- **Probability Density Function (PDF):** $f(x) = \frac{1}{b-a}$ for $a \leq x \leq b$ and $f(x) = 0$ elsewhere.

60.Write the formulae of mean and standard deviation of a uniform distribution.

- **Mean:** $\mu = \frac{a+b}{2}$
- **Standard Deviation:** $\sigma = \frac{b-a}{\sqrt{12}}$

61.Write the formulae of Probabilities in a Uniform Distribution.

- For a continuous uniform distribution on the interval [a, b]:
  - Probability density function (PDF): $f(x) = \frac{1}{b-a}$ for $a \leq x \leq b$
  - Probability of $a \leq X \leq b$: $P(a \leq X \leq b) = \frac{b-a}{b-a} = 1$
  - Probability of $X > c$: $P(X > c) = \frac{b-c}{b-a}$
  - Probability of $X < c$: $P(X < c) = \frac{c-a}{b-a}$

62.List the characteristics ofnormal distribution.

- Symmetric and bell-shaped.

- Mean, median, and mode are equal and located at the center.
- The Empirical Rule applies (68-95-99.7 rule).
- Completely described by mean and standard deviation.
- Standard normal distribution has a mean of 0 and standard deviation of 1.

63. Write the probability density function Normal Distribution

- For a normal distribution with mean μ and standard deviation σ:
  - PDF: $f(x) = \frac{1}{\sigma\sqrt{2\pi}} e^{-\frac{(x-\mu)^2}{2\sigma^2}}$

64. What are t Distribution? Write the formula for the t statistic.

t Distribution: Used for small sample sizes when the population standard deviation is unknown.

t Statistic Formula: $t = \frac{\bar{X}-\mu}{s/\sqrt{n}}$, where $\bar{X}$ is the sample mean, μ is the population mean, s is the sample standard deviation, and n is the sample size.

65. Write the Confidence Intervals formulae in t statistic.

- Confidence interval for the population mean (μ) with a t distribution:

  $\bar{X} \pm t_{\alpha/2}\left(\frac{s}{\sqrt{n}}\right)$

  where $\bar{X}$ is the sample mean, s is the sample standard deviation, n is the sample size, and $t_{\alpha/2}$ is the critical value.

66. Write the Z formulae for sample mean.

- For a population with known standard deviation (σ):

  $Z = \frac{\bar{X}-\mu}{\sigma/\sqrt{n}}$

Long Answer Questions **(THREE, FOUR OR FIVE AND SIX Marks Questions)**

1. Explain four Types of Data & Measurement Scales with example.

1. Nominal Data:
    - Description: Categories with no inherent order or ranking.
    - Example: Colors (Red, Blue, Green).
2. Ordinal Data:
    - Description: Categories with a meaningful order, but the intervals between them are not uniform.
    - Example: Education Levels (High School, Bachelor's, Master's).
3. Interval Data:
    - Description: Ordered categories with uniform intervals between them, but no true zero point.
    - Example: Temperature in Celsius (0°C does not mean the absence of temperature).
4. Ratio Data:
    - Description: Ordered categories with uniform intervals, and a true zero point.
    - Example: Height in centimeters (0 cm indicates no height).

2. Explain Kurtosis types with diagram.

Diagram should be included for this.

1. Leptokurtic:
    - Description: Tails are heavier, indicating more data in the tails.
    - Diagram: Peaks are higher and tails are fatter compared to a normal distribution.
2. Mesokurtic:
    - Description: Similar to a normal distribution, neither heavy-tailed nor light-tailed.
    - Diagram: Looks like a standard normal distribution.

3. Platykurtic:
    - Description: Tails are lighter, indicating less data in the tails.
    - Diagram: Peaks are lower, and tails are thinner compared to a normal distribution.

3. Explain Measure of Skewness with its types.

Skewness: Skewness measures the asymmetry of a distribution. There are three types:

1. Negative Skewness (Left-skewed):
    - Description: The distribution's tail is extended to the left.
    - Diagram: Tail on the left side is longer.
2. Positive Skewness (Right-skewed):
    - Description: The distribution's tail is extended to the right.
    - Diagram: Tail on the right side is longer.
3. Zero Skewness:
    - Description: The distribution is perfectly symmetrical.
    - Diagram: Left and right sides are mirror images.

4. The number of U.S. cars in service by top car rental companies in a recent year according to Auto Rental News follows. Compute the mode, the median, and the mean.

Company	Number of Cars in Service
Enterprise	643,000
Hertz	327,000
National/Alamo	233,000
Avis	204,000
Dollar/Thrifty	167,000
Budget	144,000
Advantage	20,000
U-Save	12,000
Payless	10,000
ACE	9,000
Fox	9,000
Rent-A-Wreck	7,000
Triangle	6,000

5. Compute the 35th percentile, the 55th percentile,Q1, Q2, and Q3 for the following data

16 28 29 13 17 20 11 34 32 27 25 30 19 18 33

6. The following shows the top 16 global marketing categories for advertising spending for a recent year according to Advertising Age. Spending is given in millions of U.S. dollars. Determine the first, the second, and the third quartiles for these data

Category	Ad Spending
Automotive	$22,195
Personal Care	19,526
Entertainment & Media	9,538
Food	7,793
Drugs	7,707
Electronics	4,023
Soft Drinks	3,916
Retail	3,576
Cleaners	3,571
Restaurants	3,553
Computers	3,247
Telephone	2,488
Financial	2,433
Beer, Wine & Liquor	2,050
Candy	1,137
Toys	699

7.

3.11 A data set contains the following seven values.

6 2 4 9 1 3 5

a. Find the range.

b. Find the mean absolute deviation.

c. Find the population variance.

d. Find the population standard deviation.

e. Find the interquartile range.

f. Find the z score for each value.

g. Calcualte Coefficient of Variation.

8.

3.12 A data set contains the following eight values.

4	3	0	5	2	9	4	5

a. Find the range.
b. Find the mean absolute deviation.
c. Find the sample variance.
d. Find the sample standard deviation.
e. Find the interquartile range.

CalculateCoefficient of Variation

9. Shown here is a sample of six of the largest accounting firms in the United States and the number of partners associated with each firm as reported by the Public Accounting Report. Calculate sample variance and sample standard deviation.

Firm	Number of Partners
Deloitte & Touche	2654
Ernst & Young	2108
PricewaterhouseCoopers	2069
KPMG	1664
RSM McGladrey	720
Grant Thornton	309

10.

3.15 Use your calculator or computer to find the population variance and population standard deviation for the following data.

123	090	546	378
392	280	179	601
572	953	749	075
303	468	531	646

11.

11.

3.35 On a certain day the average closing price of a group of stocks on the New York Stock Exchange is $35 (to the nearest dollar). If the median value is $33 and the mode is $21, is the distribution of these stock prices skewed? If so, how?

12.

3.36 A local hotel offers ballroom dancing on Friday nights. A researcher observes the customers and estimates their ages. Discuss the skewness of the distribution of ages if the mean age is 51, the median age is 54, and the modal age is 59.

13.

3.38 Suppose the following data are the ages of Internet users obtained from a sample. Use these data to compute a Pearsonian coefficient of skewness. What is the meaning of the coefficient?

41	15	31	25	24
23	21	22	22	18
30	20	19	19	16
23	27	38	34	24
19	20	29	17	23

14.

3.39 Construct a box-and-whisker plot on the following data. Do the data contain any outliers? Is the distribution of data skewed?

540	690	503	558	490	609
379	601	559	495	562	580
510	623	477	574	588	497
527	570	495	590	602	541

15.

Shown here is a list of the top five industrial and farm equipment companies in the United States, along with their annual sales ($ millions). Construct a pie chart and a bar graph to represent these data, and label the slices with the appropriate percentages.

Firm	Revenue ($ million)
Caterpillar	30,251
Deere	19,986
Illinois Tool Works	11,731
Eaton	9,817
American Standard	9,509

16

The following list shows the top six pharmaceutical companies in the United States and their sales figures ($ millions) for a recent year. Use this information to construct a pie chart and a bar graph to represent these six companies and their sales.

Pharmaceutical Company	Sales
Pfizer	52,921
Johnson & Johnson	47,348
Merck	22,939
Bristol-Myers Squibb	21,886
Abbott Laboratories	20,473
Wyeth	17,358

17.

The following data represent the costs (in dollars) of a sample of 30 postal mailings by a company.

3.67	2.75	9.15	5.11	3.32	2.09
1.83	10.94	1.93	3.89	7.20	2.78
6.72	7.80	5.47	4.15	3.55	3.53
3.34	4.95	5.42	8.64	4.84	4.10
5.10	6.45	4.65	1.97	2.84	3.21

Using dollars as a stem and cents as a leaf, construct a stem-and-leaf plot of the data.

18.

2.7 Construct a histogram and a frequency polygon for the following data.

Class Interval	Frequency
10–under 20	9
20–under 30	7
30–under 40	10
40–under 50	6
50–under 60	13
60–under 70	18
70–under 80	15

19.

2.6 Construct a histogram and a frequency polygon for the following data.

Class Interval	Frequency
30–under 32	5
32–under 34	7
34–under 36	15
36–under 38	21
38–under 40	34
40–under 42	24
42–under 44	17
44–under 46	8

20

2.9 Construct a stem-and-leaf plot using two digits for the stem.

212	239	240	218	222	249	265	224
257	271	266	234	239	219	255	260
243	261	249	230	246	263	235	229
218	238	254	249	250	263	229	221
253	227	270	257	261	238	240	239
273	220	226	239	258	259	230	262
255	226						

21.Explain general Methods of assigning probabilities with example.

22.A supplier shipped a lot of six parts to a company. The lot contained three defective parts. Suppose the customer decided to randomly select two parts and test them for defects. How large a sample space is the customer potentially working with? List the sample space. Using the sample space list, determine the probability that the customer will select a sample with exactly one defect.

23.

4.2 Given $X = \{1, 3, 5, 7, 8, 9\}$, $Y = \{2, 4, 7, 9\}$, and $Z = \{1, 2, 3, 4, 7\}$, solve the following.

a. $X \cup Z =$ _____ **b.** $X \cap Y =$ _____
c. $X \cap Z =$ _____ **d.** $X \cup Y \cup Z =$ _____
e. $X \cap Y \cap Z =$ _____ **f.** $(X \cup Y) \cap Z =$ _____
g. $(Y \cap Z) \cup (X \cap Y) =$ _____ **h.** X or Y = _____
i. Y and X = _____

24.A company's customer service 800 telephone system is set up so that the caller has six options. Each of these six options leads to a menu with four options. For each of these four options, three more options are available. For each of these three options, another three options are presented. If a person calls the 800 number for assistance, how many total options are possible?

25.A bin contains six parts. Two of the parts are defective and four are acceptable. If three of the six parts are selected from the bin, how large is the sample space?

Which counting rule did you use, and why? For this sample space, what is the probability that exactly one of the three sampled parts is defective?

26.Explain Marginal, Union, Joint and Conditional Probabilities with example.

27.The client company data from the Decision Dilemma reveal that 155 employees worked one of four types of positions. Shown here again is the raw values matrix (also called a contingency table) with the frequency counts for each category and for subtotals and totals containing a breakdown of these employees by type of position and by sex. If an employee of the company is selected randomly, what is the probability that the employee is female or a professional worker?

COMPANY HUMAN RESOURCE DATA

Type of Position		Sex: Male	Sex: Female	
	Managerial	8	3	11
	Professional	31	13	44
	Technical	52	17	69
	Clerical	9	22	31
		100	55	155

28.

4.8 Given $P(A) = .10$, $P(B) = .12$, $P(C) = .21$, $P(A \cap C) = .05$, and $P(B \cap C) = .03$, solve the following.

a. $P(A \cup C) =$ ____

b. $P(B \cup C) =$ ____

c. If A and B are mutually exclusive, $P(A \cup B) =$ ____

29.

4.12 According to the U.S. Bureau of Labor Statistics, 75% of the women 25 through 49 years of age participate in the labor force. Suppose 78% of the women in that age group are married. Suppose also that 61% of all women 25 through 49 years of age are married and are participating in the labor force.

a. What is the probability that a randomly selected woman in that age group is married or is participating in the labor force?

b. What is the probability that a randomly selected woman in that age group is married or is participating in the labor force but not both?

c. What is the probability that a randomly selected woman in that age group is neither married nor participating in the labor force?

30.A company has 140 employees, of which 30 are supervisors. Eighty of the employees are married, and 20% of the married employees are supervisors. If a company employee is randomly selected, what is the probability that the employee is married and is a supervisor?

31.

4.15 Use the values in the contingency table to solve the equations given.

	C	D	E	F
A	5	11	16	8
B	2	3	5	7

a. $P(A \cap E) =$ ______
b. $P(D \cap B) =$ ______
c. $P(D \cap E) =$ ______
d. $P(A \cap B) =$ ______

32.

4.19 A study by Peter D. Hart Research Associates for the Nasdaq Stock Market revealed that 43% of all American adults are stockholders. In addition, the study determined that 75% of all American adult stockholders have some college education. Suppose 37% of all American adults have some college education. An American adult is randomly selected.

a. What is the probability that the adult does not own stock?
b. What is the probability that the adult owns stock and has some college education?
c. What is the probability that the adult owns stock or has some college education?
d. What is the probability that the adult has neither some college education nor owns stock?
e. What is the probability that the adult does not own stock or has no college education?
f. What is the probability that the adult has some college education and owns no stock?

33.

5.1 Determine the mean, the variance, and the standard deviation of the following discrete distribution.

x	$P(x)$
1	.238
2	.290
3	.177
4	.158
5	.137

34.Determine the mean, the variance and the standard deviation of the following discrete distribution.

TABLE 5.2

Discrete Distribution of Occurrence of Daily Crises

Number of Crises	Probability
0	.37
1	.31
2	.18
3	.09
4	.04
5	.01

35.A Gallup survey found that 65% of all financial consumers were very satisfied with their primary financial institution. Suppose that 25 financial consumers are sampled and if the Gallup survey result still holds true today, what is the probability that exactly 19 are very satisfied with their primary financial institution?(Using Binomial Distribution formulae)

36.According to the U.S. Census Bureau, approximately 6% of all workers in Jackson, Mississippi, are unemployed. In conducting a random telephone survey in Jackson, what is the probability of

getting two or fewer unemployed workers in a sample of 20? (Using Binomial Distribution formulae)

37.Suppose bank customers arrive randomly on weekday afternoons at an average of 3.2 customers every 4 minutes. What is the probability of exactly 5 customers arriving in a 4-minute interval on a weekday afternoon? The lambda for this problem is 3.2 customers per 4 minutes. The value of x is 5 customers per 4 minutes. (Using Poisson Formula)

38.Bank customers arrive randomly on weekday afternoons at an average of 3.2 customers every 4 minutes. What is the probability of having more than 7 customers in a 4-minute interval on a weekday afternoon? (Using Poisson Formula)

39.A bank has an average random arrival rate of 3.2 customers every 4 minutes. What is the probability of getting exactly 10 customers during an 8-minute interval? (Using Poisson Formula)

40.

5.15 Find the following values by using the Poisson formula.

a. $P(x = 5 | \lambda = 2.3)$
b. $P(x = 2 | \lambda = 3.9)$
c. $P(x \leq 3 | \lambda = 4.1)$
d. $P(x = 0 | \lambda = 2.7)$
e. $P(x = 1 | \lambda = 5.4)$
f. $P(4 < x < 8 | \lambda = 4.4)$

41.Suppose the amount of time it takes to assemble a plastic module ranges from 27 to 39 seconds and that assembly times are uniformly distributed. Describe the distribution. What is the probability that a given assembly will take between 30 and 35 seconds? Fewer than 30 seconds?

42.According to the National Association of Insurance Commissioners, the average annual cost for automobile insurance in the United States in a recent year was $691. Suppose automobile insurance costs are uniformly distributed in the United States with a range of from $200 to $1,182. What is the standard deviation of this uniform distribution? What is the height of the distribution? What is the probability that a person's annual cost for automobile insurance in the United States is between $410 and $825?

43.

a. What is the probability of obtaining a score greater than 700 on a GMAT test that has a mean of 494 and a standard deviation of 100? Assume GMAT scores are normally distributed.

$P(x > 700 | \mu = 494 \text{ and } \sigma = 100) = ?$

44.GMAT test that has a mean of 494 and a standard deviation of 100? Assume GMAT scores are normally distributed. What is the probability of randomly obtaining a score between 300 and 600 on the GMAT exam?

$P(300 < x < 600 | \mu = 494 \text{ and } \sigma = 100) = ?$

45.GMAT test that has a mean of 494 and a standard deviation of 100? Assume GMAT scores are normally distributed. what is the probability of randomly drawing a score that is 550 or less?

a. $P(x \leq 550 | \mu = 494 \text{ and } \sigma = 100) = ?$

46.GMAT test that has a mean of 494 and a standard deviation of 100? Assume GMAT scores are normally distributed. What is the probability of getting a score between 350 and 450 on the same GMAT exam?

$$P(350 < x < 450 \mid \mu = 494 \text{ and } \sigma = 100) = ?$$

47.Suppose the following data are selected randomly from a population of normally distributed values. Construct a confidence interval to estimate the population mean.And 90% confidence level. (Using the t Statistic). The sample mean is 13.56 and the sample standard deviation is 7.8.

6	21	17	20	7	0	8	16	29
3	8	12	11	9	21	25	15	16

48.Assuming x is normally distributed; use the following information to compute a 99% confidence interval to estimatethe population mean.And 99% confidence level. (Using the t Statistic) The sample mean is 2.14 and the sample standard deviation is 1.29.

3 1 3 2 5 1 2 1 4 2 1 3 1 1