

බස්නාහිර පළාත් අධ්‍යාපන දෙපාර්තමේන්තුව மேல் மாகாணக் கல்வித் திணைக்களம் Department of Education - Western Province			
තෙවන වාර පරීක්ෂණය - 2026 மூன்றாம் கால சோதனை - 2026 Third Term Test - 2026			
ශ්‍රේණිය தரம் Grade	12	විෂය பாடம் Subject	Business Statistics
පත්‍රය வினாத்தாள் Paper	1	පැය மணித்தியாலம் Hours	2

Instructions:

- Answer **all** questions.
- Write your **Index number** in the designated space on the answer sheet.
- Read and follow the instructions given on the answer sheet carefully.
- In each of the questions **1 to 50**, pick one of the alternatives from (1), (2), (3), (4), (5) which is **correct** or **most appropriate** and **mark your response on the answer sheet with a cross (x)** on the number of the correct option in accordance with the instructions given at the back of the answer sheet.
- Use of the calculators is **not allowed**.

1. Which of the following statements is a true?
 - (1) Simplifying complex systems is a limitation of statistics.
 - (2) Making recommendations without studying a sufficient and reasonable sample is a misuse of statistics.
 - (3) Studying a sample and making statements about the population belongs to descriptive statistics.
 - (4) The primary objective of a statistical study is organizing data.
 - (5) Statistical techniques are used within a business only in production management.
2. Which of the following statements is a **false**?
 - (1) The number of hours a student spends on social media per day is an example of qualitative data.
 - (2) An organization's annual financial reports are an example of internal data.
 - (3) Data obtained from the internet for a study on population aging in the South Asian region are referred to as secondary data.
 - (4) Data collected from the general public in a study seeking public opinion on new education reform proposals are referred to as primary data.
 - (5) In a study of children in families in a village, the number of children in a family is a quantitative data.
3. Which of the statement/s given below regarding measurement scales is/are true?
 - A. In the ordinal scale, the magnitude between intervals does not need to be equal, but relative order is important.
 - B. An organization's organizational structure belongs to the nominal scale.
 - C. The zero is meaningful in both ordinal scale data and interval scale data.

- (1) only A.
 - (4) only A and B.

- (2) only B.
 - (5) all A, B and C.

- (3) only C.

4. Which of the following statements is a true?
- (1) In the personal interview method, biases can very easily be introduced by the interviewer.
 - (2) Secondary data obtained from any source always have lower accuracy than primary data.
 - (3) The main weakness of the direct observation method is the low response rate.
 - (4) An additional advantage of the self-enumeration method is the ability to assess the accuracy of data provided through the study of respondent behaviour.
 - (5) The focus grouped discussion method is a higher-cost method compared to the personal interview method.
5. Which of the statement/s given below is/are true?
- A.** When a large amount of data is distributed over a small range, a grouped frequency distribution is most suitable for organizing the data.
 - B.** Class width is the average of the upper- and lower-class limits of a class interval.
 - C.** Although the identity of data is lost in a grouped frequency distribution, the data are summarized.
- (1) only A. (2) only B. (3) only C.
(4) only A and B. (5) all A, B and C.
6. If the mid-value of a class interval is 22 and the difference between two consecutive mid-values is 5, the class boundaries of that class interval are:
- (1) 17.0 – 22.0 (2) 19.5 – 24.5 (3) 20.0 – 24.0 (4) 22.0 – 27.0 (5) 22.5 – 27.5
7. Which of the following statements is a true?
- (1) A histogram and a frequency polygon can be constructed for a frequency distribution with open-ended class intervals.
 - (2) Original data can be reconstructed through a grouped frequency distribution.
 - (3) When a frequency distribution with equal class widths is represented by a histogram, the frequency of each class interval is proportional to the total area of the histogram.
 - (4) A relative frequency distribution shows the cumulative frequency up to each class interval as a proportion of the total frequency.
 - (5) The "less than" cumulative frequency curve is constructed by plotting the cumulative frequency less than the upper-class limit against that upper class limit for any class interval.
8. Which of the statement/s given below is/are true?
- A.** A profile chart is most suitable to show the average lottery sales in Sri Lanka and lottery sales in the Western Province on weekdays.
 - B.** A percentage component bar chart is most suitable to represent Sri Lanka's import expenditure and export revenue over ten years.
 - C.** A pie chart is most suitable to represent the composition of government expenditure in Sri Lanka in the year 2025.
- (1) only A. (2) only B. (3) only A and B.
(4) only A and C. (5) all A, B and C.

9. In a pie chart constructed to show the breakdown of a house's total monthly expenditure of Rs.40,000 according to various types of expenditure, the angle of the sector for food was 216° . The monthly expenditure incurred for food is,
- (1) Rs. 12,000 (2) Rs. 16,000 (3) Rs. 22,000 (4) Rs. 24,000 (5) Rs. 28,000
10. Which of the statement/s given below is/are **false**?
- A. A Z-chart is most suitable to represent the distribution of market share among organizations engaged in production activities within an industry.
- B. The Lorenz curve represents the inequality of two variables.
- C. The "less than" and "more than" cumulative frequency curves intersect each other at the mode.
- (1) only A. (2) only B. (3) only A and B.
(4) only A and C. (5) all A, B and C.
11. In a table prepared for constructing a Z-chart, the annual moving total for April 2024 was 512, and its value for May was 498. If the original data for May 2024 is 68, the original data for May 2023 is,
- (1) 14 (2) 36 (3) 48 (4) 54 (5) 82
12. Which of the statement/s given below is/are true?
- A. When the mean is suitable for measuring central tendency, the standard deviation is suitable for measuring absolute dispersion and the coefficient of variation is suitable for measuring relative dispersion.
- B. Median is the most appropriate central tendency measure for making decisions based on the abundance of data.
- C. The median is the value of the observation located in the middle of a set of numbers.
- (1) only A. (2) only B. (3) only A and B.
(4) only A and C. (5) all A, B and C.
13. In a week from Monday to Saturday, the mean and mode of the number of customers who visited a bank per day are 140 and 152, respectively. The numbers of customers who visited in 4 days are 129, 145, 152, and 142, respectively. The number of customers who visited the bank on Friday and Saturday is,
- (1) 120, 145 (2) 120, 152 (3) 127, 145 (4) 132, 140 (5) 152, 152
14. The mean of the marks obtained by 40 students in an examination is 62. If a mark of 82 was incorrectly entered as 42, the corrected mean is,
- (1) 60 (2) 61 (3) 62 (4) 63 (5) 64

15. In the following ungrouped frequency distribution, if the mean is 3 and the variance is $\frac{6}{5}$ the values of a and b respectively are,

X	1	2	3	4	5
f	1	a	b	5	2

- (1) 5, 7 (2) 7, 5 (3) 8, 4 (4) 4, 8 (5) 10, 2
16. The mean of 10 numbers is 10 and the standard deviation is 3. If after removing one number, the mean remained unchanged, the new variance is,
- (1) 3 (2) 4 (3) 10 (4) 13 (5) 20
17. Which of the statement/s given below is/are true?
- A.** For the same set of data, the geometric mean is greater than the harmonic mean but smaller than the simple arithmetic mean.
- B.** The weighted mean is most suitable for finding the average of reciprocals.
- C.** When the weights assigned to all items are equal, the weighted mean is greater than the simple arithmetic mean.
- (1) only A. (2) only B. (3) only A and B.
(4) only A and C. (5) all A, B and C.
18. If the mean of two numbers is 15 and their geometric mean is 9, those two numbers are,
- (1) 15, 1 (2) 16, 14 (3) 17, 13 (4) 18, 12 (5) 27, 3
19. If one number of two numbers whose geometric mean is $\frac{1}{10}$ is $\frac{1}{16}$ the other number is,
- (1) $\frac{1}{25}$ (2) $\frac{4}{25}$ (3) $\frac{8}{16}$ (4) $\frac{10}{16}$ (5) $\frac{15}{16}$
20. In a competitive examination, the mean was calculated by giving weights to two subject categories A and B. A candidate obtained 80 marks for subject A and 60 marks for subject B, and his mean mark was 74. The percentages allocated from the total weight for subjects A and B respectively are,
- (1) 20, 80 (2) 30, 70 (3) 60, 40 (4) 70, 30 (5) 80, 20
21. The price of a green apple was Rs. 40/= and the price of a red apple was Rs. 50/=. If a person purchased green and red apples spending equal amounts of money, the average price of an apple is,
- (1) Rs. 44.00 (2) Rs. 44.44 (3) Rs. 45.00 (4) Rs. 46.67 (5) Rs. 48.00
22. Which of the following statements is a true?
- (1) When a constant is subtracted from each observation in a data set, the coefficient of variation of that data set also decreases by the magnitude of that constant.
- (2) In variance, the deviation is overestimated, and in standard deviation, the deviation is underestimated.
- (3) Quartile deviation is calculated by considering the middle range containing 50% of the observations located in the middle of a distribution.
- (4) A data set is said to be relatively uniform when that data set has a high dispersion.
- (5) Relative dispersion measures are independent of units of measurement.

23. Which of the statement(s) given below is/are true?
- A. If the mean of a moderately skewed distribution is 287 and the median is 295, then the mode is 311.
 - B. If $(Q_3 - Q_2) = \frac{1}{2} (Q_2 - Q_1)$, then the distribution is positively skewed.
 - C. There is a direct relationship between kurtosis and skewness.
- (1) only A. (2) only B. (3) only A and B.
(4) only A and C. (5) all A, B and C.
24. The weights of 40 students in a class were measured using a measuring instrument, and a mean of 65 kg and a standard deviation of 12 kg were obtained. After making the above calculations, it was found that the measuring instrument's measurements were incorrect, and to correct it, 3 kg must be added to each measurement and then multiplied by 0.8. The corrected mean and standard deviation are,
- (1) 54.4, 12 (2) 54.4, 9.6 (3) 58, 9.6 (4) 58, 12 (5) 58, 15
25. In an examination, a student who obtained 60 marks had a standardized score (z-score) of 0.5, and a student who obtained 28 marks had a standardized score of -1.5. The mean of the marks in this examination is,
- (1) 40 (2) 45 (3) 48 (4) 52 (5) 54
26. Which of the statement/s given below is/are true?
- A. Karl Pearson's product-moment correlation coefficient is a measure showing the linear relationship between a pair of variables.
 - B. If the correlation coefficient between X and Y is r and 10 is added to each X variable, the correlation coefficient remains unchanged.
 - C. The unit of measurement of the correlation coefficient is the unit of measurement of the dependent variable
- (1) only A. (2) only B. (3) only A and B.
(4) only A and C. (5) all A, B and C.
27. Three judges A, B, and C rank 6 contestants in a singing competition. A's ranks are 6, 5, 4, 3, 2, and 1 respectively. The difference between the pairs of ranks of A and B is ± 3 . The difference between the ranks of B and C is ± 1 . Accordingly, the rank correlation coefficient between A and C is,
- (1) -1 (2) -0.54 (3) -0.37 (4) +0.82 (5) +1
28. Which of the statement/s given below is/are true?
- A. When tied ranks do not exist, Spearman's rank correlation coefficient is equal to the product-moment correlation coefficient.
 - B. Spearman's rank correlation coefficient is always equal to the product-moment correlation coefficient between the ranks.
 - C. the maximum possible value for the sum of squared differences of ranks of a pair of ranked variables is obtained; there is a perfect negative agreement between that pair of variables.
- (1) only A. (2) only B. (3) only A and B.
(4) only A and C. (5) all A, B and C.

29. Which of the following statements is a **false**?
- (1) When the regression coefficient is close to zero, there is no relationship between X and Y.
 - (2) The signs of the regression coefficient and the correlation coefficient are the same.
 - (3) The positive or negative square root of the coefficient of determination is equal to the correlation coefficient.
 - (4) The product of the regression coefficient of Y on X and the regression coefficient of X on Y is equal to the coefficient of determination.
 - (5) In the regression equation $\hat{Y} = \beta_0 + \beta_1 X_1 + \beta_2 X_2$, β_2 is the amount by which Y changes when X_2 increases by one unit while X_1 is held constant.
30. When the regression line was fitted using the ordinary least squares (OLS) method, the following results were obtained. If $n = 8$, $\sum X = -34$ and $\beta_1 = 1.2$, the value of $\sum Y$ is,
- (1) 720
 - (2) 840
 - (3) 880
 - (4) 900
 - (5) 920
31. If the sum of squares of deviations of the independent variable is 1600, the sum of squares of deviations of the dependent variable is 3600, and the correlation coefficient is 0.8, the value of the regression coefficient is,
- (1) 0.64
 - (2) 0.80
 - (3) 1.60
 - (4) 1.20
 - (5) 2.56
32. If 36% of the total variance of the dependent variable is represented by errors in a regression model where the regression coefficient is -2.5, the value of the correlation coefficient is,
- (1) -0.64
 - (2) +0.64
 - (3) +0.36
 - (4) +0.80
 - (5) -0.80
33. Which of the statement/s given below regarding probability approaches is/are **false**?
- A. Under the classical approach, the probability of any event can be stated without conducting the experiment.
 - B. Under the subjective probability approach, two individuals can never obtain the same result.
 - C. The probability of global warming increasing within the coming year cannot be presented by any probability approach.
- (1) only A.
 - (2) only B.
 - (3) only A and B.
 - (4) only A and C.
 - (5) all A, B and C.
34. If A and B are two mutually exclusive and collectively exhaustive events such that $3P(A) = P(B)$ the value of $P(B)$ is,
- (1) $\frac{1}{4}$
 - (2) $\frac{1}{3}$
 - (3) $\frac{1}{2}$
 - (4) $\frac{2}{3}$
 - (5) $\frac{3}{4}$
35. A and B are two events defined in a sample space. $P(A) = P$, $P(B) = \frac{P}{2}$ and $P(A \cap B) = \frac{5}{12}P$. If A and B are two independent events, $P(B)$ is:
- (1) $\frac{2}{6}$
 - (2) $\frac{25}{72}$
 - (3) $\frac{5}{12}$
 - (4) $\frac{5}{6}$
 - (5) $\frac{65}{72}$

36. A and B are two events defined in a sample space S. $P(A' \cap B') = \frac{1}{5}$, $P(A' \cup B') = \frac{5}{6}$, and $P(B/A) = \frac{1}{4}$, then $P(B)$ is:

- (1) $\frac{1}{6}$ (2) $\frac{3}{10}$ (3) $\frac{4}{6}$ (4) $\frac{4}{5}$ (5) $\frac{25}{30}$

37. If A and B are two independent events such that $P(A) = \alpha$ and $P(A \cup B) = \beta$, the value of $P(B)$ is,

- (1) $\alpha - \beta$ (2) $\beta - \alpha$ (3) $\frac{1-\alpha}{1-\beta}$ (4) $\frac{\beta-\alpha}{1-\alpha}$ (5) $\frac{1-\alpha}{\beta-\alpha}$

38. If A and B are two independent events such that $P(A) = P(B)$ and $P(A \cup B) = 0.64$, $P(B)$ is,

- (1) 0.20 (2) 0.32 (3) 0.40 (4) 0.60 (5) 0.80

39. If A and B are two events such that $P(A) = 2P(A \cap B)$, $P(B) = 2P(A)$, and $P(A \cup B)' = P(A \cap B)$, the value of $P(B)$ is,

- (1) $\frac{1}{6}$ (2) $\frac{1}{3}$ (3) $\frac{1}{2}$ (4) $\frac{2}{3}$ (5) $\frac{5}{6}$

40. If 5 members are randomly selected from a group of 6 women and 4 men to form a committee, the probability that there are more men than women in that committee is,

- (1) $\frac{60}{252}$ (2) $\frac{66}{252}$ (3) $\frac{120}{252}$ (4) $\frac{186}{252}$ (5) $\frac{246}{252}$

41. A product has 3 defective units and 5 non-defective units. When 4 units are randomly selected from it, the probability of containing an equal number of defective and non-defective units is,

- (1) $\frac{1}{7}$ (2) $\frac{2}{7}$ (3) $\frac{3}{7}$ (4) $\frac{1}{2}$ (5) $\frac{5}{8}$

42. Which of the statement/s given below is/are true?

- A. If two events A and B defined in a sample space are such that $B \subset A$, then $P(B) = P(A \cap B)$
- B. The set consisting of all possible outcomes that can be obtained from a random experiment is called the sample space.
- C. Independence refers to events where the occurrence or non-occurrence of a certain event influences the occurrence or non-occurrence of another event.

- (1) only A. (2) only B. (3) only A and B.
 (4) only A and C. (5) all A, B and C.

43. If the mean of a random variable X is 3 and the variance is 6, the expected value and variance of , $Y = 2X + 4$ are,

- (1) 6, 12 (2) 6, 16 (3) 10, 12 (4) 10, 24 (5) 10, 28

44. Which of the statement/s given below is/are true?

- A. In a discrete probability model, since it represents the probability associated with each specific value of the random variable, it is considered a probability mass function.
- B. If X is a continuous random variable and b is a constant, the probability of $P(X = b)$ occurring is always zero.
- C. The mean of a binomial distribution is always greater than the variance, and if the probability of success is greater than 0.5, that distribution is negatively skewed,

(1) only A.

(2) only B.

(3) only A and B.

(4) only A and C.

(5) all A, B and C.

45. In a binomial distribution with $n = 4$ and $P(X = 2) = 3P(X = 3)$, the value of P is,

(1) $\frac{1}{4}$

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

(3) $\frac{1}{2}$

(4) $\frac{2}{3}$

(5) $\frac{3}{4}$

46. In a binomial distribution with a mean of 3.6 and a variance of 2.52, the number of trials and the probability of success are:

(1) 5, 0.3

(2) 5, 0.7

(3) 12, 0.3

(4) 12, 0.7

(5) 14, 0.7

47. If X follows a Poisson distribution where $P(X = 1) = P(X = 2)$, then $P(X > 1)$ is,

(1) 0.1353

(2) 0.2707

(3) 0.4060

(4) 0.5940

(5) 0.7293

48. A customer service center of a company receives an average of 5 complaints per minute. The probability of receiving at least 2 complaints in a time period of 30 seconds is:

(1) $1 - e^{-2.5}$

(2) $2.5 e^{-2.5}$

(3) $1 - 2.5 e^{-2.5}$

(4) $3.5 e^{-2.5}$

(5) $1 - 3.5 e^{-2.5}$

49. In a normal distribution with a mean of 12 and a variance of 25, if $P(X > x') = 0.1685$, the value of x' is,

(1) 9.8

(2) 14.2

(3) 16.8

(4) 23

(5) 36

50. Out of 5,000 candidates who sat for an examination, 1,000 candidates obtained less than 40 marks. If the marks in the examination are normally distributed with a standard deviation of 15, the mean mark is,

(1) 27.4

(2) 32.2

(3) 47.8

(4) 52.6

(5) 54.8



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மேல் மாகாணக் கல்வித் திணைக்களம்
Department of Education - Western Province

තෙවන වාර පරීක්ෂණය - 2026
மூன்றாம் கால சோதனை - 2026
Third Term Test - 2026

ශ්‍රේණිය
தரம் } 12
Grade

විෂයය
பாடம் } ව්‍යාපාර සංඛ්‍යාතය
Subject } Business Statistics

පත්‍රය
வினாத்தாள் } II
Paper

පැය
மணித்தியாலம் } 3
Hours

Instructions

- Read the instructions on the question paper carefully and follow them.
- Answer only five out of the six questions.
- Calculators are not allowed.

- 01.
- a) Explain primary data and secondary data used in a statistical study, giving suitable examples. (3 marks)
- b) State whether each statement is True or False, giving reasons.
- In the self-enumeration method, a shedule is used to record data.
 - Drawing conclusions about a population based on sample information is the main function of descriptive statistics.
 - The success of the self-enumeration method mainly depends on the educational level of the respondents.
 - In a statistical study, individual items are considered. (4 marks)
- c)
- What is a Lorenz Curve? Explain two situations in which Lorenze curve can be used. (2 marks)
 - The percentages of income received by employees in two industries are:

Percentage of Employees	A	B
0	0	0
20	2	5
40	10	20
60	20	40
80	40	60
100	100	100

- (a) Draw the Lorenz curves for both industries on the same graph.
- (b) Which industry shows greater inequality in income distribution?
- (c) What percentage of total income is received by the 40% of employees in each industry?

(5 marks)

d) Explain the following charts with one example each.

(a) Pie Chart

(b) Component Bar Chart

(3 marks)

e) The annual profits (Rs. million) of a company are given below. Draw a simple bar chart for the information. (3 marks)

Year	Profit
2014	5
2015	3
2016	4
2017	-0.5
2018	1.5

02.

a) What are the characteristics of a good measure of central tendency? Explain these characteristics with reference to the Mean, Median and Mode. (4 marks)

b) The weight distribution of children in a certain age group in kilograms is given below.

Weight (kg)	No. of Children
25-29	35
30-34	45
35-39	70
40-44	100
45-49	90
50-54	80
55-59	50
60-64	30

i) Calculate the Mode, Median, Mean and Standard Deviation of the above distribution. (6 marks)

ii) Calculate the Coefficient of Skewness and comment on it. (2 marks)

iii) Calculate the Coefficient of Variance and comment on it. (2 marks)

c) Define the Geometric Mean and state one practical application of it. (2 marks)

d) The calculated measures of monthly salaries of employees in factories *P* and *Q* are given below.

Factory	P	Q
No. of employees	525	595
Mean salary	475	430
Variance	9000	10000

i) Which factory pays the higher average monthly salary? (2 marks)

ii) In which factory are the salaries more consistent? (2 marks)

03.

- a) State the most appropriate measure of central tendency for each situation and briefly explain the reason.
- (a) Finding the average speed of four students who travel to school by bicycles from their homes.
 - (b) Finding the average time taken to supply water from the main water tank of a city to five locations situated at equal distances.
 - (c) Finding the average annual sales growth of a business over the past five years

(3 marks) .

b)

- i) Define the weighted Mean and explain two practical applications of it. (2 marks)
- ii) An organization conducts an examination consisting of six subjects to recruit an employee. The candidate with the highest weighted average will be selected. The marks obtained by a person who applied for this in each subject are given below.

Subject	Sinhala	Maths	English	Intelligence	General Knowledge	IT
Marks	68	52	45	34	58	70

The weight of Sinhala is three times that of each other subjects while Mathematics and English each carry double the weight of other subject and weights of other subjects are equal. Calculate the weighted average of candidate according to the relative importance of subjects.

- c) The following frequency distribution shows number of electricity consumption units of 100 families. If the median is 48.25, find the values of a and b .

No. of electricity consumption units	0-20	20-40	40-50	50-70	70-100
No. of families	10	a	30	b	15

(4 marks)

d)

- i) Calculate the percentile coefficient of kurtosis for the above distribution and comment.
(04 marks)
- ii) Draw a box and whisker plot for the above distribution and briefly comment on the nature of the distribution.

(02 marks)

04.

- a) Define Regression Analysis and explain its importance in business. (3 marks)
- b) The information about the number of units produced in a certain factory and the cost of a unit produced is given below.

No. of production units (Thousands)	0	1	2	3	4	5
Units cost (Thousands)	70	65	50	40	25	20

- i. Draw a scatter diagram and describe the relationship between two variables. (2 marks)
- ii. Fit the least squares regression line and interpret its coefficients. (5 marks)
- iii. Estimate the unit cost when production is 3,000 units. (1 mark)
- iv. Calculate and interpret the coefficient of determination. (2 marks)
- v. Calculate and interpret the correlation coefficient. (2 marks)
- c) Distinguish between the product moment correlation coefficient and the rank correlation coefficient. (2 marks)
- d) The following table shows how two judges rated the same type of food produced by 10 companies. Calculate spearman's rank correlation coefficient and explain your results.

Company	A	B	C	D	E	F	G	H	I	J
First Judge	8	7	6	1	9	2	5	4	3	10
Second Judge	9	10	3	4	8	1	5	2	6	7

(3 marks)

05. a)

- i) Explain the probability of occurring an event. State two differences between deterministic experiments and random experiments. (2 marks)
- ii) Define the relative frequency approach to probability and state two limitations. (2 marks)

b) In a sample space S , two events A and B are

- i) defined, $P(A) = 0.7$, $P(B)' = 0.6$, $P(A' \cap B') = 0.1$

Find,

$$P(A \cup B), P(A \cap B), P(A/B'), P(B'/A')$$

(2 marks)

- ii) In a department where two employees work, the probability that both employees take leave on a given day is $\frac{1}{7}$, and the probability that only one employee takes leave is $\frac{1}{5}$. Assuming their leave decisions are independent, find the probability that at least one employee **does not take** leave on that day. (3 marks)

- c) X and Y are two mutually exclusive and collectively exhaustive events defined in sample space S. If $P(X) = 10X^2 + 5X - 1$ and $P(Y) = 1 - 2X$, find the value of "X" and calculate the probability of X and Y. (3 marks)

d)

- i) State the Law of Total Probability. (1 mark)
- ii) In a multinational company, a junior executive has an 80% chance of being promoted if the annual sales target is achieved, and a 30% chance of promotion if the target is not achieved. The probability of achieving the annual sales target is 0.75. Find the probabilities of,
- (a) Achieving the sales target but not being promoted. (2 marks)
- (b) Not achieving the sales target but being promoted. (1 mark)
- (c) Being promoted. (2 marks)
- (d) Given that the executive was promoted, the probability that the sales target had been achieved. (2 marks)

06. a)

- i) Define a probability distribution and state the conditions that a discrete probability distribution must satisfy. (2 marks)
- ii) A discrete random variable Y can take only the values 1, 2, 3 and 4. Verify that $f(y) = \frac{y^2}{30}$ is the probability mass function of Y and find the probability that Y takes an even value. (3 marks)

b)

- i) Explain the Binomial random experiment and write the probability mass function of the Binomial distribution. (2 marks)
- ii) A factory produces items with a 10% probability of being defective. From a random sample of 10 items, find the probabilities that more than 50% of the items are defective and the probability that exactly two items are defective. (3 marks)

- c)
- i) Define the Poisson probability distribution. (2 marks)
 - ii) In an urban area where solar panels are widely used, the average number of power failures is 10 per four-week month. For one week, find the probabilities that:
 - (a) No power failure occurs.
 - (b) At most two power failures occur.
 - (c) At least one power failure occurs.(3 marks)
- d)
- i) State two characteristics of the Normal distribution. (1 mark)
 - ii) The time (in minutes) taken by students to complete an examination follows a Normal distribution with mean μ and standard deviation σ . The probability that a randomly selected student takes more than 68 minutes is 0.1587, and the probability that another student takes more than 76 minutes is 0.0228.
Find:
 - (a) The mean and standard deviation of the distribution.
 - (b) The probability that a randomly selected student completes the examination in less than 55 minutes.(4 marks)



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