

Paper 4-Fundamentals of Business Mathematics and Statistics

SET - I

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Full Marks: 100

Time allowed: 3 Hours

The figures in the margin on the right side indicate full marks.

This question paper has two sections.

Both the sections are to be answered subject to instructions given against each.

Section – A

(Business Mathematics)

I. (a) Choose the correct answer

[9 × 2 = 18]

1. The number to be added to each term of the ratio 3 : 7 to make it 1 : 2 is
(a) 2 (b) 1 (c) 3 (d) None of these
2. At what rate p.a. S.I. will a sum of money double itself in 25 years?
(a) 4% (b) 3% (c) 5% (d) 6%
3. If A : B = 3 : 4 & B : C = 2 : 5, then A : B : C
(a) 3 : 4 : 5 (b) 3 : 4 : 10 (c) 4 : 3 : 10 (d) 3 : 4 : 8
4. A.M. of two integral numbers exceeds their G.M. by 2 and the ratio of the numbers is 1 : 4. Find the numbers.
(a) 5, 20 (b) 1, 4 (c) 2, 8 (d) 4, 16
5. Set of even positive integers less than equal to 6 by selector method.
(a) $\{x/x < 6\}$ (b) $\{x/x = 6\}$ (c) $\{x/x \leq 6\}$ (d) None
6. The value of $\log_{\sqrt{2}} 32$ is
(a) 5/2 (b) 5 (c) 10 (d) 1/10
7. If ${}^n P_3 = 120$ then n = _____
(a) 8 (b) 4 (c) 6 (d) None of these
8. If ${}^r C_{12} = {}^r C_8$ find ${}^{22} C_r$
(a) 213 (b) 321 (c) 231 (d) None of these
9. If $3x^2 + 6x + 3 = 0$, then roots of the equation are
(a) (3, 3) (b) (-1, -1) (c) (2, 4) (d) (4, 1)

(b) State whether the following statements are true or false

(6×1=6)

(1) If 15% of x = 20% of y then x : y = 4 : 3

()

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- (2) If the terms $-1 + 2x, 5, 5+x$ are in an A.P. then x is 4 ()
- (3) The statement "Equivalent sets are always equal" is true or false ()
- (4) The logarithm of one to any base is zero ()
- (5) ${}^n C_0 = 1$ is true or false ()
- (6) The degree of the equation $3x^5 + xyz^2 + y^3$ is 3 ()

II. Answer any four questions. Each question carries 4 marks [4 × 4 = 16]

1. If $\frac{x}{b+c} = \frac{y}{c+a} + \frac{z}{a+b}$ then show that $(b-c)(x-a) = (c-a)(y-b) = (a-b)(z-c) = 0$.
2. Which is better investment – 3% per year compounded monthly (or) 3.2% per simple interest (given that $(1.0025)^{12} = 1.0304$)
3. Insert 4 arithmetic means between 4 and 324.
4. Prove that $\frac{\log\sqrt{27} + \log 8 + \log\sqrt{100}}{\log 14400} = \frac{3}{4}$
5. Prove that CALCUTTA is twice of AMERICA in respect of number of arrangements of letters.
6. If the roots of the equation $ax^2 + bx + c = 0$ are in the ratio 2 : 3, then show that $6b^2 = 25ca$.

Section - B

III. (a) Choose the correct answer [12 × 2 = 24]

1. If the co-efficient of correlation between two variables is 0.8 and their covariance is 24. If the variance of x series on Y is 25, the standard deviation of Y series will be
(a) 6.24 (b) 5.94 (c) 6.00 (d) 5.54
2. Which of the following measures of averages divide the observation into four equal parts
(a) Mean (b) Median (c) Mode (d) Quartile
3. A variable which can assume any value between two given value is called
(a) Continuous (b) Discrete Value (c) Random (d) None
4. Class mark is
(a) A midpoint of class interval (b) Upper point of class interval
(c) Lower class (d) None
5. For the observations 6, 4, 6, 5, 10, 4, 8 range is
(a) 10 (b) 9 (c) 8 (d) None

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6. Harmonic mean is used for calculating
(a) Average Growth Rate of Variables
(b) Average speed of journey
(c) Average rate of increase in net worth of a company
(d) All the above 1 to 3
7. $x = \frac{31}{6} - \frac{y}{6}$ is the regression equation of
(a) y on x (b) x on y (c) both (d) None
8. Two regression lines coincide when
(a) $r = 0$ (b) $r = 2$ (c) $r = +1$ or -1 (d) None
9. The mode for the series 3, 5, 6, 2, 6, 2, 9, 5, 8, 6 is
(a) 5.1 (b) 5 (c) 6 (d) 8
10. Standard deviation is used to measure the
(a) Degree of variation or uniformity in data (b) Mode value
(c) Extent of extremes values (d) All the three
11. If an unbiased coin is tossed twice, the probability of obtaining at least one tail is
(a) 0.25 (b) 0.50 (c) 0.75 (d) 1.00
12. The dice are thrown together. The probability that the event the difference of nos.
(a) 1 (b) -1 (c) 1 or -1 according as $b > 0$ or $b < 0$ (d) None of these

(b) State whether the following statements are true or false (12×1=12)

- (1) Horizontal base diagram is used for qualitative data ()
- (2) Median is a mathematical average ()
- (3) Co-efficient of variation = $\frac{\text{Co-efficient of variation}}{\text{Mean}} \times 100$ ()
- (4) Range is the value of difference between mode and median ()
- (5) If a coin is tossed, then probability of getting two heads is zero ()
- (6) If an unbiased coin is tossed once, then the two events head and tail are mutually exclusive ()
- (7) 10th percentile is equal to 9th Decile ()
- (8) Mean deviation can never be negative ()
- (9) The value of correlation co-efficient lies between 0 & 1 ()

(10) Bivariate data are the data collected for two variables ()

(11) When all values are equal, then standard deviation would be zero ()

(12) As the sample size increases, range tends to decrease ()

IV. Answer any four questions. Each question carries 6 marks [4 × 6 = 24]

(1) Prove that for any two positive real quantities $AM \geq GM \geq HM$.

(2) Find the median and mode of the following grouped frequency distribution:

Salaries (in ₹) per hours	5-9	10-14	15-19	20-24	25-29	Total
No. of Persons	10	20	30	25	15	100

(3) The marks obtained by 6 students were 24, 12, 16, 11, 40, 42. Find the range. If the highest mark is omitted, find the percentage change in the range.

(4) Calculate Karl Pearson's coefficient of correlation between variables X and Y using the following data:

X	20	40	30	25	10	5	10	15	30	20
Y	10	25	40	15	20	40	28	22	15	5

(5) The data about the sales and advertisement expenditure of firm are given below:

Commodity	Sales (₹ In crores)	Advertisement Expenditure (₹ In crores)
Mean	40	6
Standard deviation	10	1.5
Coefficient of correlation	0.9	

(i) Estimate the likely sales for a proposed advertisement expenditure of ₹ 10 crores.

(ii) What should be the advertisement expenditure if the firm proposes a sales target of ₹ 60 crores?

(6) What is the change that a leap year, selected at random will contain 53 Sundays?