



Online Coaching Class

Maths

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FUNCTIONS AND THEIR APPLICATIONS

Q.1. Find value of the function at $x = 0, 1, -1, 2.5$

$$f(x) = 7x + 5$$

Q.2. $f(x) = 4x - 1$ for $0 \leq x \leq 4$, find $f(0), f(1), f(1.5), f(4), f(-2)$ If this exist

Q.3. If $f(x) = 3x^2 - 2x + 1$ find x for which $f(x) = f(x - 1)$

Q.4. If $f(x) = 2 + 3x$, for $1 \leq x \leq 4$

$$= 3 + x, \text{ for } 4 \leq x < 7$$

$$= 2x + 7 \text{ otherwise}$$

Find $f(0), f(-2), f(2), f(6)$.

Q.5. If $f(x) = 4^x$, show that $f(x + 1) = 4 \cdot f(x)$

Q.6. If $f(x) = kx - 3$ and $f(3) = 9$ Find the value of k , Hence find $f(-1), f(2)$

Q.7. If $f(x) = x^2 - 2x + 7$, Find x for which $f(x) = f(x - 1) + 3$

Q.8. Find value of the function at $x = 0, 1, -1, 2.5$

$$f(x) = 7$$

Q.9. If $f(x) = 5$ for $-1 \leq x < 1$ -

$$= x + 4 \text{ for } 1 \leq x < 5$$

$$= 2x - 1 \text{ for } 5 \leq x < 10$$

Find $f(0), f(2.1), f(-0.5), f(6)$ Also solve the equation $f(x) = 6$

Q.10. Find the total revenue and average revenue functions for the following demand functions,

Also find their values for $D = 1, 4$

(i) $p = 20 - 3D$

(ii) $p = 30 - D^2$

Q.11. Find the values of total cost and average cost at $x = 2, 5$ if the total cost function is

(i) $C = 2 + 5x + x^2$

(ii) $C = 10 + 3x^2$

Q.12. The demand D and price p are expressed by $4D + 8p = 50$. Express demand function, total revenue function in terms of D . Also find their values at $D = 2$.

Q.13. Find the equilibrium price and quantity for the following demand and supply function.

(i) $p = 15 - 3D$ and $p = 4 + 8D$

(ii) $p = 7 - D$ and $p = 3 + 3D$

- Q.14.** The total cost is $c = 200 + 30x$ and revenue $R = 800 + 5x$. Find the point of no profit and no loss.
- Q.15.** If the total revenue and total cost function for a product is as follows, the minimum number of units which can be produced and sold to avoid loss.
 $R = 49x - 2x^2, C = 70 + 10x$
- Q.16.** The manufactures produces x packets of biscuits per day. The fixed cost is Rs 2000 per day, the cost of manufacturing is ₹18 per packet and the distribution charges are ₹ 2 per packet find the total cost function and also find average cost function and their values for $x = 50$.
- Q.17.** A manufacturer has put ₹40,000 as initial cost and variable cost of Rs 20 per unit for production of batteries. If each battery can be sold at Rs.40, Find total cost, total revenue, profit function. Also find No. of batteries to be produced to achieve the break-even point of no profit, no loss.
- Q.18.** A manufacturer makes toys and the weekly total cost is given by $C = 1200 + 40x$.
- If each toy is sold at ₹100, find the number of units to be produced and sold for no loss.
 - If the selling price is increases by 20%, find the no. of units to be produced and sold to ensure no loss.
 - If it is known in advance that the weekly demand for goods will be 60 find selling price of a toy to ensure no loss.
- Q.19.** The total cost function is $C = 500 + 10x$ and the total revenue function is $R = 700 + 5x$. Find the point at which there will be no profit, no loss i.e. break-even point.
- Q.20.** If the demand of the function $p = 10 - 2D$, find total revenue and average revenue when D is 5 units.
- Q.21.** If the total cost function is $C = 4 + 3x + x^2$, find the cost when x is 10 units. Find average cost when x is 2 units.

DERIVATIVES AND APPLICATION OF DERIVATIVES

❖ Differentiate w.r.t x the following functions

Q.1. $x^5 - \log x + e^x + 4^x + 25$

Q.2. $4x^6 + 7 \log x - 10e^x + 5(3^x) - 100$

Q.3. $x^5 + 5^x + 5^5$

Q.4. $x^{\frac{7}{2}} - 5x^{\frac{5}{2}} + 4\sqrt{x} - 10$

Q.5. $x^3 3^x + e^x \log x$

Q.6. $(x^2 + 3x + 10)(4e^x - 5 \log x)$

Q.7. $x^4 e^x - 5x \log x$

Q.8. $(2x^3 - 5x^2)(10^x + 5e^x)$

Q.9. $\frac{\log x}{8^x}$

Q.10. $\frac{x^2 - 2x + 5}{x - 1}$

Q.11. $\frac{2x^2 + 3x + 5}{x^2 + 1}$

Q.12. $\frac{x^3 \log x}{x^2 + 1}$

Q.13. $\frac{x - \sqrt{x}}{\sqrt{x} + 3}$

Q.14. $\frac{(2x + 5)(3x - 1)}{4x - 1}$

Q.15. $\sqrt{5x^2 + 10x + 3}$

Q.16. $(4x + 1)^4$

Q.17. Differentiate w.r.t. x $x^{-3} 5^x + e^x \log x$.

Q.18. Find second order derivative $x^3 + 3x^2 + \log x$.

- Q.19.** Find second order derivative $x^5 + 5^5 + x^{-7} + e^x$
- Q.20.** Find $\frac{d^2y}{dx^2}$ if $y = 4x^3 + 3x^2 + 4x - 25$
- Q.21.** Find the second order derivative w.r.t x of the function $2e^x - \log x - 4^x$.
- Q.22.** If $f(x) = \log(x^2 + 5)$, find $f''(x)$.
- Q.23.** Find $\frac{d^2y}{dx^2}$ if $y = \sqrt{x^2 + 3x + 1}$
- Q.24.** If $y = 7e^{2x} - 4e^{-2x}$, show that $\frac{d^2y}{dx^2} = 4y$.
- Q.25.** Find the values of x for which the function $f(x) = x^2 - 3x + 1$ is (i) increasing, (ii) decreasing.
- Q.26.** Find the values of x for which the function $f(x) = 3x^2 - 2x + 5$ is (i) increasing, (ii) decreasing.
- Q.27.** Find the values of x for which the function $f(x) = 2x^3 - 3x^2 - 72x + 21$ is (i) increasing (ii) decreasing.
- Q.28.** Find x for which the function $f(x) = 4x^3 - 12x^2 - 36x + 2$ is (i) increasing (ii) decreasing.
- Q.29.** Find the value of x for which the function $f(x) = 4x + \frac{1}{4x}$, $x \neq 0$ is (i) increasing (ii) decreasing.
- Q.30.** Find x for which the function $f(x) = x + \frac{2}{x}$, $x \neq 0$ is (i) increasing and (ii) decreasing.
- Q.31.** Examine for maxima and minima the function $f(x) = 2x^3 - 6x^2 - 90x + 100$.
- Q.32.** Examine for maxima and minima the function $f(x) = x + \frac{9}{x}$, $x \neq 0$.
- Q.33.** Divide 30 into two parts so that their product is maximum.
- Q.34.** Divide 100 into two parts so that the sum of their squares is minimum.
- Q.35.** Examine for maxima and minima the function.
- $$f(x) = 3\sqrt{x} + \frac{3}{\sqrt{x}} + 5, x > 0.$$
- Q.36.** Find the sides of a rectangle with area 25 sq. cms. and perimeter minimum.
- Q.37.** Find the maximum area of a rectangle with given perimeter 10 cms.
- Q.38.** Differentiate w.r.t. $x : (3x^2 + 7x + 8)(7^x - 8e^x)$
- Q.39.** If $y = x^3 + 5x^2 + 10x + 25$, find $\frac{d^2y}{dx^2}$.

- Q.40.** Find x for which the function $f(x) = x^3 - 6x^2 - 15x - 4$ is (i) increasing (ii) decreasing.
- Q.41.** Examine for maxima and minima the function $f(x) = x^3 - 9x^2 + 24x + 17$.
- Q.42.** Examine for maxima and minima the function $f(x) = x + \frac{16}{x}, x \neq 0$.
- Q.43.** Examine the maxima and minima for the function $f(x) = 2\sqrt{x} + \frac{2}{\sqrt{x}}, x > 0$.
- Q.44.** The cost of producing x items is given by $x^2 + 10x + 15$. Find the average cost and the marginal cost functions. What is the marginal cost when $x = 5$. Find x for which marginal cost = average cost?
- Q.45.** The total cost function is given by $C = 2x^2 + 4x + 25$. Find the average cost, the marginal cost and the marginal average cost when $x = 20$.
- Q.46.** The total cost of producing x items is given by $C = 15e^{2x}$. Find the marginal cost when $x = 2$.
- Q.47.** The demand function is $D = \frac{p+3}{p-1}$ where $D =$ Demand and $p =$ price. Find the elasticity of demand when price is 5.
- Q.48.** The demand function is $D = \sqrt{100 - p^2}$. Where $D =$ demand and $p =$ price. Find the elasticity of demand where the price is 4.
- Q.49.** Find the price if the marginal revenue is 20 and the elasticity of demand is 2.
- Q.50.** Find the elasticity of demand if the marginal revenue is 50 and the price is 25.
- Q.51.** Find the marginal revenue if the average revenue is 45 and the elasticity of demand is 5.
- Q.52.** The total cost of producing x items is given by $C = 4.5^{4x}$. Find the average cost and marginal cost when $x = 4$.
- Q.53.** The average cost function is given by $\frac{x^3 + 2x^2 + x + 5}{x}$. Find the total cost and marginal cost functions. Find the total cost, average cost and marginal cost when $x = 10$.
- Q.54.** The demand function is given by $p = 30 + 6D + D^2$ where $p =$ price and $D =$ demand. Find the total revenue, the average revenue and the marginal revenue when the demand is 4.
- Q.55.** The total revenue is given by $R = 20D - D^2$ where $D =$ demand. Find the demand function. Also find AR when MR = 0.
- Q.56.** The cost of producing x items is given by $2x^2 + 3x + 98$. Find the average cost, the marginal cost and the marginal average cost functions. Find the marginal cost and the marginal average cost when $x = 10$. Find x for which marginal cost = average cost.

- Q.57.** Total cost function is $C = Q^3 - 100Q^2 + 25Q$ where $Q =$ number of items produced. Find Q for which the average cost is decreasing.
- Q.58.** The total cost function is $C = Q^3 - 400Q^2 + 2000Q$ where $Q =$ number of items produced. Find Q for which the number of average cost is decreasing.
- Q.59.** Total cost function is $C = 300x - x^3 + 75$. Find x for which the total cost function is decreasing.
- Q.60.** The total cost function is given by $C = 900x - 12x^3 + 1000$. Find x for which the total cost is decreasing.
- Q.61.** 61. A manufacturing company produces x items at a total cost of ₹ $(100 + 2x)$. The demand function is $p = 100 - x$ where $p =$ price and $x =$ demand. Find x for which total revenue is increasing. Also find x for which total profit is increasing.
- Q.62.** A manufacturer can sell x items at a price ₹ $(280 - x)$ each. Total cost of producing x items is ₹ $(x^2 + 10x + 12)$. Find x for which the profit is maximum.
- Q.63.** The total cost function is given by $C = x^3 - 24x^2 + 189x + 100$. Find x for which the cost is minimum.
- Q.64.** The total revenue function is given by $R = 2x^3 - 63x^2 + 648x + 10$. Find x for which the revenue is maximum.
- Q.65.** The demand function is $D = \sqrt{225 - 2p^2}$ where $D =$ demand and $p =$ price. Find the elasticity of demand when price is 5.
- Q.66.** The total revenue is given by $R = 100 + 40D - D^2$ where $D =$ demand. Find the demand function. Also find total revenue when marginal revenue is zero.
- Q.67.** The demand function is given by $p = 40 + D - D^2 + D^3$ where $p =$ price and $D =$ demand. Find the total revenue, the average revenue and the marginal revenue when the demand is 10.
- Q.68.** Find the elasticity of demand if the marginal revenue is 20 and price is 50.
- Q.69.** The total cost function is given by $C = 3x^3 - 36x^2 + 108x + 200$. Find x for which total cost is decreasing.
- Q.70.** A manufacturer sells x items at price ₹ $(420 - x)$ each. The total cost of manufacturing x items is ₹ $(x^2 + 20x + 40)$. Find x for which profit is maximum.
- Q.71.** The total cost function is $C = x^3 - 9x^2 + 24x + 70$. Find x for which the total cost is minimum.

- Q.72.** Total revenue function is given by $R = 4x^3 - 72x^2 + 420x + 500$. Find x for which the total revenue is maximum.
- Q.73.** The manufacturing company produces x items at a total cost of ₹ $(100 + 2x)$. The demand function is $p = 200 - x$ where $p =$ price and $x =$ demand. Find x for which the total revenue is increasing. Also find x for which total profit is increasing.

INTEREST AND ANNUITY

- Q.1.** An amount of ₹ 2,300 was borrowed by Rohit, at a simple interest of 12% p.a. He returned the amount with interest, after 3 years. Calculate the total amount, including the simple interest he had to repay.
- Q.2.** Mr. Patel borrowed ₹ 20,000 from Mr. Shah. After 8 months, he returned the amount, with the simple interest. If the rate was 12% p.a., find the interest he had paid.
- Q.3.** A sum of ₹ 10,000 was taken as a loan by Tushar at a Simple interest of 14% p.a. Find the total amount, with interest, to be returned by him after $1\frac{1}{2}$ years.
- Q.4.** Atul invested ₹ 25,000 for 6 years in a credit society, giving simple interest of 10% p.a. Find the total sum, he will receive in the end of 6 years.
- Q.5.** A sum of ₹ 6,400, accumulated to ₹9,280, in some years. If the rate of simple interest is 9%, find the period.
- Q.6.** Simple interest on a certain sum for 4 years at 7% p.a. is more than simple interest on the same sum for 2 and a half years at the same rate by ₹ 840. Find the principal amount.
- Q.7.** John kept a certain amount in a bank, giving simple interest at 8% p.a. for 5 years and got simple interest of ₹ 10,000. His friend Disha, also kept identical amount in another bank for $3\frac{1}{2}$ years, giving simple interest at 11%p.a. Calculate the interest Disha will get.
- Q.8.** Akshay borrowed ₹80,000, from his friend, partly at 10% p.a. and the remaining at 12% p.a. After 4 years, he returned the total amount with a total simple interest of ₹ 34,400. Find the amounts he borrowed at each of these rates.
- Q.9.** Karan and Kiran borrowed ₹18,000 and ₹25,000 respectively, at the same rate of simple interest. Karan repayed the loan with interest of ₹ 5,040, after $3\frac{1}{2}$ years. How much, should Kiran pay, after $4\frac{1}{2}$ years to pay off the loan, including simple interest?
- Q.10.** Mr. Bhandari took a loan of ₹ 80,000 from Mr. Sharma. At the same time, he borrowed ₹ 1,20,000 from Mr. Tiwari, as well, at a rate of simple interest greater than the first by 3%. After 3 years, Mr. Bhandari returned both the loans, along with total simple interest of ₹ 64,800. Find the rates of interest for both the loans.
- Q.11.** Ramesh took a loan of ₹ 30,000 from a bank on simple interest at the rate of 11% p.a. He also took a loan from his friend of ₹ 40,000 at 10% p.a. on simple interest. On which principal the simple interest will be more after 3 years and how much more?

- Q.12.** A principal amounts to ₹ 9,680, after 3 years and to ₹ 10,800, after 5 years. Find the principal.
- Q.13.** Sneha deposited ₹ 50,000 in a bank, on a simple interest. She withdrew ₹ 20,000 from that after $2\frac{1}{2}$ years and the interest upto that point as well. Thereafter, she removed the remaining amount after 4 years, and the simple interest accrued till that time as well. In all, she received ₹ 22,050 as total simple interest. Find the rate of interest p.a.
- Q.14.** (a) Find the simple interest on ₹ 1,00,000 at 8% p.a. for 5 years.
 (b) A sum of ₹75,000 amounts to ₹ 1,15,500 in 6 years. What is the rate of simple interest p.a.? Also find the simple interest on ₹ 90,000 at the same rate for 10 years.
 (c) An amount of ₹ 15,000 becomes ₹23,100 at 6% p.a. simple interest in n years. Find n . Also calculate the simple interest for the same period on ₹12,500 at 10% p.a.

EXERCISE 2

- Q.15.** Mr. Desai borrows ₹ 12,000 for 4 years at compound interest rate of 8% p.a. How much will he have to repay at the end of the period.
- Q.16.** Ketan got a fixed deposit receipt of ₹ 50,000 for 4 years with rate compound interest of 9.5% p.a. Find the total accumulated value of the F.D., when it matures, after 4 years.
- Q.17.** Rahul kept ₹ 20,000 for 4 years in a bank as a fixed deposit. At time of maturity he received total amount of ₹ 27,210, with compound interest. Find rate of interest.
- Q.18.** Pooja kept a certain amount in a fixed deposit in a co-operative bank which offered 10% rate of interest, compounded annually. At the time of maturity, after 4 years, she received ₹ 73,205. Find the principal amount.
- Q.19.** Find the total amount, with interest, if a sum of ₹ 8,000 is kept in a bank for 3 years with 12% p.a. compounded half yearly.
- Q.20.** The accumulated amounts for a certain principal, with compound interest at a certain rate in 2 years and in 3 years are respectively ₹ 2,662 and ₹ 2928.2. Find the principal and the rate of interest.
- Q.21.** The simple and compound interest for 2 years, on the same principal, at the same rate are ₹ 7,200 and ₹ 7,632 respectively. Find the rate of interest.
- Q.22.** The difference between simple interest and compound interest on a certain principal for 2 years at 6% rate of interest p.a., is ₹ 13.50, find the principal, simple interest and compound interest.

EXERCISE 3

- Q.23.** A car was brought at ₹ 5,40,000. Find its resale price after 3 years by considering 10% depreciation p.a.
- Q.24.** An equipment was brought at ₹ 4,60,000, 5 years back. Find its market price by considering 7% p.a. depreciation.
- Q.25.** An LCD T.V was brought at ₹ 40,500, 3 years back. Find its current market price by considering 6% depreciation p.a.
- Q.26.** A Tata car was brought 3 years back at ₹ 2,20,000. Find its current price with 12% depreciation p.a.
- Q.27.** A scooter has resale price of ₹49,572, after 3 years with 10% rate of depreciation p.a. Find its original price.
- Q.28.** A scooter was purchased at a certain price. Its value after 1 year was ₹ 38,400, after considering certain rate of depreciation. Further, its value decreased to ₹ 36,864, after 2 years. Find its original price and rate of depreciation p.a.
- Q.29.** An equipment was purchased at ₹ 10,00,000. Find its depreciated value for 5 years by considering 10% depreciation for each year.
- Q.30.** A machinery of ₹ 5,00,000 was purchased by a manufacturer. Find out its price, for 3 years by considering 10% depreciation for each year.

EXERCISE 4

- Q.31.** Find the future value if ₹ 1,25,000 were kept in a fixed deposit for 5 years at 9% compound interest p.a.
- Q.32.** Find the accumulated value of ₹ 24,500 kept as a fixed deposit, after 7 years at 7% p.a., compounded annually.
- Q.33.** Mrs. Joshi kept ₹ 55,000 in a bank in fixed deposit for 3 years at 9% p.a. so as to get a minimum of ₹ 70,000 after 3 years. Check whether her requirement will be fulfilled or not.
- Q.34.** Mr. Shah was approached by a person with two schemes, as he wanted to invest ₹ 1,20,000. In scheme A, the period was 8 years with 9% rate p.a. compounder annually. In scheme B, the period was 10 years with 8% compound interest p.a. Advice him about the choice of scheme w.r.t the amount to be received.
- Q.35.** Sonali invested ₹ 8,00,000 in a bank at a certain rate and got ₹ 9,33,120 as the final amount after 2 years. Find the rate of compound interest.

- Q.36.** Raghu invested ₹ 60,000 in a bank at a certain rate and got ₹ 75,264 after 2 years. Find the rate of compound interest.
- Q.37.** Santosh invested a certain amount in a bank for 3 years and received ₹ 1,19,790 as the final amount at a certain rate of interest. He deposited an identical amount in another bank for 5 years and got ₹ 1,44,945.9 as the final amount with same rate. Find the principal amount and the common rate of compound interest.

EXERCISE 5

- Q.38.** Find the present value at 5% rate of interest of ₹ 7,056 payable 2 years from now.
- Q.39.** Find the present worth of ₹ 13,310 at 10% rate of interest, payable 3 years from now.
- Q.40.** Kesar promised to give Ketan ₹ 3,66,025 after 4 years. If the rate of interest is 10%, what is its present worth?
- Q.41.** Aayesh promised to give Sania ₹ 12,50,000 after 7 years at 6% rate of compound interest p.a. What is its present worth?
- Q.42.** Sahil will pay Shrikant ₹ 25,000 after 2 years and he will pay Subhash ₹ 32,000 after 3 years. Find the total present worth of both payments, if the interest rate is 8% p.a., compounded annually.
- Q.43.** Sunil promised to pay Aamir ₹ 15,000 after 3 years with compound rate of interest 8% p.a. He also promised to pay Aakash ₹ 20,000 after 4 years with compound rate of interest 9% p.a. Find the present worth of these payments. Also find the total present worth of the money Sunil has to pay.
- Q.44.** If the present value of a sum of ₹ 29,160 due after 2 years is ₹ 25,000, find the rate of interest, compounded annually.
- Q.45.** Anita promised to pay ₹ 8,00,000 after 5 years to Nameeta. She also promised to pay Soham ₹ 4,50,000 after 4 years. Find the total present worth of both payments, if the rate of interest is 7% p.a. compounded annually.

EXERCISE 6

- Q.46.** Karan deposits ₹ 5,000 at the end of each year in a bank at 9% p.a. compound interest. What will be the total amount he will receive after 6 years?
- Q.47.** Nikhil deposits ₹ 6,000 at the end of every month in a bank giving 9% compound interest p.a. Find the accumulated amount after 1 year.

- Q.48.** Vikas deposits ₹ 7,000 at the end of every quarter, at 10% compound interest p.a. Find the amount of annuity he will receive after 2 years.
- Q.49.** Minal deposited ₹ 6,000 at the end of every year for 10 years, with 12% compound interest p.a. What is the total amount she will receive after 10 years?
- Q.50.** Rakesh deposits ₹ 800 at the end of every month for 3 years, with 8% compound interest p.a. What is the total amount he will receive at the end of the period?
- Q.51.** Viral invests ₹ 1,400 at the end of each quarter for 5 years in a recurring deposit at 8% p.a. compound interest. Find the final amount.
- Q.52.** Find the annuity to be paid at the end of each year for 5 years resulting into the maturity amount of ₹ 73,261.2 at the rate 10% p.a.
- Q.53.** Find the annuity to be paid at the end of every month if the maturity value after 3 years @12% p.a. is ₹ 38,769.19.
- Q.54.** The rate of interest is 8% p.a., compounded half yearly. Find the effective rate of interest.
- Q.55.** Mr. Doshi deposited ₹ 12,000 at the end of every year for 3 years. He received interest as 8% per annum, compounded half yearly. Find the effective rate and accumulated value.

EXERCISE 7

- Q.56.** A loan is repaid fully, with interest in 4 equal yearly instalments of ₹ 20,000, at 7% p.a., compounded annually. Find the present value of the loan.
- Q.57.** What is the present worth of annuity of ₹ 25,000 per year for 3 years, with 9% rate of interest, compounded annually.
- Q.58.** Karan purchased a T.V set and paid ₹ 5,000 immediately, another ₹ 5,000 after a year and ₹ 5,000, after 2 years and thus became debt free. Find the price of T.V set if the compound interest charged was 3.5% p.a.
- Q.59.** Mr. Desai bought a one ton A.C with a cash payment of ₹ 5,000 and 4 monthly instalments of ₹ 2,500 each, what is the cost of A.C. if the company charges 12% interest, compounded annually?
- Q.60.** Karan purchased a second hand motorbike with initial payment of ₹ 20,000 and six monthly instalments of ₹ 5,000 each. If the seller wishes to get 12% compound interest p.a., find the price of the bike.

- Q.61.** Hitesh bought Honda 'Activa' scooter by paying a cash of ₹ 10,000 and the remaining amount in 4 equal quarterly instalments of ₹ 11,000 each. If company wants to get 12% rate of interest p.a., find the present value of the scooter.
- Q.62.** Sneha bought an I.F.B washing machine by paying ₹ 6,000 and the remaining amount in 4 equal quarterly instalments. If the price of washing machine is ₹ 16,000 and the shopkeeper wants to earn 12% rate of interest, compounded annually, find the instalment amount.
- Q.63.** A home-theatre is purchased on installment basis such that ₹ 6,000 as down payment and 4 quarterly installments of ₹ 3,000, each payable at the end of each quarter. If the rate of compound interest is 7% p.a., find the cash price of the system.
- Q.64.** A dealer sells a tape recorder at ₹ 1,000 on initial payment followed by 2 yearly installments of ₹ 1,500 each at the end of first year and second year respectively. If the compound interest charged is 16% p.a., find the cash price of the tape recorder.

EXERCISE 8

- Q.65.** Mr. Doshi wants to take a loan of ₹ 4 Lakhs, which he intends to return after 4 years, with interest. Bank A offers him the loan of 4 lakhs at 6% p.a., flat interest rate and Bank B offers him at 8% p.a., on monthly reducing balance. Comparing the EMI's decide about the choice of bank he should make.
- Q.66.** Jigar took a loan of ₹ 50,000 from a company for a period of 1 year at 12% p.a. Find the EMI, using reducing balance method. Find the interest component and the principal component for first two months.
- Q.67.** Ridhi takes a loan of ₹ 80,000 from a person for a period of 10 months. Compute the EMI at 12% p.a. on reducing balance.
- Q.68.** Nilesh intends to take a loan of ₹ 2 lakhs and he wants to repay it in 5 years, with interest. Axis Bank offers him the loan amount at 9% p.a. on monthly reducing balance Bank of Malaysia offers the loan at 7% p.a. flat interest rate. Decide the choice of bank Nilesh should make by comparing the EMI's.
- Q.69.** Anil took a loan of ₹ 60,000 with 10% interest per month, to be repayment in 5 months. Calculate the EMI using reducing balance. Also calculate the interest and the principal repayment components for each EMI.

BIVARIATE LINEAR CORRELATION

- Q.1.** The value of Spearman's rank correlation coefficient between a set of n values of variables X and Y was found to be $2/3$. If the sum of the squares of the differences in ranks was 55. Find n , the number of observations.
- Q.2.** The coefficient of rank correlation between marks in two subjects obtained by a group of students is 0.5. If the sum of the squares of the differences in ranks is 42. Find the number of students in a group.
- Q.3.** Two judges gave the following marks to a series of seven one act plays drama competition. Calculate the rank correlation coefficient.

Play No.	1	2	3	4	5	6	7
Marks by Judge A	15	12	7	9	8	5	13
Marks by Judge B	12	10	5	7	6	4	9

- Q.4.** Ten industries are ranked according to profits earned (R_1) and working capital (R_2). Find rank correlation coefficient.

Industry	A	B	C	D	E	F	G	H	I	J
R_1	1	3	5	2	4	10	7	6	8	9
R_2	4	1	10	3	2	6	5	9	8	7

- Q.5.** Calculate rank correlation coefficient for the following data respectively marks in Economics (x) and marks in English (y).

X	56	37	65	60	54	51	40	70
Y	50	42	55	48	51	53	38	47

- Q.6.** Find Spearman's coefficient of correlation for the following data.

X	33	37	42	23	21	15	13	30	39
Y	17	27	32	12	13	11	9	25	30

- Q.7.** Three judges gave the following ranks to eight participants in a beauty contest. Calculate coefficient of rank correlation for each of the three possible pairs and decide which pair of judges has the most common approach.

Candidate No.	1	2	3	4	5	6	7	8
Rank by Judge A	7	6	5	8	3	1	2	4
Rank by Judge B	6	8	4	7	1	2	3	5

Rank by Judge C	4	5	6	7	3	1	2	8
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- Q.8.** Calculate rank correlation coefficient for the following data representing marks in two tests for a group of 7 students.

Marks in Test 1	52	34	47	65	44	34	54
Marks in Test 2	65	59	65	68	80	60	57

- Q.9.** The marks obtained by 10 students are as follows. Find rank correlation coefficient.

Roll no.	1	2	3	4	5	6	7	8	9	10
Marks in Accounts	90	88	90	76	88	62	99	90	70	76
Marks in English	61	58	64	73	73	78	58	82	58	67

- Q.10.** The data regarding expenses and savings for 6 families is shown below. Compute the rank correlation coefficient.

Family No.	1	2	3	4	5	6
Expenses (₹)	2010	2040	2250	2100	2250	2455
Savings (₹)	1075	985	1100	985	985	1100

- Q.11.** Calculate coefficient of correlation.

<i>X</i>	3	1	2	7	-1	4
<i>Y</i>	-7	2	1	5	-3	5

- Q.12.** Calculate Product moment correlation for the following data:

<i>X</i>	17	8	12	13	10	12
<i>Y</i>	13	7	10	11	8	9

- Q.13.** Find the number of pairs of observations from the following data.

$$r = 0.5, \sum(x - \bar{x})(y - \bar{y}) = 120, \sigma x^2 = 25, \sum(y - \bar{y})^2 = 72.$$

- Q.14.** Calculate the product moment coefficient of correlation using the following data.

$$n = 20, \sum x = 260, \sum y = 450, \sum x^2 = 4720, \sum y^2 = 12230 \text{ and } \sum xy = 9050$$

- Q.15.** Find Pearson's coefficient of correlation for the following data.

Marks in Maths	10	2	5	7	9	4	8
Marks in Economics	8	4	4	8	5	3	7

Q.16. The distribution of marks in English (x) and marks in Accounts (y) for a group of ten students is given below. Calculate product moment coefficient of correlation.

X	25	20	17	16	20	14	23	21	15	12
Y	24	17	22	18	20	18	24	20	16	14

Q.17. The heights in cms (x) and weight in kgs (y) of a group of students. Find the coefficient of correlation.

X	130	128	132	135	140	142	135	139
Y	31	30	35	32	41	40	35	34

Q.18. For a bivariate data no. of items are 50. Sum of product of deviation from their respective mean is 420, No. of items = 50, $\sigma_x = 3.5$, $\sigma_y = 4.5$. Calculate coefficient of correlation.

Q.19. Calculate the Karl Pearson's coefficient of correlation.

X	212	214	205	220	225	214	215
Y	500	515	511	530	522	516	525

Q.20. Following is data for 8 pair of observation. Compute the correlation coefficient.

$$\begin{aligned} \sum(x-20) &= 13, & \sum(y-40) &= 15, & \sum(x-20)(y-40) &= 192, \\ \sum(x-20)^2 &= 119, & \sum(y-40)^2 &= 345. \end{aligned}$$

Q.21. From the following data calculate the Karl Pearson's coefficient of correlation.

No. of pairs of observations = 12

$$\sum x = 35, \sum y = 60, \sum x^2 = 140, \sum y^2 = 450, \sum xy = 105$$

Q.22. Find coefficient of correlation for the following data.

Sales	140	138	126	132	135	131	137	142
Expense	122	140	118	119	132	125	145	150

Q.23. Draw Scatter Diagram for the following data and interpret it.

X	3	6	9	12	15	18
Y	30	25	20	15	10	15

Q.24. Find the coefficient of correlation for the following data.

Marks in French	53	59	72	43	93	35	55	80
Marks in Maths	35	49	63	36	75	28	38	71

Q.25. The ranks of 10 candidates in three subjects A, B, and C are given below. Find the rank correlation coefficient for each of the three possible pairs and comment on the result.

Candidate	1	2	3	4	5	6	7	8	9	10
Rank in A	1	3	4	2	5	10	8	6	7	9
Rank in B	3	5	1	2	6	10	4	9	7	8
Rank in C	2	3	5	1	4	9	6	7	8	10

Q.26. The credit earned by 5 students in sports and extra-curricular activities are follows. Calculate Spearman's Rank correlation coefficient.

Student No.	1	2	3	4	5
Credit in Sports	85	85	70	60	60
Credit in Extra-Curricular	85	92	81	63	63

Q.27. Represent the following data by a Scatter Diagram and interpret it.

X	80	84	90	95	100
Y	110	115	118	105	120

BIVARIATE LINEAR REGRESSION

Q.1. For a bivariate distribution, the following results are obtained:

$$\bar{x} = 65$$

$$\bar{y} = 53$$

$$\sigma_x = 4.7$$

$$\sigma_y = 5.2$$

Correlation coefficient, $r = 0.78$

Find the two regression equations and hence obtain (a) y when $x = 63$ (b) x when $y = 50$.

Q.2. The averages for rainfall and yield of a crop are 42.7 cms and 850 kgs respectively. The corresponding standard deviation are 3.2 cms and 14.1 kgs. The coefficient of correlation is 0.65. Estimate the yield when the rainfall is 40 cms.

Q.3. The following data is given for marks of 10 students in two subjects History and Geography.

Average marks in History = 65

Standard Deviation of marks in History = 4.3

Average marks in Geography = 39

Standard Deviation of marks in Geography = 1.2

Coefficient of correlation = 0.75

Estimate

(i) marks in History of a student securing 37 marks in Geography

(ii) marks in Geography of a student with 60 marks in History.

Q.4. For a bivariate data, $\bar{x} = 43$, $\bar{y} = 37$, regression coefficient of y on $x = 0.59$, regression coefficient of x on $y = 0.72$. Find

(i) y if $x = 50$, with the help of regression equation of y on x

(ii) x when $y = 40$, using equation of x on y

(iii) the coefficient correlation

Q.5. For the bivariate distribution, mean value of $x = 25.3$, mean value of $y = 152.4$, s.d of $x = 1.8$, s.d of $y = 5.7$ and the coefficient of correlation $r = 0.82$. Find the two regression equations and estimate y when $x = 24$ and x when $y = 145$.

Q.6. The regression equation of y on x is $2x - 3y + 14 = 0$ and that of x on y is $3x - y - 42 = 0$. Find mean values of x and y .

Q.7. The two lines of regression are $2x + 3y - 61 = 0$ and $x + y - 25 = 0$. Find (i) the mean value of x and y ; (ii) the coefficient of correlation. (iii) the most probable value of y when $x = 20$.

- Q.8. From the following regression equations $2x - y = 17$ and $4x - 3y = 1$, find (i) mean value of x and y ; (ii) coefficient of correlation; (iii) most probable value of y when $x = 30$; (iv) most probable value of x when $y = 32$.
- Q.9. Given the following regression equations $x + 2y - 40 = 0$, $2x + y - 38 = 0$ and variance of $y = 9$, find (i) mean values of x and y ; (ii) the coefficient of correlation; (iii) standard deviation of x ; (iv) variance of x .
- Q.10. The regression equation of income (x) on expenditure (y) is $3x - 2y = 3900$. The ratio of the standard deviation of income and expenditure is 4:3. Find the coefficient of correlation between income and expenditure. Also find the average income if the average expenditure is ₹ 1200.
- Q.11. Given that for 7 pairs of observation $\sum x = 219$, $\sum y = 16.9$, $\sum xy = 564.8$, $\sum x^2 = 7364$.
- Q.12. Given that for 10 pair of values, $\bar{x} = 2203$, $\bar{y} = 5730$, $\sum (x - \bar{x})^2 = 74196450$, $\sum (x - \bar{x})(y - \bar{y}) = 64000000$. Estimate the value of y when $x = 10000$.
- Q.13. From the following data, find the regression equations and further estimate y if $x = 16$ and x if $y = 20$.

X	3	4	6	10	12	13
Y	12	11	15	16	19	17

- Q.14. For the following data, find the two regression lines and hence estimate y when $x = 20$ and x when $y = 20$.

X	9	5	11	15	10	13	16
Y	11	8	14	20	13	15	22

- Q.15. The following data represents the figures in kgs for demands of two commodities A and B . **Find:**
- (i) the most probable demand for A when demand for B is 105 kgs
- (ii) the most probable demand for B when demand for A is 110 kgs.

Demand for A (x)	107	113	109	103	110	117	114
Demand for B (y)	105	110	103	100	110	111	108

- Q.16. From the following data, estimate y when $x = 142$.

x	140	155	163	167	145	150	148
y	122	135	140	139	125	130	125

Q.17. From the following data find the two regression equations and hence estimate y when $x = 16$ and estimate x when $y = 12$.

x	14	10	15	11	9	12	6
y	8	6	4	3	7	5	9

Q.18. Find the regression equations for the following data and hence estimate y when $x = 15$ and x when $y = 20$.

x	10	12	14	19	8	11	17
y	20	24	25	21	16	22	20

Q.19. Find the two regression equations and also estimate y when $x = 15$ and x when $y = 18$ using both the methods.

x	11	7	9	5	8	6	10
y	16	14	12	11	15	14	17

Q.20. Given the two regression equations as $4x - y - 23 = 0$ and $3x - 2y + 4 = 0$. Find (i) the coefficient of correlation (ii) the mean values of x and y . (iii) Find the value of y when $x = 10$ (iv) Find the value of x when $y = 17$.

Q.21. Find the two regression equation from the following: $\bar{x} = 30$, $\bar{y} = 50$, $\sigma_x = 4.1$, $\sigma_y = 5.2$, $r = 0.8$.

TIME SERIES ANALYSIS

Q.1. Find the trend component for the following time series using free hand curve.

Year	1976	1977	1978	1979	1980	1981	1982	1983
Production of Rice (in thousand tonnes)	62	63	66	65	68	72	71	74

Q.2. Calculate trend by considering three yearly moving averages for the following time series of price indices for the years 2000-2006.

Year	2000	2001	2002	2003	2004	2005	2006
Price Index	111	115	116	118	119	120	122

Q.3. Find the trend for the following data by calculating 3 yearly moving averages.

Year	1999	2000	2001	2002	2003	2004	2005
Production	37	45	52	42	58	63	50

Q.4. Find three yearly moving averages for the following time series of a company.

Year	2000	2001	2002	2003	2004	2005	2006
Exports	46	53	72	57	62	78	60

Q.5. Obtain moving averages of length 5 for the following time series representing sales in lakhs of ₹ during 1996-2004.

Year	1996	1997	1998	1999	2000	2001	2002	2003	2004
Sales	51	53	50	57	60	55	59	62	68

Q.6. Find five-yearly moving averages for the following data which represents production in thousand units of a small scale industry.

Year	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989
Production	110	104	78	105	109	120	115	110	115	122

Q.7. Find five yearly moving averages.

Year	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006
Time Series	87	90	92	98	105	93	100	110	125	110

Q.8. Find the trend component of the following time series of production in thousand kilogram during 1971-1978 using 4 yearly moving averages.

Year	1971	1972	1973	1974	1975	1976	1977	1978
Production	12	15	18	17	16	20	23	22

Q.9. Calculate four yearly moving averages for the following data:

Year	1980	1981	1982	1983	1984	1985	1986	1987
y	242	250	253	249	254	256	250	257

Q.10. The following table represents the number of workers employed in a small – scale industry during the years 1995-2005. Calculate 4 yearly moving averages.

Year	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005
No. of Workers	432	470	448	459	478	470	470	492	480	484	490

Q.11. Fit a straight line trend and hence estimate the product for the 2002.

Year	1997	1998	1999	2000	2001
Production	75	82	85	90	98

Q.12. Fit a straight line trend to the following data representing imports in million ₹ of a certain company. Also find an estimate for the year 2008.

Year	2000	2001	2002	2003	2004	2005	2006
Imports	48	50	58	45	45	41	49

Q.13. The following table represents assets of a multi-national company in crores of ₹. Fit a straight line trend and estimate the figure for the year 2008.

Year	2001	2002	2003	2004	2005	2006
Assets	83	92	71	84	110	115

Q.14. Fit a straight line trend by the method of least squares for the following data which represents the expenditure in lakhs of ₹ on advertisements of a certain company. Also find an estimate for the year 2005.

Year	1997	1998	1999	2000	2001	2002	2003	2004
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Expenditure	21	24	32	40	30	49	57	60
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Q.15. Calculate seasonal indices for the following data:

Expenditure (in lakhs of ₹)				
Year	I	II	III	IV
2003	55	53	57	51
2004	56	55	60	53
2005	57	55	60	54

Q.16. Determine seasonal indices for the following data.

Exports (in thousands of ₹)				
Year	January-March	April-June	July- September	October-December
2003	107	120	114	113
2004	109	123	115	112
2005	110	122	114	114
2006	108	125	116	113

Q.17. Calculate 3 yearly moving averages for the following time series.

Year	1996	1997	1998	1999	2000	2001	2002
Time Series	53.6	48.4	45.6	51.2	46.8	42.5	40.7

Q.18. Calculate 5 yearly moving averages for the following time series giving the number of units produced (in thousands) in a factory during the year (1997-2004).

Year	1997	1998	1999	2000	2001	2002	2003	2004
No. of Units	243	251	254	256	256	245	250	254

Q.19. Find the moving averages of length 4 for the following data.

Year	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008
Sales (in thousands)	60	69	81	86	78	93	102	107	100	109

Q.20. Fit a straight line trend by the method of least squares for the following time series and estimate the trend for the year 2008.

Year	2000	2001	2002	2003	2004	2005	2006
No. of workers	45	49	51	50	52	53	50

Q.21. Use the method of least squares to find straight line trend for the following time series of production in thousand units during the year 1995-2002. Also estimate trend for the year 2003.

Year	1995	1996	1997	1998	1999	2000	2001	2002
Production	80	90	92	84	94	99	92	102

Q.22. Determine seasonal indices for the following data:

Production (in thousand units)				
Year	I	II	III	IV
2002	47	56	49	43
2003	45	59	50	44
2004	46	63	52	41
2005	45	61	50	42
2006	49	64	51	40

INDEX NUMBERS

Q.1. For the following data construct the following types of index numbers:

- (i) Average of price relative method (ii) Aggregative method

Items	Price in ₹	
	Base Year	Current Year
P	4	5
Q	12	16
R	6	9
S	30	40
T	8	11

Q.2. Consider the calculations of index numbers by:

- (i) Aggregate Method (ii) Average of price relative.

Commodity	Price	
	1985(p_0)	1995(p_1)
A	400	850
B	300	700
C	8	3000
D	600	1300

Q.3. Calculate for the following data the types of index number as given below:

- (i) Aggregative method (ii) Average of price relatives.

Items	Price in ₹	
	Base Year	Current Year
A	113.50	277.00
B	203.00	363.50
C	470.00	545.75

Q.4. From the following data calculate: (i) I_L ; (ii) I_P ; (iii) I_F ; (iv) I_{DB} ; (v) I_{ME} .

Commodity	Base Year		Current Year	
	Price	Quantity	Price	Quantity
A	4	15	5	20
B	8	20	12	30
C	6	25	8	20

D	6	3	8	4
E	14	2	20	3

Q.5. From the following data calculate (i) I_L (ii) I_P (iii) I_F (iv) I_{DB} (v) I_{ME} .

Commodity	Base Year		Current Year	
	Price	Quantity	Price	Quantity
P	5	6	20	25
Q	3	6	25	18
R	4	5	12	15

Q.6. For the following data calculate : (i) Weighted Aggregate Index Number (ii) Weighted Index using Arithmetic Mean Rule (iii) Weighted Index using Geometric Mean Rule.

Commodity	Weight	Price	
		Base Year	Current Year
P	13	5.00	21
Q	16	55	79
R	27	43	87
S	44	11	32.50

Q.7. Calculate for the following data the index number as given below: (i) Unweighted aggregative method (ii) Weighted aggregative method (iii) Unweighted average of price relatives (iv) Weighted average of price relatives.

Commodity	Weight	Price in ₹	
		2000	2010
A	130	550	1345
B	450	630	1250
C	75	150	335
D	225	450	778
E	120	225	886

Q.8. Calculate the cost of living index number for the following data.

Group	Weights W	Index Number I
Food	48	160
Fuel and Lighting	7	120
Clothing	10	140
House Rent	10	100

Miscellaneous	25	80
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Q.9. From the following data, calculate the cost of living index number for the year 2009 by the family budget method.

Group	Prices in 1999	Prices in 2009	Weight
Food	5	12	60
Clothing	16	30	5
Fuel	10	25	10
Rent	20	60	15
Miscellaneous	18	36	10

Q.10. For the following data calculate the cost of living index number for the year 2006 by the Aggregative expenditure method.

Commodity	Quantity Year 2004	Price Per Unit	
		Year 2004	Year 2006
Rice	15	3	4
Wheat	18	2	3
Sugar	12	5	6
Pulses	8	4	5
Ghee	5	10	12
Milk	10	3	4

Q.11. Calculate the cost of living index number for 2005, by the family budget method from the following data.

	Food	Rent	Clothing	Fuel	Others
Price in 2000	100	25	80	40	50
Price in 2005	110	25	100	60	55
Expenses on	40%	15%	20%	10%	15%

Q.12. Given that the cost of living index numbers for 2004 with 2000 as base is 150. If the income of a person is ₹ 15,000 in 2004. What is his real income in this period with 1980 as base.

Q.13. The consumer price index for upper middle class for 2005 with 2000 as base is 175, when a sales manager used to earn ₹ 45,000. How much should he get in 2005 in order to maintain the same standard of living?

Q.14. Calculate the real income from the following data in examples (a) and (b).

(a)

Year	2000	2001	2002	2003	2004
Income (₹)	6000	7000	8000	9000	10,000
Index No.	150	175	160	180	200

(b)

Year	2003	2004	2005	2006	2007
Income (₹)	4000	4500	4800	5000	6000
Index No.	100	120	120	125	160

Q.15. Reconstruct the following series of indices using 1980 as the base.

Year	1976	1977	1978	1979	1980	1981	1982
Index	110	130	150	175	180	200	210

Q.16. In the following series of index numbers shift base from 2000 to 2003.

Year	2000	2001	2002	2003	2004	2005
Index	100	105	110	125	150	180

Q.17. The table shows below series of index of wholesale prices of a certain commodity based on 2000.

Year	2000	2001	2002	2003
Index	100	108	120	150

Shift the base year to 2002 and obtain new series of index.

Q.18. From the following data, construct chain base index number.

Year	2001	2001	2002	2003	2004
Prices	23	28	35	45	52

Q.19. Find chain base index numbers for the following.

Year	2010	2011	2012	2013	2014
Prices	15	18	25	32	40

Q.20. Calculate chain base index number for the following data.

	Average Sales (in hundreds ₹)			
Commodity	2012	2013	2014	2015
A	35	39	42	45
B	38	45	52	60

C	42	51	56	65
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Q.21. Calculate chain base index numbers for the following.

Commodity	2000	2001	2002	2003
P	12	18	25	30
Q	15	22	27	35
R	25	32	38	40

Q.22. Consider two index number series A and B as follows and splice them together so as to have one common series with base year (i) 2005, (ii) 2010.

Series A

Year	2005	2006	2007	2008	2009	2010
Index No. (base 2005)	100	107	115	120	130	150

Series B

Year	2010	2011	2012	2013
Index No.	100	109	124	145

Q.23. Splice the following series together, to form a common series with base year 2010.

Year	2007	2008	2009	2010
Index	100	112	125	130

Year	2010	2011	2012	2013
Index	100	118	135	150

Q.24. Splice the following series together, to form a common series with base year 2009.

Year	2009	2010	2011	2012
Index	100	117	132	145

Year	2012	2013	2014	2015	2016
Index	100	110	122	130	138

DISCRETE PROBABILITY DISTRIBUTION

- Q.1.** If a fair coin is tossed 4 times, find the probability that number of heads is (i) none (ii) only 2 (iii) all (iv) at least 2.
- Q.2.** Q.2 It is observed that 40% of online application forms for a certain examination are faulty. If 5 forms are selected at random, find the probability that out of them (i) 3 are faulty (ii) at most 2 are faulty (iii) all are correct (iv) all are faulty.
- Q.3.** The probability of winning a game is 0.3, Neil plays 5 games. Find probability that he wins (i) at least 3 games (ii) at most 1 game.
- Q.4.** There is 80% chance of catching a cold on a rainy day. If 4 persons are selected at random on a rainy day, find probability that no. of persons catching cold out of them is (i) 2 or 3 (ii) no one.
- Q.5.** If mean and variance of a Binomial distribution are 4 and 2 respectively, find probability that no. of successes is (i) only 3 (ii) at most 1.
- Q.6.** If mean and standard deviation of a Binomial distribution are 8 and 2 respectively, find probability that no. of successes is (i) only 6 (ii) 3 or 4.
- Q.7.** It is observed that 60% of students choose I.T as optional subject at H.S.C. If 10 are selected at random, find probability that the number of students with I.T as optional subject is (i) only 4 (ii) at most 3 (iii) nil.
- Q.8.** A variate X follows Poisson distribution with parameter 3. Evaluate (a) $P(x < 1)$ (b) $P(x > 1)$ (Given: $e^{-3} = 0.0498$)
- Q.9.** The average number of phone calls per minute in a call centre is 4. Find the probability that during a specific minute, the number of calls is (i) only 2 (ii) at least 2 (iii) less than 2. (Given that $e^{-4} = 0.0183$)
- Q.10.** It is observed that 3 % of apples in a consignment are bad. Find the probability that, in a consignment of 200 apples, the number of bad apples is (i) less than 2 (ii) only 2 (iii) at least 3. (Given that $e^{-6} = 0.0025$)
- Q.11.** The probability that the marriage will be broken within 3 years is 5 %. Find the probability that, out of 60 married couples, the number of marriages broken within 2 years is (i) nil (ii) more than 1 (Given that $e^{-3} = 0.0498$)

- Q.12.** The number of rickshaw's crossing a road per minute is 2. Find the probability that, on a specific minute, the number of rickshaw's on the road is (i) nil (ii) only 1 (iii) at least 2. (Given: $e^{-2} = 0.1353$)
- Q.13.** Akash receives, on an average, 5 messages per day. Find the probability that on a specific day, he will receive (i) only 2 (ii) at least 4 (iii) less than 3 messages. (Given: $e^{-5} = 0.0067$)
- Q.14.** It is observed that, during summer, the average demand for A.C is 3 pieces per day. The shop keeps the stock of 5 pieces per day. Find the probability that on a particular day in summer, the demand will exceed the supply. (Given: $e^{-3} = 0.0498$)
- Q.15.** 1.3% of persons reaching 80 years die within a year. Find the probability that out of 100 such persons, the number of persons, not reaching their next birthday is (i) nil (ii) at least 1 (iii) less than 2. (Given: $e^{-1.3} = 0.275$)
- Q.16.** For a Poisson distribution with standard deviation of 2 units, find the probability (i) $x = 1$ (ii) $x < 3$ (iii) $x \geq 3$. (Given: $e^{-4} = 0.0183$)
- Q.17.** If X is a random variable following Poisson distribution with relation $4 \times P(x = 2) = 3 \times P(x = 1)$, find the probability of (i) $x = 0$ (ii) $x = 2$ (iii) $x \geq 2$. (Given $e^{-1.5} = 0.2231$)
- Q.18.** It is observed that 2.3% of the items in a box of 100 items are not satisfactory. If there are 400 such boxes, find the no. of boxes which will have (i) no defective (ii) only one defective (iii) less than 2 defectives. (Given: $e^{-2.3} = 0.1003$)
- Q.19.** It is found that 1.4% of the items in a box of 100 items are defective. Out of 600 boxes, how many will have (i) no defective (ii) at least one defective items? (Given: $e^{-1.4} = 0.2466$)
- Q.20.** A biased coin turns head 3 out of 5 times. Find probability that in next 7 throws, it shows head (i) 4 times (ii) only once (iii) at most once.
- Q.21.** The chance that a student will pass a test is 40%. Out of 6 students appearing for the test, find the probability that (i) only 2 pass (ii) no one passes (iii) all 6 pass.
- Q.22.** A Help-line claims that 90% of their customers are given help. If 10 customers are selected at random, find probability that out of them, the number of customers helped is (i) exactly 6 (ii) 6 to 8 (including both) (iii) all of them.
- Q.23.** It is observed that 7 items manufactured on a machine are defective per day. Find the probability that on a particular day, the number of defectives items on a machine are (i) nil (ii) only 1 (iii) less than 3. (Given that $e^{-7} = 0.0009$)

Q.24. A Poisson variate has standard deviation 3. Find $P(0)$ and $P(1)$ (Given: $e^{-9} = 0.000123$)

Q.25. For a Poisson distribution, the ratio of probabilities of $(x = 0)$ and $(x = 1)$ is 1:4. Find the probability of $(x = 2)$, given that $e^{-4} = 0.0183$.

NORMAL DISTRIBUTION

- Q.1.** Find the values of the quartiles of a normal distribution with mean 400 and standard deviation 16. ($Q_1 = 489.208, Q_3 = 510.792$)
- Q.2.** For a normal distribution the lower quartile Q_1 is 95 with standard deviation 15. Find (i) median (ii) the limits for the middle 50% of the observations (iii) mean deviation.
- Q.3.** For a normal distribution the mean is 600 and the standard deviation is 60. Find (i) mean deviation (ii) quartile deviation and the quartiles.
- Q.4.** If quartile deviation is 134.9, find standard deviation.
- Q.5.** State the probability density function of a normal variate with mean 50 and variance 9.
- Q.6.** For a standard normal variate Z , find the area (using the table)
- (i) between $z = 0$ and $z = 2.3$
 - (ii) between $z = -1.3$ and $z = 0$
 - (iii) to the right of $z = -1.4$
 - (iv) to the left of $z = -0.59$
- Q.7.** For the standard normal variate Z , find the area (using the table).
- (i) to the left of $z = 1.848$
 - (ii) to the right of $z = 0.284$
 - (iii) between $z = 0.6$ and $z = 2.0$
 - (iv) between $z = -1.68$ and $z = -0.3$
 - (v) between $z = -1.2$ and $z = 2.04$
- Q.8.** If X follows normal distribution with mean 12 and variance 2500, find
- (i) $P(X \leq 140)$, (ii) $P(X \geq 110)$, (iii) $P(100 \leq X \leq 130)$
- Q.9.** If X follows normal distribution with mean 150 and standard deviation 400, find
- (i) $P(X \leq 166)$, (ii) $P(X \geq 126)$, (iii) $P(X \leq 121)$,
 - (iv) $P(X \geq 182)$, (v) $P(120 \leq X \leq 130)$, (vi) $P(126 \leq X \leq 182)$
- Q.10.** Average yield of a certain crop was found to be 20.5 kgs per plot with standard deviation 3.2 kgs. Assuming Normal distribution, (i) how many plots out of 1000 will have a yield of 25 kgs or more (ii) what percentage of plots will yield between 17.3 kgs and 30.1.
- Q.11.** If the weights of 10000 soldiers in a regiment are normally distributed with a mean of 72 kgs and a standard deviation of 5kgs how many soldiers have weights above 82 Kgs ? Also find the percentage of soldiers with weights between 67 and 77 kgs.

- Q.12.** 1000 candidates appeared for a certain examination. The mean marks were 58 with a standard deviation of 5 marks.
Assuming the distribution of marks to be Normal.
Find: (i) the proportion of students securing more than 68 marks.
(ii) The number of students securing marks between 53 and 68.
(iii) the percentage of students with marks below 53.
- Q.13.** Mean and Standard deviation of chest measurements of 1200 soldiers are 85 cms and 5 cms respectively. How many of them are expected to have chest measurements exceeding 90 cms, assuming the measurements follow the normal distribution. How many soldiers have their chest measurements between 80 cms and 90 cms.
- Q.14.** The income distribution of workers in a certain factory was found to be normal with mean Rs. 500 and standard deviation of Rs. 50. There were 228 persons getting above Rs. 600. How many person were there in all? Also find the number of workers with income between Rs. 500 and Rs. 600.
- Q.15.** A survey of 20,000 T.V. Sets revealed that the life in hours of T.V. picture tubes is normally distributed with a mean of 1000 hrs and a standard deviation of 100 hrs.
(i) How many picture tubes lasted more than 800 hrs.
(ii) Find the percentage of tubes with life between 800 hrs and 1000 hrs.
- Q.16.** The heights of 500 'black-forest' cakes have a normal distribution with mean of 6.50 cms and a standard of 0.8 cms. Find the maximum heights of the flattest 100 cakes. Also find the minimum height of the thickest 20% cakes.
- Q.17.** A firm has 1000 accounts which are normally distributed with a mean of Rs. 10,000 and standard deviation of Rs. 1,000, Find:
(i) the number of accounts with amounts lying between Rs. 8,000 and Rs. 11,000.
(ii) The number of accounts with an amount of Rs. 7,500 or less.
- Q.18.** In a certain examination mean of marks scored by 500 students is 45 with a standard deviation of 15. Assuming the distribution to the Normal, find:
(i) the number of students securing marks between 30 and 60.
(ii) The limits within which marks of the middle 50 percent of the students lie.