

Business Math – XII (Mgmt.)

Model Set - I

- Express the complex number $(1 + 3i)^2$ in the form of $A + iB$
 - Let $A = \{1, 2, 3\}$ and $B = \{1, 3, 5\}$ Find $A \times B$. Also find the relation from A to B satisfies $x + y \geq 5$ where $x \in A$, and $y \in B$
- Find the sum of series : $-10 -5 -0 + \dots, \dots, +75$ **Ans: 585**
 - Insert 3 geometric means between $2\frac{1}{4}$ and $\frac{4}{9}$. **Ans: $(\frac{3}{2}, 1, \frac{2}{3})$**
- If 3 person enter a bus in which there are 10 vacant seats, find in how many ways they can sit . **Ans: 720**
 - If $A = \begin{pmatrix} 2 & 1 \\ -3 & 0 \end{pmatrix}$ and $B = \begin{pmatrix} 0 & 2 & 3 \\ 1 & -1 & 0 \end{pmatrix}$ find $5AB$ **Ans: $\begin{pmatrix} 5 & 15 & 30 \\ 0 & -30 & -45 \end{pmatrix}$**
- Show that the points $A(1, 2)$, $B(3, 4)$ and $(-3, -2)$ are collinear.
 - For what value of k will the point $(2, -1)$ lie on the curve $Kx^2 - 2y^2 - 2x + 3y - 3 = 0$ **Ans : 3**
- Using logarithms , find the value of:
 $\frac{23.1 \times 2.56}{\sqrt[3]{52.89}}$
 - If $f(x) = x - \frac{1}{x}$ show that $f(a) = f(\frac{-1}{a})$
- Examine the continuity of the following function $f(x) = 3x^2 - 8x + 6$ **Ans: at $x = 1$**
 - Fine the derivative of, $e^x \cdot \log x$
- Evaluate: $\int \frac{x+2}{x-2} dx$
 - The annual rate of repair cost is given by $\frac{dc}{dt} = 10t + 100$, where t is the age of machine in years and $\frac{dc}{dt}$ is in rupees per years. Find the total cost after 5 years.
- Compute coefficient of variation of the following individual series: 35, 52, 53, 56, 58, 52, 50, 51, 49 **Ans: 12.13**
 - The chance that A can solve a certain problem is $\frac{2}{3}$ and the chance the B can solve it $\frac{3}{4}$. Find the problem would be solved by at least one of them. **Ans: $\frac{11}{12}$**

- If the four quantities a, b, c and d are in the ratio such that $a:b=2:3$, $b:c=4:5$ and $c:d=\frac{7}{9}$. Find the ratio between a and d , also find the continued ratio
 - The list price of an article is 25% above the selling price and cost price is 40% below the list price find the rate of discount ? **Ans : 20%**
- Find the difference between the banker's discount and true discount on RS. 330 in 4 years at 2.5% p.a
 - Find the arbitrary rate of exchange between New York and Kathmandu from the following data. RS.13.75=€1, £2= 3 Euro , \$9 =11.25 swiss france and 18.1 swiss france =12 Euro.

“Group” – “B”

- $$\begin{vmatrix} x-y-z & 2x & 2x \\ 2y & y-z-x & 2y \\ 2z & 2z & z-x-y \end{vmatrix} = (x+y+z)^3$$
- From first principle; find differential coefficient of, $\frac{1}{\sqrt{2x+3}}$
- Given the demand function $p=20-Q$ and the total cost function $C=Q^2 +8Q+2$ determine optimal output Q , price P and total profit under profit maximization **Ans: $Q = 3$, $P = 17$, $\pi = 16$**
- Draw the graph of the following inequalities;
 $6x + 5y \leq 30$, $x \geq 1$, $y \geq 2$. Find the feasible region and also find vertices of feasible region. **Ans: $(1, 2)$, $(\frac{10}{3}, 2)$, $(1, \frac{24}{5})$**
- Calculate mean and standard deviation of the following data

Marks	0-10	10-20	20-30	30-40	40-50
No of students	7	12	24	10	7
- X, Y and Z start a business with a capital of Rs. 21,000, X gives 1000 more than Z and Y, Rs. 2000 more than Z. At the end of the year the profit to be divided is 16% of the total capital, what amount should each receive? **Ans: 1120, (X), 1280(Y), 960(Z)**
- Find the difference of simple and compound interest on 2500 for 32 year at 4% p.a ? **Ans: Rs. 11.**
- What is present value of an immediate annuity of Rs. 1200 payable for 5 years compound interest at the rate of 9% p.a?

Model Set - II

1. a. Find the modulus of $\frac{1+2i}{1-2i}$ Ans:1
 b. Express the complex number $(3 - 2i)(6 - 8i)$ in the form of $A + iB$
 Ans: $2 + (-36)i$
2. a. How much salary does a man receive in 9th years and also find total salary for 9 years if his salary was Rs. 2,000 with an increment of Rs. 200 in each year ?
 Ans: Rs. 36,000, Rs. 25,200
 b. In a GP, the first term is 5, the last term 1215 and sum 1820, find the common ratio .
 Ans: 3
3. a. Find the value of $44_{c_{20}} \times 20 = 44_{c_{21}} \times 21$ Ans: $\frac{7}{8}$
 b. Find the value of x, y and z if

$$\begin{pmatrix} x+y & 2y-z \\ 3y+z & z \end{pmatrix} = \begin{pmatrix} 4 & 3 \\ 7 & 1 \end{pmatrix}$$
 Ans: $x=2, y=2, z=1$
4. a. Find the equation of a straight line passing through the points (2, -3) with slope $\frac{-2}{3}$.
 Ans: $2x + 3y + 50 = 0$
 b. Where does the straight line through (3, 4) and (5, 6) intersect y-axis.
 Ans: At the point (0, 1)
5. a. Using four figure log table, compute:

$$\frac{\sqrt[3]{12.7} \times (0.84)^4}{0.625}$$
 Ans: 1.859
 b. Prove that $\lim_{x \rightarrow 1} \frac{x^2 - \sqrt{x}}{\sqrt{x} - 1} = 3$
6. A A function $g(x)$ is defined by: $g(x) = \begin{cases} \frac{x^2-9}{x-3} & \text{at } x \neq 3 \\ K & \text{at } x = 3 \end{cases}$ find the value of K so that the function $f(x)$ is continuous.
 Ans: K = 6
7. a. Evaluate: $\int \frac{ax^2 + bx + c}{x^2} dx$ Ans: $ax + b \log x - \frac{c}{x} + k$
 b. The marginal cost of a product is $MC = 36 - 20x + 6x^2$ and the initial cost is Rs. 20 find the total cost function Ans : $-2x^3 - 10x^2 + 36x + 20$
8. a. compute the mean deviation from mean of the following data

Marks	10	15	20	25	30
No. of students	2	4	6	8	5

 Ans : 5.12

- b. A dog contains 6 white, 5 blue, 4 black marbles. A marble is drawn at random, what is the probability of drawing a black or white marble? Ans: $\frac{2}{3}$
9. a. Mr. A and Mr. B hired a pasture for 30 days and paid Rs. 1000. A put 6 cows for a certain number of days and paid Rs. 750. B put 10 cows for the remaining number of days and paid remaining sum. How long had A put his cows?
 Ans: A: 25 days
 b. An article is sold for Rs.150 at a gain. Had it been sold for Rs.135 there would have been a loss equal to 50% of the original gain find the cost price of the article Ans: 140
10. a. If Rs 126.36 = £1, 50p = 3.52 marks, 43 francs = 1, 3.91 marks = \$1, find the arbitrary rate of exchange of between francs and Kathmandu
 b. Find the amount of annuity of Rs 400 per year for 5 years at 6% p.a?

“Group” – “B”

11. Show that: $\begin{vmatrix} 1 & a & a^2 \\ 1 & b & b^2 \\ 1 & c & c^2 \end{vmatrix} = (b-c)(c-a)(a-b)$
12. Find the derivative of $\sqrt{\frac{1+x}{1-x}}$ Ans: $\frac{1}{(1-x)^2} \sqrt{\frac{1-x}{1+x}}$
13. A plant produces Q metric tones of steel per week at a total cost of $(\frac{1}{3}Q^3 - Q^2 + 452Q + 50)$. Of the market price is fixed at Rs. 500 per metric tones, show that the plant produce 8 metric tones per week to make profit maximum
14. Find the objective value of the function Max : $Z = 9x + 7y$ subjected to $X + 2y \leq 7, x - y \leq 4, x \geq 0, y \geq 0$ Ans 52 [max]
15. Calculate mean and the standard deviation from the following data

Profit in Rs	0-10	10-20	20-30	30-40	40-50
No of shop	8	13	16	8	5
16. A and B started business with capitals of Rs.5000, and Rs. 4000 respectively. After 6 months they admitted C with a capital of Rs. 8000, if the profit at the end of the year amounts to Rs. 13,000, find the share of them. Ans: A 5000, B 4000, C 4000
17. Find the compound interest on Rs. 6900 for 3 years if the interest be payable half yearly and the rate of interest for first two years being 6% per annum and for the third year 9% per annum
 Ans: CI 1576
18. If the banker's discount of Rs. 28000 at 3.5% per annum be equal to the true discount on Rs. 28375 for the sometime at the same rate, when is the sum due?
 Ans: n = 9 months

SET - III

Group A **[(10×2)×3=60]**

1. a. Express the complex number $\frac{3-\sqrt{-4}}{2+\sqrt{-1}}$ in the form $A + iB$.
(Ans: $\frac{4}{5} - \frac{7}{5}i$)
 b. If $A = \{1,2,3\}$ and $B = \{2,3\}$. Find the relation in $A \times B$ satisfying $y > x$.
 2. a. A man has a monthly salary of Rs. 6500. If he gets an increment of Rs. 150 every year; how much salary does he receive in the 10th year?
Ans: 7850
 b. The sum of a G.P., whose common ratio is 2 and the last term is 768, is 1533. Find the first term. (Ans: 3)
 3. a. In how many ways can the letters of the word 'EXAMINATION' be arranged?
(Ans: $\frac{11!}{2! 2! 2!}$)
 b. If $A = \begin{pmatrix} 1 & 2 \\ 3 & 1 \end{pmatrix}$, show that $A^2 - 2A - 5I = O$ where I and O are 2×2 identity and zero matrix.
 4. a. A point divides internally the line joining the points (3,5) and (7,5) in the ratio of 3:4. Find the co-ordinate of the point.
 b. Find the value of k , if the lines $2x - 3y + k = 0$, $3x - 4y - 13 = 0$ and $8x - 11y - 33 = 0$ are concurrent.
 5. a. Evaluate using log table:
 $\frac{(3.678)^4}{\sqrt[3]{42.75}}$ (Ans: 52.38)
 b. Evaluate: $\lim_{x \rightarrow \infty} (\sqrt{x+a} - \sqrt{x})$
 6. a. Examine the continuity and discontinuity of the function

$$f(x) = \begin{cases} \frac{x^2-7x}{x-7}, & x \neq 7 \\ 5, & x = 7 \end{cases} \text{ at } x = 7.$$

 b. Find $\frac{dy}{dx}$ of $y = e^{2x} \log x$.
 7. a. Integrate: $\int \frac{1}{\sqrt{x+a}-\sqrt{x-a}} dx$.
 b. If the marginal cost of a product is given by $MC = 8 + 6x - 3x^2$ and fixed cost is Rs. 150. Find the cost function. Ans: $8x + 3x^2 - x^3 + 150$

8. a. Calculate the standard deviation from the following data:

Marks:	10	20	30	40	50	60
No. of students:	3	7	10	20	12	8

(Ans: 13.45)
 b. A card is drawn at random from a well-shuffled deck of 52 cards; find the probability that the card is drawn is i. a black card ii. an ace.
(Ans: $\frac{1}{2}$, $\frac{1}{13}$)
 9. a. If 30 men can do a piece of work in 11 days working 9 hours a day. How many hours a day 55 men to work in order to finish another work thrice as great in 18 days?
 b. A buys an article and sells it to B at a profit of 10%, B sells it to C at a gain of 20%, If C paid Rs. 924 for it, what did A pay for it ?
 10. a. A bill of Rs. 16790 drawn for 150 days was discounted in the bank at the rate of 5% P.a. What was banker's discount and how much did the holder of the bill received? Ans: BD = Rs. 345, DV = 16445
 b. What is the rate percent per annum of a sum of money doubles itself in 17 years at compound interest? Ans: 4.2%

Group B **[8 × 5 = 40]**

11. Using the Cramer's rule solve the equations:
 $9y - 5x = 3, x + z = 1, z + 2y = 2$. Ans: $x = 3, y = 2, z = -2$
12. Find from the first principle the derivative of $\sqrt{x+3}$. Ans: $\frac{1}{2}\sqrt{x+3}$
13. The demand equation of certain commodity is, $P = \frac{1}{3}Q^2 - 10Q + 75$. Find the value of Q and corresponding value of P that maximize the revenue. Ans: $Q = 5$ and $P = \frac{100}{3}$
14. Maximize: $F = 8x - 5y + 40$ subject to
 $x + 2y \leq 10, x - y \geq 1, x \geq 0, y \geq 0$. Ans: (0, 0), (1, 0), (4, 3), (0, 5)
15. Obtain the quartile deviation and coefficient of quartile deviation from the following distribution:

Class:	0-10	10-20	20-30	30-40	40-50	50-60
Frequency:	15	18	25	32	19	16

Ans: 12.33, 0.46
16. Ram, Shyam and Hari form a business with capitals of Rs. 5,000, Rs. 4500 and Rs. 6500 respectively. After 6 months, Ram doubles his capital and next three months. Shyam triples his capitals. If the profit at end of the year amounted to Rs. 8300, find the profits obtained by each of Ram, Shyam and Hari. Ans: 3000, 2700, 2600

17. A Kathmandu merchant was 5100 Bhattas to merchant in Bangkok, the rate of remitting the amount by T.T. is Rs. 424 per 100 Bhattas while the rate of remitting through the amount by sight draft is 0.24 Bhatta for a rupee. Which is cheaper method and how much does he gain by remitting the amount through cheaper method.

Ans: Sight draft is cheaper by Rs. 374

18. Find the present value of annuity if Rs. 400 for 10 years at 5% compound interest find the extra payment it had been annuity due. **Ans: Rs. 154.48**

SET - IV

Group A [(10×2)×3=60]

- If $x - iy = \frac{2-3i}{2+3i}$, prove that $x^2 + y^2 = 1$.
 - 20 students play football and 16 students play hockey. It is found that 10 students play both games. Find the number of students playing at least one game. **Ans: 26**
- If 9th term of an A.P. is zero; prove that 29th term is double of the 19th term.
 - There are 8 varieties of monkey in a certain zoo. The variety form a G.P. If 4th and 6th variety consist 54 and 486 monkey respectively, find the number of first and last variety. **Ans: 24374**
- In how many ways can the letters of the word 'ASSASSINATION' be arranged?
 - If $A = \begin{pmatrix} 3 & 2 \\ 1 & 5 \end{pmatrix}$, find a matrix X such that $A - 3X = \begin{pmatrix} 3 & 5 \\ -8 & 2 \end{pmatrix}$.
Ans: $x = \begin{pmatrix} 0 & -1 \\ 3 & 1 \end{pmatrix}$
- Show that (3,5), (1,1), (5,3) and (7,7) are the vertices of rhombus.
 - Find the equation of a straight line passing through the point (1,2) and making an intercept of 3 on the positive y-axis. **Ans: $x + y - 3 = 0$**
- Find the value of r when $\log \left(1 - \frac{r}{100}\right) = \frac{\log 3843 - \log 5555}{20}$
Ans: r = 1.83
 - Evaluate: $\lim_{x \rightarrow \infty} \frac{3x^2 + 4x - 5}{8x^2 - x + 18}$. **Ans: $\frac{3}{8}$**
- A function $f(x)$ is defined as follows:

$$f(x) = \begin{cases} \frac{x^2 - 5x}{x - 5} & \text{for } x \neq 5 \\ k & \text{for } x = 5 \end{cases}$$

Find the value of k so that the function $f(x)$ is continuous at $x = 5$.

Ans: 5

- b. Find $\frac{dy}{dx}$ if $y = (5x^2 - 4x + 7)^8$. **Ans: $8(5x^2 - 4x + 7)^7(10x - 4)$**

- Evaluate: $\int \frac{x+3}{3x-2} dx$. **Ans: $\frac{x}{3} + \frac{11}{9} \log(3x-2) + c$**
 - If the marginal cost (MC) for a product is $6x + 4$ and the cost of producing 100 items is Rs. 31,400. Find the total cost function. **Ans: $3x^2 + 4x + 1000$**
- Calculate the mean deviation from mean from the following data:

Marks:	10	15	20	25	30
No. of Students:	2	4	6	8	5

Ans: 5.12

- b. In a single throw of two dice, find the probability of obtaining total of 11.

Ans: $\frac{2}{36}$

- 20 men can do a piece of work in 24 days. After working for six days, additional number of men is added to finish the work in 21 days from the beginning find the number of additional men. **Ans: 4**
 - An article was sold at its marked price Rs. 6,200 and discount of 15% was allowed, the dealer still made a profit of 25%. Find cost price.

Ans: 4216

- Find the scrap value of a machine costing Rs. 20,000 after 10 years on 10% per annum. **Ans: 6966**
 - The interest on a sum is Rs. 600 and the discount for the same time at the same rate is 500. Find the sum. **Ans: 3000**

Group B [$8 \times 5 = 40$]

- Find from the first principle, the derivative of $\frac{1}{x+2}$. **Ans: $\left(\frac{-1}{(x+2)^2}\right)$**
- Prove that: $\begin{vmatrix} 1+a & 1 & 1 \\ 1 & 1+a & 1 \\ 1 & 1 & 1+a \end{vmatrix} = a^2(a+3)$.
- A firm has a demand function $p = 108 - 5Q$ and cost function $c = -12Q + Q^2$. Find the price at which profit is maximum. Find maximum profit. Also find output for minimum cost. **Ans: P = 58, Q = 6**
- Using Cramer's rule, solve the following equations:
 $4x - 3y = -5, x + y + z = 6, 3x - 2y - 4z = -13$.

15. Find mean and standard deviation from the given data:
 Marks: 0-10 10-20 20-30 30-40 40-50 50-60
 No. of students: 2 5 10 25 7 2
16. A, B and C engage in a business with a joint capital of 18,000. A give Rs. 2,000 more than B and B Rs. 2,000 more than C. Divide a profit of Rs. 1,080 among them. **Ans: 480, 360, 240**
17. Determine the par of exchange between London and New York £1 contained 61.635 grains of $\frac{11}{12}$ fine and \$1 contained 25.8 grains of gold $\frac{9}{10}$ fine. **Ans: £1 = \$ 2.43**
18. In how many years will an annuity of Rs. 400 amount to Rs. 4,064 at 3% per annum compound interest. **Ans: 9 years approx**

SET - V

Group A [(10×2)×3=60]

- Express the complex number $\frac{2-6i}{2+7i}$ in the form $A + iB$. **(Ans: $\frac{4}{5} - \frac{7}{5}i$)**
 - If $A = \{1,2,3\}$ and $B = \{2,3\}$. Find the relation in $A \times B$ satisfying $y > x$.
- How much salary does a man receive in 9th years and also find total salary for 9 years if his salary was Rs. 2,000 with an increment of Rs. 200 in each year
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 - Where does the straight line through (3, 4) and (5, 6) intersect y-axis?
- Using log table Evaluate: $\frac{\sqrt[3]{12.7 \times (0.84)^4}}{0.625}$ **Ans: 1.859**
 - Prove that $\lim_{x \rightarrow 1} \frac{x^2 - \sqrt{x}}{\sqrt{x} - 1} = 3$
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- | | | | | | |
|----------------|----|----|----|----|----|
| Marks | 10 | 15 | 20 | 25 | 30 |
| No. of student | 2 | 4 | 6 | 8 | 5 |

Ans : 5.12
 - An article is sold for Rs.150 at a gain .Had it been sold for Rs135 there would have been a loss equal to 50% of the original gain find the cost price of the article
Ans: 140
- If Rs 126.36 = £1, 50p = 3.52 marks, 43 franc = 1, 3.91 marks = \$1, find the arbitrary rate of exchange of between francs and Kathmandu
 - Fine the amount of annuity of Rs 400 per year for 5years at 6%.p.a?

Group B

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- Find from the first principle, the derivative of $\frac{1}{x+2}$. **Ans: $\left(\frac{-1}{(x+2)^2}\right)$**
- Prove that: $\begin{vmatrix} 1+a & 1 & 1 \\ 1 & 1+a & 1 \\ 1 & 1 & 1+a \end{vmatrix} = a^2(a+3)$.
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Ans: Q = 5 and P = $\frac{100}{3}$
- Maximize: $F = 8x - 5y + 40$ subject to $x + 2y \leq 10, x - y \geq 1, x \geq 0, y \geq 0$. **Ans: (0, 0), (1, 0), (4, 3), (0, 5)**
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