

Class XII (Business Math)

Set I

Candidates are required to give their answers in their own words as far as practicable.
The figures in the margin indicate full marks.

Attempt all the questions

GROUP 'A' /10X2X3=60]

- Q.N.1** a) Express the complex number $\frac{1-i}{1+i}$ in the form of $A+iB$.
b) Let $A = \{1,2,3\}$. Find the relation in $A \times A$ satisfying the condition $x > y$ for all $(x, y) \in A \times A$. Find the domain of the relation.
- Q.N.2** a) If the n^{th} term of an A.P. 23,26,29,32..... is equal to the n^{th} term of an A.P. 59,58,57,56,..... find the number of terms.
b) Insert 3 geometric means between $2\frac{1}{4}$ and 36
- Q.N.3** a) In how many ways the letters of the word "COMMERCE" can be arranged?
b) If $A = \begin{pmatrix} 5 & 2 & -1 \\ 0 & -3 & 2 \end{pmatrix}$ and $B = \begin{pmatrix} -1 & 2 & 3 \\ 5 & 0 & -2 \end{pmatrix}$, find $2A + 3B$.
- Q.N.4** a) Find the equation of the line through the point of intersection of $x + 2y = 5$, $x - 3y = 7$ and passing through the point $(0, 0)$.
b) In what ratio is the line joining the points $(-1, 8)$ and $(5, 2)$ divided by the point $(3, 4)$?
- Q.N.5** a) With the help of log table, find the value of $\sqrt[7]{\frac{(5.1)^2 \times 29^3}{(64.0)^2}}$
b) Evaluate: $\lim_{x \rightarrow 0} \frac{\sqrt{x+1} - \sqrt{1-x}}{x}$
- Q.N.6** a) Find the value of K so that the function
$$f(x) = \begin{cases} \frac{x^2 - 5x}{x - 5} & \text{for } x \neq 5 \\ k & \text{for } x = 5 \end{cases}$$
is continuous at $x = 5$.
b) Find the derivative of: $y = \frac{1}{\sqrt[3]{x^2 - 2x + 1}}$
- Q.N.7** a) Find the following integrals: $\int \frac{2x - 3}{(x^2 - 3x + 2)^4} dx$

b) The marginal revenue function is $6x^2 + 4x + 3$, x being the output. Find the total revenue function.

Q.N.8 a) What will be the median of a distribution if mean = 30 and mode is 24?

b) A bag contains 12 white balls, 8 green balls and 5 blue balls. If a ball is drawn from the bag, what is the probability that the ball drawn is either a white ball or a green ball?

Q.N.9 a) In a race of one kilometer, Mr. X beats Mr. Y by 70 meters, Mr. Y beats Mr. Z by 80 meters, by how much does Mr. Y beat Mr. Z ?

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.

Q.N.10 a) If 6 chairs are worth 4 tables, 5 tables are worth 3 desks and 20 desks are worth 6 daraj, find the cost of a daraj when a chair is worth Rs 960.

b) The difference between the simple interest and the compound interest on a certain sum for 3 years at 5% p.a. is Rs 33.55. Find the sum invested.

GROUP 'B' [8X5=40]

Q.N.11 Prove that:
$$\begin{vmatrix} 1+x & 1 & 1 \\ 1 & 1+y & 1 \\ 1 & 1 & 1+z \end{vmatrix} = xyz \left(1 + \frac{1}{x} + \frac{1}{y} + \frac{1}{z}\right)$$

Q.N.12 What do you mean by the derivative of a function? Find $\frac{dy}{dx}$ of

$$y = \sqrt{\frac{1-x}{1+x}}$$

Q.N.13 The demand function for a certain commodity is $P = \frac{1}{3}Q^2 - 10Q + 75$.

Find the value of Q and the corresponding value of P that maximizes the revenue.

Q.N.14 Solve the following L.P. problem graphically:

Maximize $Z = 2x + 3y$,

Subject to the constraints: $2x + y \leq 14$, $x + 2y \leq 10$, $y \geq 0$.

Q.N.15 Following are the marks obtained by two students Ram and Hari in 10 tests of 100 marks each.

Test	1	2	3	4	5	6	7	8	9	10
Marks of Ram	54	60	56	68	72	52	48	76	80	44
Marks of Hari	66	57	51	72	69	63	60	54	75	48

Who is more consistent in performance?

- Q.N.16** A and B started 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 13000, find the profit according to time devotion.
- Q.N.17** If bankers discount of Rs. 28000 at 3.5% per annum be equal to the true discount on Rs. 28735 for the same time at the same rate, when are the sum due ?
- Q.N.18** Find the amount of an annuity of Rs 700 a year at 4 years at 5% p.a.

Best of Luck

*Candidates are required to give their answers in their own words as far as practicable.
The figures in the margin indicate full marks.*

Attempt all the questions

GROUP 'A' /10X2X3=60/

Q.N.1 a) If $x - iy = \frac{2 - 3i}{2 + 3i}$, prove that $x^2 + y^2 = 1$.

b) In a statistical investigation of 500 families in a certain town, it was found that 40 families had neither a radio nor a TV and 320 families had a radio and 190 a TV. How many families in that group had both radio and TV?

Q.N.2 a) Starting salary of a man is Rs 7200 per month. If he gets an increment of Rs 200 every year, what will his salary be in the tenth year?

b) Find three numbers in geometric progression whose sum is 14 and whose product is 64.

Q.N.3 a) A college has 7 good badminton players. In how many ways can a team of 5 players be selected?

b) If $A = \begin{pmatrix} 1 & 2 \\ 3 & 1 \end{pmatrix}$, show that $A^2 - 2A - 5I = 0$ where I and O are identity and null matrix of order 2 respectively.

Q.N.4 a) In what ratio is the line joining the points (2, -3) and (5, 6) divided by X-axis?

b) Find the equation of the straight line passing through the points (2, 5) and (x, 3) if its slope is 2.

Q.N.5 a) With the help of log table, find the value of $\sqrt[3]{\frac{12.7 \times (0.86)^4}{(0.625)^3}}$

b) Evaluate: $\lim_{x \rightarrow 3} \frac{x - 3}{\sqrt{x - 2} - \sqrt{4 - x}}$

Q.N.6 a) Examine the continuity of the following function at the point $x = 5$.

$$f(x) = \begin{cases} \frac{x^2 - 25}{x - 5} & \text{when } x \neq 5 \\ 10 & \text{when } x = 5 \end{cases}$$

b) Find the differential coefficient of: $\frac{1}{\sqrt{x+a} - \sqrt{x-b}}$

Q.N.7 a) Evaluate: $\int \frac{(1 + \log x)^2}{x} dx$

b) If the demand function is $P = 30 - 2Q$, find the marginal revenue when the level of output is 5.

Q.N.8 a) Calculate the mean deviation from the mean of the following data:

Bonus	10	15	20	25
Frequency	3	5	5	7

b) What is the probability of drawing a heart or an ace from a deck of 52 cards?

Q.N.9 a) If 200 men can make an embankment 5km long in 25 days, how much over time per day must 60 men work to finish an embankment 2 km long in 32 days, 12 hours being a day's regular working hour?

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.

Q.N.10 a) Determine the par of exchange between London and New York if £1 contained 61.635 grains of gold $\frac{11}{12}$ fine and \$1 contained 25.8 Grains of gold $\frac{9}{10}$ fine.

b) A donor decides to grant to the students of a college an annual scholarship of Rs 6000 for a period of 10 years. What should he deposit in a bank with compound interest at 12% p.a., so that the sum may be sufficient to grant a scholarship? Assume that the scholarship is payable to the students at the end of the year.

GROUP 'B' [8X5=40]

Q.N.11 Prove that: $\begin{vmatrix} 1+a & 1 & 1 \\ 1 & 1+b & 1 \\ 1 & 1 & 1+c \end{vmatrix} = abc \left(1 + \frac{1}{a} + \frac{1}{b} + \frac{1}{c}\right)$

Q.N.12 Find from the first principle, the derivative of $\frac{1}{2x+3}$

- Q.N.13** If the revenue function is $R = Q - 3Q^2$ and cost function $C = Q^2 - 2Q$, find the value of maximum profit.
- Q.N.14** Maximize and minimize the objective function $F = X + 2y$
Subject to the constraints: $x + y \geq 2$, $2x - y \leq 4$, $y \leq 2$.
- Q.N.15** Find the mean and the standard deviation from the following frequency distribution.

Marks	0-10	10-20	20-30	30-40	40-50
No. of students	7	12	24	10	7

- Q.N.16** Ram and Shyam contribute Rs 5000 and 4000 towards partnership. They agree to divide the profit up to the 25% of the total capital equally amongst themselves and further agree that the excess if any should be divided in proportional to their capitals. How should a profit of Rs 2700 be divided between them?
- Q.N.17** **Find the difference between the banker's discount and true discount on a bill of Rs 15250 due in months hence at 5% p.a.**
- Q.N.18** The simple interest on a certain sum for 3 years is Rs 240 and the compound interest on the same sum for 2 years is Rs 163.20 Find the sum and the rate percent.

Best of Luck

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Attempt all the questions

GROUP 'A' /10X2X3=60]

Q.N.1 a) Find the modulus of $\left| \frac{8+6i}{5-12i} \right|$

b) If $A = \{-1, 0, 1\}$ and R be a relation on A such that $R = \{(x, y) : x + y \leq 2\}$, write the elements of the relation R . Also Find domain and range of R .

Q.N.2 a) Find the first term and the common difference of an A.P, whose 7th and 15th terms are $2\frac{5}{16}$ and $5\frac{1}{2}$ respectively.

b) Find three numbers in geometric progression whose sum is 14 and whose product is 64.

Q.N.3 a) In an Examination paper on Business mathematics, 10 questions are set In how many ways can you chose 6 questions to answer ?

b) If $A = \begin{pmatrix} 1 & 2 \\ 3 & 4 \end{pmatrix}$, $B = \begin{pmatrix} 1 & 0 \\ 2 & 3 \end{pmatrix}$, $C = \begin{pmatrix} 1 & -1 \\ 0 & 1 \end{pmatrix}$,

Verify that $A(BC) = (AB)C$

Q.N.4 a) Find the equation of the line through the point of intersection of $x + 2y = 5$, $x - 3y = 7$ and passing through the point $(0, 0)$.

b) In what ratio is the line joining the points $(-1, 8)$ and $(5, 2)$ divided by the point $(3, 4)$?

Q.N.5 a) Using logarithms, find the value of

$$\frac{23.1 \times 2.56}{\sqrt[3]{52.89}}$$

b) Evaluate: $\lim_{x \rightarrow 0} \frac{\sqrt{1-x^2} - \sqrt{1+x^2}}{x^2}$

Q.N.6 a) Find the value of K so that the function

$$f(x) = \begin{cases} \frac{x^2 - 3x}{2x - 6} & \text{for } x \neq 3 \\ k & \text{for } x = 3 \end{cases}$$

Is continuous at $x = 3$?

b) Find derivative of $y = x^2 \log x$

Q.N.7 a) Find the following integrals: $\int xe^x dx$

b) The marginal revenue function is $6x^2 + 4x + 3$, x being the output.

Find the total revenue function.

Q.N.8 a) What will be the median of a distribution if mean = 30 and mode is 24?

b) What is the probability of drawing a king or queen from a deck of 52

cards?

Q.N.9 a) In a race of one kilometer, Mr. X beats Mr. Y by 70 meters, Mr. Y beats Mr. Z by 80 meters, by how much does Mr. X beat Mr. Z ?

b) A merchant in Nepal buys goods in London to the value of £1000. Find the value of the goods in N.C. When the rate of exchange between India and Nepal is Rs.1.60 (N.C.) for Re 1 (I.C.) and between London and India is £10= Rs.833

Q.N.10 a) A buys an article and sells it to B at a profit of 25%, B sells it to C at loss of 10% and of C sells it to D at profit of 12%. If D paid Rs 3465 for it, what did A pay for it?

b) What is the present value of immediate annuity of Rs 1200 payable for 5 years, compound interest at the rate of 9 % p.a. ?

GROUP 'B' /8X5=40/

Q.N.11 Solve the following system of equation by using Cramer's rule.

$$2x + 3y = 4$$

$$4x - z = 5$$

$$4y + 3z = -5$$

Q.N.12 Find from the first principle, the derivative of $y = \sqrt{x}$

Q.N.13 The demand function for a certain commodity is $P = \frac{1}{12}Q^2 - 10Q + 300$. Find the value of Q and the corresponding value of P that maximizes the revenue.

Q.N.14 Solve the following L.P. problem graphically:

$$\text{Maximize } Z = 6x + 10y + 20,$$

$$\text{Subject to the constraints: } 3x + 5y \leq 15, 5x + 2y \leq 10, x \geq 0, y \geq 0.$$

Q.N.15 Find the mean and the standard deviation from the following frequency distribution.

Marks	5-15	15-25	25-35	35-45	45-55
No. of students	8	6	6	4	1

Q.N.16 Ram, Shyam and Hari form a business with a capital Rs 21000 of which Ram gives Rs 1000 more than Hari and Shyam Rs. 2000 more

than Hari. At the end of the year the profit to be divided is 16% of total capital what should each receive?

Q.N.17 The difference between the true and banker's discount on a certain bill due three months' notice at 4% p.a. is Rs 5. Find

- a) The true discount
- b) The banker's discount
- c) The amount of the bill

Q.N.18 The difference between the simple interest and the compound interest on a certain sum for two years at 4% p.a. is Rs 32. Find the sum invested.

Candidates are required to give their answers in their own words as far as practicable. The figures in the margin indicate full marks.

Attempt all the questions

GROUP 'A' [10X2X3=60]

1. a. If $x - iy = \frac{2-3i}{2+3i}$, prove that $x^2 + y^2 = 1$.
 b. If $A = \{1, 2, 3\}$ and $B = \{2, 3\}$. Find the relation satisfying $y > x$.
2. a. Find the sum of the following A.S
 $5 + 7 + 9 + 11 + \dots + 25$
 b. Insert 3 G.M's between $2\frac{1}{4}$ and $\frac{4}{9}$.
3. a. In how many ways letters of word "Business" be arranged?
 b. If $A = \begin{pmatrix} 4 & 2 & -1 \\ 3 & -7 & 1 \end{pmatrix}$ and $B = \begin{pmatrix} 2 & 3 \\ -3 & 0 \\ -1 & 5 \end{pmatrix}$, Find the products AB and

BA. Comment on the result.

4. a. Prove that $(1, 0)$, $(3, 1)$, $(2, 2)$ and $(-2, 1)$ are the vertices of a parallelogram.
 b. Find the equation of the straight line passing through the point $(-3, 5)$ and making equal intercept on the axes.
5. a. Evaluate the following (using log table) $\frac{(3.678)^4}{\sqrt[3]{42.75}}$
 b. Find the limit of: $\lim_{x \rightarrow 0} \frac{\sqrt{x+4} - 2}{x}$
6. a. Find the value of k of the following cases so that the function

$$f(x) = \begin{cases} kx-1 & \text{for } x < 2 \\ 2x-3 & \text{for } x \geq 2 \end{cases} \text{ is continuous at } x = 2$$

- b. Find $\frac{dy}{dx}$, $x^2 + y^2 = 2ax$.
7. a. Evaluate: $\int \frac{3x+1}{x-2} dx$

- b. If the marginal cost of product is given by $MC = 36 - 20x + 6x^2$ and the initial cost is Rs. 20. Find total cost and average cost function.
8. a. Calculate mean deviation from the following frequency table.

Bonus:	10	15	20	25
Frequency:	3	5	5	7

- b. What is the probability of drawing red card from deck of 52 cards?
9. a. A contractor had to complete his work of a road in 16 days. He employed 30 persons for 12 days and completes $\frac{5}{7}$ of the work. How many more persons should be employed now in order to complete the work in time?
- 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. Find the present value of annuity of Rs. 8000 a year for 20 years at discount 5% p.a?
- b. The simple interest on a certain sum for 3 years at 4% p.a is Rs. 240. Find the compound interest on the same sum at the same rate for same time.

Group B

[8 x 5 = 40]

11. Solve the following system of equation by using Cramer's rule.
 $x - y - z = -2$
 $5x + 20z = 30$
 $10y - 20z = 10$
12. By using first principle, find the differential coefficient of $y = 2x^2 + 3x + 1$.
13. Given the demand function $P = 16 - Q$ and cost function $C = 2 + Q^2$. Find the value of maximum profit.
14. Minimize the objective function $z = x + y$. Subject to the constraints.
 $3x + 2y \geq 12$
 $x + 3y \geq 9$
 $x \geq 0, y \geq 0$

15. Find the quartile deviation.

Marks	20 - 30	30 - 40	40 - 50	50 - 60	60 - 70	70-80
No. Of Std.	3	5	6	8	4	4

16. Sukhi and Khushi entered into partnership investing Rs. 10,000 and 7,500 respectively. They passed an agreement that after charging 6% interest on their respective capitals the balance of the profit. If any should be shared by them in equal ratio. Find the share of each partner if the business makes the profit.
17. A student going to Australia for study charged his entire amount Rs. 44,992 into Australian Dollars at the rate of 1 Australian dollar = Rs. 56.24. He spent Rs. 400 Australian dollars in Australia. On returning to Nepal, the amount

left with him and got Rs. 22,600. Find the new rate of exchange between Nepal and Australia.

18. A banker discount a bill which has 25 days to run before it is legally due at $5\frac{1}{16}\%$ p.a. The discount to Rs. 20.25 for what sum was bill is drawn.

Set V

Group A (10×2×3=60)

Q.N.1 a) If $-6 \leq 3x + 3 \leq 12$ prove that $|x| \leq 3$.

b) If $f(x) = x + |x|$ find $f(3)$, $f\left(\frac{-4}{3}\right)$ and $f(-2)$.

Q.N.2 a) Prove that the points (4, 0), (2, 3) and (8,-6) are collinear.

b) If $x+2$, $3x$, $4x+1$ are in A.P. then find x .

Q.N.3 a) Show that the points (7, 10), (-2, 5) and (3,-4) are the vertices of a right angled isosceles triangle.

b) In how many ways can a committee of 5 members be selected from 6 men and 5 women consisting of 3 men and 2 women?

Q.N.4 a) In how many ways can the letters of the word "MANAGEMENT" be arranged?

b) Using log table, evaluate $\sqrt[3]{\frac{9620}{108 \times (62.4^3)}}$.

Q.N.5 a) Evaluate the following determinants without expanding

$$\begin{vmatrix} 1/a & bc & 1 \\ 1/b & ca & 1 \\ 1/c & ab & 1 \end{vmatrix}$$

b) Evaluate: $\lim_{x \rightarrow 3} \frac{x-3}{\sqrt{x-2} - \sqrt{4-x}}$

Q.N.6 a) A buys an article and sells it to B at a profit of 25%, B sells it to C at loss of 10% and of C sells it to D at profit of 12%. If D paid Rs 3465 for it, what did A pay for it?

b) In how years will sum of money double itself at 4% p.a. compound interest payable half yearly?

Q.N.7 a) Examine the continuity and discontinuity of the function at the point $x=5$,

$$f(x) = \begin{cases} \frac{x^2 - 25}{x - 5} & \text{when } x \neq 5 \\ 10 & \text{When } x = 5 \end{cases}$$

b) A merchant in Nepal buys goods in London to the value of £1000. Find the value of the goods in NC when the rate of the exchange between India and Nepal is Rs 1.65 for Rs 1 IC. And between London and India is £20 for 1690 IC.

Q.N.8 a) Find the derivatives of $e^x \log x$.

b) If four quantities a,b,c and d are such that a:b = 3:4, b:c = 6:7 and c:d = 8:9 then find the ratio between a and d and also the continued ratio?

Q.N.9 a) Evaluate: $\int_0^1 \frac{3dx}{\sqrt{3x+1}}$

b) If for 2 units of production total revenue is 300. Find the total revenue function given that $MR=36-20x+6x^3$

Q.N.10 a) In moderately skewed distribution mean and median are 35.07 and 35.17 respectively. Find out value of mode.

b) What is the probability of drawing a Queen or a Jack from a deck of 52 cards?

GROUP B [8X5=40]

Q.N.11 Prove that:
$$\begin{vmatrix} a & b & c \\ a^2 & b^2 & c^2 \\ bc & ca & ab \end{vmatrix} = (b-c)(c-a)(a-b)(ab+bc+ca).$$

Q.N.12 Find $\frac{dy}{dt}$ of $y = \sqrt{\frac{1-t}{1+t}}$

Q.N.13 Given the demand function $P = 16 - Q$ and cost function $C = 2 + Q^2$. Find the value of maximum profit.

Q.N.14 Maximize the objective function $z = x + 2y$ subject to the constraints.

$$x + y \geq 12$$

$$2x - y \leq 9$$

$$y \leq 2$$

Q.N.15 Find the mean and the standard deviation from the following frequency table.

Marks	0-4	4-8	8-12	12-16	16-20	20-24
No of Students	7	7	10	15	7	6

Q.N.16. A, B and C engage in a business with a joint capital of Rs 18000. A gives 2000 more than B and B Rs 2000 more than C. Divide a profit of Rs 1080 among them.

Q.N.17. A loan of Rs. 10,000 is to be paid by 30 equal installments, find the amount of each installment to cover the principal and compound interest at 4% per annum.

Q.N.18 Find the difference between the banker's discount and the true discount on the bill of Rs 4,368 due in 146 days at 10% p. a.

Best of Luck

