Class 11 Business Mathematics 2078

Model set A

Group A Multiple choice questions (11×1=11)

1. The price elasticity of demand measures

a. the slope of a budget curve.

b. how often the price of a good changes.

c. the responsiveness of the quantity demanded to changes in price.

d. how sensitive the quantity demanded is to changes in demand.

2. If roots of $ax^2 + bx + c = 0$ are equal,then

a. $b^2 - 4ac = 0$ b. $b^2 - 4ac > 0$ c. $b^2 - 4ac < 0$ d. None of them

3. If a consumer has an income of Rs.1600 to spend on two goods X and Y whose per unit prices are Rs. 200 and Rs. 50 respectively, then the slope of the budget constraint is

a. 4 b. -4 c. 3 d. 5

4. The derivative of constant term is

a. 1 c. 3 b. 2 d. 5

5. If $y = x^n$,then $\int x^n \ dx$ is

a. $\frac{x^{n+1}}{n} + c$ b. $\frac{x^{n+1}}{n+1} + c$ c. $\frac{x^{n+1}}{n+1}$ d. $\frac{x^{n-1}}{n-1} + c$

6. If x+2, 3x and 4x+1 are in A.P., then the value of x is

a. 3 b. 2 c. 1 d.4

7. To start a partnership business, the minimum number of partners required is

a. 2 b. 3 c. 4 d. 5

8. If the true discount on a certain sum for 5 months at 12% p.a. is Rs. 200 ,then the present worth is

a. Rs.2000 b. Rs.3000 c. Rs.4000 d. Rs.5000

9. The linear function of the variables which is to be maximize or minimize is called

a. constraints b. objective function c. Decision variable d. None of them

10. The most repeated value in a distribution is called

a. Mean b. Median c. Mode d. Quartile

11. The total number of possible outcomes in toss of three unbiased coins together is

a. 3 b. 6 c. 8 d. 5

Group B (Short answer questions) [8 x5 = 40]

12. (a) Given a basic Keynesian macroeconomic model : Y = C+ I, C = 60 + 0.4Y , I_o = Rs. 300. Determine the equilibrium level of national income(Y_e) and the equilibrium level of consumption(C_0).

(b) Amongst 50000 people of Nepal , a person infected coronavirus disease(COVID-19) had recently return back home from a foreign country. The spread coviD-19 through the person body is given by the equation P(t) = $\frac{5000}{1+4999e^{-0.5t}}$,

where P(t) is the total number of people infected at time of t days.

(i) How many people are initially infected from COVID-19 ?

(ii) The country will luckdown ,if 10% of the people are found to be infected from COVID-19. On what day will it close ?

(iii) How many people will become infected eventually from COVID-19? (2 +2+1)

13. The demand and supply functions of a good are $P_d = 60 - 0.6\ Q_d$ and $P_s = 20 + 0.2\ Q_s$ respectively.

(i) Calculate the equilibrium price and quantity.

(ii) Calculate the consumer surplus and producer surplus at market equilibrium.

(iii) Calculate the total surplus . (2 + 2 +1)

14. (a) Prove that : $\lim_{x\to\infty} \sqrt{x}\left(\sqrt{x+a} - \sqrt{x}\right) = \frac{a}{2}$

(b) A function *f(x)* is defined as follows: *f(x)* = $\frac{x^x - 4x}{x-4}$ $for\ x \neq 4$

= k for x = 4

Find the value of k so that the function f(x) is continuous at x=4 (3 + 2)

15. (a) Differentiate $y = \frac{1}{\sqrt{2x-3}-\sqrt{2x-5}}$ with respect to x.

(b) The average cost of making x units of an article in rupees is $\frac{25}{x} + 3 + \frac{2}{\sqrt{x}}$. Find the marginal cost at 100 units of output. (3 + 2)

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

(b) Evaluate : $\int (5x+3)\sqrt{2x-1}\ dx$ (2 + 3)

17. A dealer deals in only two items, cycle and scooters. He has Rs. 500000 to invest and a space to store at most 60 pieces. One scooter costs him Rs.250000 and cycle costs him Rs.5000. He can sell a scooter at profit of Rs. 5000 and a cycle at profit Of Rs.1500.Assuming that he can sell all the items that he buys, how should he invest his money in order that he may maximize his profit ? solve problem graphically.

18. a) calculate the most repeated value after regrouping the distribution given below:

Value	0-10	10-20	20-40	40-50	50-60	60-70	70-80
frequency	10	15	50	20	10	20	5

(b) An analysis of monthly wages paid to the workers in two firms A and B belonging to the same industry gives the following results.

	Firm A	Firm B
No of workers	500	600
Average monthly wages	Rs.186	Rs. 175
Variance of distribution of wages	Rs 81	Rs 100

(i) In which firm, A and B is there greater variability in individual wages ?

(ii) Calculate the average monthly wages and the variance of the distribution of wages all of the workers in the firms A and B taken together .

19. (a) The arithmetic mean and standard deviation of set 9 items are 43 and 5 respectively. If an item of value 63 is added to the set find mean standard deviation of 10 items.

(b) A bag contains 6 black ,4 white and 8 red balls . If three balls are drawn at random, find the probability that 9i) all the three are red (ii) two are white and 1 black (iii) one of each colour. (2+3)

Group C (Long answer questions) [3 x 8 = 24]

20. (a)A and B entered into partnership with Rs.70000 and Rs. 60000 respectively. After 3 months, A withdraw $\frac{2}{7}$ of his capital, but after 3 months more, he put back $\frac{3}{5}$ of what he had withdrawn. The profit at the end of the year is Rs.72600. How much of this should A and B receive?

(b) Find three numbers in A.P. such that their squares is 350. (4+4)

21 (a) If the marginal revenue function for the output x is MR=$\frac{6}{(x+2)^2}$+5 , find the total revenue function. Also, show that the demand is P=$\frac{3}{x+2} + 5$.

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22. (a) If the median income of 150 workers of a factory is Rs. 7000,find the missing frequencies and compute mean income of the workers.

Income in '000 Rs.'	0-2	2-4	4-6	6-8	8-10	10-12	12-14
No. of workers	10	?	25	50	?	15	10

(b)The probability that a man will be alive 25 years hence is 0.3 and the probability that his wife will be alive 25 years hence is 0.4. Find the probability that 25 years hence

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(a) Calculate an appropriate measure of average for the following distribution giving reasons for your choice.

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(b)A person has got 12 friends of whom 8 are relatives. In how many ways can he invite 7 guests such that 5 of them may be relatives? (4+4)

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Group C (Long answer questions) [3 x 8 = 24]

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22. (a) If the median income of 150 workers of a factory is Rs. 7000,find the missing frequencies and compute mean income of the workers.

Income in '000 Rs.'	0-2	2-4	4-6	6-8	8-10	10-12	12-14
No. of workers	10	?	25	50	?	15	10

(b)The probability that a man will be alive 25 years hence is 0.3 and the probability that his wife will be alive 25 years hence is 0.4. Find the probability that 25 years hence

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value	Less than 10	10-20	20-30	30-40	40 and above
Frequency	5	10	20	10	5

(b)A person has got 12 friends of whom 8 are relatives. In how many ways can he invite 7 guests such that 5 of them may be relatives? (4+4)

All the best!!!

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Model set B

Group A Multiple choice questions (11×1=11)

1. If the price elasticity of supply (Es) = 1 then the supply is

a. unit elastic b. inelastic c. elastic d. non of them

2. If roots of $px^2 + qx + r = 0$ are real unequal,then

a. $q^2 - 4pr = 0$ b. $q^2 - 4pr > 0$ c. $q^2 - 4pr < 0$ d. None of them

3. If a costumer has an income of Rs.192000 to spend on two goods A and B whose per unit prices are Rs. 800 and Rs. 1200 respectively, then the equation of cost constraint is

a. 2x+3y =240 b. 2x-3y =480 c. 2x+3y =480 d. 2x= 3y +240

4. The derivative of e^x is

a. e^x c. 1 b. 0 d. x

5. If $y = (a + bx)^n$,then $\int (a + bx)^n,\ dx$ is

a. $\frac{(a+bx)^{n+1}}{(a+bx)} + c$ b. $\frac{(a+bx)^{n+1}}{a(n+1)} + c$ c. $\frac{(a+bx)^{n+1}}{b(n+1)} + c$ d. $\frac{(a+bx)^{n-1}}{b(n-1)} + c$

6. If a ,c and b are in A.P., then the value of c is

a. $\frac{a+b}{2}$ b. $\frac{a+c}{2}$ c c. $\frac{a-b}{2}$ d. $\frac{a-c}{2}$

7. what is the value of ${}^8P_5$?

a. 6702 b. 6720 c. 2670 d. 7620

8. A bill was drawn for Rs 5400 and was discounted in Bank for Rs.5130 . If the rate of discount was 10% p.a.,then the time of bill is

a. 1 year b. 9 months c. 10 months d. 11 months

9. The linear function of the variables which is to be maximize or minimize is called

a. Decision variable b. objective function c. constraints d. None of them

10. What will be median value in a distribution if mean=30 mode = 24 ?

a. 27 b. 28 c. 25 d. 29

11. What is the probability of drawing heart or an ace from pack of 52 cards ?

a. $\frac{5}{13}$ b. . $\frac{4}{13}$ c. . $\frac{4}{52}$ d. . $\frac{3}{13}$

Group B (Short answer questions) [8 x5 = 40]

12. (a) A firm has a demand function P=108-5Q and the average cost function AC=-12+Q.Find the marginal profit fnction and its value when Q=8. Also find the maximum profit.

(b) Amongst 60000 people of Nepal , a person infected coronavirus disease(COVID-19) had recently return back home from a foreign country. The spread coviD-19 through the person body is given by the equation P(t) = $\frac{600}{1+355e^{-0.2t}}$,

where P(t) is the total number of people infected at time of t days.

(i) How many people are initially infected from COVID-19 ?

(ii) The country will luckdown ,if 20% of the people are found to be infected from COVID-19. On what day will it close ?

(iii) How many people will become infected eventually from COVID-19? (2 +2+1)

13. The demand and supply functions of a good are $P_d = 70 - 0.65\ Q_d$ and $P_s = 80 + 0.5Q_s$ respectively.

(i) Calculate the equilibrium price and quantity.

(ii) Calculate the consumer surplus and producer surplus at market equilibrium.

(iii) Calculate the total surplus . (2 + 2 +1)

14. (a) Prove that : $\lim_{x\to\infty} \sqrt{x}\left(\sqrt{x+1}-\sqrt{x}\right) = \frac{1}{2}$

(b) A function *f(x)* is defined as follows: $f(x) = \frac{x^x-9}{x-3}$ $for\ x \neq 3$

$= k$ *for x = 3*

Find the value of k so that the function f(x) is continuous at x=3 (3 + 2)

15. (a) Differentiate y = $\sqrt{ax^2+bx+c}$ with respect to x.

(b)Solve: $x^2 - x - 6 \geq 0$. Present the solution set in number line. (3 + 2)

16. (a) Evaluate : $\int \frac{3x+1}{x-2}\ dx$

(b) Evaluate : $\int x\sqrt{1-3x^2}\ dx$ (2 + 3)

17. Given the following constraints are :

$3x+5y \leq 15$, $5x+2y \leq 10$ and $x \geq 0, y \geq 0$

i)Find the feasible solution. ii) find the vertices of feasible region . iii) find the extreme values of F=6x+10y+20 (5)

18. a) calculate the mode of the distribution given below:

Value	Less than 10	Less than 20	Less than 40	Less than 50	Less than 60	Less than 70	Less than 80
frequency	5	10	17	28	35	43	50

(b) An analysis of monthly wages paid to the workers in two firms X and Y belonging to the same industry gives the following results.

	Firm X	Firm Y
No of workers	400	500
Average monthly wages	Rs.150	Rs. 200
Variance of distribution of wages	Rs 100	Rs 64

(i) In which firm, X and Y is there greater variability in individual wages ?

(ii) Calculate the average monthly wages and the variance of the distribution of wages all of the workers in the firms X and Y taken together .

19. (a) If 5 times the 6^{th} term of an A.P. is equal to the 8 times the 9^{th} term, show that the 14^{th} term of the A.P. is zero.

(b) A bag contains 10 black ,6 white and 5 red balls . If three balls are drawn at random, find the probability that (i) all the three are white. (ii) two are red and 1 black (iii) one of each colour. (2+3)

Group C (Long answer questions) [3 x 8 = 24]

20. Ram,Shyam and Hari formed a partnership by contributing Rs.5000, Rs. 3000 and Rs. 2500 respectively. Hari will look after management and gets 12.5% of the profit as salary. Remaining profits are distributed in proportion to their capital contribution. If at the end of the year ,Hari got Rs.280 from the firm,what were the total profit of the firm and how much did Ram and Shyam receive? (8)

21 (a) If the marginal revenue function for the output x is MR=$\frac{ab}{(x+b)^2}$-c , find the total revenue function. Also, show that the demand is P=$\frac{a}{x+b} - c$.

(b) The marginal cost function of a firm is 5+6e^x, where x is the output. Find the total cost function and total average cost function if the fixed cost is Rs. 3000. (4+4)

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