Paper 4-Fundamentals of Business Mathematics and Statistics

SET - II

Paper 4-Fundamentals of Business Mathematics and Statistics

Full Marks: 100 **Time allowed: 3 Hours**

Section – A
(Fundamentals of Business Mathematics)

I. Answer any two questions. Each question carries 5 marks [2 ×5 = 10]

1. **A sum of money invested at C.I payable yearly amounts to `10,816 at the end of the second year and to ` 11,248.64 at the end of the third year. Find the rate of interest and the sum.**
2. **In a class containing 50 students, 15 play tennis, 20 play cricket and 20 play Hockey, 3 play Tennis and Cricket, 6 play Cricket and Hockey and 6 play Tennis and Hockey, 7 play no game at all. How many play Cricket, Tennis and Hockey?**
3. **Find two positive numbers whose product is 16 having minimum sum.**

Answer:

1. Let the sum be Rs. P and rate of interest be i%.

A_1 = 10,816 (`) $A_2$ = ` 11,248.64, n = 1

C.I. = $A_2 - A_1$ = 11,248.64 – 10,816
= ` 432.64.

C.I. = $P[(1+i)^n-1]$
=> 432.64 = $10,816 [(1+i)^n-1]$
=> $0.04 = (1+i)^1 - 1$
=> $1 + i = 1.04$

$$i = 1.04 - 1 = 0.04 \times 100 = 4\%$$

A = $P[(1+i)^n-1]$

$$\Rightarrow 10,816 = P\left(1 + \frac{4}{100}\right)^2$$
$$= P\,(1.04)^2$$
$$= P\,(1.0816)$$

$$P = \frac{10816}{1.0816} = ` 10,000.$$

2. Let the students who play tennis be 'T' and the students who play cricket be 'C' and the students who play be Hockey be 'H'.

n(T) = 15, n(C) = 20, n(H) = 20, $n(T \cap C) = 3$, $n(C \cap H) = 6$, $n(T \cap H) = 6$, $n(T \cap C \cap H) = ?$

$\therefore$ $n(T \cup C \cup H) = 50 - 7 = 43$.

We know that,

$n(T \cup C \cup H) = n(T) + n(C) + n(H) - n(T \cap C) - n(C \cap H) - n(H \cap T) + n(H \cap C \cap T)$
$\Rightarrow 43 = 15 + 20 + 20 - 6 - 3 + n(H \cap C \cap T)$
$= 55 - 15 + n(H \cap C \cap T)$
$= 40 + n(H \cap C \cap T)$

$\therefore$ n (H ∩ C ∩ T) = 43 – 40 = 3.

No. of students who play all three = 3.

3. Let x, y be two positive numbers.

$xy = 16 \Rightarrow y = \frac{16}{x}$

Let the sum function be u = x + y

$$Ù (x) = x + \frac{16}{x}$$

In order to the sum is to be minimum its derivative is zero and 2nd derivative > 0.

$\therefore \frac{du}{dx} = 0$

$\Rightarrow 1+16 (\frac{-1}{x^2}) = 0$

$\Rightarrow (\frac{16}{x^2}) = 1 \Rightarrow x^2 = 16$

$\therefore x = 4$

Again, $\frac{d^2u}{dx^2} = -16\left(\frac{2}{x^3}\right) = \frac{32}{x^3}$

Now, $\frac{d^2u}{dx^2}$ at x = 4 $= \frac{32}{4^3} = \frac{32}{64} = \frac{1}{2} = > 0.$

$\therefore$ The sum is minimum at x = 4

When x = 4 the $y = \frac{16}{4} = 4.$

II. Answer any two questions. Each question carries 3 marks [2 ×3 = 6]

1. What sum of money will produce ` 28,600 as an interest in 3 years and 3 months at 2.5% p.a. simple interest?

2. Show that $\left(\frac{x^b}{x^c}\right)^{a} \cdot \left(\frac{x^c}{x^a}\right)^{b} \cdot \left(\frac{x^a}{x^b}\right)^{c} = 1$

3. Find the matrix 'X' where AX = B and A = $\begin{pmatrix} 1 & 2 \\ 9 & 4 \end{pmatrix}$ **and B =** $\begin{pmatrix} 3 & 12 \\ 13 & 52 \end{pmatrix}$

Answer:

1. Let the sum be ` P.

Given S.I. = ` 28,600, r = 2.5% p.a. S.I.

t = 3 years 3 months

$= 3\frac{3}{12} = 3\frac{1}{4}$ years

$S.I. = \frac{prt}{100}$

$\Rightarrow 28,600 = P \times \frac{2.5}{100} \times \frac{13}{4}$

$\therefore P = \frac{28600 \times 100 \times 4}{13 \times 2.5} =$ ` 3,52,000.

∴ The required sum be ` 3,52,000.

2. L.H.S. $= \left(\frac{x^b}{x^c}\right)^a \cdot \left(\frac{x^c}{x^a}\right)^b \cdot \left(\frac{x^a}{x^b}\right)^c$

$= \left(x^{b-c}\right)^a \cdot \left(x^{c-a}\right)^b \cdot \left(x^{a-b}\right)^c$

$= x^{ab-ac} \times x^{bc-ab}\, x^{ac-bc}$

$= x^{\cancel{ab}-\cancel{ac}+\cancel{bc}-\cancel{ab}+\cancel{ac}-\cancel{bc}}$

$= x^0 \quad = 1 \quad = \text{R.H.S.}$

3. Let $x = \begin{pmatrix} a & b \\ c & d \end{pmatrix}$

Given $A = \begin{pmatrix} 1 & 2 \\ 9 & 4 \end{pmatrix}$; $B = \begin{pmatrix} 3 & 12 \\ 13 & 52 \end{pmatrix}$ and

$AX = B$

$\Rightarrow \begin{pmatrix} 1 & 2 \\ 9 & 4 \end{pmatrix}\begin{pmatrix} a & b \\ c & d \end{pmatrix} = \begin{pmatrix} 3 & 12 \\ 13 & 52 \end{pmatrix}$

$\Rightarrow \begin{pmatrix} a+2c & b+2d \\ 9a+4c & 9b+4d \end{pmatrix} = \begin{pmatrix} 3 & 12 \\ 13 & 52 \end{pmatrix}$

∴ $a + 2c = 3 \rightarrow (1)$

$9a + 4c = 13 \rightarrow (2)$

$2\times(1) = 2a + 4c = 6$

$9a + 4c = 13$

$- \quad - \quad -$

$-7a = -7$

$a = 1$

From (1) $1+2c = 3 \Rightarrow 2c = 2 \Rightarrow \boxed{c = 1}$

Again, $b + 2d = 12 \rightarrow (3)$

$9b + 4d = 52 \rightarrow (4)$

$2\times(3) = 2b + 4d = 24$

$9b + 4d = 52$

$- \quad - \quad -$

$-7b = -28$

$b = 4$

From (3) $4 + 2d = 12$

$\Rightarrow 2d = 8$

$\Rightarrow d = 4$

∴ $x = \begin{pmatrix} a & b \\ c & d \end{pmatrix} = \begin{pmatrix} 1 & 4 \\ 1 & 4 \end{pmatrix}$

III. Choose the correct answer **[5 × 1 = 5]**

1. The ratio $\frac{5}{3} : 2\frac{1}{4}$ is -

(a) ratio of lesser inequality

(b) ratio of greater inequality

(c) 20 : 9

(d) 5 : 27

2. $\log\left(\frac{a^2}{bc}\right) + \log\left(\frac{b^2}{ac}\right) + \log\left(\frac{c^2}{ab}\right)$ is equal to -

(a) 0
(b) 1
(c) 2
(d) abc

3. **If $^{n}p_3 = 120$ then n = ___**
   (a) 8
   (b) 4
   (c) 6
   (d) None of these
4. **If the numerator is multiplied by it becomes equal to 1 however if 2 is deducted from denominator it becomes equal to 1. The number is ____**
   (a) 5/7
   (b) 3/7
   (c) 5/8
   (d) 1/3
5. **If A = $\begin{bmatrix} 2 & 3 \\ 4 & 5 \end{bmatrix}$ then transpose of the transpose of A = ____**
   (a) $\begin{bmatrix} 2 & 5 \\ 4 & 3 \end{bmatrix}$
   (b) $\begin{bmatrix} 2 & 5 \\ 3 & 4 \end{bmatrix}$
   (c) $\begin{bmatrix} 2 & 4 \\ 3 & 5 \end{bmatrix}$
   (d) $\begin{bmatrix} 2 & 3 \\ 4 & 5 \end{bmatrix}$

Answer:

1. The ratio $\frac{5}{3} : 2\frac{1}{4}$

$= \frac{5}{3} : \frac{9}{4}$

$= \frac{5}{3}(12) : \frac{9}{4}(12)$

$= 20 : 27$

Here $20 < 27$

$\therefore$ Ratio of lesser inequality. (Option : a)

(2) $\log\left(\frac{a^2}{bc}\right) + \log\left(\frac{b^2}{ca}\right) + \log\left(\frac{c^2}{ab}\right)$

$= \log\left(\frac{a^2}{bc} \cdot \frac{b^2}{ca} \cdot \frac{c^2}{ab}\right)$

$= \log\left(\frac{a^2b^2c^2}{a^2b^2c^2}\right)$

$= \log 1 = 0$ (Option : a)

(3) Given $^{n}p_3 = 120$

$$\Rightarrow \frac{\lfloor n}{\lfloor n-3} = 120$$

$$\Rightarrow \frac{n(n-1)(n-2)\cancel{(n-3)!}}{\cancel{(n-3)!}} = 120$$

$$\Rightarrow n(n-1)(n-2) = 6.5.4$$

$$\therefore \quad \boxed{n = 6} \qquad \text{(Option : c)}$$

(4) By verification (Option : d) is correct.

(5) Given $A = \begin{pmatrix} 2 & 3 \\ 4 & 5 \end{pmatrix}$

$$\left(A^{T}\right)^{T} = A = \begin{pmatrix} 2 & 3 \\ 4 & 5 \end{pmatrix} \qquad \text{(Option : d)}$$

IV. Fill in the blanks **[5 × 1 = 5]**

1. $\left(\frac{1}{2} + \frac{1}{3}\right) : \left(\frac{1}{2}, \frac{1}{3}\right)$ **= _____**

2. If A and B are two disjoint sets then x (A ∪ B) is equal to ____

3. If $64^{x} = 2 \oplus 2$ then x = _____

4. There are 10 points in a plane and among then 4 are collinear. The total number of triangles formed by joining them is ____

5. ° logx dx = _____

Answer:

1. $\left(\frac{1}{2} + \frac{1}{3}\right) : \left(\frac{1}{2}, \frac{1}{3}\right)$

$$= \frac{\left(\frac{3+2}{6}\right)}{\left(\frac{1}{6}\right)}$$

$$= \frac{5}{6} : \frac{1}{6}$$

$$= 5 : 1$$

2. Given A and B are two disjoint sets then
$n(A \cup B) = n(A) + n(B) - n(A \cap B)$.

3. $\therefore \quad 64^{x} = 2 \oplus 2$

$$\Rightarrow \left(2\sqrt{2}\right)^{4x} = \left(2\sqrt{2}\right)^{1}$$

$$\Rightarrow (2 \oplus 2)^{4x} = (2 \oplus 2)^{1}$$

$\therefore \quad 4x = 1$

$x = ¼.$

4. Required No. of Triangle

$= 10_{C_3} : 4_{C_3}$

$= \frac{\lfloor 10}{\lfloor 7 \lfloor 3} - \frac{\lfloor 4}{\lfloor 3 \lfloor 1} \quad = \frac{10 \times 9 \times 8 \times \lfloor 7}{\lfloor 7 \lfloor 3} - 4$

$= \frac{10 \times 9^3 \times 8^4}{6_3} - 4$

$= 120 - 4$

$= 116.$

5. $\int \log x \, dx = x\log x - x + c.$

V. State whether the following statements are true or false **[5 × 1 = 5]**

1. The fourth proportional of ` 5, ` 3.50, 150gm is 125gms.

2. The statement "I am hungry I will eat something" is true or false.

3. The statement {2} ? {2, 3, 5} is true or false.

4. The decimal part of the value of logarithm of a number is called mantissa.

5. $\int_0^1 e^x dx = e + 1$

Answer:

1. ` 5, ` 3.50, 150gms, d is 125 gm
   a b c d

   $\frac{5}{3.5} = \frac{150}{d}$

   $\Rightarrow \frac{50}{35} = \frac{150}{d}$

   $\Rightarrow \frac{10}{7} = \frac{150}{d}$

   $\Rightarrow d = \frac{150 \times 7}{10} = 105$ gm.

   $\therefore$ The given statement is False. (F)

2. The given statement is true. (T)

3. The statement {2} ? {2, 3, 5} is False (F)

4. The decimal part of the value of Logarithm of a number is called Mantissa (T)

5. $\int_0^1 e^x dx = e^x \Big|_0^1 = e^x - e^0 = e^x - 1$ (F)

VI. Match the following **[5 × 1 = 5]**

1.	**If** $\frac{A}{3} = \frac{B}{4} = \frac{C}{5}$ **then A:B:C = ___**	**A**	**4**
2.	$\log_{10000} x = -\frac{1}{4}$ **then x = ___**	**B**	$\log_e(\frac{3}{2})$

3.	**If (n + 1) ! = 20 (n – 1) ! then n = _____**	**C**	$\frac{1}{10}$
4.	**$\lim_{x\to 0} \frac{3^x - 2^x}{x}$ = _____**	**D**	**1**
5.	**If A = $\begin{bmatrix} x-2 & 4 \\ 3 & 5 \end{bmatrix}$ and B = $\begin{bmatrix} 1 & 4 \\ 3 & 5 \end{bmatrix}$ and A = B then x = ____**	**E**	**3 : 4 : 5**

Answer:

1.	Let $\frac{A}{3} = \frac{B}{4} = \frac{C}{5}$ $\therefore$ a => A : B : C = 3 : 4 : 5	E	3 : 4 : 5
2.	$\log_{10000} x = -\frac{1}{4}$ $x = \left[10^4\right]^{-\frac{1}{4}} = 10^{-1} = \frac{1}{10}$	C	$\frac{1}{10}$
3.	Given $(n+1)! = 20(n-1)!$ $\Rightarrow$ $(n+1)\, n(n-1)! = 20\,(n-1)!$ $\Rightarrow$ $(n+1)(n) = 5 \times 4$ $\therefore n = 4$	A	4
4.	$\lim_{x\to 0} \frac{3^x - 2^x - 1 + 1}{x}$ $= \lim_{x\to 0} \frac{(3^x - 1) - (2^x - 1)}{x}$ $= \lim_{x\to 0} \frac{(3^x - 1)}{x} - \lim_{x\to 0} \frac{(2^x - 1)}{x}$ $= \log 3 - \log 2$ $= \log_e \left(\frac{3}{2}\right)$	B	$\log_e\left(\frac{3}{2}\right)$
5.	Given A = $\begin{bmatrix} x-2 & 4 \\ 3 & 5 \end{bmatrix}$ and B = $\begin{bmatrix} 1 & 4 \\ 3 & 5 \end{bmatrix}$ and A = B $\Rightarrow$ $x - 2 = -1$ $\Rightarrow$ $x = 2 - 1$ $= 1$	D	1

VII. Answer the following in one (or) two steps **[4 ×1 = 4]**

1. **Construct the truth table for p ω q.**
2. **Two positive integers are such that the sum of first and twice the second is atmost 8 and their difference is atmost 2. Draw the graph of solution set.**
3. **Find $A_{2\times 3}$ when $a_{ij} = i + 2j$**
4. **The average cost function (AC) for certain commodity is AC = $2x - 1 + \frac{50}{x}$ in terms of output x. Find the Marginal Cost.**

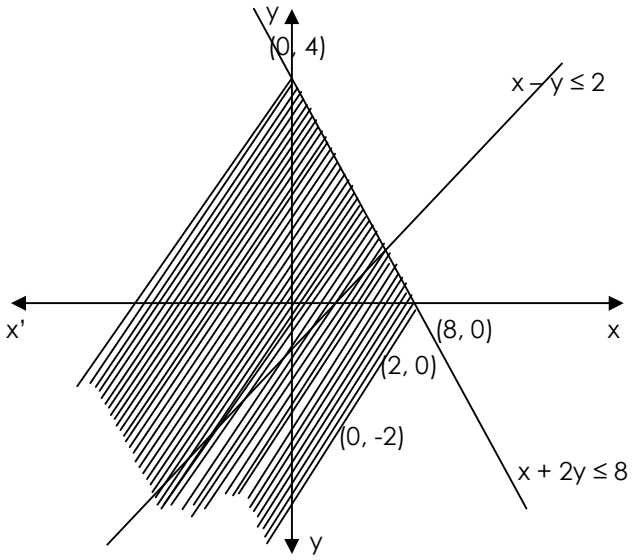
Answer:

1. The truth table for p ω q

p	q	p ω q
T	T	T
T	F	F
F	T	F
F	F	T

2. Graph: Let x, y be two positive numbers.

$x + 2y \le 8, \quad x - y \le 2, \quad x \ge 0, \quad y \ge 0$



3. Given $a_{ij} = i+2j$

$$A_{2\times3} = \begin{bmatrix} a_{11} & a_{12} & a_{13} \\ a_{21} & a_{22} & a_{23} \end{bmatrix}$$

$$= \begin{bmatrix} 3 & 5 & 7 \\ 4 & 6 & 8 \end{bmatrix}$$

4. Given the average cost function (AC) for certain commodity is

$$AC = 2x - 1 + \frac{50}{x} \qquad x - \text{output.}$$

$\therefore$ Total Cost (TC) $= x\,(AC)$

$$= x\left(2x - 1 + \frac{50}{x}\right)$$

$$= 2x^2 - x + 50.$$

$\therefore$ Marginal cost (MC) $= \frac{dc}{dx}$

$$= 4x - 1.$$

Section – B
(Fundamentals of Business Statistics)

VIII. Answer any Nine questions of the following. Each question carries 2 marks [9 × 2 = 18]

1. **(Class frequency) / (Width of the class) is defined as**
   - **(a) Frequency density**
   - **(b) Frequency distribution**
   - **(c) Both**
   - **(d) None**
2. **The mean height of 8 students is 152 cm. Two more students of heights 143 cm and 156 cm join the group. New mean height is equal to**
   - **(a) 153**
   - **(b) 152.5**
   - **(c) 151.5**
   - **(d) 151**
3. **In Ogive, obscissa corresponding to ordinate N/2 is**
   - **(a) Median**
   - **(b) 1st quartile**
   - **(c) 3rd quartile**
   - **(d) None**
4. **The variables x and y are related by 5x+6y=70 and median of x is 8. What is the median of y?**
   - **(a) 4**
   - **(b) 4.5**
   - **(c) 6**
   - **(d) 5**
5. **What is the modal value for the numbers 4, 3, 8, 15, 4, 3, 6, 3, 15, 3, 4.**
   - **(a) 3**
   - **(b) 4**
   - **(c) 15**
   - **(d) None of these**
6. **If x and y are related as 4x + 3y + 11 = 0 and mean deviation of x is 2.70. What is mean deviation of y?**
   - **(a) 7.20**
   - **(b) 14.40**
   - **(c) 3.60**
   - **(d) None of these**
7. **$(Q_3 - Q_1) / (Q_3 + Q_1)$ is**
   - **(a) Coefficient of Quartile deviation**
   - **(b) Coefficient of Mean deviation**
   - **(c) Coefficient of Standard deviation**
   - **(d) None**
8. **The value of correlation coefficient lies between**
   - **(a) -1 and +1**
   - **(b) -1 and 0**
   - **(c) 0 and 1**
   - **(d) None**

9. If the coefficient of correlation between two variables is -0.2, then the coefficient of determination is
(a) 0.4
(b) 0.02
(c) 0.04
(d) 0.16

10. A, B and C are three mutually exclusive and exhaustive events such that P(A)=2 P(B) = 3 P(C). What is P (B)?
(a) 6/11
(b) 6/22
(c) 1/6
(d) 1/3

11. If a card is drawn at random form a pack of 52 cards, what is the chance of getting a Spade or an ace?
(a) 4/13
(b) 5/13
(c) 0.25
(d) 0.20

12. Two dice are thrown together. The probability that 'the event the difference of no.s. shown is 2' is
(a) 2/9
(b) 5/9
(c) 4/9
(d) 7/9

Answer:

1. a
2. c
3. a
4. d
5. a
6. c
7. a
8. a
9. c
10. a
11. a
12. a

IX. Answer any nine questions of the following. Each question carries 2 marks [9 × 2 = 18]

1. If the median of 5, 9, 11, 3, 4, x, 8 is 6. Find the value of x.
2. If the first quartile is 104 and quartile deviation is 18. Find the third quartile.
3. If $\overline{X}$ = 56.2 , Z = 55; Find M
4. An aeroplane covers the four sides of a square at varying speeds of 500, 1000, 1500, 2000 km per hour respectively. What in the average speed of the plane around the square.
5. In a Moderately Asymmetrical Distribution. Compute M.D. and Q.D. Given S.D. = 50
6. Calculate S.D. for first 10 natural nos.

7. Given Mean = 50, C.V = 40%, Karl Pearson's Coefficient of Skewness = - 0.4. Find standard deviation and Mode.

8. If two regression coefficients b_{xy} = 0.87 and b_{yx} = 0.49, find 'r'.

9. Two cards are drawn from a well shuffled pack of playing cards. Determine the probability that both are aces.

10. The probability that A can solve a problem is 2/3 and that B can solve is 3/4. If both of them attempt the problem, what is the probability that the problem get solved?

11. Two dice are thrown at a time and the sum of the numbers on them is 6. Find the probability of getting the number 4 on anyone of the dice.

12. If three dice are thrown simultaneously, then the probability of getting a score of 5 is

Answer:

1. Given 5, 9, 11, 3, 4, x, 8

   => median = 6

   Arranging in ascending order

   3, 4, 5, x, 8, 9, 11

   $$\text{Median} = \left(\frac{N+1}{2}\right)^{th} \text{ term}$$

   $$6 = \left(\frac{7+1}{2}\right)^{th} \text{ term}$$

   $$6 = \left(\frac{8}{2}\right)^{th} \text{ term}$$

   $$6 = (4)^{th} \text{ term}$$

   $$6 = x$$

   $$\therefore \quad x = 6$$

2. Given Q_1 = 104

   Quartile deviation = 18

   Now $$\frac{Q_3 - Q_1}{2} = 18$$

   $$\frac{Q_3 - 104}{2} = 18$$

   $$Q_3 = 36 + 104$$

   $$Q_3 = 140.$$

3. $\bar{x}$ = 56.2

   Z = 55

   We know that Mode = 3 median – 2 mean

   $$\therefore \text{Median} = \frac{\text{Mode} + 2\,\text{Mean}}{3}$$

   $$= \frac{55 + 2(56.2)}{3}$$

   $$= \frac{55 + 112.4}{3}$$

   $$= \frac{167.4}{3}$$

Median = 55.8

4. Given

x	1/x
500	0.002
1000	0.001
1500	0.0006
2000	0.0005
	0.0041

$$H.M. = \frac{N}{\sum \frac{1}{x}}$$

$$= \frac{4}{0.0041}$$

$$= 975.609.$$

5. Given S.D. = 50

We know that

$$M.D. = \frac{4}{5} (S.D.)$$

$$= \frac{4}{5} (50)$$

M.D. = 40.

We know that

$$Q.D. = \frac{2}{3} (S.D.)$$

$$= \frac{2}{3} (50)$$

Q.D. = 33.33.

6. We know that S.D. of first n natural nos. is

$$\sqrt{\frac{1}{12}(n^2 - 1)}$$

$\therefore$ Given n = 10.

$$= \sqrt{\frac{1}{12}(10^2 - 1)}$$

$$= \sqrt{\frac{1}{12}(99)}$$

$$= \sqrt{8.25}$$

$$= 2.87.$$

7. Given $\bar{x} = 50$

C.V. = 40%

$S_{kp} = -0.4$.

Now

$$C.V. = \frac{\sigma}{\bar{x}} \times 100$$

$$40 = \frac{\sigma}{50} \times 100$$

$$\sigma = \frac{40 \times 50}{100}$$

$$\sigma = 20.$$

Now

$$S_{kp} = \frac{\bar{x} - z}{\sigma}$$

$$-0.4 = \frac{50 - z}{20}$$

$$(-0.4)(20) = 50 - z$$

$$-8 = 50 - z$$

$$Z = 58$$

8. Given $b_{yx} = 0.49$

$b_{xy} = 0.87$

Now $r = \sqrt{b_{xy} \times b_{yx}}$

$= \sqrt{(0.87) \times (0.49)}$

$= \sqrt{0.4361}$

$= 0.66.$

9. Given $n(s) = 52.$

The probability of getting drawn two cards are aces is $\frac{{}^4C_2}{{}^{52}C_2}$

$$= \frac{6}{1326}$$

$$= \frac{1}{221}$$

10. Given

The probability of A solving problem is P(A)

$$P(A) = \frac{2}{3}$$

The probability of B solving problem is P(B)

$$P(B) = \frac{3}{4}$$

The probability of A not solving problem is $P(\bar{A})$

$$= 1 - P(A) = 1 - \frac{2}{3} = \frac{1}{3}$$

The probability of B not solving problem is $P(\bar{B})$

$$= 1 - P(B) = 1 - \frac{3}{4} = \frac{1}{4}$$

Now, the probability if both attempts the problem get solved is $1 - P(\bar{A})\,P(\bar{B})$

$$= 1 - \frac{1}{4} \times \frac{1}{3} = 1 - \frac{1}{12} = \frac{11}{12}.$$

11. Two dices are rolled => $n(s) = 6^2 = 36$.
The probability of getting number 4 on anyone of die along with condition that sum of numbers on dices must be 6 is P(A).

$$P(A) = \frac{2}{36}$$

$$P(A) = \frac{1}{18}$$

12. Three dices are rolled => $n(s) = 6^3 = 216$.
The probability of getting a score of 5 is P(A)

$$P(A) = \frac{6}{216}$$

$$P(A) = \frac{1}{36}.$$

X. Answer any FOUR of the following questions **[4 × 6 = 24]**

1. Draw Pie diagram to represent the data

Item	Food	Rent	Clothing	Fuel	Education	Miscellanies
Expenditure	240	125	66	57	42	198

2. Compute coefficient of Mean Deviation from Mean for following data:

X	0-4	4-8	8-12	12-16	16-20	20-24	24-28	28-32
F	4	9	23	55	62	30	12	5

3. Find Karl Pearson Co-efficient of Correlation for the following

Marks in Economics	48	60	72	62	56	40	39	52	30
Marks in Accountancy	62	78	65	70	38	54	60	32	31

4. Find Quantity Index No. from following data i) Laspeyre's, ii) Paasche's iii) Dorbish and Bowley's

	2001		2005	
Commodity	Quantity	Value	Quantity	Value
A	5	40	6	60
B	5	30	5	40
C	6	24	6	30
D	5	10	10	40

5. Find the trend values by using 3 yearly moving averages method

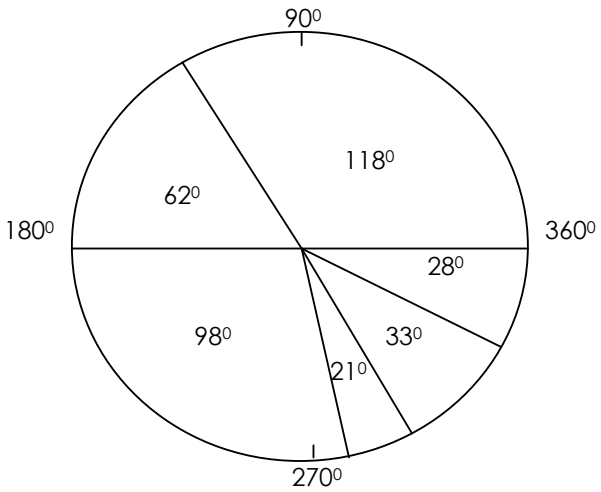
Year	2007	2008	2009	2010	2011	2012	2013
Sales (`'000)	33	35	60	67	68	82	90

6. A cricket club has 15 members of which only 5 can bowl. If the names of 15 members are put into a box and 11 names are drawn at random, then the probability of obtaining 11 member team containing exactly three bowlers is:

Answer:

1. Food : 240 => angles = 240/728 × 360 = 118^0 (app)
   Rent : 125 => angles = 125/728 × 360 = 62^0 (app)
   Clothing : 66 => angles = 66/728 × 360 = 33^0 (app)
   Fuel : 57 => angles = 57/728 × 360 = 28^0 (app)
   Education : 42 => angles = 42/728 × 360 = 21^0 (app)
   Miscellaneous : 198 => angles = 198/728 × 360 = 98^0 (app)
   728

   PIE CHART:



118^0 = Food
62^0 = Rent
33^0 = Cloth
28^0 = Fuel
21^0 = Education
98^0 = Miscellaneous

2.

x	f	m	fm	$\|D\| = \|M - \bar{A}\|$	f|D|
0 - 4	4	2	8	14.5	58
4 – 8	9	6	54	10.5	94.5
8 – 12	23	10	230	6.5	149.5
12 – 16	55	14	770	2.5	137.5
16 – 20	62	18	1116	1.5	93
20 – 24	30	22	660	5.5	165
24 – 28	12	26	312	9.5	114
28 - 32	5	30	150	13.5	67.5
	200		3300		879

Mean = $\frac{\sum fm}{\sum f} = \frac{3300}{200} = 16.5.$

M.D. from mean = $\frac{\sum f(D)}{\sum f} = \frac{879}{200} = 4.395.$

Coe. of M.D. = $\frac{M.D.}{\bar{x}}$

$= \frac{4.395}{16.5}$

$= 0.266.$

3.

x	y	$x = x - \bar{x}$	x^2	$y = y - \bar{y}$	y^2	xy
48	62	-3	9	7.56	57.15	-22.68
60	78	9	81	23.56	555.07	212.04
72	65	21	441	10.56	111.51	221.76
62	70	11	121	15.56	242.11	171.16
56	38	5	25	-16.45	270.60	-82.25
40	54	-11	121	-0.45	0.20	4.95
39	60	-12	144	5.56	30.91	-66.72
52	32	1	1	-22.45	504.00	-22.45
30	31	-21	441	-23.45	549.90	492.45
459	490	0	1384	0	2321.45	908.26

$$\bar{x} = \frac{\sum x}{N} = \frac{459}{9} = 51$$

$$\bar{y} = \frac{\sum y}{N} = \frac{490}{9} = 54.44$$

$$r = \frac{\sum xy}{\sqrt{\sum x^2 \cdot \sum y^2}}$$

$$= \frac{908.26}{\sqrt{(1384)(2321.45)}}$$

$$= \frac{908.26}{\sqrt{3212886.8}}$$

$$= \frac{908.26}{1792.45}$$

$$= 0.506.$$

4. Quantity Index

p_0	q_0	v	p_1	q_1	v	$p_0 q_1$	$p_1 q_0$
8	5	40	10	6	60	48	50
6	5	30	8	5	40	30	40
4	6	24	5	6	30	24	30
2	5	10	4	10	40	20	20
		104			170	122	140

$$\text{Laspeyre's} = \frac{\sum p_0 q_1}{\sum p_0 q_0} \times 100$$

$$= \frac{122}{104} \times 100$$

$$= 117.31$$

$$\text{Pasche's} = \frac{\sum p_1 q_1}{\sum p_1 q_0} \times 100$$

$$= \frac{170}{140} \times 100$$

$$= 121.43$$

$$\text{Dorbish \& Bowley's} = \frac{L + P}{2}$$

$$= \frac{117.31 + 121.43}{2}$$

$$= \frac{238.74}{2}$$

$$= 119.37.$$

5.

Year	Sales	3 – y Month Total	3 – y Month Average ($\frac{\text{Month Total}}{3}$)
2007	33	--	--
08	35	128	42.67
09	60	162	54
10	67	195	55
11	68	217	72.33
12	82	240	80
13	90	--	--

6. Total No. of members = 15
No. of bowlers = 5.
Remaining members out of 15 excluding 5 bowlers
=> 15 – 5 = 10.
Now, the probability of obtaining 11 members team containing atleast 3 bowlers is

Bowlers (5)	Remaining (10)	Probability	
3	8	${}^5C_3 \times {}^{10}C_8$	450
4	7	${}^5C_4 \times {}^{10}C_7$	1200
5	6	${}^5C_5 \times {}^{10}C_6$	210
			1860

∴ Probability is 1860.