सामान्य निर्देश (General Instructions)

1. परीक्षार्थी यथासम्भव अपने शब्दों में ही उत्तर दें। (Candidates are required to give their answers in their own words as far as practicable.)
2. सभी प्रश्न अनिवार्य हैं। (All questions are compulsory.)

भाग-अ (Part-A)

प्र. 1. यदि ${}^7P_r = 42$ हो, तो r का मान बताएँ। (If ${}^7P_r = 42$, find the value of r.)

Sol. $\because \quad {}^7P_r = 42$

$$\Rightarrow \quad \frac{7!}{(7-r)!} = 42$$

$$\Rightarrow \quad \frac{7\times6\times5!}{(7-r)!} = 7\times6$$

$$\Rightarrow \quad 7\times6\times5! = 7\times6(7-r)!$$

$$\Rightarrow \quad (7-r)! = \frac{7\times6\times5!}{7\times6}$$

$$\Rightarrow \quad (7-r)! = 5!$$

$$\Rightarrow \quad 7-r = 5$$

$$\Rightarrow \quad 7-5 = r$$

$$\therefore \quad r = 2 \qquad \textbf{Ans.}$$

प्र. 2. श्रेणी $1, \sqrt{3}, 3, \ldots\ldots$ का दसवाँ पद ज्ञात करें। (Find the 10th term of the series $1, \sqrt{3}, 3, \ldots\ldots$)

Sol. First term, $a = 1$

$$\text{Common ratio, } r = \frac{\sqrt{3}}{1} = \sqrt{3}$$

$$T_{10} = ?$$

$$\because \quad T_n = ar^{n-1}$$

$$T_{10} = ar^{10-1}$$

$$= 1(\sqrt{3})^9 = 81\sqrt{3} \qquad \textbf{Ans.}$$

प्र. 3. यदि किसी समान्तर श्रेणी का 8वाँ और 25वाँ पद क्रमशः 15 और 49 है, तो पहला पद और पदान्तर ज्ञात कीजिए। (If 8th and 25th term of an A.P. are 15 and 49 respectively, then find its first term and common difference.)

Sol. Let a = first term and d = common difference

$$T_8 = 15 \text{ and } T_{25} = 49$$

$$\because \quad T_8 = a + (8-1)d$$

$$15 = a + 7d \qquad \ldots(i)$$

$$\text{Also,} \quad T_{25} = a + (25-1)d$$

$$49 = a + 24d \qquad \ldots(ii)$$

From equation (i) and (ii), we get;

$$a + 7d = 15$$

$$\underline{a + 24d = 49}$$

$$-17d = -34$$

$$d = 2$$

Putting the value of $d = 2$ in equation (i)

$$a + 7\times2 = 15$$

$$a = 15 - 14 = 1$$

Hence, first term = 1 and

common difference = 2. **Ans.**

प्र. 4. यदि $A = \{11, 12, 13, 14, 15, 16\}$ और $B = \{11, 12, 15, 16, 17, 18, 19\}$ हो, तो $(A-B)$ और $(B-A)$ ज्ञात करें। (If $A = \{11, 12, 13, 14, 15, 16\}$ and $B = \{11, 12, 15, 16, 17, 18, 19\}$, find the value of $(A-B)$ and $(B-A)$.)

Sol. $A - B = \{11, 12, 13, 14, 15, 16\}$

$$- \{11, 12, 15, 16, 17, 18, 19\}$$

$$= [13, 14, 15]$$

$B - A = \{11, 12, 15, 16, 17, 18, 19\}$

$$- \{11, 12, 13, 14, 15, 16\}$$

$$= \{17, 18, 19\} \qquad \textbf{Ans.}$$

प्र. 5. 3 व्यक्तियों में 6 पुरस्कारों को कितने प्रकार से बाँटा जा सकता है, यदि प्रत्येक व्यक्ति को कितने भी पुरस्कार दिए जा सकते हैं। (In how many ways 6 prizes can be distributed among 3 persons, if each can be given as many prizes ?)

Sol. Number of persons = 3

Number of prizes = 6

Since each person is eligible for any of the prizes.

So number of ways to distribute the first price = 3

Similarly number of ways to distribute

the second prize = 3

So that if 6 prize will distribute at there persons

$= 3 \times 3 \times 3 \times 3 \times 3 \times 3$

$= 3^6 = 729$ **Ans.**

प्र. 6. मान निकालें (Evaluate :) $\begin{vmatrix} 1 & 2 & 4 \\ 1 & 3 & 9 \\ 1 & 4 & 16 \end{vmatrix}$.

Sol. $\Delta = \begin{vmatrix} 1 & 2 & 4 \\ 1 & 3 & 9 \\ 1 & 4 & 16 \end{vmatrix}$

$= 1\begin{vmatrix} 3 & 9 \\ 4 & 16 \end{vmatrix} - 2\begin{vmatrix} 1 & 9 \\ 1 & 16 \end{vmatrix} + 4\begin{vmatrix} 1 & 3 \\ 1 & 4 \end{vmatrix}$

$= 1(48 - 36) - 2(16 - 9) + 4(4 - 3)$

$= 1 \times 12 - 2 \times 7 + 4 \times 1$

$= 12 - 14 + 4$

$= 16 - 14 = 2$ **Ans.**

प्र. 7. यदि (If) $A = \begin{bmatrix} 3 & 2 & 0 \\ 1 & 0 & 1 \\ 2 & 1 & 3 \end{bmatrix}$ हो, तो A^2 ज्ञात करें।

(then find A^2.)

Sol. $A^2 = A \times A = \begin{bmatrix} 3 & 2 & 0 \\ 1 & 0 & 1 \\ 2 & 1 & 3 \end{bmatrix}\begin{bmatrix} 3 & 2 & 0 \\ 1 & 0 & 1 \\ 2 & 1 & 3 \end{bmatrix}$

$= \begin{bmatrix} 9+2+0 & 6+0+0 & 0+2+0 \\ 3+0+2 & 2+0+1 & 0+0+3 \\ 6+1+6 & 4+0+3 & 0+1+9 \end{bmatrix}$

$= \begin{bmatrix} 11 & 6 & 2 \\ 5 & 3 & 3 \\ 13 & 7 & 10 \end{bmatrix}$ **Ans.**

प्र. 8. मान निकालें (Evaluate :)

$$\int \frac{(x^3+8)(x-1)}{x^2-2x+4}dx$$

Sol. $$\int \frac{(x^3+8)(x-1)}{x^2-2x+4}dx$$

$$= \int \frac{(x+2)(x^2-2x+4)(x-1)}{(x^2-2x+4)}dx$$

$$= \int (x+2)(x-1)dx$$

$$= \int (x^2+x-2)dx$$

$$= \int (x^2+x-2)dx$$

$$= \int x^2dx + \int xdx - \int x^0dx + c$$

$$= \frac{x^{2+1}}{2+1} + \frac{x^{1+1}}{1+1} - x + c$$

$$= \frac{x^3}{3} + \frac{x^2}{2} - x + c$$ **Ans.**

प्र. 9. यदि ${}^nC_5 = {}^nC_7$ है, तो n का मान ज्ञात करें। (If ${}^nC_5 = {}^nC_7$, find the value of n.)

Sol. ${}^nC_5 = {}^nC_7$

$\therefore$ $n = 5 + 7 = 12$

$\left[\because {}^nC_p = {}^nC_q \right.$

$\left. \therefore n = p + q \right]$ **Ans.**

प्र. 10. एक पाठशाला में 60% विद्यार्थियों ने राष्ट्रीय सुरक्षा कोष में तथा 70% विद्यार्थियों ने राष्ट्रीय बचत योजना में चन्दा दिया। कितने प्रतिशत विद्यार्थियों ने दोनों ही योजनाओं में चन्दा दिया ? (In a school 60% students donated in National Security Fund and 70% students donated in National Saving Scheme. How much students donated in both the Schemes ?)

Sol. A = Set of student who donate NSF

B = Set of student who donate NSS

Total number of student, $n(A \cup B) = 100$

$n(A) = 60, n(B) = 70$

$\because$ $n(A \cup B) = n(A) + n(B) - n(A \cap B)$

$100 = 60 + 70 - n(A \cap B)$

$100 = 130 - n(A \cap B)$

$n(A \cap B) = 130 - 100 = 30$

Hence, 30% students donated in both the Scheme. **Ans.**

प्र. 11. यदि (If) $y = x^4 + 4x^3 + 5x - 6$ हो, तो (Find) $\frac{dy}{dx}$ का मान निकालें।

Sol. $y = x^4 + 4x^3 + 5x - 6$

$$\frac{dy}{dx} = \frac{d}{dx}(x^4 + 4x^3 + 5x - 6)$$

$$= \frac{d}{dx}(x^4) + \frac{d}{dx}(4x^3) + \frac{d}{dx}(5x) - \frac{d}{dx}(6)$$

$= 4 \times x^{4-1} + 4 \times 3x^{3-1} + 5x^{1-1} - 0$

$= 4x^3 + 12x^2 + 5$ **Ans.**

प्र. 12. G.P. में तीन संख्याएँ निकालें, जिनका गुणनफल 216 तथा योग 21 है। (Find the three numbers in G.P. whose product is 216 and sum is 21.)

Sol. Three number in G.P. are $\frac{a}{r}$, a and ar respectively.

According to question, product of three number is 216.

$$\Rightarrow \quad \frac{a}{r} \times a \times ar = 216$$
$$\Rightarrow \quad a^3 = 216$$
$$\Rightarrow \quad a^3 = 6^3$$
$$\therefore \quad a = 6$$

Also $\quad \frac{a}{r} + a + ar = 21$

$$\Rightarrow \quad \frac{a + ar + ar^2}{r} = 21$$
$$\Rightarrow \quad a + ar + ar^2 = 21r$$
$$\Rightarrow \quad a + ar + ar^2 - 21r = 0$$

(putting the value of a = 6)

$$\Rightarrow \quad 6 + 6r + 6r^2 - 21r = 0$$
$$\Rightarrow \quad 6r^2 - 21r + 6r + 6 = 0$$
$$\Rightarrow \quad 3(2r^2 - 5r + 2) = 0$$
$$\Rightarrow \quad 2r^2 - r - 4r + 2 = 0$$
$$\Rightarrow \quad 2r^2 - 4 - 4r + 2 = 0$$
$$\Rightarrow \quad 2r(2r-1) - 2(2r-1) = 0$$
$$(r-2)(2r-1) = 0$$

If $r - 2 = 0$ and $2r - 1 = 0$

$$\Rightarrow \quad r = 2$$

and $\quad 2r = 1 \therefore r = \frac{1}{2}$

When $r^2 = \frac{1}{2}$, then numbers are $\frac{6}{2}$, $6, 6 \times 2$ *i.e.*, 3, 6, 12.

प्र. 13. प्रमाणित करें। (Prove that)

$$\begin{vmatrix} a-b-c & 2a & 2a \\ 2b & b-c-a & 2b \\ 2c & 2c & c-a-b \end{vmatrix} = (a+b+c)^3$$

Sol. $\begin{vmatrix} a-b-c & 2a & 2a \\ 2b & b-c-a & 2b \\ 2c & 2c & c-a-b \end{vmatrix}$

Operating $c_1 \to c_1 - c_2$ and $c_2 \to c_2 - c_3$

$$= \begin{vmatrix} -(a+b+c) & 0 & 2a \\ a+b+c & -(a+b+c) & 2b \\ 0 & a+b+c & c-a-b \end{vmatrix}$$

$$= (a+b+c)(a+b+c)\begin{vmatrix} -1 & 0 & 2a \\ 1 & -1 & 2b \\ 0 & 1 & c-a-b \end{vmatrix}$$

$r_2 \to r_2 + r_1$

$$= (a+b+c)^2 \begin{vmatrix} -1 & 0 & 2a \\ 0 & -1 & 2b+2a \\ 0 & 1 & c-a-b \end{vmatrix}$$

$$= (a+b+c)^2(-1)\begin{vmatrix} -1 & 2b+2a \\ 1 & c-a-b \end{vmatrix}$$

$$= (a+b+c)^2(-1)(-c+a+b-2b-2a)$$
$$= (a+b+c)^2(-1) \times (-c-a-b)$$
$$= (a+b+c)^2.(a+b+c)$$
$$= (a+b+c)^3$$ **Proved.**

प्र. 14. एक थैले में 3 लाल, 5 काली, 5 पीली गेंदें हैं। एक गेंद निकालने पर उसके लाल या पीली गेंद निकालने की प्रायिकता है ? (A bag contains 3 red, 5 black, and 5 yellow balls. What is the probability of getting red or yellow in a single drawn of one ?)

Sol. Total balls $[n(S)] = 3 + 5 + 5 = 13$

Let, A = Event of getting a red ball

B = Event of getting a yellow ball

Probability of getting red ball, [P(A)]

$$= \frac{n(A)}{n(S)} = \frac{3}{13}$$

Probability of getting yellow ball, [P(B)]

$$= \frac{n(B)}{n(S)} = \frac{5}{13}$$

$\therefore$ Required probability = P(A) + P(B)

$$= \frac{3}{13} + \frac{5}{13} = \frac{8}{13}$$ **Ans.**

प्र. 15. हरात्मक माध्य क्या है ? इसका समीकरण सूत्र दीजिये। (What is Harmonic Mean ? Give the equation.)

Ans. विभिन्न चरों का हरात्मक माध्य उसके मूल्यों के व्युत्क्रमों के समान्तर माध्य का व्युत्क्रम होता है प्रति रूपया के रूप में दिए गए मूल्य आदि को औसत मात्रा का पता करने के लिए विशेष रूप से प्रयोग में लाई जाती है। (Harmonic mean is the receiprocal of the arithmetic mean of the reciprocal of all the items of a group.)

Formula :

$$\text{H.M.} = \frac{N}{\frac{1}{x_1} + \frac{1}{x_2} + \frac{1}{x_3} + \ldots\ldots + \frac{1}{x_n}}$$

प्र. 16. निम्नलिखित सारणी से y_1 ज्ञात करें। (Find the value of y_1 from the following :)

x	1	2	3	4	5
y	2·000	?	2·0846	2·0954	2·1253
	y_0	y_1	y_2	y_3	y_4

Sol.

X	Y	
1	2·000	y_0
2	?	y_1
3	2·0846	y_2
4	2·0954	y_3
5	2·1253	y_4

By Binomial Expansion Method,

$$(y-1)^4 = 0$$

$$y_4 - 4y_3 + 6y_2 - 4y_1 + y_0 = 0$$

$$2{\cdot}1253 - 4 \times 2{\cdot}0954 + 6 \times 2{\cdot}0846 - 4y_1 + 2{\cdot}000 = 0$$

$$2{\cdot}1253 - 8{\cdot}3816 + 12{\cdot}5076 - 4y_1 + 2{\cdot}000 = 0$$

$$2{\cdot}1253 + 12{\cdot}5076 + 2{\cdot}000 - 8{\cdot}3816 - 4y_1 = 0$$

$$16{\cdot}5129 - 8{\cdot}3816 - 4y_1 = 0$$

$$-4y_1 = -16{\cdot}5129 + 8{\cdot}3816$$

$$-4y_1 = -8{\cdot}1313$$

$$y_1 = \frac{8{\cdot}1313}{4}$$

$$y_1 = 2{\cdot}032825 \quad \text{Ans.}$$

प्र. 17. निम्नलिखित सारणी के लिए गुणोत्तर माध्य ज्ञात करें। (Calculate the G.M. of the following series :)

अंक (Marks)	0-10	10-20	20-30	30-40	40-50
विद्यार्थियों की संख्या (No. of Students)	5	7	12	25	9

Sol. Calculation of G.M.

C.I.	m.v. (x)	$\log x$	f	$f\log x$
0-10	5	0·6990	5	3·4951
10-20	15	1·1761	7	8·2327
20-30	25	1·3979	12	16·7748
30-40	35	1·5441	25	38·6025
40-50	45	1·6532	9	14·8788
			$\Sigma f = 57$	$\Sigma f\log x =$ 80·8839

Geometric mean (G. M.)

$$= \text{Al}\left(\frac{\Sigma f\log x}{\Sigma f}\right) = \text{Al}\left(\frac{80{\cdot}8839}{57}\right)$$

$$= \text{Al}\,(1{\cdot}4053) = 25{\cdot}66 \quad \text{Ans.}$$

प्र. 18. निम्नलिखित सारणी से बहुलक निकालिए। (Calculate mode from the following data :)

वर्ग (Size)	0-10	10-20	20-30	30-40	40-50	50-60	60-70
बारंबारता (Frequency)	5	8	20	30	25	10	2

Sol. Inclusive Series

Convert this series into Exclusive Series

$$L_1 = 20 - 0{\cdot}5 = 19{\cdot}5$$

$$L_2 = 30 - 0{\cdot}5 = 29{\cdot}5$$

Size	C.I.	Frequency
0-10	0·5-10·5	5
10-20	10·5-20·5	8
20-30	20·5-30·5	20
30-40	30·5-40·5	30
40-50	40·5-50·5	25
50-60	50·5-60·5	10
60-70	60·5-70·5	2

By inspection method,

Highest Frequency = 30

संख्या	बारंबारता
0-10	5
10-20	8
20-30	20
30-40	30
40-50	25
50-60	10
60-70	2
योग	100

Calculation of median

Size	f	c.f.
0-10	5	5
10-20	8	13
20-30	20	33
30-40	30	63
40-50	25	88
50-60	10	98
60-70	2	100
	$N = 100$	

$$m = \frac{N}{2} \text{ item} = \frac{100}{2} \text{ item}$$

$= 50^{\text{th}}$ item lies in C.I. 30

$\therefore$ Median Class = 30–40

Now, $L = 30$, $i = 10$, $c = 33$

$$m = 50, \quad f = 30$$

$$\text{Median} = L_1 - \frac{m - c}{f} \times i$$

$$= 30 - \frac{50 - 33}{30} \times 10$$

$$= 30 - \frac{170}{30} = 30 - 17$$

$$= 13 \quad \text{Ans.}$$

प्र. 19. निम्न आंकड़ों से बहुलक निकालिए। (Calculate mode from the following data :)

वर्ग (Size)	0-5	5-10	10-15	15-20	20-25	25-30	30-35
बारंबारता (Frequency)	5	10	20	30	25	15	5

Sol. Inclusive Series

Convert this series into Exclusive Series

$$L_1 = 15 - 0{\cdot}5 = 14{\cdot}5$$

$$L_2 = 20 - 0{\cdot}5 = 19{\cdot}5$$

Size	C.I.	Frequency
0-5	0·5-5·5	5
5-10	5·5-10·5	10
10-15	10·5-15·5	20
15-20	15·5-20·5	30
20-25	20·5-25·5	25
25-30	25·5-30·5	15
30-35	30·5-35·5	5

By inspection method,

Highest Frequency = 30

∴ Mode Class = 39.5 – 49.5

$l_1 = 39.5, i = 10, f_1 = 36, f_0 = 29, f_2 = 25$

$$\text{Mode } (Z) = l_1 + \left(\frac{f_1 - f_0}{2f_1 - f_0 - f_2}\right) \times i$$

$$= 39.5 + \left(\frac{36 - 29}{2 \times 36 - 29 - 25}\right) \times 10$$

$$= 39.5 + \frac{7}{18} \times 10 = 39.5 + \frac{35}{9}$$

$= 39.5 + 3.88 = 43.38$ **Ans.**

प्र. 20. विभिन्न वर्षों के लिए किसी जिले की जनसंख्या निम्न है 2005 के लिए जनसंख्या ज्ञात करें। (The population of different Districts for different years are as follows. Find the population 2015.)

वर्ष (Year)	2000	2001	2002	2003	2004
जनसंख्या (लाखों में) [Population (in million)]	7	9	36	14	16

Sol.

Year	Population (in million)	
2000	7	y_0
2001	9	y_1
2002	?	y_2
2003	14	y_3
2004	16	y_4
2005	?	y_5

$$\because \quad (y-1)^4 = 0$$

$$y_4 - 4y_3 + 6y_2 - 4y_1 + y_0 = 0$$

$$16 - 4 \times 14 + 6y_2 - 4 \times 9 + 7 = 0$$

$$16 - 56 + 6y_2 - 36 + 7 = 0$$

$$16 + 7 - 56 - 36 + 6y_2 = 0$$

$$23 - 92 + 6y_2 = 0$$

$$6y_2 = 92 - 23$$

$$6y_2 = 69 \quad \therefore \quad y_2 = \frac{69}{6} = 11.5$$

Population of 2005,

$$(y-1)^5 = 0$$

$$y_5 - 5y_4 + 10y_3 - 10y_2 + 5y_1 - y_0 = 0$$

$$y_5 + 5 \cdot 16 + 10 \cdot 14 - 10 \cdot 11.5 + 5 \cdot 9 - 7 = 0$$

$$y_5 - 80 + 140 - 115 + 45 - 7 = 0$$

$$y_5 + 140 + 45 - 80 - 115 - 7 = 0$$

$$y_5 + 185 - 202 = 0$$

$$y_5 = 202 - 185$$

$y_5 = 17$ million **Ans.**

प्र. 21. निम्नलिखित आंकड़ों से बहुलक निकालें। (Calculate mode from the following data)

आकार (Size)	0-5	5-10	10-15	15-20	20-25	25-30
आवृत्ति (Frequency)	10	25	50	7	13	5

Sol.

C.I.	f	
0-5	10	
5-10	25	f_0
10-15	50	f_1
15-20	7	f_2
20-25	13	
25-30	5	

By inspection method:

Highest Frequency = 50

∴ Mode Class = 10 – 15

$l_1 = 10, i = 5, f_1 = 50, f_0 = 25, f_2 = 7$

$$Z = l_1 + \left(\frac{f_1 - f_0}{2f_1 - f_0 - f_2}\right) \times i$$

$$= 10 + \left(\frac{50 - 25}{2 \times 50 - 25 - 7}\right) \times 5$$

$$= 10 + \left(\frac{25}{100 - 32}\right) \times 5$$

$= 10 + 1.84 = 11.84$ **Ans.**

प्र. 22. एक व्यक्ति 4 में से 3 निशाने सही लगाता है और दूसरा व्यक्ति 3 में से 2 निशाने सही लगाता है। यदि दोनों ही व्यक्ति एक साथ प्रयास करें, तो लक्ष्य के भेदने की संभावना ज्ञात कीजिए। (A person is known to hit the target 3 out of 4 shots whereas another person is known to hit the target 2 out of 3 shots. Find the probability of the target being hit at all when they both try ?)

Sol. The probability that first person hit the target, $P(A) = \frac{3}{4}$

Probability that the second person hits the target, $P(B) = \frac{2}{3}$

The events are not mutually exclusive since both if them may hit the target

The probability that both may hit the target

$$P(A \cdot B) = \frac{3}{4} \times \frac{2}{3}$$

$$\therefore P(A \text{ or } B) = P(A) + P(B) - P(A \cdot B)$$

$$= \left(\frac{3}{4} + \frac{2}{3}\right) - \left(\frac{3}{4} \times \frac{2}{5}\right) = \frac{9+8}{12} = \frac{6}{12}$$

$$= \frac{17-6}{12} = \frac{11}{12}$$ **Ans.**

प्र. 23. निम्नलिखित समंकों से न्यूनतम वर्ग विधि द्वारा सीधी रेखा प्रवृत्ति आयोजित करें। *(Find the trend line by the least square method from the following data :)*

Sol.

Year	Time Deviation from 2002 (x)	x^2	Price y	xy	Trend $y_c = a + bx$
2000	– 5	25	107	– 535	102.73
2001	– 3	9	110	– 330	110
2002	– 1	1	114	– 114	111.22
2003	1	1	112	112	112.44
2004	3	9	115	345	113.66
2005	5	25	113	565	114.88
$N = 6$		$\Sigma x^2 = 70$	$\Sigma y = 671$	$\Sigma xy = 43$	$\Sigma y_c = 670.98$ or 671

$$a = \frac{\Sigma y}{N} = \frac{671}{6} = 111.83 \text{ and}$$

$$b = \frac{\Sigma xy}{\Sigma x^2} = \frac{43}{70} = 0.61$$

$\Rightarrow$ Calculation of Trend value of the following year :

$$y_c = a + bx$$

Year 2000 = 111.83 + 0.61 (–5)
= 111.83 – 3.05 = 108.78

Year 2001 = 111.83 + 0.61 (–3)
= 111.83 – 1.83 = 110

Year 2002 = 111.83 + 0.61 (–1)
= 111.83 – 0.61 = 111.22

Year 2003 = 111.83 + 0.61 (1)
= 111.83 + 0.61 = 112.44

Year 2004 = 111.83 + 0.61 (3)
= 111.83 + 1.83 = 113.66

Year 2005 = 111.83 + 0.61 (5)
= 111.83 + 3.05
= 114.88 **Ans.**

प्र. 24. दो पासे फेंके जाते हैं। सम्भावना ज्ञात कीजिए कि योग न तो 7 हो और न ही 11 *(If a pair of dice is Thrown, find the probability that the sum is neither 7 nor 11.)*

Sol. Let, A = Event of getting a sum of 7

B = Event of getting a sum of 11

Expected outcomes are 6×6

$= n(S) = 36$

A = {(1, 6), (6, 1), (5, 2), (2, 5), (3, 4), (4, 3)}

$n(A) = 6$

Probability of getting A,

$$A[P(A)] = \frac{n(A)}{n(S)} = \frac{6}{36} = \frac{1}{6}$$

B = {(6, 5), (5, 6)}

$n(B) = 2$

Probability of getting P[P(B)]

$$= \frac{n(B)}{n(S)} = \frac{2}{36} = \frac{1}{18}$$

The probability that the sum is neither 7 and 11

$$= 1 - [P(A) + P(B)] - 1 = \left[\frac{1}{6} + \frac{1}{18}\right]$$

$$= 1 - \left[\frac{3+1}{18}\right] = 1 - \frac{4}{18} = \frac{14}{18} = \frac{7}{9}$$

$\therefore$ Required Probability $= \frac{7}{9}$ **Ans.**

प्र. 25. निम्न आँकड़ों से अज्ञात आवृत्ति की गणना करें, यदि माध्य 67.45 हो। (Find the missing frequency from the following data, if Mean is 67.45.)

आकार (Size)	60-62	63-65	66-68	69-71	72-74
आवृत्ति (Frequency)	15	51	?	81	24

Ans.

C.I.	$m.v.(x)$	f	fx
60 – 62	61	15	915
63 – 65	64	54	3456
66 – 68	67	f_1	$67f_1$
69 – 71	70	81	5670
72 – 74	73	24	1752
		$\Sigma f = 174 + f_1$	$\Sigma fx = 11,793 + 67f$

Direct Method

$$\text{Mean } (\bar{x}) = \frac{\Sigma fx}{\Sigma f}$$

$$67.45 = \frac{11793 + 67f_1}{174 + f_1}$$

$$67.45\,(174 + f_1) = 11793 + 67f_1$$

$$11736.3 + 67.45f_1 = 11793 + 67f_1$$

$$67.45f_1 - 67f_1 = 11793 - 11736.3$$

$$0.45f_1 = 56.7$$

$$f_1 = \frac{56.7}{0.45}$$

$$f_1 = 126 \qquad \textbf{Ans.}$$