CLASS → X

SUB → MATHS

PHASE → II

CH → PROBABILITY

In this chapter, the probability means theoretical or classical probability.

Probability of an event E, written as P(E) is defined as

$$P(E) = \frac{\text{Number of outcomes favourable to E}}{\text{Total number of possible outcomes}}$$

Complement of an event E is denoted by $\bar{E}$ or E'.

Let, E be any event, then we have,

i) $0 \leq P(E) \leq 1$

ii) $P(E) + P(\bar{E}) = 1$

Ex :→ 22

5) Let, E be the event of winning a game.

∴ $P(E) = \frac{5}{11}$

∴ Probability of losing $= P(\bar{E}) = 1 - \frac{5}{11} = \frac{6}{11}$

17) In a single throw of die the total possible outcomes are 6. (1, 2, 3, 4, 5 & 6)

i) Out of these numbers odd numbers are 1, 3, 5

∴ Total no of favourable outcomes = 3

∴ P(getting an odd number) $= \frac{\cancel{3}^{1}}{\cancel{6}_{2}} = \frac{1}{2}$

ii) Out of all possible outcomes the numbers less than 5 are 1, 2, 3, 4.

∴ P(getting an odd number) $= \frac{\cancel{4}^{2}}{\cancel{6}_{3}} = \frac{2}{3}$

iii) Out of all possible outcomes the number greater than 5 is 6

∴ Total no of favourable outcome = 1

∴ P(getting a number greater than 5) $= \frac{1}{6}$

viii) P(getting a number divisible by 2 or 3)

= P(getting a number divisible by 2) + P(getting a number divisible by 3) − P(getting a number divisible by 2 & 3)

$= \frac{3}{6} + \frac{2}{6} - \frac{1}{6} = \frac{\cancel{4}^{2}}{\cancel{6}_{3}} = \frac{2}{3}$

23) Total integers between 0 and 100 are 99

The numbers which are divisible by 7 are

7, 14, 21, 28, 35, 42, 49, 56, 63, 70, 77, 84, 91, 98

i) P(Getting an integer divisible by 7) $= \frac{14}{99}$

ii) P(Getting an integer not divisible by 7) $= 1 - \frac{14}{99}$

$= \frac{99-14}{99} = \frac{85}{99}$

[Children are requested to go through Note on a pack of 52 cards in page no 608]

35) i) P(Getting 2 of spades) $= \frac{1}{52}$

ii) P(Getting a jack) $= \frac{\cancel{4}}{\cancel{52}_{13}} = \frac{1}{13}$

iii) P(Getting a king of red colour) $= \frac{\cancel{2}^{1}}{\cancel{52}_{26}} = \frac{1}{26}$

iv) P(Getting a card of diamond) $= \frac{\cancel{13}^{1}}{\cancel{52}_{4}} = \frac{1}{4}$

v) P(Getting a king or a queen) $= \frac{\cancel{8}^{2}}{\cancel{52}_{13}} = \frac{2}{13}$

vi) P(Getting a non-face card) $= \frac{\cancel{40}^{10}}{\cancel{52}_{13}} = \frac{10}{13}$

[$\because$ Total face cards = 12]

vii) P(Getting a black face card) $= \frac{\cancel{6}^{3}}{\cancel{52}_{26}} = \frac{3}{26}$

viii) P(Getting a black card) $= \frac{26}{52} = \frac{1}{2}$

ix) P(Getting a non-ace card) $= \frac{\cancel{48}^{12}}{\cancel{52}_{13}} = \frac{12}{13}$

x) P(Getting non-face card of black colour) $= \frac{\cancel{20}^{5}}{\cancel{52}_{13}} = \frac{5}{13}$

xi) Total cards from spade = 13

Total jack = 4

But, there is one ~~two~~ jack from spade.

$\therefore$ Total card which are spade or Jack $= 13+4-1 = 16$

P(getting neither a spade nor a jack) $= \frac{\cancel{36}^{9}}{\cancel{52}_{13}} = \frac{9}{13}$

xii) P(getting neither a heart nor a red king) $= \frac{\cancel{38}^{19}}{\cancel{52}_{26}}$

[Heart → 13, Red king → 2

Either ~~H~~ or red king $= 13+2-1 = 14$]

[H/W → 37, 38, 40, 41 and chapter test]
all the sums

Ch → 8
Matrices.

A matrix is a rectangular arrangement of numbers, arranged in rows and columns.

If a matrix has m rows and n columns then it is called a matrix of order $m \times n$.

Matrices are usually denoted by capital letters.

Two matrices A and B are equal if

i) Both the matrices have the same order.

ii) The corresponding elements of both the matrices are equal.

8.1

3) i) $a_{ij} = 2i - j$

$a_{11} = 2-1 = 1$; $a_{12} = 2-2=0$; $a_{21} = 4-1=3$; $a_{22} = 4-2 = 2$

$\therefore A = \begin{bmatrix} a_{11} & a_{12} \\ a_{21} & a_{22} \end{bmatrix} = \begin{bmatrix} 1 & 0 \\ 3 & 2 \end{bmatrix}$

10) $\begin{bmatrix} 3x+4y & 2 & x-2y \\ a+b & 2a-b & -1 \end{bmatrix} = \begin{bmatrix} 2 & 2 & 4 \\ 5 & -5 & -1 \end{bmatrix}$

$3x+4y = 2$ — (i)
$x-2y = 4$ — (ii)

$a+b = 5$ — (iii)
$2a-b = -5$ — (iv)

Solving (i) & (ii)

$\cancel{3}x+4y = 2$
$\cancel{3}x-6y = 12$
$-\quad+\quad-$
$10y = -10$
$y = -1$

$\therefore x = 4+2\times -1$
$= 2$

Solving (iii) & (iv)

$a+\cancel{b} = 5$
$2a-\cancel{b} = -5$
$3a = 0$
$a = 0$
$b = 5$

$\therefore$ Solution is $x = 2$, $y = -1$; $a = 0$, $b = 5$

9) $A+2B-3C = \begin{bmatrix} 1 & 2 \\ -2 & 3 \end{bmatrix} + 2\begin{bmatrix} -2 & -1 \\ 1 & 2 \end{bmatrix} - 3\begin{bmatrix} 0 & 3 \\ 2 & -1 \end{bmatrix}$

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

$= \begin{bmatrix} -3 & -9 \\ -6 & 10 \end{bmatrix}$

10) $X+Y = \begin{bmatrix} 7 & 0 \\ 2 & 5 \end{bmatrix}$ and $X-Y = \begin{bmatrix} 3 & 0 \\ 0 & 3 \end{bmatrix}$

Adding two we get —

$2X = \begin{bmatrix} 10 & 0 \\ 2 & 8 \end{bmatrix}$

$X = \begin{bmatrix} 5 & 0 \\ 1 & 4 \end{bmatrix}$

Subtracting two we get —

$2Y = \begin{bmatrix} 4 & 0 \\ 2 & 2 \end{bmatrix}$

$Y = \begin{bmatrix} 2 & 0 \\ 1 & 1 \end{bmatrix}$

Multiplication of Matrices

Two matrices A and B can be multiplied together to get the product matrix AB if and only if the number of columns in A is equal to the number of rows in B.

If A is of order $m \times n$ and B is of order $n \times p$ then AB is of order $m \times p$ and is defined as $AB = [c_{ik}]_{m \times p}$

where $(i,k)^{th}$ element of AB = $\left\{ \begin{array}{l} \text{Sum of the products of the} \\ \text{elements of } i^{th} \text{ row of A} \\ \text{with the corresponding elements} \\ \text{of the } k^{th} \text{ column of B} \end{array} \right.$

8.3

2) $A = \begin{bmatrix} 2 & 5 \\ 1 & 3 \end{bmatrix}$ $B = \begin{bmatrix} 1 & -1 \\ -3 & 2 \end{bmatrix}$

$AB = \begin{bmatrix} 2 & 5 \\ 1 & 3 \end{bmatrix}\begin{bmatrix} 1 & -1 \\ -3 & 2 \end{bmatrix}$

$= \begin{bmatrix} 2-15 & -2+10 \\ 1-9 & -1+6 \end{bmatrix}$

$= \begin{bmatrix} -13 & 8 \\ -8 & 5 \end{bmatrix}$

$BA = \begin{bmatrix} 1 & -1 \\ -3 & 2 \end{bmatrix}\begin{bmatrix} 2 & 5 \\ 1 & 3 \end{bmatrix}$

$= \begin{bmatrix} 2-1 & 5-3 \\ -6+2 & -15+6 \end{bmatrix}$

$= \begin{bmatrix} 1 & 2 \\ -4 & -9 \end{bmatrix}$

$AB \neq BA$

11) $A = \begin{bmatrix} 1 & -2 \\ 2 & -1 \end{bmatrix}$ $B = \begin{bmatrix} 3 & 2 \\ -2 & 1 \end{bmatrix}$

$\therefore 2B - A^2 = 2\begin{bmatrix} 3 & 2 \\ -2 & 1 \end{bmatrix} - \begin{bmatrix} 1 & -2 \\ 2 & -1 \end{bmatrix}\begin{bmatrix} 1 & -2 \\ 2 & -1 \end{bmatrix}$

$= \begin{bmatrix} 6 & 4 \\ -4 & 2 \end{bmatrix} - \begin{bmatrix} 1-4 & -2+2 \\ 2-2 & -4+1 \end{bmatrix}$

$= \begin{bmatrix} 6 & 4 \\ -4 & 2 \end{bmatrix} - \begin{bmatrix} -3 & 0 \\ 0 & -3 \end{bmatrix}$

$= \begin{bmatrix} 9 & 4 \\ -4 & 5 \end{bmatrix}$

28) $A = \begin{bmatrix} 3 & x \\ 0 & 1 \end{bmatrix}$ $B = \begin{bmatrix} 9 & 16 \\ 0 & -y \end{bmatrix}$

$A^2 = \begin{bmatrix} 3 & x \\ 0 & 1 \end{bmatrix}\begin{bmatrix} 3 & x \\ 0 & 1 \end{bmatrix} = \begin{bmatrix} 9 & 4x \\ 0 & 1 \end{bmatrix}$

$\because A^2 = B$

$\begin{bmatrix} 9 & 4x \\ 0 & 1 \end{bmatrix} = \begin{bmatrix} 9 & 16 \\ 0 & -y \end{bmatrix}$

$4x = 16$ $1 = -y$

$x = 4$ $y = -1$

[H.W. → 37, Chapter test]