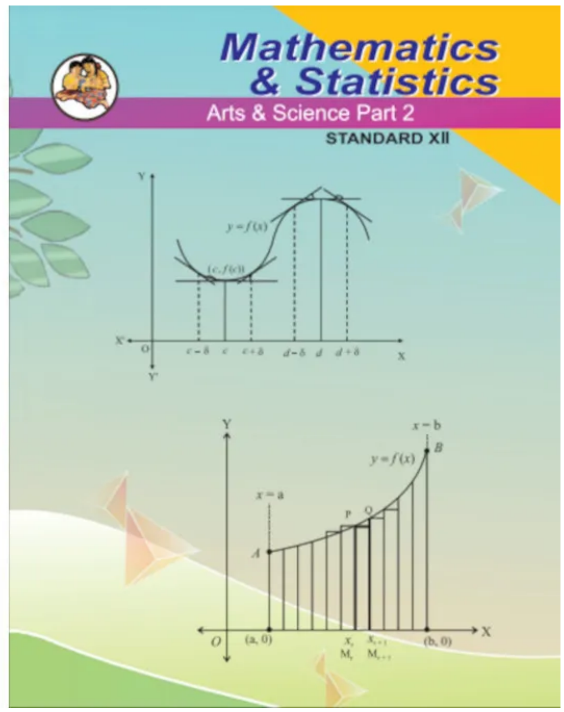
Maharashtra Board Solutions Class 12-Arts & Science Maths (Part 2): Chapter 8- Binomial Distribution

Class 12 - Chapter 8 Binomial Distribution



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Maharashtra Board Solutions Class 12-Arts & Science Maths (Part 2): Chapter 8- Binomial Distribution

Class 12: Maths Chapter 8 solutions. Complete Class 12 Maths Chapter 8 Notes.

Maharashtra Board Solutions Class 12-Arts & Science Maths (Part 2): Chapter 8- Binomial Distribution

Maharashtra Board 12th Maths Chapter 8, Class 12 Maths Chapter 8 solutions

Ex 8.1

Question 1.
A die is thrown 6 times. If 'getting an odd number' is a success, find the probability of
(i) 5 successes
(ii) at least 5 successes
(iii) at most 5 successes.
Solution:
Let X = number of successes, i.e. number of odd numbers.
p = probability of getting an odd number in a single throw of a die
$\therefore$ p = $\frac{3}{6} = \frac{1}{2}$ and q = 1 – p = 1 – $\frac{1}{2}$ = $\frac{1}{2}$
Given: n = 6
$\therefore$ X ~ B(6, $\frac{1}{2}$)
The p.m.f. of X is given by

$$p(X=x) = {}^nC_x\, p^x q^{n-x}$$

$$\text{i.e. } p(x) = {}^6C_x\left(\frac{1}{2}\right)^x\left(\frac{1}{2}\right)^{6-x} = {}^6C_x\left(\frac{1}{2}\right)^6,\ x = 0, 1, 2, \ldots, 6$$

(i) $P(5 \text{ successes}) = P[X=5]$

$$= p(5) = {}^6C_5\left(\frac{1}{2}\right)^6$$

$$= {}^6C_1 \times \frac{1}{64} \quad \ldots [\because {}^nC_x = {}^nC_{n-x}]$$

$$= \frac{6}{64} = \frac{3}{32}$$

Hence, the probability of 5 successes is $\frac{3}{32}$.

(ii) P(at least 5 successes) = P[X ≥ 5]
= p(5) + p(6)

$$= {}^6C_5\left(\frac{1}{2}\right)^6 + {}^6C_6\left(\frac{1}{2}\right)^6$$

$$= ({}^6C_5 + {}^6C_6)\left(\frac{1}{2}\right)^6 = (6+1)\frac{1}{64} = \frac{7}{64}$$

Hence, the probability of at least 5 successes is $\frac{7}{64}$.

(iii) P(at most 5 successes) = P[X ≤ 5]
= 1 – P[X > 5]

$$= 1 - p(6) = 1 - {}^6C_6\left(\frac{1}{2}\right)^6$$

$$= 1 - 1 \times \frac{1}{64} = \frac{63}{64}$$

Hence, the probability of at most 5 successes is $\frac{63}{64}$.

Question 2.
A pair of dice is thrown 4 times. If getting a doublet is considered a success, find the probability of two successes.
Solution:
Let X = number of doublets.
p = probability of getting a doublet when a pair of dice is thrown
∴ p = $\frac{6}{36} = \frac{1}{6}$ and

q = 1 – p = 1 – $\frac{1}{6}$ = $\frac{5}{6}$
Given: n = 4
∴ X ~ B(4, $\frac{1}{6}$)
The p.m.f. of X is given by

$$P(X=x) = {}^nC_x p^x q^{n-x}$$

$$\text{i.e. } p(x) = {}^nC_x \left(\frac{1}{6}\right)^x \left(\frac{5}{6}\right)^{4-x}, \ x = 0, 1, 2, 3, 4$$

$$\therefore \ P(2 \text{ successes}) = P(X=2)$$

$$= p(2) = {}^4C_2 \left(\frac{1}{6}\right)^2 \left(\frac{5}{6}\right)^{4-2}$$

$$\frac{4!}{2! \cdot 2!} \left(\frac{1}{6}\right)^2 \left(\frac{5}{6}\right)^2$$

$$= \frac{4 \cdot 3 \cdot 2!}{2! \cdot 2 \cdot 1} \times \frac{1}{36} \times \frac{25}{36}$$

$$= \frac{25}{216}$$

Hence, the probability of two successes is $\frac{25}{216}$.

Question 3.
There are 5% defective items in a large bulk of items. What is the probability that a sample of 10 items will include not more than one defective item?
Solution:
Let X = number of defective items.
p = probability of defective item

$\therefore$ p = 5% = $\frac{5}{100} = \frac{1}{20}$
and q = 1 − p = 1 − $\frac{1}{20}$ = $\frac{19}{20}$
$\therefore$ X ~ B(10, $\frac{1}{20}$)
The p.m.f. of X is given by

$$P(X=x) = {}^nC_x p^x q^{n-x}$$

$$\text{i.e. } p(x) = {}^{10}C_x \left(\frac{1}{20}\right)^x \left(\frac{19}{20}\right)^{10-x}, \ x = 0, 1, 2, \ldots, 10.$$

P(sample of 10 items will include not more than one defective item) = P[X ≤ 1]

$$= P(x=0) + P(x=1)$$

$$= {}^{10}C_0 \left(\frac{1}{20}\right)^0 \left(\frac{19}{20}\right)^{10-0} + {}^{10}C_1 \left(\frac{1}{20}\right)^1 \left(\frac{19}{20}\right)^{10-1}$$

$$= 1 \cdot 1 \cdot \left(\frac{19}{20}\right)^{10} + 10 \times \left(\frac{1}{20}\right) \times \left(\frac{19}{20}\right)^9$$

$$= \left(\frac{19}{20}\right)^9 \left[\frac{19}{20} + \frac{10}{20}\right]$$

$$= \left(\frac{19}{20}\right)^9 \left(\frac{29}{20}\right) = 29\left(\frac{19^9}{20^{10}}\right)$$

Hence, the probability that a sample of 10 items will include not more than one defective item = $29\left(\frac{19^9}{20^{10}}\right)$.

Question 4.
Five cards are drawn successively with replacement from a well-shuffled deck of 52 cards, find

the probability that
(i) all the five cards are spades
(ii) only 3 cards are spades
(iii) none is a spade.
Solution:
Let X = number of spade cards.
p = probability of drawing a spade card from a pack of 52 cards.
Since there are 13 spade cards in the pack of 52 cards.
$\therefore p = \frac{13}{52} = \frac{1}{4}$ and
$q = 1 - p = 1 - \frac{1}{4} = \frac{3}{4}$
Given: n = 5
$\therefore X \sim B(5, \frac{1}{4})$
The p.m.f. of X is given by

$$P(X = x) = {}^nC_x\, p^x q^{n-x}$$

$$\text{i.e. } p(x) = {}^5C_x \left(\frac{1}{4}\right)^x \left(\frac{3}{5}\right)^{5-x},\ x = 0, 1, 2, \ldots, 5$$

(i) P(all five cards are spade)

$$= P(X = 5) = p(5) = {}^5C_5 \left(\frac{1}{4}\right)^5 \left(\frac{3}{4}\right)^{5-5}$$

$$= 1\left(\frac{1}{4}\right)^5 \left(\frac{3}{4}\right)^0$$

$$= 1 \cdot \frac{1}{1024} \cdot 1 = \frac{1}{1024}$$

Hence, the probability of all the five cards are spades = $\frac{1}{1024}$

(ii) P(only 3 cards are spade) = P[X = 3]

$$p(3) = {}^5C_3\left(\frac{1}{4}\right)^3\left(\frac{3}{4}\right)^{5-3}$$

$$= \frac{5!}{3!\ 2!}\left(\frac{1}{4}\right)^3\left(\frac{3}{4}\right)^2$$

$$= \frac{5\cdot4\cdot3!}{3!\cdot2\cdot1} \times \frac{1}{64} \times \frac{9}{16} = \frac{45}{512}$$

Hence, the probability of only 3 cards are spades = $\frac{45}{512}$

(iii) P(none of cards is spade) = P[X = 0]

$$= p(0) = {}^5C_0\left(\frac{1}{4}\right)^0\left(\frac{3}{4}\right)^{5-0}$$

$$= 1 \times 1 \times \left(\frac{3}{4}\right)^5 = \frac{243}{1024}$$

Hence, the probability of none of the cards is a spade = $\frac{243}{1024}$

Question 5.
The probability of a bulb produced by a factory will fuse after 150 days of use is 0.05. Find the probability that out of 5 such bulbs
(i) none
(ii) not more than one
(iii) more than one
(iv) at least one, will fuse after 150 days of use.
Solution:
Let X = number of fuse bulbs.
p = probability of a bulb produced by a factory will fuse after 150 days of use.
∴ p = 0.05

and q = 1 – p = 1 – 0.05 = 0.95
Given: n = 5
∴ X ~ B(5, 0.05)
The p.m.f. of X is given by
P(X = x) = $^nC_x p^x q^{n-x}$
i.e. p(x) = $^5C_x (0.05)^x (0.95)^{5-x}$, x = 0, 1, 2, 3, 4, 5
(i) P(none of a bulb produced by a factory will fuse after 150 days of use) = P[X = 0]
= p(0)
= $^5C_0 (0.05)^0 (0.95)^{5-0}$
= 1 × 1 × $(0.95)^5$
= $(0.95)^5$
Hence, the probability that none of the bulbs will fuse after 150 days = $(0.95)^5$.

(ii) P(not more than one bulb will fuse after 150 days of j use) = P[X ≤ 1]
= p(0) + p(1)
= $^5C_0 \cdot (0.05)^0 (0.95)^{5-0} + {^5C_1} (0.05)^1 (0.95)^4$
= 1 × 1 × $(0.95)^5$ + 5 × (0.05) × $(0.95)^4$
= $(0.95)^4$ [0.95 + 5(0.05)]
= $(0.95)^4$ (0.95 + 0.25)
= $(0.95)^4$ (1.20)
= (1.2) $(0.95)^4$
Hence, the probability that not more than one bulb will fuse after 150 days = $(1.2)(0.95)^4$.

(iii) P(more than one bulb fuse after 150 days)
= P[X > 1]
= 1 – P[X ≤ 1]

= 1 – (1.2)$(0.95)^4$
Hence, the probability that more than one bulb fuse after 150 days = 1 – (1.2)$(0.95)^4$.

(iv) P(at least one bulb fuse after 150 days)
= P[X ≥ 1]
= 1 – P[X = 0]
= 1 – p(0)
= 1 – $^5C_0(0.05)^0(0.95)^{5-0}$
= 1 – 1 × 1 × $(0.95)^5$
= 1 – $(0.95)^5$
Hence, the probability that at least one bulb fuses after 150 days = 1 – $(0.95)^5$.

Question 6.
A bag consists of 10 balls each marked with one of the digits 0 to 9. If four balls are drawn successively with replacement from the bag, what is the probability that none is marked with the digit 0?
Solution:
Let X = number of balls marked with digit 0.
p = probability of drawing a ball from 10 balls marked with the digit 0.
∴ p = $\frac{1}{10}$
and q = 1 – p = 1 – $\frac{1}{10}$ = $\frac{9}{10}$
The p.m.f. of X is given by
$P(X=x) = {}^nC_x\, p^x q^{n-x}$

$$\text{i.e. } p(x) = {}^4C_x \left(\frac{1}{10}\right)^x \left(\frac{9}{10}\right)^{4-x}, x = 0, 1, \ldots, 4$$

P(none of the ball marked with digit 0) = P(X = 0)

$$= p(0) = {}^4C_0 \left(\frac{1}{10}\right)^0 \left(\frac{9}{10}\right)^{4-0}$$

$$= 1 \times 1 \times \left(\frac{9}{10}\right)^4 = \left(\frac{9}{10}\right)^4$$

Hence, the probability that none of the bulb marked with digit 0 is $\left(\frac{9}{10}\right)^4$

Question 7.

On a multiple-choice examination with three possible answers for each of the five questions. What is the probability that a candidate would get four or more correct answers just by guessing?

Solution:

Let X = number of correct answers.

p = probability that a candidate gets a correct answer from three possible answers.

$\therefore$ p = $\frac{1}{3}$ and q = 1 – p = 1 – $\frac{1}{3}$ = $\frac{2}{3}$

Given: n = 5

$\therefore$ X ~ B(5, $\frac{1}{3}$)

The p.m.f. of X is given by

$$P(X = x) = {}^nC_x\, p^x q^{n-x}, x = 0, 1, 2, 4, 5$$

$$\text{i.e. } p(x) = {}^5C_x \left(\frac{1}{3}\right)^x \left(\frac{2}{3}\right)^{5-x}, x = 0, 1, 2, 3, 4, 5$$

P(four or more correct answers) = P[X ≥ 4]

= p(4) + p(5)

$$= {}^5C_4 \left(\frac{1}{3}\right)^4 \left(\frac{2}{3}\right)^{5-4} + {}^5C_5 \left(\frac{1}{3}\right)^5 \left(\frac{2}{3}\right)^{5-5}$$

$$= 5 \times \left(\frac{1}{3}\right)^4 \times \left(\frac{2}{3}\right)^1 + 1 \times \left(\frac{1}{3}\right)^5 \left(\frac{2}{3}\right)^0$$

$$= \left(\frac{1}{3}\right)^4 \left[5 \times \frac{2}{3} + \frac{1}{3}\right]$$

$$= \left(\frac{1}{3}\right)^4 \left[\frac{10}{3} + \frac{1}{3}\right] = \frac{1}{81} \times \frac{11}{3} = \frac{11}{243}$$

Hence, the probability of getting four or more correct answers = $\frac{11}{243}$.

Question 8.
A person buys a lottery ticket in 50 lotteries, in each of which his chance of winning a prize is $\frac{1}{100}$, find the probability that he will win a prize
(i) at least once
(ii) exactly once
(iii) at least twice.
Solution:
Let X = number of winning prizes.
p = probability of winning a prize
$\therefore p = \frac{1}{100}$
and $q = 1 - p = 1 - \frac{1}{100} = \frac{99}{100}$
Given: n = 50
$\therefore X \sim B(50, \frac{1}{100})$
The p.m.f. of X is given by

$P(X=x)={}^nC_x p^x q^{n-x}$

i.e., p(x) = ${}^{50}C_x\left(\frac{1}{100}\right)^x\left(\frac{99}{100}\right)^{50-x}$, x = 0, 1, 2,… 50

(i) P(a person wins a prize at least once)

$$=P[X\geqslant 1]=1-P[X<1]=1-p(0)$$

$$=1-{}^{50}C_0\left(\frac{1}{100}\right)^0\left(\frac{99}{100}\right)^{50-0}$$

$$=1-1\times 1\times\left(\frac{99}{100}\right)^{50}$$

$$=1-\left(\frac{99}{100}\right)^{50}$$

Hence, probability of winning a prize at least once = 1 – $\left(\frac{99}{100}\right)^{50}$

(ii) P(a person wins exactly one prize) = P[X = 1] = p(1)

$$={}^{50}C_1\left(\frac{1}{100}\right)^1\left(\frac{99}{100}\right)^{50-1}$$

$$=50\times\left(\frac{1}{100}\right)\times\left(\frac{99}{100}\right)^{49}$$

$$=\frac{1}{2}\left(\frac{99}{100}\right)^{49}$$

Hence, probability of winning a prize exactly once = $\frac{1}{2}\left(\frac{99}{100}\right)^{49}$

(iii) P(a persons wins the prize at least twice) = P[X ≥ 2]

= 1 – P[X < 2]

= 1 – [p(0) + p(1)]

$$= 1 - \left[{}^{50}C_0 \left(\frac{1}{100}\right)^0 \left(\frac{99}{100}\right)^{50-0} + {}^{50}C_1 \left(\frac{1}{100}\right)^1 \left(\frac{99}{100}\right)^{50-1} \right]$$

$$= 1 - \left[1 \times 1 \times \left(\frac{99}{100}\right)^{50} + 50 \times \frac{1}{100} \times \left(\frac{99}{100}\right)^{49} \right]$$

$$= 1 - \left[\left(\frac{99}{100}\right)^{50} + \frac{1}{2}\left(\frac{99}{100}\right)^{49} \right]$$

$$= 1 - \left(\frac{99}{100}\right)^{49} \left[\frac{99}{100} + \frac{1}{2} \right]$$

$$= 1 - \left(\frac{99}{100}\right)^{49} \left[\frac{149}{100} \right]$$

$$= 1 - 149\left(\frac{99^{49}}{100^{50}}\right)$$

Hence, the probability of winning the prize at least twice = $1 - 149\left(\frac{99^{49}}{100^{50}}\right)$.

Question 9.

In a box of floppy discs, it is known that 95% will work. A sample of three of the discs is selected at random. Find the probability that (i) none (ii) 1 (iii) 2 (iv) all 3 of the sample will work.

Solution:

Let X = number of working discs.

p = probability that a floppy disc works

$\therefore$ p = 95% = $\frac{95}{100} = \frac{19}{20}$

and q = 1 – p = 1 – $\frac{19}{20} = \frac{1}{20}$

Given: n = 3

$\therefore X \sim B(3, \frac{19}{20})$

The p.m.f. of X is given by

$$P(X = x) = {}^nC_x\, p^x q^{n-x}$$

$$\text{i.e. } p(x) = {}^3C_x \left(\frac{19}{20}\right)^x \left(\frac{1}{20}\right)^{3-x},\ x = 0, 1, 2, 3$$

(i) P(none of the floppy discs work) = P(X = 0)

$$= p(0) = {}^3C_0 \left(\frac{19}{20}\right)^0 \left(\frac{1}{20}\right)^{3-0}$$

$$= 1 \times 1 \times \frac{1}{20^3} = \frac{1}{20^3}$$

Hence, the probability that none of the floppy disc will work = $\frac{1}{20^3}$.

(ii) P(exactly one floppy disc works) = P(X = 1)

$$= p(1) = {}^3C_1 \left(\frac{19}{20}\right)^1 \left(\frac{1}{20}\right)^{3-1}$$

$$= 3 \times \frac{19}{20} \times \left(\frac{1}{20}\right)^2$$

$$= 3\left(\frac{19}{20^3}\right)$$

Hence, the probability that exactly one floppy disc works = $3\left(\frac{19}{20^3}\right)$

(iii) P(exactly two floppy discs work) = P(X = 2)

$$= p(2) = {}^3C_2\left(\frac{19}{20}\right)^2\left(\frac{1}{20}\right)^{3-2}$$

$$= \frac{3 \cdot 2!}{2! \cdot 1!} \times \frac{(19)^2}{(20)^2} \times \frac{1}{20} = 3\left(\frac{19^2}{20^3}\right)$$

Hence, the probability that exactly 2 floppy discs work = $3\left(\frac{19^2}{20^3}\right)$

(iv) P(all 3 floppy discs work) = P(X = 3)

$$= p(3) = {}^3C_3\left(\frac{19}{20}\right)^3\left(\frac{1}{20}\right)^{3-3}$$

$$= 1 \times \left(\frac{19}{20}\right)^3 \times \left(\frac{1}{20}\right)^0$$

$$= \left(\frac{19}{20}\right)^3$$

Hence, the probability that all 3 floppy discs work = $\left(\frac{19}{20}\right)^3$.

Question 10.
Find the probability of throwing at most 2 sixes in 6 throws of a single die.
Solution:
Let X = number of sixes.
p = probability that a die shows six in a single throw
∴ p = $\frac{1}{6}$
and q = 1 – p = 1 – $\frac{1}{6}$ = $\frac{5}{6}$

Given: n = 6

$\therefore X \sim B(6, \frac{1}{6})$

The p.m.f. of X is given by

$$P(X=x)={}^nC_x p^x q^{n-x}$$

i.e. $p(x)={}^6C_x\left(\frac{1}{6}\right)^x\left(\frac{5}{6}\right)^{6-x}$, $x=0, 1, 2, \ldots, 6$

$P(\text{at most 2 sixes})=P[X \leqslant 2]$

$=p(0)+p(1)+p(2)$

$$={}^6C_0\left(\frac{1}{6}\right)^0\left(\frac{5}{6}\right)^{6-0}+{}^6C_1\left(\frac{1}{6}\right)^1\left(\frac{5}{6}\right)^{6-1}+{}^6C_2\left(\frac{1}{6}\right)^2\left(\frac{5}{6}\right)^{6-2}$$

$$=1\times 1\times\left(\frac{5}{6}\right)^6+6\times\left(\frac{1}{6}\right)\times\left(\frac{5}{6}\right)^5+\frac{6!}{2!\ 4!}\times\left(\frac{1}{6}\right)^2\times\left(\frac{5}{6}\right)^4$$

$$=\left(\frac{5}{6}\right)^6+\left(\frac{5}{6}\right)^5+\frac{6\times 5}{2\times 1}\left(\frac{1}{6}\right)^2\left(\frac{5}{6}\right)^4$$

$$=\left(\frac{5}{6}\right)^6+\left(\frac{5}{6}\right)^5+15\times\frac{1}{36}\times\left(\frac{5}{6}\right)^4$$

$$=\left[\left(\frac{5}{6}\right)^2+\left(\frac{5}{6}\right)+\frac{15}{36}\right]\left(\frac{5}{6}\right)^4$$

$$=\left(\frac{25}{36}+\frac{5}{6}+\frac{15}{36}\right)\cdot\left(\frac{5}{6}\right)^4$$

$$=\left(\frac{25+30+15}{36}\right)\left(\frac{5}{6}\right)^4$$

$$= \frac{70}{36}\left(\frac{5}{6}\right)^4$$

$$= \frac{7}{3} \times \frac{10}{12} \times \left(\frac{5}{6}\right)^4$$

$$= \frac{7}{3} \times \frac{5}{6} \times \left(\frac{5}{6}\right)^4 = \frac{7}{3}\left(\frac{5}{6}\right)^5$$

Hence, probability of throwing at most 2 sixes = $\frac{7}{3}\left(\frac{5}{6}\right)^5$.

Question 11.

It is known that 10% of certain articles manufactured are defective. What is the probability that in a random sample of 12 such articles, 9 are defective?

Solution:

Let X = number of defective articles.

p = probability of defective articles.

∴ p = 10% = $\frac{10}{100} = \frac{1}{10}$

and q = 1 – p = 1 – $\frac{1}{10}$ = $\frac{9}{10}$

Given: n = 12

∴ X ~ B(12, $\frac{1}{10}$)

The p.m.f. of X is given by

$$P[X = x] = {}^nC_x p^x q^{n-x}$$

$$\text{i.e. } p(x) = {}^{12}C_x \left(\frac{1}{10}\right)^x \left(\frac{9}{10}\right)^{12-x}, x = 1, 2, 3, ..., 12$$

$$P(9 \text{ defective articles}) = P[X = 9]$$

$$= p(9) = {}^{12}C_9 \left(\frac{1}{10}\right)^9 \left(\frac{9}{10}\right)^{12-9}$$

$$= \frac{12!}{9!3!} \left(\frac{1}{10}\right)^9 \left(\frac{9}{10}\right)^3$$

$$= \frac{12 \times 11 \times 10 \times 9!}{9! \times 3 \times 2 \times 1} \times \frac{1}{10^9} \times \frac{9^3}{10^3}$$

$$= 2 \times 11 \times 10 \cdot \frac{9^3}{10^{12}} = 22\left(\frac{9^3}{10^{11}}\right)$$

Hence, the probability of getting 9 defective articles = $22\left(\frac{9^3}{10^{11}}\right)$

Question 12.
Given X ~ B(n, P)
(i) If n = 10 and p = 0.4, find E(x) and Var(X).
(ii) If p = 0.6 and E(X) = 6, find n and Var(X).
(iii) If n = 25, E(X) = 10, find p and SD(X).
(iv) If n = 10, E(X) = 8, find Var(X).
Solution:
(i) Given: n = 10 and p = 0.4
∴ q = 1 – p = 1 – 0.4 = 0.6
∴ E(X) = np = 10(0.4) = 4
Var(X) = npq = 10(0.4)(0.6) = 2.4
Hence, E(X) = 4, Var(X) = 2.4.

(ii) Given: p = 0.6, E (X) = 6

E(X) = np
6 = n(0.6)
n = $\frac{6}{0.6}$ = 10
Now, q = 1 – p = 1 – 0.6 = 0.4
∴ Var(X) = npq = 10(0.6)(0.4) = 2.4
Hence, n = 10 and Var(X) = 2.4.

(iii) Given: n = 25, E(X) = 10
E(X) = np
10 = 25p
p = $\frac{10}{25} = \frac{2}{5}$
∴ q = 1 – p = 1 – $\frac{2}{5}$ = $\frac{3}{5}$
Var(X) = npq = $25 \times \frac{2}{5} \times \frac{3}{5}$ = 6
∴ SD(X) = √Var(X) = √6
Hence, p = $\frac{2}{5}$ and S.D.(X) = √6.

(iv) Given: n = 10, E(X) = 8
E(X) = np
8 = 10p
p = $\frac{8}{10} = \frac{4}{5}$
q = 1 – p = 1 – $\frac{4}{5}$ = $\frac{1}{5}$
Var(X) = npq = $10\left(\frac{4}{5}\right)\left(\frac{1}{5}\right) = \frac{8}{5}$
Hence, Var(X) = $\frac{8}{5}$.

Maharashtra Board Solutions Class 12 Arts & Science Maths (Part 2)

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The Maharashtra State Board of Secondary and Higher Secondary Education or MSBSHSE (Marathi: महाराष्ट्र राज्य माध्यमिक आणि उच्च माध्यमिक शिक्षण मंडळ), is an **autonomous and statutory body established in 1965**. The board was amended in the year 1977 under the provisions of the Maharashtra Act No. 41 of 1965.

The Maharashtra State Board of Secondary & Higher Secondary Education (MSBSHSE), Pune is an independent body of the Maharashtra Government. There are more than 1.4 million students that appear in the examination every year. The Maha State Board conducts the board examination twice a year. This board conducts the examination for SSC and HSC.

The Maharashtra government established the Maharashtra State Bureau of Textbook Production and Curriculum Research, also commonly referred to as Ebalbharati, in 1967 to take up the responsibility of providing quality textbooks to students from all classes studying under the Maharashtra State Board. MSBHSE prepares and updates the curriculum to provide holistic development for students. It is designed to tackle the difficulty in understanding the concepts with simple language with simple illustrations. Every year around 10 lakh students are enrolled in schools that are affiliated with the Maharashtra State Board.

FAQs

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Who developed the Maharashtra State board books?

As of now, the MSCERT and Balbharti are responsible for the syllabus and textbooks of Classes 1 to 8, while Classes 9 and 10 are under the Maharashtra State Board of Secondary and Higher Secondary Education (MSBSHSE).

How many state boards are there in Maharashtra?

The Maharashtra State Board of Secondary & Higher Secondary Education, conducts the HSC and SSC Examinations in the state of Maharashtra through its nine Divisional Boards located at Pune, Mumbai, Aurangabad, Nasik, Kolhapur, Amravati, Latur, Nagpur and Ratnagiri.

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