# ©゙" doubtnut 

India's Number 1 Education App

## MATHS

# BOOKS - CHHAYA PUBLICATION MATHS (BENGALI 

 ENGLISH)
## BINOMIAL DISTRUTION

## Example

1. $25 \%$ of the inhabitnts in a large town are bespectacled. What is the probability that a randomly selected group of 6 inhabitants will include at most 2 bespectacled pesons?

- Watch Video Solution

2. The incidence of occupational disease is such that on the average $20 \%$ of workers suffer from it. If 10 workers are selected at random, find the probability that exactly 2 workers suffer from the disease.

## - Watch Video Solution

3. The incidence of occupational disease is such that on the averatge $20 \%$ of workers suffer from it. If 10 wrkers are selected at random, find the probability that not more that 2 workers suffer from the disease.

## - Watch Video Solution

4. If the probability of success in a single trial is 0.05 , how many

Bernoulli trials must be performed in, order that the probabiliy of
at least one success is $\frac{2}{3}$ or more.

## - Watch Video Solution

5. $M$ and $E$ are two equally strong football teams. what is the probability that $M$ beats $E$ in exactly 5 games out of 8 .

## - Watch Video Solution

6. $M$ and $E$ are two equally strong football teams. what is the probability that $E$ beats $M$ in at least 2 games out of 4 .

## - Watch Video Solution

7. What is the probability that in a family of 4 children there will be at least one boy?
8. Find the probability that in a family of 4 children there will be at least 1 boy and 1 girl.

## - Watch Video Solution

9. An unbiased coin is tossed 6 times .Find using binomial distribution, the probability of getting at least 5 heads .

## - Watch Video Solution

10. Eight balanced coins are thrown simultaneously. Find the probability of getting

Exactly 3 heads.
11. Eight balanced coins are thrown simultaneously. Find the probability of getting at least 3 heads.

## - Watch Video Solution

12. Eight balanced coins are thrown simultaneously. Find the probability of getting
not more than 3 heads.

## - Watch Video Solution

13. Determine the binomial distribution whose mean is 9 and variance is 6 .
14. If X follows a binomial distribution with mean 3 and varience $\frac{3}{2}$, find
$P(X \geq 1)$.

## - Watch Video Solution

15. If X follows a binomial distribution with mean 3 and varience $\frac{3}{2}$, find
$P(X \leq 5)$.

## - Watch Video Solution

16. For a binomial distribution, the mean and S.D. are respectively 4 and $\sqrt{3}$. Calculate the probability of getting a non-zero value from this distribution.
17. Show that the standard deviation of a binomial distribution cannot exceed $\frac{\sqrt{n}}{2}$.

## - Watch Video Solution

18. In a binomial distribution consisting of 5 independent trials, probabilities of 1 and 2 successes are 0.4096 and 0.2048 respectively. Find the parameter $p$ of the distribution.

## - Watch Video Solution

19. If the sum of the mean and variance of a binomial distribution for 5 trials is 1.8 ; find the distribution.
20. An unbiased die is thrown again and again until three sixes are obatined. Find the probability of obtaining third six in the sixth throw of the die.

## - Watch Video Solution

21. What is the probability if guessing correctly at least six of the ten answers in a TRUE-FALSE objective test ?

## - Watch Video Solution

22. The following statement cannot be true-why? "The mean of a binomial distritution is 4 and the standard deviation is 3."
23. Five coins are tossed 3200 times. Find the expected frequencies of the distribution of heads and tails, and tabulate the result. Calculate the mean number of heads and standard deviation.

## - Watch Video Solution

Mcq

1. The parameters of binomial distibuton are
A. n,p,q
B. p,q
C. n, q
D. None of these

Answer: D
2. The mean of a binomial distribution with parameters n and p is
A. np
B. $n(1-p)$
C. $(n+1) p$
D. $(n-1) p$

## Answer: A

## - Watch Video Solution

3. The variance of a binomial distribution with parameters $n$ and $p$ is
A. $>\frac{n}{4}$
B. $\leq \frac{n}{4}$
C. $>\frac{n^{2}}{4}$
D. $\leq \frac{n^{2}}{4}$

## Answer: B

## - Watch Video Solution

4. The S. D of a binomial distribution with parameters $n$ and $p$ is
A. np
B. $\sqrt{n p}$
C. $\sqrt{n p(1-p)}$
D. $2 \sqrt{n p}$

## Answer: C

5. The probability of a man hitting a target is $\frac{1}{4}$. How many times must he fire so that the probability of his hitting the target at least once is greater than $\frac{2}{3}$ ?
A. 4
B. 5
C. 6
D. greater than 4

## Answer:

## - Watch Video Solution

6. A coin is tossed $n$ times. The probability of getting head at least once is more than 0.8 , then the value of n is
A. 2
B. 3
C. 4
D. 5

## Answer:

## - Watch Video Solution

7. In a precision bombing attack, there is a $50 \%$ chance that any one bomb will strike the target. Two direct hits are required to destory the target completely. The number of bombs which should be dropped to give a $99 \%$ chance or better of completely destroying the target can be
A. 12
B. 11
C. 10
D. 13

## Answer: A::B::D

## - Watch Video Solution

8. A fair coin is tossed 99 times. Let $X$ be the nunber of times head occurs. Then $P(X=r)$ is maximum when $r$ is
A. 49
B. 52
C. 51
D. 50

## Answer: A::D

9. If X follows a binomial distribution with parameters $\mathrm{n}=101$ and $p=\frac{1}{3}$ the $\mathrm{P}(\mathrm{X}=\mathrm{r})$ is maximum if r equals
A. 34
B. 33
C. 32
D. 31

## Answer: A: B

## D Watch Video Solution

## Very Short Answer Type Questions

1. Write down the probability distribution, mean and variance of a binomial distribution.

## D Watch Video Solution

2. Let $x$ be a binomily destributed random variable with parameters
n and p . For what value of p is $\operatorname{Var}(\mathrm{x})$ a maximum, if you assume that n is fixed.

## - Watch Video Solution

3. In each case determine wheather the given values can be looked upon as the values of a probability distribution of a random variable which can take up only the values $1,2,3$ and 4 and explain your answer :

$$
f(1)=0.26, f(2)=0.26, f(3)=0.26, f(4)=0.22
$$

4. In each case determine wheather the given values can be looked upon as the values of a probability distribution of a random variable which can take up only the values $1,2,3$ and 4 and explain your answer :
$f(x)=\frac{x+1}{4}$.

## - Watch Video Solution

5. A student obtained the following results.Comment on the accuracy of his results :
for a binomial distribution, mean=16 and S.D=4.

- Watch Video Solution

6. A student obtained the following results.Comment on the accuracy of his results :
for a binomial distribution, mean $=4$ and variance $=3$.

## - Watch Video Solution

7. Seven unbiased coins are tossed simultaneously at random. Find the probability of getting exactly two tails.

## - Watch Video Solution

8. Seven unbiased coins are tossed simultaneously at random. Find the probability of getting
at most two tails
9. Seven unbiased coins are tossed simultaneously at random. Find the probability of getting at least two tails.

## - Watch Video Solution

10. Eight coins are thrown simultaneously. Show that the probability of getting at least 6 heads is $\frac{37}{256}$.

## - Watch Video Solution

11. An unbiased coin is tossed 8 times. Find using binomial distribution, the probability of getting at least 3 heads.
12. Six coins are tossed simultaneously. Find the probability of getting

3 heads.

## - Watch Video Solution

13. Six coins are tossed simultaneously. Find the probability of getting
no head.

## - Watch Video Solution

14. Six coins are tossed simultaneously. Find the probability of getting
at least one head.
15. Six coins are tossed simultaneously. Find the probability of getting
not more than 3 heads.

## - Watch Video Solution

16. Find the probility that in a family of 5 children there will be at least one boy.

## - Watch Video Solution

17. Find the probility that in a family of 5 children there will be at least one boy and one girl.
18. The mean and variance of a binomial distribution are 4 and 3 respectively. Find the values of its parameters.

## - Watch Video Solution

19. Find the probability of guessing correctly at least 5 of the eight answers in a True-False objective test.

## - Watch Video Solution

20. If a fair is tossed 10 times, find the probability of exactly six heads.
21. If a fair is tossed 10 times, find the probability of at least six heads.

## D Watch Video Solution

22. If a fair is tossed 10 times, find the probability of at most six heads.

## D Watch Video Solution

23. Five cards are drawn successively with replacement from a wellshuffled deck of 52 cards. What is the probability that all the five cards are spades?

## - Watch Video Solution

24. Five cards are drawn successively with replacement from a wellshuffled deck of 52 cards. What is the probability that only 3 cards are spades?

## - Watch Video Solution

25. Five cards are drawn successively with replacement from a wellshuffled deck of 52 cards. What is the probability that none is a spade?

## - Watch Video Solution

## Short Answer Type Questions

1. If a variable is binomially distributed, determine its mean and variance and S.D.

## Watch Video Solution

2. Obtain the variance of a binomial distribution and show that the variance cannot exceed $\frac{n}{4}$.

## - Watch Video Solution

3. Calculate the mean and variance of a binomial distribution and hence show that $v<m$.

## - Watch Video Solution

4. Prove that the variance of a binomial distribution cnnot be greater than its mean.
5. $5 \%$ of the electric values are defective. 10 values are drawn at random. Find the probability that at least two defective values are found.

## - Watch Video Solution

6. If $X$ follows a binomial distribution with mean 4 and variance 2 , find $P(X \geq 5)$.

## - Watch Video Solution

7. The mean and variance of a binomial distribution are 4 and $\frac{4}{3}$ respectively. Find the $P(X \geq 1)$.
8. Find the binomial distribution for which the mean and variance are 12 and 3 respectively.

## - Watch Video Solution

9. The probability that a student entering a university will gradute is 0.4 . Find the probability that out of 3 students of the university none will gradute.

## - Watch Video Solution

10. The probability that a student entering a university will gradute is 0.4 . Find the probability that out of 3 students of the university only one will gradute.
11. The probability that a student entering a university will gradute is 0.4 . Find the probability that out of 3 students of the university all will gradute.

## - Watch Video Solution

12. The probability of a bomb hitting a target is 0.2 . Two direct hits are necessary to destroy a bridge. If six bombs are aimed at the bridge, find the probability that the bridge is destroyed.

## D Watch Video Solution

13. The probability of success in a single trial of a random experiment is constant and the trial is repeated inependently seven timed, if the probability of 4 successes is equal to 3
successes, find the probability of 3 successes in 5 independent trials of the experiment.

## - Watch Video Solution

14. A random variable $X$ follows binomial distribution with mean 3 and stanard deviation $\sqrt{2}$. Find the values of $\mathrm{P}(\mathrm{X}=2)$ and $P(X \leq 1)$.

## - Watch Video Solution

15. A random variable follows binomial distribution with mean 4 and standard deviation $\sqrt{2}$. Find the probability of assuming nonzero value for the variate.
16. Five percent of the articles produced by a machine are defective.

Find the mean and S.D in a lot of 100 articles.

## - Watch Video Solution

17. If the probability of a defective bolt is $\frac{1}{10}$, find mean

## - Watch Video Solution

18. If the probability of a defective bolt is $\frac{1}{10}$, find variance for the distribution of defective bolts in a total of 400 .
19. If the mean and variance of a certain binomal distribution are 4 and 3.2 respectively, find the probability of at least one success.

## - Watch Video Solution

20. A binomial random variable $X$ satisfies the relation $9 P(X=4)=P(X=2)$ when $n=6$. Find the value of the parameters $p$.

## - Watch Video Solution

21. Five unbiased dice are thrown together 96 times. Find the expected frequencies when throwing 1,2 or 3 is regarded as a success.

## - Watch Video Solution

22. Eight coins are tossed at a time for 256 tiems. Find the expected frequencies of the distribution of heads and tails and tabulate the result. Calculate the mean number of heads and standard deviation.

## - Watch Video Solution

23. The overall percentage of failures in a certain examination is 40 .

What is the probability that out of a group of 6 candidates at least
4 passed the examination?

## - Watch Video Solution

24.4 coins are tossed at a time. What is the probability that there are 2 heads and 2 tails?
25. In a basket, it is known that 1 out of 5 eggs are rotten. 18 eggs are selected randomly. Find the probability that there are exactly 3 rotten eggs. Again find the probability that there are exactly 4 rotten eggs. Which one is greater?

## - Watch Video Solution

26. $5 \%$ of the electric values are defective. 10 values are drawn at random. Find the probability that at least two defective values are found.

## - Watch Video Solution

27. The incidence of occupational desease in an industry is such that the workers have a $20 \%$ chance of suffering from it. What is
the probability that out of six workers 4 or more will catch the disease?

## D Watch Video Solution

28. If the probability of success in a single trial is 0.01 , how many Bernoulli trials must be performed in, order that the probabiliy of at least one success is $\frac{1}{2}$ or more?

## - Watch Video Solution

29. Suppose that half the population of a town are consumers of rice. Each of 100 investigators interviews 10 individualas to see wheather they are consumers of rice. How many investigators do you expert to report that three or more but less than six people are consumers of rice?
30. In 10 independent throws of a defective die, the probability that an even number will appear 5 times is twice the probability that an even number will appear 4 times. Find the probability that an even number will not apper at all in 10 independent throws of the die.

## - Watch Video Solution

## Integer Answer Type

1. A die is tossed thrice. Getting an even number is considered as success, the variance of the binomial distribution is $\frac{3}{k}$, then K equals to
2. If $x$ follows binomial distribution with mean 4 and variance 2 . The value of $P(|X-4| \leq 2)$ is $\frac{119}{16 k}$. What will be the value of $K$ ?

## (D) Watch Video Solution

3. The value of expection of the number of heads in 15 tosses of a coin is $\frac{15}{k}$. The value of $K$ will be

## - Watch Video Solution

$$
\begin{aligned}
& \text { 4. If } \left.\begin{array}{c}
\text { for } \\
P(X=1)
\end{array}\right)=P(X=2)=\alpha \text {, write } P(X=4) \text { in terms of } \alpha \text {. }
\end{aligned}
$$

5. The expected number of boys in a family with 8 children, assuming the sex distribution to be equally probable, is n . Find n .

## - Watch Video Solution

## Comprehension Type

1. The probability that a bulb produced by a factory will fuse after 150 days of use is 0.05 .

The probability that out of 5 such bulbs not more than one will fuse after 150 days of use is
A. $\frac{5}{5}\left(\frac{19}{20}\right)^{4}$
B. $\frac{6}{5}\left(\frac{19}{20}\right)^{4}$
C. $\frac{3}{5}\left(\frac{19}{20}\right)^{4}$
D. $\frac{4}{5}\left(\frac{19}{20}\right)^{4}$

## - Watch Video Solution

2. The probability that a bulb produced by a factory will fuse after 150 days of use is 0.05 .

The probability that out of 5 such bulbs more than one will fuse after 150 days of use is
A. $1-\left(\frac{6}{5}\right)\left(\frac{19}{20}\right)^{4}$
B. $1-\left(\frac{3}{5}\right)\left(\frac{19}{20}\right)^{4}$
C. $1-\left(\frac{7}{9}\right)\left(\frac{19}{20}\right)^{4}$
D. $1-\left(\frac{2}{5}\right)\left(\frac{19}{20}\right)^{4}$

## Answer: A

3. The probability that a bulb produced by a factory will fuse after 150 days of use is 0.05 .

The probability that out of 5 such bulbs at least one will fuse after 150 days of use is
A. $1-\left(\frac{19}{20}\right)^{4}$
B. $1-\left(\frac{19}{20}\right)^{3}$
C. $1-\left(\frac{19}{20}\right)^{2}$
D. $1-\left(\frac{19}{20}\right)^{5}$

## Answer: D

## D Watch Video Solution

4. A person buys a lottery ticket in 50 lotteres, in each of which his chance of winning a prize is $\frac{1}{100}$.

What is the probability that he will win a prize at least once?
A. $1-\left(\frac{98}{100}\right)^{50}$
B. $1-\left(\frac{97}{100}\right)^{50}$
C. $1-\left(\frac{99}{100}\right)^{50}$
D. None of these

## Answer: C

## - Watch Video Solution

5. A person buys a lottery ticket in 50 lotteres, in each of which his
chance of winning a prize is $\frac{1}{100}$.
What is the probability that he will win a prize exactly once?
A. $\frac{1}{2}\left(\frac{99}{100}\right)^{49}$
B. $\frac{1}{2}\left(\frac{99}{100}\right)^{50}$
C. $\frac{1}{2}\left(\frac{99}{100}\right)^{48}$
D. None of these

## Answer: A

## - Watch Video Solution

6. A person buys a lottery ticket in 50 lotteres, in each of which his chance of winning a prize is $\frac{1}{100}$.

What is the probability that he will win a prize at least twice?
A. $1-\frac{99^{49} \times 149}{(100)^{50}}$
B. $1-\frac{99^{50} \times 149}{(100)^{49}}$
C. $1-\frac{99^{50} \times 150}{(100)^{49}}$
D. None of these

## D Watch Video Solution

## Assertion Reason Type

1. Statement-I: Under some condition in the random experiment, p and $q$ are the probability of 'success' and probability of 'failure' respectively, then the probability for $x$ success is $f(x)={ }^{n} C_{x} p^{x} q^{n-x}(x=0,1,2, \ldots \ldots, n)$

Statement-II: Sample space of a random experiment has only two sample points one is success and other is failure.
A. Statement I is True, Statement II is True, Statement II is a correct explanation for Statement I
B. Statement I is True, Statement II is True, Statement II is not a correct explanation for Statement I
C. Statement I is True, Statement II is False.
D. Statement I is False, Statement II is True.

## Answer: A

## - Watch Video Solution

2. If random variable $x$ satisfying binomial distribution and its probability distribution
$f(x), \quad \operatorname{then} f(x)={ }^{n} C_{x} p^{x} q^{n-x}(x=0,1,2, \ldots \ldots, n)$ and $\bar{x}=E(x)$
Statement I: $E\left(x^{2}\right)=n(n-1) p^{2}+n p$
Statement II: $E(x)=n p$.
A. Statement I is True, Statement II is True, Statement II is a correct explanation for Statement I
B. Statement I is True, Statement II is True, Statement II is not a correct explanation for Statement I
C. Statement I is True, Statement II is False.
D. Statement I is False, Statement II is True.

Answer: A

- Watch Video Solution

