

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?

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.

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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.



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



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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.



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.



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.

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



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.

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

not more than 3 heads.

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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

 $P(X \ge 1).$

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15. If X follows a binomial distribution with mean 3 and varience $\frac{3}{2}$,

find

 $P(X \leq 5).$

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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 $\frac{\sqrt{n}}{2}$.

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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.

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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.

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21. What is the probability if guessing correctly at least six of the

ten answers in a TRUE-FALSE objective test ?

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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.

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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)
- $\mathsf{C}.\,(n+1)p$
- D. (n-1)p

Answer: A

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3. The variance of a binomial distribution with parameters n and p

is

A.
$$> \frac{n}{4}$$

$$\begin{array}{l} \mathsf{B.} \ \leq \displaystyle \displaystyle \frac{n}{4} \\ \mathsf{C.} \ > \displaystyle \displaystyle \frac{n^2}{4} \\ \mathsf{D.} \ \leq \displaystyle \displaystyle \frac{n^2}{4} \end{array}$$

Answer: B



4. The S. D of a binomial distribution with parameters n and p is

A. np

B.
$$\sqrt{np}$$

C.
$$\sqrt{np(1-p)}$$

D. $2\sqrt{np}$

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:



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	

Answer:

D. 5



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

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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 n=101 and

 $p=rac{1}{3}$ the P(X=r) is maximum if r equals

A. 34

B. 33

C. 32

D. 31

Answer: A::B

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Very Short Answer Type Questions

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

binomial distribution.



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



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 :

$$f(x) = rac{x+1}{4}.$$

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5. A student obtained the following results.Comment on the accuracy of his results :

for a binomial distribution, mean=16 and S.D=4.



6. A student obtained the following results.Comment on the accuracy of his results :

for a binomial distribution, mean=4 and variance =3.

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7. Seven unbiased coins are tossed simultaneously at random. Find

the probability of getting

exactly two tails.

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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.

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

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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.

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13. Six coins are tossed simultaneously. Find the probability of

getting

no head.

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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.

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16. Find the probility that in a family of 5 children there will be

at least one boy.

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17. Find the probility that in a family of 5 children there will be

at least one boy and one girl.





21. If a fair is tossed 10 times, find the probability of

at least six heads.

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22. If a fair is tossed 10 times, find the probability of
at most six heads.
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23. Five cards are drawn successively with replacement from a well-
shuffled deck of 52 cards. What is the probability that
all the five cards are spades?
Vatch Video Solution

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

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25. Five cards are drawn successively with replacement from a well-

shuffled deck of 52 cards. What is the probability that

none is a spade?

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Short Answer Type Questions

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

variance and S.D.



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.

6. If X follows a binomial distribution with mean 4 and variance 2,

find $P(X \ge 5)$.

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7. The mean and variance of a binomial distribution are 4 and $\frac{4}{3}$

respectively. Find the $P(X \ge 1)$.

8. Find the binomial distribution for which the mean and variance

are 12 and 3 respectively.



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.



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.

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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.

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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.

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

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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.



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.



9P(X=4)=P(X=2) when n=6. Find the value of the parameters p.

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

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.

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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?

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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 ?



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.



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?



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?

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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.



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 $rac{119}{16k}.$ What will be the value of K?



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



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.
$$\frac{4}{5} \left(\frac{19}{20}\right)^4$$

Answer: B

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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



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

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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

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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?

$$\begin{array}{l} \mathsf{A.1} - \frac{99^{49} \times 149}{\left(100\right)^{50}} \\ \mathsf{B.1} - \frac{99^{50} \times 149}{\left(100\right)^{49}} \\ \mathsf{C.1} - \frac{99^{50} \times 150}{\left(100\right)^{49}} \end{array}$$

D. None of these

Answer: A

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 $f(x) = {}^{n} C_{x} p^{x} q^{n-x} (x = 0, 1, 2,, n)$

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), then $f(x) = {}^{n} C_{x} p^{x} q^{n-x} (x = 0, 1, 2,, n)$ and $\bar{x} = E(x)$ Statement I: $E(x^{2}) = n(n-1)p^{2} + np$ Statement II: E(x) = np.

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

