

# BINOMIAL DISTRIBUTIONS

CANSU OLCE

A STAR MATHS ([www.astarmaths.com.au](http://www.astarmaths.com.au))

1. A ranger fires 5 shots at a target. If  $X$  represents the number of shots that hit the target, list all the possible values of  $X$ .
  
2. A dice is rolled 8 times. If  $X$  represents the number of times a prime number occurs, list all possible values of  $X$ .
  
3. Eddy plays 3 sets of badminton with Chadran. The probability of Eddy winning any set is  $\frac{1}{6}$ . Given the variable  $X$  represents the number of games Eddy wins. Find the probability distribution of  $X$ .
  
4. Zainal's record shows that he can score 7 goals out of 10 penalty kicks.
  - a) If Zainal takes 3 penalty kicks and  $X$  represents the number of goals he scores, list all possible values of  $X$ .
  - b) Find the probability distribution of  $X$ .
  
5. An unfair dice is rolled 10 times. The probability of getting an even number is 0.3. If  $X$  represents the number of times an even number occurs, find the mean, variance and standard deviation of  $X$ .

6.

Colour	White	Red	Green
Number of balls	2	3	3

The table shows the contents of a box, 6 balls are drawn at random from the box with replacement. If  $X$  represents the number of times a red ball is drawn, find the mean and standard deviation of  $X$ .

7. A binomial experiment involves 24 trials and the random variable  $X$  represents the number of successes occurring. Given that the mean of  $X$  is 3, find the standard deviation of  $X$ .

8. The probability that a light bulb produced by a machine is defective is 0.1. A sample of  $n$  light bulbs is taken at random and the random variable  $X$  represents the number of defective bulbs. Given that  $X$  has a standard deviation of 1.5, find

- a) the value of  $n$ .
- b) the mean of  $X$ .

9. Six students apply for the PSD Scholarships. The probability of each student getting one of the scholarships is  $1/3$ . Find the probability that

- a) all the students will get the scholarships.
- b) only 2 students will get the scholarships.
- c) at least 2 students will get the scholarships.

10. It is given that 2% of the calculators produced by a factory will fail the quality control test. A random sample of 10 calculators is taken from the factory for quality control test. Find the probability that
- none of the calculators will fail the test.
  - less than 2 calculators will fail the test.
  - not more than 2 calculators will fail the test.
11. Ali fires 5 shots at a target in a training session on shooting. The probability that Ali's shot hits the target is 0.8. Find the probability that
- Ali will successfully hit the target 2 times.
  - all of Ali's shots fail to hit the target.
  - Ali will successfully hit the target 2 times.
12. A bag contains 10 marbles out of which 7 are red marbles.
- If a marble is picked at random from the bag, find the probability of picked a red marble.
  - A student picks 5 marbles at random from the bag with replacement. Find the probability that the student will get
    - 3 red marbles
    - less than 2 marbles which are not red in colour.
13. For every 10 eggs contained in a basket, 3 eggs are rotten. A sample of 7 eggs is chosen at random from the basket. Find the probability that
- exactly 3 eggs are rotten.
  - at least 6 eggs are good.

14. A machine produces glass rods. Given  $X$  represents the number of defective glass rods in a random sample of  $n$  glass rods produced by the machine. The mean and variance of  $X$  are 5 and 4.9 respectively.
- Calculate the value of  $n$  and the probability that a glass rod produced by the machine is defective.
  - If a sample of 10 glass rods is chosen at random, calculate the probability that at least one glass rod is defective.
15. In a game, a player has to guess the number of sweets in a container. Given the probability of making a correct guess is  $p$ .
- Find the value of  $p$  and the number of guesses required so that the mean and standard deviation for the number of correct guesses are 27 and  $\frac{3\sqrt{3}}{2}$  respectively.
  - If a player makes 8 guesses, find the probability that 5 of them are correct.

ANSWER KEY

1.  $X=\{0, 1, 2, 3, 4, 5\}$
2.  $X=\{0, 1, 2, 3, 4, 5, 6, 7, 8\}$
- 3.

X	0	1	2	3
P(X)	125/216	25/72	5/72	1/216

4. a)  $X=\{0, 1, 2, 3\}$
- b)

X	0	1	2	3
P(X)	0.027	0.189	0.441	0.343

5. Mean=3, Variance =2.1, Standard deviation=1.449
6. Mean=2.25, Standard deviation=1.19
7. 1.62
8. a)25, b)2.5
9. a)1/729 b)80/243 c)473/729
10. a) 0.8171 b) 0.9838 c) 0.99991
11. a) 0.0512 b) 0.00032 c) 0.9421
12. a) 0.7 b) i) 0.3087 ii) 0.5282
13. a) 0.2269 b) 0.3294
14. a) n=250, p=0.02 b) 0.1829
15. a)  $p=3/4, n=36$   
b)0.2076