Binomial Distribution Questions:

A coin is tossed 8 times and counting the number of tails. Find the probability of getting exactly 5 tails.

Solution:

We know that,

P(x) = (nCx) p^x (1-p)^(n-x)

Here, x = 5 and n = no of events = 8

P = probability of success = ½ = 0.5

(1-p) = not getting exactly 5 tail = 1-0.5 = 0.5

Substitute all the values in the formula we get,

P(x = 3) = 8C3 (0.5)^3 (0.5)^(8-3)
= 56*0.125*0.03125
= 0.21875

A test contains 10 multiple choice questions. Each question has five choices for the correct answer. Only one of the choice is correct. What is the probability of getting 70% with random guessing ?

Solution:

P(x) = (nCx) p^x (1-p)^(n-x)

Here, x = (70/100) * 10 = 7 and n = no of events = 10

P = probability of success = 1/ 5 = 0.2

P(x = 7) = (10C7) (0.2)^7 (1-0.2)^(10 – 7)

= 120 * 0.0000128*0.512

= 0.0007864

An experiment consist of free throw shot, probability of making it is 25%. If 15 shots are taken, find the probability of making less than 3 shots.

Solution:

The possible outcomes that will make this happen are 2 shots, 1 shot, and 0 shots.

Since these are mutually exclusive, we can add these probabilities.

$P(x< 3) = P(x = 0) + P(x = 1) + P(X = 2)$

$= 15C2\ (0.25)^2\ (0.75)^{13} + 15C1\ (0.25)^1\ (0.75)^{14} + 15C0\ (0.25)^0\ (0.75)^{15}$

$= 0.156 + 0.067 + 0.013 = 0.236$

There is a 24 percent chance of sinking less than 3 shots.

A biased coin is tossed 6 times. The probability of heads on any toss is 0:3. Let X denote the number of heads that come up.

Calculate:

(i) $P(X = 2)$
(ii) $P(X = 3)$
(iii) $P(1 < X <= 5)$.

Solution:

(i) If we call heads a success then this X has a binomial distribution with parameters $n = 6$ and $p = 0:3$.

$P(X = 2) = 0.\ 324135$

(ii) $P(X = 3) = 0.\ 18522$:

(iii) We need $P(1 < X <= 5)$

$P(X = 2) + P(X = 3) + P(X = 4) + P(X = 5)$
$= 0.\ 578$

A Math quiz consists of **10 multiple-choice questions**. Each question has **five possible answers**, only one of which is correct. Suppose a student plans to **guess the answer** to each question.

(i) What is the probability that the student gets no answers correct?

(ii) What is the probability that the student gets two answers correct?

Solution:

This is a binomial experiment,

Where:
n=number of trials = 10

“success” of each trial is ``correctly guessing the answer”.

Each answer is independent of the others.

Since each answer is guessed and there are five choices for each question, we have

P(success) = 1/5 = 0.20

So, n=10, and **P(success) = 0.20**

1) What is the probability that the student gets ***no answers*** correct?

We need to find,

P(X=0) = P(0) = 0.1074

Hence the student has 11% chance of getting no answer correct.

2) What is the probability that the student gets ***two answers*** correct?

Here we need to find,

P(X=2) = 0.3020

Hence the student has 30% chance of getting exactly two answers correct using the guessing strategy.

A product-quality researcher runs a study on a particular brand of Memory Chips. The Memory chip have a 1% probability of being defective. What is the probability that at most one chip is defective in a batch of 25 chips?

Solution:

Here it is a binomial distribution,
Given that, 25 chips being checked one-by-one. Each chip either works (success) or not (failure).

x = number of defective chips in a batch of 25.

$P(x > 1) = 1 – P(x <= 1) = 1 – 0.9742 = 2.58\%$