

Assignment 1

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Download all python codes from

<https://github.com/ImNamitaKumari/Probability-and-Random-Variables/blob/main/Assignment1/codes/Assignment1.py>

and latex-tikz codes from

<https://github.com/ImNamitaKumari/Probability-and-Random-Variables/blob/main/Assignment1/Assignment1.tex>

1 PROBLEM

(3.2) An experiment succeeds twice as often as it fails. Find the probability that in the next six trials, there will be at least 4 successes.

2 SOLUTION

Let X be the random variable denoting the number of successes in n trials. X follows a Binomial Distribution. Let p be the probability of success in each trial. Then, $(1 - p)$ is the probability of failure in each trial.

As per question,

$$p = 2(1 - p) \quad (2.0.1)$$

$$\implies p = 2/3 \quad (2.0.2)$$

For a binomial distribution,

$$\Pr(X = k) = {}^nC_k p^k (1 - p)^{n-k} \quad (2.0.3)$$

For the given question, $n = 6$ and $p = 2/3$.

$$\Pr(X \geq 4) = \sum_{i=4}^6 [{}^6C_i p^i (1 - p)^{6-i}] \quad (2.0.4)$$

$$= \frac{240}{729} + \frac{192}{729} + \frac{64}{729} \quad (2.0.5)$$

$$= \frac{496}{729} \quad (2.0.6)$$

Hence, probability of at least 4 successes in the next six trials is $\frac{496}{729} = 0.680384$.