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,

$$p = 2(1-p) \tag{2.0.1}$$

$$\implies p = 2/3 \tag{2.0.2}$$

For a binomial distribution,

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

For the given question,

Variable	n	p
Value	6	2/3

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

$$= \frac{240}{729} + \frac{192}{729} + \frac{64}{729} \tag{2.0.5}$$

$$= \frac{496}{729} \tag{2.0.6}$$

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