

# PROBABILITY

T SIVA PARVATHI - FWC22089

**13.4.5** <sup>1</sup> Find the probability distribution of the number of successes in two tosses of a die, where a success is defined as

- (a) number greater than 4
- (b) six appears on at least one die

**Solution:** Given that a die tossed two times,

Variable	Values	Description
$n$	2	Number of tosses of a die
$X_1$	$\{1,2,3,4,5,6\}$	1st toss outcomes of a die
$X_2$	$\{1,2,3,4,5,6\}$	2st toss outcomes of a die
$p_1$	$\frac{1}{3}$	$\Pr(X > 4)$
$q_1$	$1 - p_1$	$\Pr(X \leq 4)$
$p_2$	$\frac{1}{6}$	$\Pr(X = 6)$
$q_2$	$1 - p_2$	$\Pr(X \neq 6)$

Table 2: Variable Description

Refer 2 for numericals,

- (a) number greater than 4

$X_1$  and  $X_2$  are independent events, so the desired outcome is

$$X = X_1 + X_2 \quad (13.4.1.1)$$

In  $n$  Bernoulli trials with  $k$  success and  $(n - k)$  failures, the probability of  $k$  success in  $n$ -Bernoulli trials can be given as,

$$p_{X_i}(k) = \begin{cases} {}^nC_k p^k q^{n-k} & 0 \leq k \leq n \\ 0 & \text{otherwise} \end{cases} \quad (13.4.1.2)$$

Probability distribution of getting number greater than 4,

$$p_X(k) = {}^nC_k p_1^k q_1^{n-k}, 0 \leq k \leq 2 \quad (13.4.1.3)$$

- (b) six appears on at least one die

$X_1$  and  $X_2$  are independent events, so the desired outcome is

$$X = X_1 + X_2 \quad (13.4.2.4)$$

Probability distribution of getting six on atleast one die is,

$$p_X(k) = {}^nC_k p_2^k q_2^{n-k}, 0 \leq k \leq 2 \quad (13.4.2.5)$$

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<sup>1</sup>Read question numbers as (CHAPTER NUMBER).(EXERCISE NUMBER).(QUESTION NUMBER)

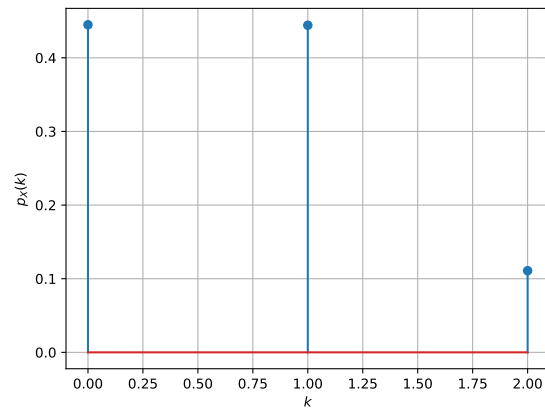


Figure 1: Stem plot for the distribution  $\Pr(X > 4)$

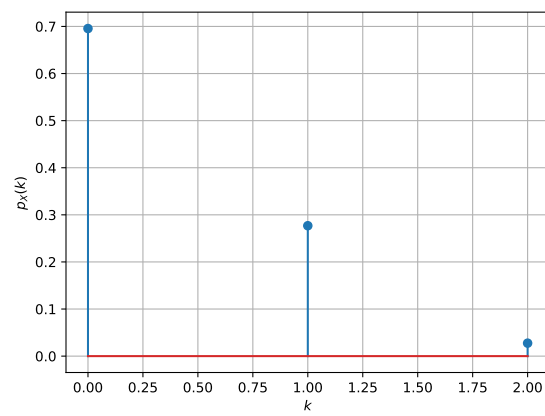


Figure 2: Stem plot for the distribution  $\Pr(X = 6)$