# PROBABILITY

T SIVA PARVATHI - FWC22089

**13.4.5** [1] 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

$$X = X_1 + X_2 \tag{13.4.1.1}$$

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

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

Probability distribution of getting number greater than 4,

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

**(b)** six appears on at least one die

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

$$X = X_1 + X_2 \tag{13.4.2.4}$$

Probability distribution of getting six on atleast one die is,

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

[1] Read question numbers as (CHAPTER NUMBER).(EXERCISE NUMBER).(QUESTION NUMBER)

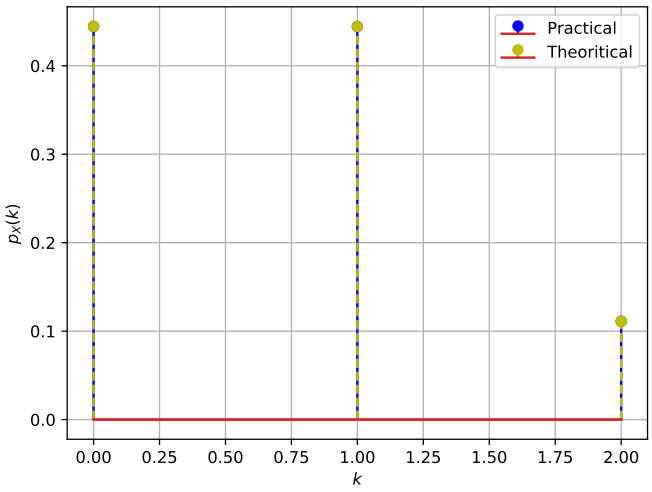


Figure 1: Stem plot for the distribution $\Pr(X > 4)$

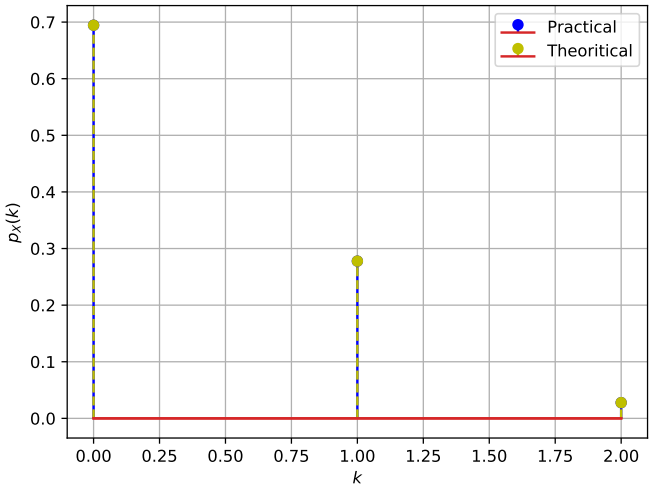


Figure 2: Stem plot for the distribution $\Pr(X = 6)$