NCERT 10.3.3.3.6

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Question:
A die has two faces each with number 1 and three faces with number 2 and one face with number 3. Find P(1 or 3)
Theoretical solution:

$$\text{Total outcomes} = 6.$$

$$\text{Favorable outcomes} = 2 + 1 = 3.$$

$$P(1 \text{ or } 3) = \frac{\text{Favorable outcomes}}{\text{Total outcomes}} = \frac{3}{6} = \frac{1}{2}.$$

Computational solution:
The PMF for the die is:

$$P(X = k) = \begin{cases} \frac{2}{6}, & k = 1 \\ \frac{3}{6}, & k = 2 \\ \frac{1}{6}, & k = 3 \\ 0, & \text{otherwise} \end{cases}$$

The cumulative distribution function (CDF) of the given die is:

$$F(k) = \begin{cases} 0, & k < 1 \\ \frac{2}{6}, & 1 \le k < 2 \\ \frac{5}{6}, & 2 \le k < 3 \\ 1, & k \ge 3 \end{cases}$$

Conclusion

Probability for the face 1 or 3 to occur is:
As both the events are disjoint

$$P(X = 1 \text{ or } X = 3) = P(X = 1) + P(X = 3) = \frac{2}{6} + \frac{1}{6} = \frac{1}{2}$$

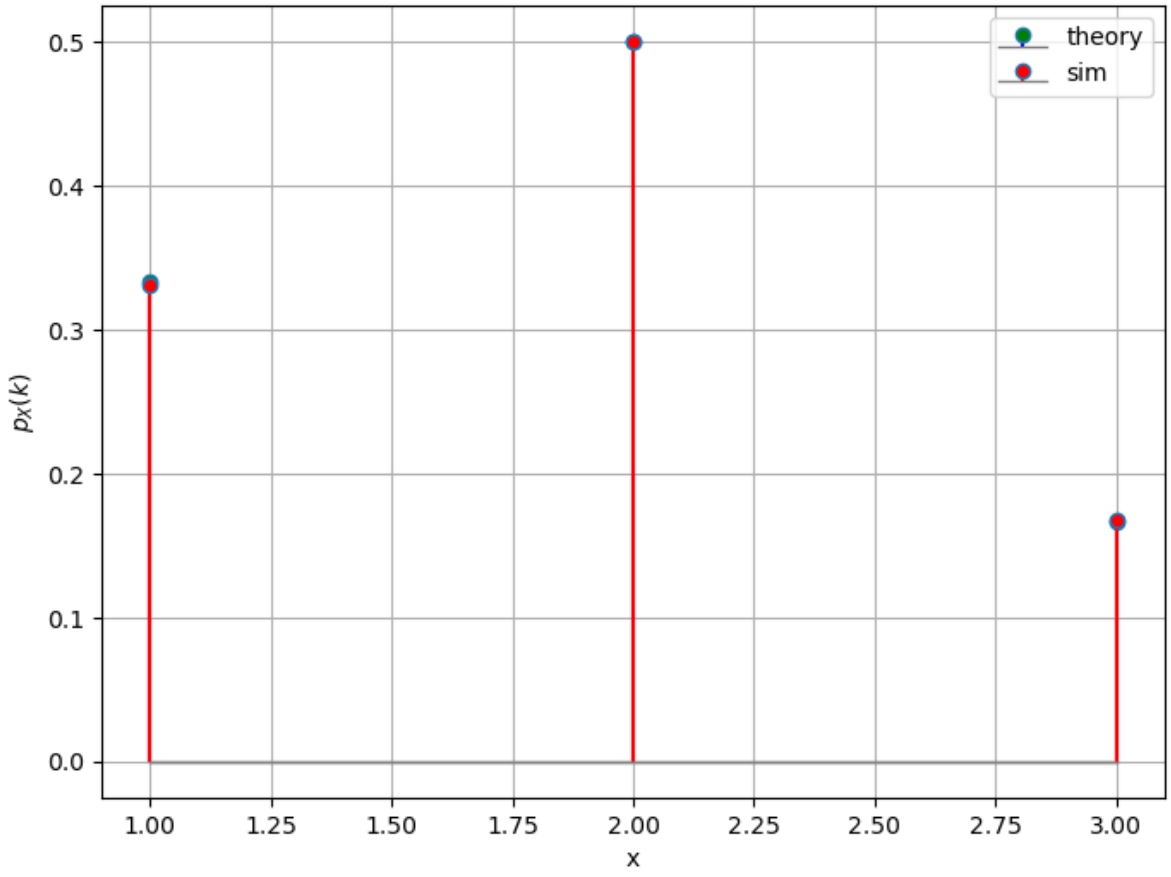

Fig. 1. PMF plot

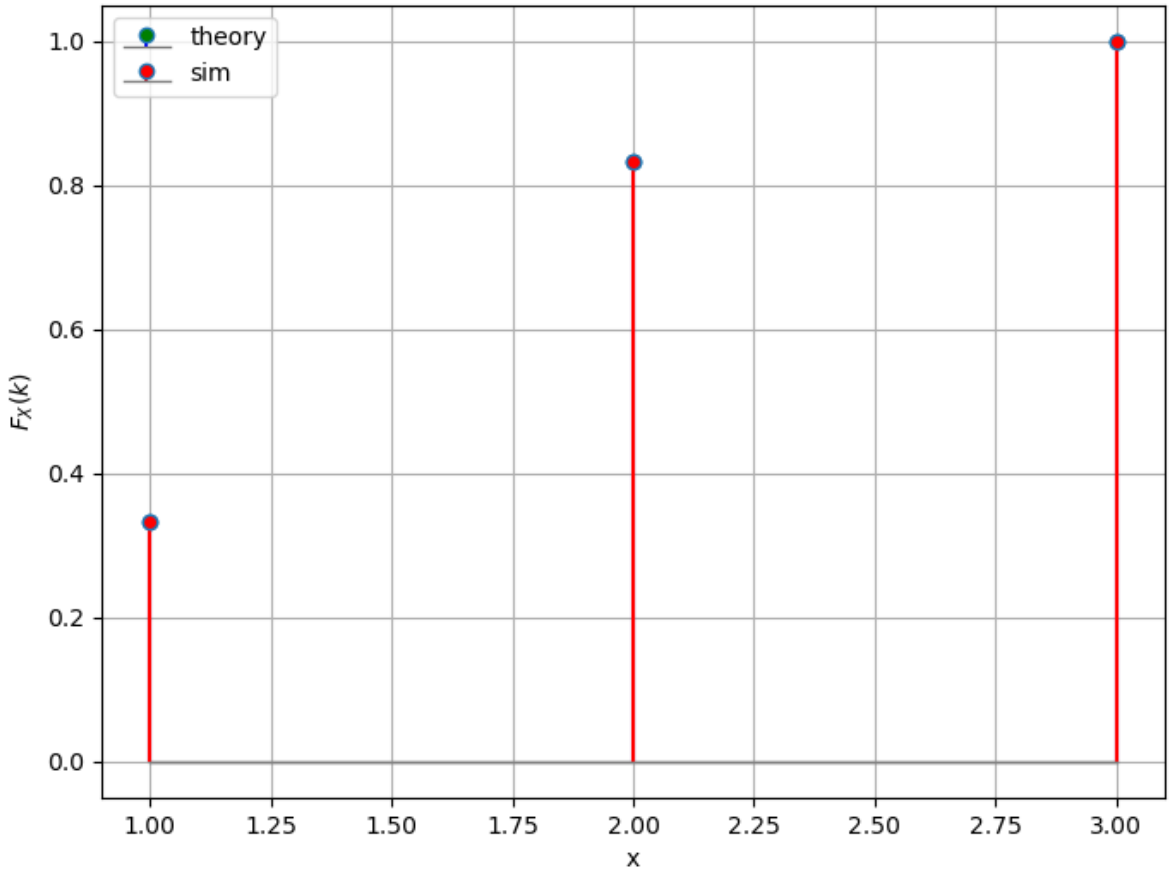

Fig. 2. CDF plot