Statistical Methods for Computer Science

Assignment 4 — STU33009

1. (a) The sum of the two dice rolls must be to 2, which can only happen if both roll a 1. Therefore the event is (1,1).

   (b) The two dice rolls must add to 3. Therefore the event is {(1,2),(2,1)}.

   (c) The dice rolls must sum to 4. Therefore the event is {(1,3),(2,2),(3,1)}

   (d) The total number of possible combinations is $6^2 = 36$. The given event consists of 3 possible outcomes. Therefore the probability is $\frac{3}{36} = \frac{1}{12} = 0.08333333333$

2. (a) The possible values of X are {3,1,-1,3}

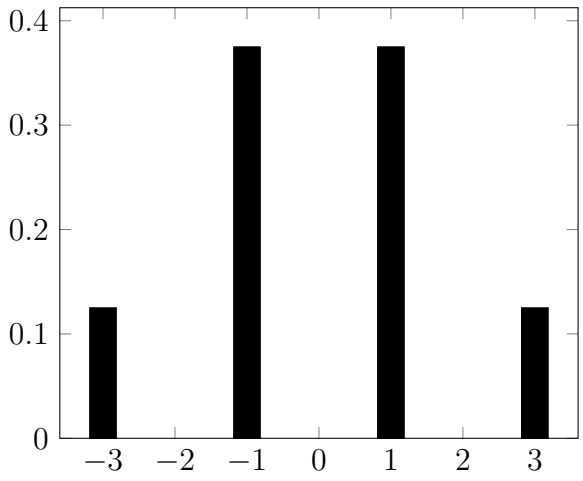
   (b) The total number of outcomes possible is $2^3 = 8$. Therefore,

$$P(X = -3) = \frac{1}{8} = 0.125$$

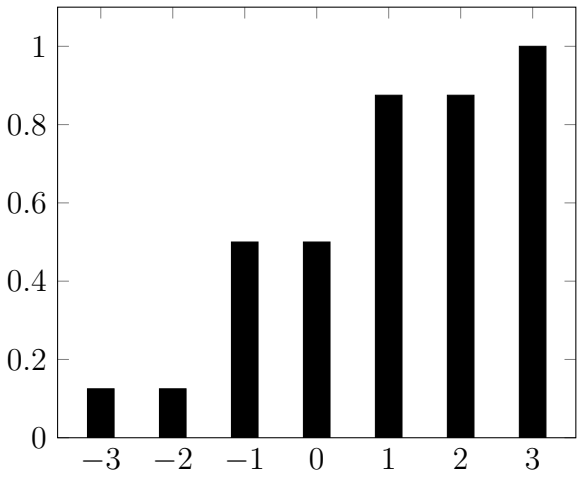
   (c) In order to get $X = -1$, there must be one head within the combination. This head can be the outcome of any one of the three flips,

$$P(X = -1) = \binom{3}{1} \cdot \frac{1}{8} = \frac{3}{8} = 0.375$$

   (d) The following are the PMF and the CDF of X



(a) PMF



(b) CDF

3. (a) In any given roll, the outcome can only be greater than or equal to one. Therefore,

$$P(X \geq 1) = 1$$

(b) In order for the minimum to be 2 or more, not a single dice can roll a 1. Hence, for each dice we are only left with 5 outcomes out of 6,

$$P(X \geq 2) = \frac{5}{6} \cdot \frac{5}{6} \cdot \frac{5}{6} \cdot \frac{5}{6} = \left(\frac{5}{6}\right)^4 = 0.4822530864$$

(c) $P(X \leq k)$ for all values of k,

$$P(X \leq 1) = 1 - P(X \geq 2) = 1 - \left(\frac{5}{6}\right)^4 = 0.5177469136$$

$$P(X \leq 2) = 1 - \left(\frac{4}{6}\right)^4 = 0.8024691358$$

$$P(X \leq 3) = 1 - \left(\frac{3}{6}\right)^4 = 0.9375$$

$$P(X \leq 4) = 1 - \left(\frac{2}{6}\right)^4 = 0.987654321$$

$$P(X \leq 5) = 1 - \left(\frac{1}{6}\right)^4 = 0.9992283951$$

$$P(X \leq 6) = 1$$

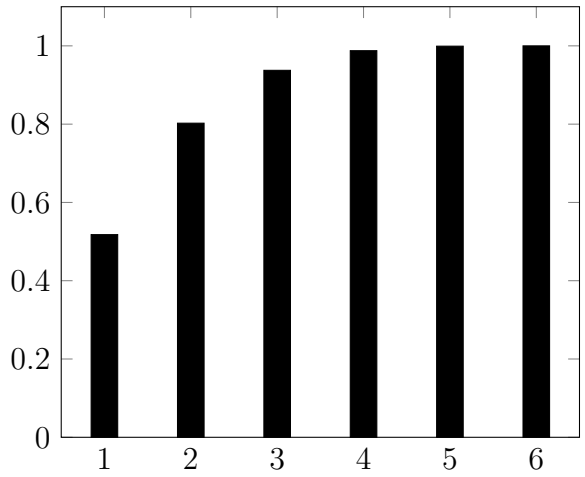


Figure 2: CDF