Assignment 2

**AI1110**: Probability and Random Variables
Indian Institute of Techonology, Hyderabad

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10.15.1.12 A game of chance consists of spinning an arrow which comes to rest pointing at one of the numbers 1, 2, 3, 4, 5, 6, 7, 8 (see Fig. 15.5), and these are equally likely outcomes. What is the probability that it will point at:

(i) 8?
(ii) an odd number?
(iii) a number greater than 2?
(iv) a number less than 9?
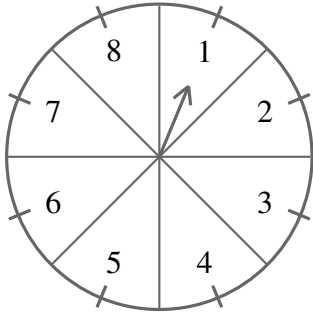
Solution: Let X be a random variable defined as the value given by the pointer. The distribution is unform since all the outcomes are equally likely. Probability of the pointer pointing a number is;

$$p = \frac{1}{8} \qquad (1)$$

$$n = 8 \qquad (2)$$

Let $F_X(i)$ be the Cumulative distribution function(CDF) such that;

$$F_X(i) = \sum_0^i {}^nC_i \times p^i \times (1-p)^{(n-i)} \qquad (3)$$

(i) For i = 8, required probability is equivalent to;

$$\Pr(X = 8) = F_X(8) - F_X(7) \qquad (4)$$

$$= \frac{1}{8} \qquad (5)$$

$$= 0.125 \qquad (6)$$

(ii) For i being odd, required probability is equivalent to;

$$\Pr(X = \{1, 3, 5, 7\})$$
$$= F_X(7) - F_X(6) + F_X(5) - F_X(4)$$
$$+ F_X(3) - F_X(2) + F_X(1) - F_X(0)$$

$$= \frac{4}{8} \qquad (7)$$

(iii) For i greater than 2, required probability is equivalent to;

$$\Pr(2 < X \le 8) = F_X(8) - F_X(2) \qquad (8)$$

$$= \frac{6}{8} \qquad (9)$$

$$= 0.75 \qquad (10)$$

(iv) For i less than 9, required probability is equivalent to;

$$\Pr(1 \le X < 9) = F_X(8) - F_X(0) \qquad (11)$$

$$= \frac{8}{8} \qquad (12)$$

$$= 1 \qquad (13)$$

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