Probability Assignment 3

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1 Problem statement

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. 4), and these are equally likely outcomes. What is the probability that it will point at:

1) 8?
2) an odd number?
3) a number greater than 2?
4) a number less than 9?

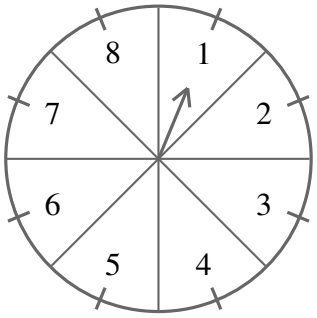

Fig. 4. Spinner

2 Answer

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.

$$\therefore \Pr(X = k) = \frac{1}{8} \tag{1}$$

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

$$F_X(k) = P(X \le k) \tag{2}$$

$$= \begin{cases} 0, & k \le 0 \\ \frac{k}{8} & 1 \le k \le 8 \\ 1, & k \ge 9 \end{cases} \tag{3}$$

1) For k = 8, required probability is equivalent to;

$$\Pr(X = 8) = \frac{1}{8} \tag{4}$$

$$= 0.125 \tag{5}$$

2) For k being odd:

$$\Pr(X = \{1, 3, 5, 7\}) = \frac{4}{8} \tag{6}$$

$$= 0.5 \tag{7}$$

3) For k greater than 2:

$$\Pr(X > 2) = 1 - \Pr(X \le 2) \tag{8}$$

$$= 1 - (F_X(2) - F_X(0)) \tag{9}$$

$$= \frac{6}{8} = 0.75 \tag{10}$$

4) For k less than 9:

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

$$= \frac{8}{8} = 1 \tag{12}$$