Question 10.13.2.6
Probability and Random Processes

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Question 10.13.2.6:
A game consists of spinning an arrow which comes to rest pointing at one of the regions (1, 2 or 3) (Fig. 13.1). Are the outcomes 1, 2 and 3 equally likely to occur? Give reasons.

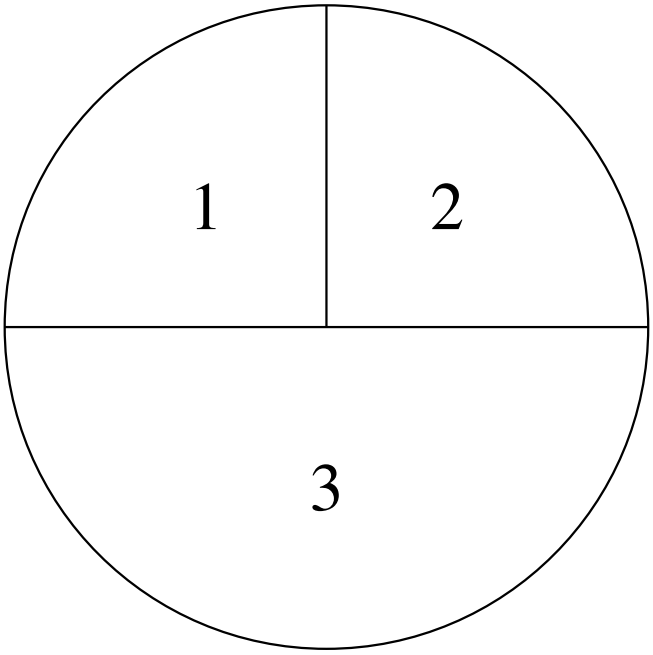

Fig. 0. Fig.13.1

Solution:
Define a random variable X such that,
$X = k$ denote the event of arrow resting in region k

$p_X(k)$ = Probability of the arrow to rest in region k

$$p_X(k) = \frac{\text{Angle covered by region k}}{\text{Total angle}} \tag{1}$$

$$\therefore p_X(1) = \frac{90^\circ}{360^\circ} = \frac{1}{4} \tag{2}$$

$$= 0.25 \tag{3}$$

$$p_X(2) = \frac{90^\circ}{360^\circ} = \frac{1}{4} \tag{4}$$

$$= 0.25 \tag{5}$$

$$p_X(3) = \frac{180^\circ}{360^\circ} = \frac{1}{2} \tag{6}$$

$$= 0.5 \tag{7}$$

$$\therefore p_X(k) = \begin{cases} 0.25 & ,k = 1 \\ 0.25 & ,k = 2 \\ 0.5 & ,k = 3 \end{cases} \tag{8}$$

$p_X(k)$ are not equal for all k. Therefore, the events are not equally likely.