Question:A student says that if you throw a die, it will show up 1 or not 1. Therefore, the probability of getting 1 and the probability of getting 'not 1' each is equal to $\frac{1}{2}$. Is this correct? Give reasons.

Solution:

Given,

A die is thrown

Total number of outcomes $= 6$

Hence, Probability of getting any number be $p_X(X = i) = \frac{1}{6}$

Then, by using pmf

$$p_X(2 \leq X \leq 6) = \sum_{i=2}^{6} p_X(X = i) \tag{1}$$

$$p_X(X = 1) = 1 - p_X(2 \leq X \leq 6) \tag{2}$$

$$= 1 - \sum_{i=2}^{6} p_X(X = i) \tag{3}$$

$$= 1 - p_X(X = 2) + p_X(X = 3) + p_X(X = 4) + p_X(X = 5) + p_X(X = 6) \tag{4}$$

$$= 1 - \frac{5}{6} \tag{5}$$

$$= \frac{1}{6} \tag{6}$$

$$\implies \Pr(2 \leq X \leq 6) \neq \Pr(X = 1) 7 \tag{7}$$

Since, $\Pr(X = 1)$ and $\Pr(2 \leq X \leq 6)$ are not equal.

$\therefore$ The given statement is not true