Bonus Question

AI1110: Probability and Random Variables

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Question:
Let X represent the difference between the number of heads and the number of tails obtained when a coin is tossed 6 times.What are possible values of X?

Solution:
Let A be a random variable which represents the number of Heads obtained in 6 coin tosses.
And B be a random variable which represents the number of Tails obtained in 6 coin tosses.
Then,
$A \in \{0, 1, 2, 3, 4, 5, 6\}$
Similarly,
$B \in \{0, 1, 2, 3, 4, 5, 6\}$

$$A + B = 6 \tag{1}$$

$$X = |A - B| \tag{2}$$

from eq(1)

$$X = |A - (6 - A)| \tag{3}$$

$$X = |2A - 6| \tag{4}$$

$$X = \begin{cases} 6 & A \in \{0, 6\} \\ 4 & A \in \{1, 5\} \\ 2 & A \in \{2, 4\} \\ 0 & A \in \{3\} \end{cases} \tag{5}$$

Hence, The possible values of X are {0,2,4,6}