Solution to 12.13.4.3

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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 the possible values of X?

Solution:

It is given that the coin is tossed 6 times.

$$X = |\text{number of heads} - \text{number of tails}| \tag{1}$$

1) when 6 heads came,

$$X(6\text{H}, 0\text{T}) = |6 - 0| \tag{2}$$
$$= 6 \tag{3}$$

2) when 5 heads and 1 tail came,

$$X(5\text{H}, 1\text{T}) = |5 - 1| \tag{4}$$
$$= 4 \tag{5}$$

3) when 4 heads and 2 tails came,

$$X(4\text{H}, 2\text{T}) = |4 - 2| \tag{6}$$
$$= 2 \tag{7}$$

4) when 3 heads and 3 tails came,

$$X(3\text{H}, 3\text{T}) = |3 - 3| \tag{8}$$
$$= 0 \tag{9}$$

5) when 2 heads and 4 tails came,

$$X(2\text{H}, 4\text{T}) = |2 - 4| \tag{10}$$
$$= 2 \tag{11}$$

6) when 1 head and 5 tails came,

$$X(1\text{H}, 5\text{T}) = |1 - 5| \tag{12}$$
$$= 4 \tag{13}$$

7) when 6 tails came,

$$X(0\text{H}, 6\text{T}) = |0 - 6| \tag{14}$$
$$= 6 \tag{15}$$

Therefore, X is a random variable which can take the values 0, 2, 4 or 6