Assignment: Probability

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13.4.3 [1]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:

Variable	Value	Description
n	6	Number of trails
p_1	$\frac{1}{2}$	Probability of getting a head
q_1	$1 - p_1$	Probability of not getting a head
p_2	$\frac{1}{2}$	Probability of getting a tail
q_2	$1 - p_2$	Probability of not getting a tail
X_1	$\{0, 1, 2, 3, 4, 5, 6\}$	No.of heads in 6 tosses of a coin
X_2	$\{0, 1, 2, 3, 4, 5, 6\}$	No.of tails in 6 tosses of a coin

Table 13.4.3.2: Variable description.

(a) Number of heads in 6 tosses of a coin.

$$p_{X_1}(k) = \left\{ {}^nC_k p_1{}^k q_1{}^{n-k} \quad 0 \le k \le 6 \right. \tag{13.4.1.1}$$

(b) Number of tails in 6 tosses of a coin.

$$p_{X_2}(k) = \left\{ {}^nC_k p_2{}^k q_2{}^{n-k} \quad 0 \le k \le 6 \right. \tag{13.4.2.2}$$

Thus, the desired outcome is

$$X = X_1 - X_2 \tag{13.4.2.3}$$

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[1]Read question numbers as (CHAPTER NUMBER).(EXERCISE NUMBER).(QUESTION NUMBER)

$$X(6H, 0T) = |6 - 0| = 6 \qquad (13.4.2.4)$$
$$X(5H, 1T) = |5 - 1| = 4 \qquad (13.4.2.5)$$
$$X(4H, 2T) = |4 - 2| = 2 \qquad (13.4.2.6)$$
$$X(3H, 3H) = |3 - 3| = 0 \qquad (13.4.2.7)$$
$$X(2H, 4T) = |2 - 4| = 2 \qquad (13.4.2.8)$$
$$X(1H, 5T) = |1 - 5| = 4 \qquad (13.4.2.9)$$
$$X(0H, 6T) = |0 - 6| = 6 \qquad (13.4.2.10)$$

Thus, the possible values of X are 0,2,4 and 6.