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	$\frac{1}{2}$	Probability of getting a head
q	1-p	Probability of not getting a head
X	$\{0,1,2,3,4,5,6\}$	Number of heads in 6 tosses of a coin

Table 13.4.3.2: Variable description.

(a) Number of heads in 6 tosses of a coin.
By using Binomial distribution

$$\Pr(X) = {}^{n}C_{X} p^{X} q^{n-X} \tag{13.4.1.1}$$

X	0	1	2	3	4	5	6
$\Pr(X)$	$\frac{1}{64}$	$\frac{6}{64}$	$\frac{15}{64}$	$\frac{20}{64}$	$\frac{15}{64}$	$\frac{6}{64}$	$\frac{1}{64}$

Table 13.4.1.4: Probability distribution of X.

$\implies$ A coin is tossed 6 times and X represents the difference between the number of heads and the number of tails.Y $= \{0,1\}$ represents the head and tail.

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

Random Variable	**Outcome**
Y = 0	Head
Y = 1	Tail

Table 13.4.1.6: Outcomes of Random Variable.

$$X(60,01) = |6-0| = 6 \tag{13.4.1.2}$$
$$X(50,11) = |5-1| = 4 \tag{13.4.1.3}$$
$$X(40,21) = |4-2| = 2 \tag{13.4.1.4}$$
$$X(30,31) = |3-3| = 0 \tag{13.4.1.5}$$
$$X(20,41) = |2-4| = 2 \tag{13.4.1.6}$$
$$X(10,51) = |1-5| = 4 \tag{13.4.1.7}$$
$$X(00,61) = |0-6| = 6 \tag{13.4.1.8}$$

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