

Assignment

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Question 12.13.3.52

A bag contains $(2n + 1)$ coins. It is known that n of these coins have a head on both sides where as the rest of the coins are fair. A coin is picked up at random from the bag and is tossed. If the probability that the toss results in a head is $\frac{31}{42}$, determine the value of n .

Solution:

RV	Values	Description
X	0	Getting unfair coin
	1	Getting fair coin
Y	0	Getting Head
	1	Getting Tail

TABLE I
RANDOM VARIABLE DECLARATION.

PMF is

$$p_X(k) = \begin{cases} \frac{n}{2n+1} & k = 0 \\ \frac{n+1}{2n+1} & k = 1 \end{cases} \quad (1)$$

Conditional probability,

$$\Pr(Y = 0|X = 0) = 1 \quad (2)$$

$$\Pr(Y = 0|X = 1) = \frac{1}{2} \quad (3)$$

Given that,

$$p_Y(0) = p_X(0) \Pr(Y = 0|X = 0) + p_X(1) \Pr(Y = 0|X = 1) \quad (4)$$

$$\frac{31}{42} = \frac{n}{2n+1} + \frac{1}{2} \times \frac{n+1}{2n+1} \quad (5)$$

$$\Rightarrow n = 10 \quad (6)$$