

Chapter 13 Probability

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Q10.13.3.38: In a game, the entry fee is Rs 5. The game consists of a tossing a coin 3 times. If one or two heads show, Sweta gets her entry fee back. If she throws 3 heads, she receives double the entry fees. Otherwise she will lose. For tossing a coin three times, find the probability that she

- 1) loses the entry fee.
- 2) gets double entry fee.
- 3) just gets her entry fee.

Solution: Let, X_i be the random variable that represent the a single toss resulting in head and Y be the random variable that represent the total tosses.

Parameter	value	description
X_i	1	first toss
	2	second toss
	3	third toss
n	3	number of tosses
p,q	$\frac{1}{2}$	toss result in heads/tails
Y	$\sum_{i=0}^3 X_i$	three tosses

TABLE 3

The pmf of Y is,

$$\Pr(Y = k) = {}^nC_k (p)^k (q)^{n-k}, \quad 1 \leq k \leq n \quad (1)$$

From above equations (1) we can say, Probability that she loss the fees (0 heads),

$$p_Y(0) = {}^3C_0 \left(\frac{1}{2}\right)^0 \left(\frac{1}{2}\right)^{3-0} \quad (2)$$

$$= \frac{1}{8} \quad (3)$$

$$= 0.125 \quad (4)$$

Probability that she gets double entry fees(3 heads),

$$p_Y(3) = {}^3C_3 \left(\frac{1}{2}\right)^3 \left(\frac{1}{2}\right)^{3-3} \quad (5)$$

$$= \frac{1}{8} \quad (6)$$

$$= 0.125 \quad (7)$$

Probability that she just gets the entry fees(1 heads + 2 heads),

$$p_Y(1) + p_Y(2) = {}^3C_1 \left(\frac{1}{2}\right)^1 \left(\frac{1}{2}\right)^{3-1} + {}^3C_2 \left(\frac{1}{2}\right)^2 \left(\frac{1}{2}\right)^{3-2} \quad (8)$$

$$= \frac{3}{8} + \frac{3}{8} \quad (9)$$

$$= 0.750 \quad (10)$$