

NCERT Assignment

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In a family having three children, there may be no girl, one girl, two girls, or three girls. So the probability of each is $1/4$. Is this correct? Justify your answer.

Solution:

NO, it is not correct.

| Parameter | Values | Description |
|-----------|-----------------------|---------------------------|
| n | 3 | Number of children |
| k | 0,1,2,3 | Number of girls |
| p | 0.5 | Probability of girl |
| X | 1 if girl 0 if boy | Bernoulli Random Variable |
| Y | $\sum_{i=1}^n X_i$ | Binomial Random Variable |

TABLE 1: Definition of X and parameters.

The cdf of Y is given by

$$F_Y(n) = \Pr(Y \leq n) \quad (1)$$

$$= \sum_{k=0}^n {}^3C_k p^k (1-p)^{3-k} \quad (2)$$

1)

$$F_Y(0) = \Pr(Y \leq 0) \quad (3)$$

$$= \sum_{k=0}^0 {}^3C_k (0.5)^k (0.5)^{3-k} \quad (4)$$

$$= 0.125 \quad (5)$$

$$(6)$$

2)

$$F_Y(1) = \Pr(Y \leq 1) \quad (7)$$

$$= \sum_{k=0}^1 {}^3C_k (0.5)^k (0.5)^{3-k} \quad (8)$$

$$= 0.375 \quad (9)$$

$$(10)$$

3)

$$F_Y(2) = \Pr(Y \leq 2) \quad (11)$$

$$= \sum_{k=0}^2 {}^3C_k (0.5)^k (0.5)^{3-k} \quad (12)$$

$$= 0.375 \quad (13)$$

$$(14)$$

4)

$$F_Y(3) = \Pr(Y \leq 3) \quad (15)$$

$$= \sum_{k=0}^3 {}^3C_k (0.5)^k (0.5)^{3-k} \quad (16)$$

$$= 0.125 \quad (17)$$

\therefore Hence Proved that the probability is not $1/4$ for each of them.