Assignment

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Question: Assume that in a family, each child is equally likely to be a boy or a girl. A family with three children is chosen at random. The probability that the eldest child is a girl given that the family has at least one girl is

1) $\frac{1}{2}$
2) $\frac{1}{3}$
3) $\frac{2}{3}$
4) $\frac{4}{7}$

Solution:

we know,

RV	Value	Description
X	0	eldest one is girl
	1	middle one is girl
	2	youngest one is girl
Y	0	atleat one girl
	1	all three boys

TABLE 4
RV DESCRIPTION TABLE

$$\Pr(Y=1) = \frac{1}{8} \tag{1}$$

$$\Pr(Y=0) = 1 - \Pr(Y=1) \tag{2}$$

$$= \frac{7}{8} \tag{3}$$

$$\Pr(X=0) = \frac{1}{2} \tag{4}$$

so the required probability is,

$$\Pr(X=0 \mid Y=0) = \frac{\Pr(X=0)}{\Pr(Y=0)} \tag{5}$$

$$= \frac{4}{7} \tag{6}$$

Therefore, the probability that the eldest child is a girl given that the family has atleast one girl is $\frac{4}{7}$