

# PROBABILITY

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13.1.6 <sup>1</sup> A coin is tossed three times where

(i) E:head on third toss, F:head on first two tosses

(ii)E:atleast two heads,F:atmost two heads

(iii)E:atmost two tails,F:atleast one tail

determine  $P(E | F)$

**Solution:** : In an experiment of tossing a coin 3 times, random variable  $X \in \{0, 1, 2, 3\}$  follows binomial distribution.

By using the binomial distribution formula :

$$\Pr(X=k)={}^nC_k \times p^k \times (1-p)^{n-k}$$

Random Variable	Values	Description
X	{0,1,2,3}	Number of heads or tails in a respective cases

Table 13.1.6.2: Random variable  $X$

Variable	Description
k	total number of success
p	probability of success of individual trial
n	number of trials =3

Table 13.1.6.4: variable and Description

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<sup>1</sup>Read question numbers as (CHAPTER NUMBER).(EXERCISE NUMBER).(QUESTION NUMBER)

Pr(Event)	Values
Pr(F)	Using product rule
	$\frac{1}{2} \times \frac{1}{2}$
	0.25
Pr(EF)	Using product rule
	$\frac{1}{2} \times \frac{1}{2} \times \frac{1}{2}$
	0.125
Pr(E F)	$\frac{Pr(EF)}{Pr(F)}$
	0.5

Table 13.1.6.6: E:head on third toss, F:head on first two tosses

Pr(Event)	Expression	Value
Pr(F)	$\Pr(X=0) + \Pr(X=1) + \Pr(X=2)$	
Pr(F)	${}^3C_0(\frac{1}{2})^3 + {}^3C_1(\frac{1}{2})^3 + {}^3C_2(\frac{1}{2})^3$	0.875
Pr(EF)	$\Pr(X=2)$	
Pr(EF)	${}^3C_2(\frac{1}{2})^3$	0.375
Pr(E F)	$\frac{Pr(EF)}{Pr(F)}$	0.428

Table 13.1.6.8: E:atleast two heads,F:atmost two heads

Pr(Event)	Expression	Value
Pr(F)	$\Pr(X \geq 1)$	
Pr(F)	$1 - \Pr(X=0)$	0.875
Pr(EF)	$\Pr(X=2) + \Pr(X=1)$	
Pr(EF)	${}^3C_1(\frac{1}{2})^3 + {}^3C_2(\frac{1}{2})^3$	0.75
Pr(E F)	$\frac{Pr(EF)}{Pr(F)}$	0.857

Table 13.1.6.10: E:atmost two tails,F:atleast one tail