

Probability # $P\left(\frac{E}{F}\right) = \frac{P(E \cap F)}{P(F)} = \frac{1/4}{2/4}$

① Conditional prob. →

$E \cap F = \{GB\} \rightarrow n(E \cap F) = 1$

$P(E/F) = 1/2$



Ex:- 2 Child → { GG, BB, GB, GB } → Event → given

occurs

1 Boy in family.

Sample space

already occurs

E
F

When first child is girl.

→ { GB, GB } → $n(E) = 2$
→ { GG, GB } → $n(F) = 2$

$$\# \textcircled{1} \quad P(E/F) = \frac{P(E \cap F)}{P(F)}$$

$$\textcircled{2} \quad P(F/E) = \frac{P(F \cap E) / P(E \cap F)}{P(E)}$$

$$\textcircled{3} \quad P(E \cap F) = P(\bar{E}) + P(F) - P(E \cup F)$$

Q. Given that E & F are events such that
 $\underline{P(E) = 0.6}$, $\underline{P(F) = 0.3}$, $\underline{P(E \cap F) = 0.2}$

Find $\underline{P(E|F)}$ & $\underline{P(F|E)}$.

Solⁿ $P(E|F) = \frac{P(E \cap F)}{P(F)} = \frac{0.2}{0.3} = \frac{2}{3}$ ✓

$P(F|E) = \frac{0.2}{0.6} = \frac{1}{3}$ ✓

Qus $\underline{P(A \cup B)}$, if $\underline{2P(A) = P(B) = \frac{5}{13}}$ &

$\underline{P(A|B) = \frac{2}{5}}$

Solⁿ $\therefore P(A|B) = \frac{2}{5}$
 $\frac{P(A \cap B)}{P(B)} = \frac{2}{5}$

$P(A \cap B) = \frac{2}{5} \times P(B)$

$P(A \cap B) = \frac{2}{5} \times \frac{5}{13} = \frac{2}{13}$

$P(A \cup B) = P(A) + P(B) - P(A \cap B)$
 $= \frac{5}{26} + \frac{5}{13} - \frac{2}{13}$

$\frac{11}{26}$

$\frac{5 + 10 - 4}{26}$

Q. A coin is tossed 3 times where [find $P(E/F) = ?$]

(i) $E \rightarrow$ Head on third Toss, $F \rightarrow$ Head on first two tosses

Solⁿ:- When coin is tossed 3 times:-

$$S = \Omega = \{ \underline{HHH}, \underline{HHT}, HTH, THH, HTT, THT, TTH, TTT \}$$

$$E \rightarrow \{ HHH, HTH, THH, TTH \} \Rightarrow P(E) = 4/8$$

$$F \rightarrow \{ HHH, HHT \} \Rightarrow P(F) = 2/8$$

$$E \cap F = \{ HHH \} \Rightarrow P(E \cap F) = 1/8$$

$$\text{So :- } P(E/F) = \frac{P(E \cap F)}{P(F)} = \frac{1/8}{2/8} = \frac{1}{2} \quad \text{Q.E.D.}$$

Q. Two coin are tossed.

ii) $E \rightarrow$ not tail appears, $F \rightarrow$ no head appears.

Solⁿ.

$$\Rightarrow S = 2 \times 2 = 4 = \{ HH, TT, TH, HT \}$$

$$E \rightarrow \{ HH \} \rightarrow P(E) = \frac{1}{4}$$

$$F \rightarrow \{ TT \} \rightarrow P(F) = \frac{1}{4}$$

$$E \cap F = \{ \phi \} \rightarrow P(E \cap F) = 0$$

$$P(E|F) = \frac{0}{\frac{1}{4}} = 0 \quad \checkmark$$

Ans:- A Die is thrown 3 times: $\{E \cap F\} = \{6, 5, 4\} \rightarrow P(E \cap F) = \frac{1}{216}$

$E \rightarrow$ 4 appears on the third toss | $F \rightarrow$ 6 & 5 appears respectively on 1st two Tosses.

Solⁿ:- $S = 6 \times 6 \times 6 = 216$

$\frac{1/216}{1/36} = \frac{1}{6}$

$E \rightarrow$ $\left\{ \begin{array}{l} (1, 1, 4) \quad (1, 2, 4) \quad \text{---} \quad \text{---} \quad \text{---} \quad (1, 6, 4) \\ (2, 1, 4) \quad (2, 2, 4) \quad \text{---} \quad \text{---} \quad \text{---} \quad (2, 6, 4) \\ (3, 1, 4) \quad (3, 2, 4) \quad \text{---} \quad \text{---} \quad \text{---} \quad (3, 6, 4) \\ (4, 1, 4) \quad (4, 2, 4) \quad \text{---} \quad \text{---} \quad \text{---} \quad (4, 6, 4) \\ (5, 1, 4) \quad (5, 2, 4) \quad \text{---} \quad \text{---} \quad \text{---} \quad (5, 6, 4) \\ (6, 1, 4) \quad (6, 2, 4) \quad \text{---} \quad \text{---} \quad \text{---} \quad (6, 6, 4) \end{array} \right\}$

$F \rightarrow \left\{ (6, 5, 1) \quad (6, 5, 2) \quad (6, 5, 3) \quad (6, 5, 4) \quad (6, 5, 5) \quad (6, 5, 6) \right\}$

$P(F) = \frac{6}{216} = \frac{1}{36}$

Q. A black & Red Dice are rolled.

a) Find \rightarrow Condi. Prob. of obtaining a sum greater than 9, given that The black die resulted in a 5.

Sol^m: $S = 6 \times 6 = 36$
Let $E \rightarrow$ Sum of Dice greater than 9.

$$E = \left\{ \overset{B}{\textcircled{5}}, \overset{R}{\textcircled{5}} \right\} \left\{ \overset{B}{\textcircled{5}}, \overset{R}{\textcircled{6}} \right\} \{ 6, 5 \} \{ 6, 6 \} \{ 6, 4 \} \{ 4, 6 \}$$

$$P(E) = \frac{6}{36} = \frac{1}{6}$$

$$F = \left\{ \textcircled{5, 1} \right\} \left\{ \textcircled{5, 2} \right\} \left\{ \textcircled{5, 3} \right\} \left\{ \textcircled{5, 4} \right\} \left\{ \textcircled{5, 5} \right\} \left\{ \textcircled{5, 6} \right\}$$

$$P(F) = \frac{6}{36} = \frac{1}{6}$$

$$(E \cap F) = \left\{ \textcircled{5, 5} \right\} \left\{ \textcircled{5, 6} \right\}$$

Q. Assume that each born child is equally likely to be a boy or a girl. If a family has two children, what is the conditional prob. that both are girls given that

- (i) the youngest is girl (ii) at least one is a girl.

$$E = \{G, G\}$$

(i) $F = \{ \underbrace{(B, G)}, \underbrace{(G, G)} \}$

$F = \{ (B, G), (G, G), (G, B) \}$

Q. Given that the 2 no. appearing on throwing 2 dice are different. Find the proba. of event 'the sum of no. on the dice is 4'

Solⁿ

2 Dice \rightarrow 36

$E \rightarrow \{ (1,3) (3,1) (2,2) \}$

$F = \{$
 $(1,2) (1,3) (1,4) (1,5) (1,6)$
 $(2,1) (2,3) (2,4) (2,5) (2,6)$
 $(3,1) (3,2) (3,4) (3,6)$
 $(4,1)$
 $(5,1)$
 $(6,1) (6,2) \quad \text{---} \quad \text{---} \quad (6,5) \}$