Conditional Probability

lass 12 Maths

Conditional Probability

F has already occurred

$$P(E|F) = \frac{P(E \cap F)}{P(F)}; P(F) \neq 0.$$

E, F Two events

Same sample space S of a random expt.

Props

① $P(S|F) = 1$

$P(S|E) = 1$

$P(E|E) = 1$

$P(F|F) = 1$

② $P[(A \cup B)|F] = P(A|F) + P(B|F) - P[(A \cap B)|F]$

A, B, F Events

$P(S) \neq 0$

③ $P(E'|F) = 1 - P(E|F)$

A card is drawn in favour of a well shuffled pack of 52 cards at random. Find the probability of getting an ace when it is given that card drawn was black card.

n E to get an Ace (4)

n F to get black (26)

$n(S) = 52$

$P(E) = \frac{n(E)}{n(S)}$

$P(E) = \frac{4}{52}$; $P(F) = \frac{26}{52}$

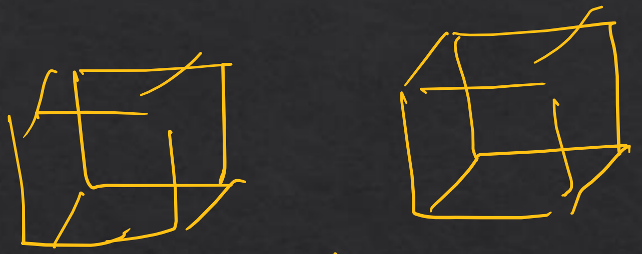
$n(E \cap F) = 2$

$P(E \cap F) = \frac{2}{52}$

$P(E|F) = \frac{P(E \cap F)}{P(F)}$

$= \frac{2/52}{26/52} = \frac{1}{13}$ Ans

A pair of dice is thrown. Find the probability of getting a doublet if it~~s~~ is known that sum of the numbers of the two dice is 10.



1, 2, 3, 4, 5, 6   1, 2, 3, 4, 5, 6

$$(E) = \{(1,1), (2,2), (3,3), (4,4), \boxed{(5,5)}, (6,6)\}$$

$$n(E) = 6$$

$$(F) = \{(4,6), \boxed{(5,5)}, (6,4)\}$$

$$n(F) = 3$$

$$P(E) = \frac{6}{36} \qquad P(F) = \frac{3}{36}$$

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

$$P(E|F) = \frac{P(E \cap F)}{P(F)}$$

$$P(E|F) = \frac{1/36}{3/36}$$

$$\boxed{P(E|F) = 1/3}$$

Ans

6×6

$$n(S) = 36$$

	D_1: 1	2	3	4	5	6
D_2: 1	(1,1)	(2,1)	(3,1)	. . .		
2	(1,2)	(2,2)				
3			(3,3)			
4				(4,4)		
5					(5,5)	
6						(6,6)

If E and F are two events of the same sample space of an experiment and P(A) = 9/20, P(B) = 8/15 and P(AUB) = 47/60, find the following.
i) P(A|B), ii) P(B|A), iii) P(A'|B), iv) P(B'|A')

$$P(A \cup B) = P(A) + P(B) - P(A \cap B)$$

$$P(A \cap B) = P(A) + P(B) - P(A \cup B)$$

$$= \frac{9}{20} + \frac{8}{15} - \frac{47}{60}$$

$$= \frac{27 + 32 - 47}{60} = \frac{59 - 47}{60}$$

$$P(A \cap B) = \frac{12}{60} = \frac{1}{5}$$

(i) $P(A|B)$

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

$$= \frac{1/5}{8/15}$$

$$= \frac{1}{\cancel{5}} \times \frac{\cancel{15}^{3}}{8} = \frac{3}{8}$$

(ii) $P(B|A)$

$$= \frac{P(A \cap B)}{P(A)} = \frac{1/5}{9/20}$$

$$= \frac{1}{\cancel{5}} \times \frac{\cancel{20}^{4}}{9} = \frac{4}{9}$$

$P(A'|B) = 1 - P(A|B) = 1 - \frac{3}{8} = \frac{8-3}{8} = \underline{\underline{5/8}}$

$$\boxed{P(B'|A') = \frac{P(A \cup B)'}{1 - P(A)}}$$

$P(A \cup B) + P(A \cup B)' = 1$

$$= \frac{1 - P(A \cup B)}{1 - P(A)} = \frac{1 - \frac{47}{60}}{1 - 9/20} = \frac{13/60}{11/20}$$

$$= \frac{13}{\cancel{60}_{3}} \times \frac{\cancel{20}}{11} = \underline{\underline{\frac{13}{33}}}$$

$\underline{\text{Ans}}$

$P(A \cup B) = P(A) + P(B) - P(A \cap B)$