Assignment 5

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Question: A black and a red dice is rolled.

1) Find the conditional probability of obtaining a sum greater than 9, given that the black die resulted in a 5.
2) Find the conditional probability of obtaining the sum 8, given that the red die resulted in a number less than 4.

Solution: In the question two dice red and black are rolled.

$\therefore$ the number of elements in the sample space n(S)=36

1) Let us take the event of the sum being greater than 9 be E and the event of black die rolling 5 be F.
   Then,
   $E = \{(4,6),(5,5),(5,6),(6,4),(6,5),(6,6)\}$
   $F = \{(5,1),(5,2),(5,3),(5,4),(5,5),(5,6)\}$
   Now,
   $EF = \{(5,5),(5,6)\}$
   $\therefore$ n(EF) = 2, n(F) = 6

$$\text{So,} P(EF) = \frac{2}{36} \tag{1}$$

$$P(F) = \frac{6}{36} \tag{2}$$

From (1) and (2)

$$P(E|F) = \frac{P(EF)}{P(F)} \tag{3}$$

$$= \frac{\frac{2}{36}}{\frac{6}{36}} \tag{4}$$

$$= \frac{1}{3} \tag{5}$$

2) Let us take the event of the sum being 8 be M and the event of red die rolling less than 4 be N.
   Then,
   $M = \{(2,6),(3,5),(4,4),(5,3),(6,2)\}$
   $N = \{(1,1),(1,2),(1,3),(2,1),(2,2),(2,3),(3,1),(3,2),$
   $(3,3),(4,1),(4,2),(4,3),(5,1),(5,2),(5,3),(6,1),(6,2),$
   $(6,3)\}$

Now,
$MN = \{(5,3),(6,2)\}$
$\therefore$ n(MN) = 2, n(N)= 18

$$\text{So,} P(MN) = \frac{2}{36} \tag{6}$$

$$P(N) = \frac{18}{36} \tag{7}$$

From (6) and (7)

$$P(M|N) = \frac{P(MN)}{P(N)} \tag{8}$$

$$= \frac{\frac{2}{36}}{\frac{18}{36}} \tag{9}$$

$$= \frac{1}{9} \tag{10}$$