Probability Assignment

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12.13.1.10
A black and a red dice are rolled.
(a) Find the conditional probability of obtaining a sum greater than 9, given that the black die resulted in a 5.

(b) Find the conditional probability of obtaining the sum 8, given that the red die resulted in a number less than 4.

Solution

Given,

A black and red dice are rolled simultaneously.
Then the number of sample space = 36

(a) Given,

The black die resulted in 5.

Let A be the event that sum of the number on dice is greater than 9.
A = $\{(4,6),(5,5),(5,6),(6,4),(6,5),(6,6)\}$

$$\Pr(A) = \frac{6}{36} = \frac{1}{6} \tag{1}$$

Let B be the event that black dice resulted in 5.

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

$$\Pr(B) = \frac{6}{36} = \frac{1}{6} \tag{2}$$

Probability of common outcomes of the event A and B is,

$$\Pr(AB) = \frac{2}{36} = \frac{1}{18} \tag{3}$$

The conditional probability of the given event is,

$$\Pr(A|B) = \frac{\Pr(AB)}{\Pr(B)} \tag{4}$$

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

(b) Given,

The red dice is resulted in a number less than 4.

Let E be the event that sum of the number on dice is 8.
E = $\{(2,6),(3,5),(4,4),(5,3),(6,2)\}$

$$\Pr(E) = \frac{5}{36} \tag{6}$$

Let F be the event that red dice results in number less than 4.
F={(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)}

$$\Pr(F) = \frac{18}{36} = \frac{1}{2} \tag{7}$$

Probability of common outcomes of the event E and F is,

$$\Pr(EF) = \frac{2}{36} = \frac{1}{18} \tag{8}$$

The conditional probability of the given event is given by,

$$\Pr(E|F) = \frac{\Pr(EF)}{\Pr(F)} \tag{9}$$

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