# Assignment 4

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**Question:** A black and a red ball is rolled.

(i) Find the conditional probability of obtaining a sum greater than 9,given that black die resulted in a 5

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

**Solution:**

(i) let, B denote black coloured die and R denote red colored die then, the sample space for the given experiment will be:
S=
{ (B1,R1),(B1,R2),(B1,R3),(B1,R4),(B1,R5),(B1,R6),
(B2,R1),(B2,R2),(B2,R3),(B2,R4),(B2,R5),(B2,R6),
(B3,R1),(B3,R2),(B3,R3),(B3,R4),(B3,R5),(B3,R6),
(B4,R1),(B4,R2),(B4,R3),(B4,R4),(B4,R5),(B4,R6),
(B5,R1),(B5,R2),(B5,R3),(B5,R4),(B5,R5),(B5,R6),
(B6,R1),(B6,R2),(B6,R3),(B6,R4),(B6,R5),(B6,R6)}
(a) let $A$ be the event of 'obtaining a sum greater than 9' and $B$ be the event of ' getting 5 on black die' then $A = \{$(B4,R6),(B5,R5),(B5,R6),(B6,R4)
,(B6,R5),(B6,R6)$\}$
and B= {(B5,R1),(B5,R2),(B5,R3),
(B5,R4),(B5,R5),(B5,R6)}

$$\Rightarrow A \cap B = \{(B5, R5), (B5, R6)\}$$

So,

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

$$P(A \cap B) = \frac{2}{36} = \frac{1}{19} \tag{2}$$

Now we know that by defination of conditional probability,

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

Now substiting the value we get

$$\Rightarrow P\left(\frac{A}{B}\right) = \frac{\frac{1}{18}}{\frac{1}{6}} = \frac{6}{18} = \frac{1}{3} \tag{3}$$

(ii) let, A be the event of obtaining a sum 8 and B be the event of 'getting a number less than 4 on red die'
then $A =$(B2,R6),(B3,R5),(B4,R4),
(B5,R3),(B6,R2) }
B= {(B1,R1),(B2,R1),(B3,R1),(B4,R1),(B5,R1),(B6,R1),
(B1,R2),(B2,R2),(B3,R2),(B4,R2),(B5,R2),(B6,R2),
(B1,R3),(B2,R3),(B3,R3),(B4,R3),(B5,R3),(B6,R3)}
and, $\Rightarrow A \cap B = \{(B5, R3), (B6, R2)\}$
So,

$$P(A) = \frac{5}{36} \tag{4}$$

$$P(B) = \frac{18}{36} = \frac{1}{2}, \tag{5}$$

$$P(A \cap B) = \frac{2}{36} = \frac{1}{19} \tag{6}$$

so, we know that by conditional probability,

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

Now by substiting the value we get

$$\Rightarrow P\left(\frac{A}{B}\right) = \frac{\frac{1}{18}}{\frac{1}{2}} = \frac{2}{18} = \frac{1}{9} \tag{7}$$