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 **CONDITIONAL PROBABILITY**

**Let** A and B be two events, such that P(A)>0. P(B/A) is the probability of B given that A has occurred. Since A is known to have occurred, it becomes the new sample space replacing the original S.

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

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

Question 1. Find the Probability that a single toss of a dice will result in a number in a number less than 4 if(a) no other information is given and (b)it is given that the toss resulted is an odd number.

Solution. Sample space S= {1,2,3,4,5,6}

 (a) Let Event A=number less than 4 i.e {1,2,3}

 P(A) = (3/6)=(1/2)

 (b) Let Event B= toss result in a odd number i.e {1,3,5}

 P(B) = (3/6) = (1/2)

 $P\left(A∩B\right)$ = (2/6) = (1/3)

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

 =(1/3)/(1/2)=2/3.

Question2. One Bag contains 4 white balls and 2 black balls, another contains 3 white and 5 black balls. If one ball is drawn from each bag. Find the probability that (a) both are white (b) both are black(c) one is white and one is black.

Solution. Bag A = {4W,2B}

 Bag B = {3W,5B}

 Event W1 =Ball drawn from the bag A is white

 Event W2 =Ball drawn from the bag B is white

(a) both are white

 P(W1 $∩ $W2) = P(W1)\*P(W2/W1) = P(W1)\*P(W2)=(4/6)\*(3/8)=(1/4).

(b) both are black

 Event W’1 =Ball drawn from the bag A is not white i.e it is black

 Event W’2 =Ball drawn from the bag B is not white i.e it is black

 P(W’1 $∩$W’2) = P(W’1)\*P(W’2/W’1) = P(W’1)\*P(W’2)=(2/6)\*(5/8)=(5/24).

(c) Event W3 = one is white and one is black

 P(W3) = 1- P(W1 $∩ $W2) - P(W’1 $∩$W’2)

 =1-(1/4)-(5/24) =(13/24).

**Questions for Practice**.

Q1. Find the probability of not getting a 7 or 11 total on either of two tosses of a pair of fair dice.

Q2. A fair dice is tossed twice. Find the probability of getting a 4, 5 or 6 on the first toss and a 1 , 2 ,3 or 4 on the second toss.

Q3.A box contains 2 red and 3 blue marbles. Find the probability that if two marbles are drawn at random(without replacement).(a)both are blue(b)both are red(c)one is red and one is blue.

Q4.Find the probability of drawing 3 aces at random from a deck of 52 ordinary cards if the cards are (a)replaced (b)not replaced.

Q5. If atleast one child in a family with two children is a boy, what is the probability that both children are boys.

Reference.

Probability and Statistics –Murray R. Spiegel