More on Probability

Example 1

A coin is tossed twice, find the probability that
(a) heads is obtained on the first toss,
(b) tails are obtained for both tosses,
(c) hence, at least 1 head is obtained for the 2 tosses.

Solution: List of possible outcomes: HT, HH, TH, TT

(a) $P(\text{head first}) = \frac{2}{4} = \frac{1}{2}$

(b) $P(TT) = \frac{1}{4}$

(c) $P(\text{at least 1 head}) = 1 - \frac{1}{4} = \frac{3}{4}$

Example 2

A container contains 28 sweets. There are two flavours, vanilla and chocolate. The probability of drawing a vanilla flavoured sweet from the bag is $\frac{2}{7}$.

(a) What is the number of chocolate flavoured sweets in the bag?

(b) Assuming that a sweet drawn is placed back into the bag after each draw. Find the probability of drawing a vanilla flavoured sweet followed by a chocolate flavoured sweet.

Solution: (a) $P(C) = 1 - P(V) = \frac{5}{7}$

$$\text{No. of choc sweets} = 28 \times \left(\frac{5}{7}\right)$$
$$= 20$$

(b) Since P(V) and P(C) are mutually exclusive,

$$P(V \text{ and } C) = P(V) \times P(C)$$
$$= \frac{2}{7} \times \frac{5}{7}$$
$$= \frac{10}{49}$$

Example 3

Jack draws a card from a pack of playing cards and also tosses a coin. Find the probability of Jack obtaining
(a) a card which is an ace and heads on the coin,
(b) a card which is the king of hearts and tails on the coin.

Solution: (a) $\text{P(ace and heads)} = \text{P(ace)} \times \text{P(heads)}$

$$= \frac{13}{52} \times \frac{1}{2}$$
$$= \frac{1}{8}$$

(b) $\text{P(king of hearts, tails)} = \text{P(king of hearts)} \times \text{P(tails)}$

$$= \frac{1}{52} \times \frac{1}{2}$$
$$= \frac{1}{104}$$

Example 4

There are two bags of marbles. Bag A contains 3 red and 2 yellow marbles. Bag B contains 5 yellow and 7 green marbles. Susan draws one marble from each bag. What is the probability that none of the marbles drawn are yellow?

Solution: $\text{P(non-yellow from Bag A)} = \frac{3}{5}$

$\text{P(non-yellow from Bag B)} = \frac{7}{12}$

$\text{P(non-yellow from both bags)} = \frac{3}{5} \times \frac{7}{12}$

$$= \frac{7}{20}$$

Example 5

A fair 6-sided die is rolled twice. The scores are added together. Find the probability that the sum of the scores is
(a) '8',
(b) an even number.

Solution: Construct a possibility diagram:

Outcome of first die	+	Outcome of second die					
		1	2	3	4	5	6
	1	2	3	4	5	6	7
	2	3	4	5	6	7	8
	3	4	5	6	7	8	9
	4	5	6	7	8	9	10
	5	6	7	8	9	10	11
	6	7	8	9	10	11	12

(a) P(sum of 8)

$$= \frac{\text{number of outcomes with sum = 8}}{\text{total number of possible outcomes}}$$

$$= \frac{5}{36}$$

(b) P(sum is even no.)

$$= \frac{\text{number of outcomes with sum = even no.}}{\text{total number of possible outcomes}}$$

$$= \frac{18}{36}$$

$$= \frac{1}{2}$$

Example 6

Helen draws a ball from a bag containing 5 balls of different colours: 2 red balls, 2 green balls and 1 black ball. As the same time, Jill tosses a 6-faced die.
Find the probability of getting
(a) a red ball and number '4' on the die,
(b) a black ball and number '1' on the die.

Solution: Construct possibility diagram:

Outcome of balls	+	Outcome of die					
		1	2	3	4	5	6
	R	R1	R2	R3	R4	R5	R6
	R	R1	R2	R3	R4	R5	R6
	G	G1	G2	G2	G4	G5	G6
	G	G1	G2	G2	G4	G5	G6
	B	B1	B2	B3	B4	B5	B6

(a) $P(R4) = \frac{2}{30} = \frac{1}{15}$

(b) $P(B1) = \frac{1}{30}$