25 Probability

After studying this lesson you will acquire knowledge about the following :

- Introduction of the probability tree and to show the sample space on the probability tree
- Solving problems using probability tree

It is important to recollect what you have learnt about representing the occurance of an event in day to day life in different ways.

25.1 Sample space

Example 1

(i) In a random experiment where an unbiased coin is tossed, the sample space,

S = {H , T}

Here, getting the tail is *T* and the head is H

(ii) In a random experiment a fair dice with the faces numbered from 1 to 6 is thrown. Then the sample space,

S = {1, 2, 3, 4, 5, 6}

(iii) In a random experiment to find out whether a new born child is a boy or a girl, the sample space

S = {M, F}

Here *M* is for a boy and *F* is for a girl

25.2 Events

An event is a subset of the sample space.

Example 2

(i) When a coin is tossed , getting a head is an event. If we name this event as A.

then A = {H}
This is a subset of the sample space S = {H , T}

(ii) When a dice is thrown, getting an odd number is an event. If we denote this event by B.
then B = {1,3,5}
This is a subset of S = {1, 2, 3, 4, 5, 6}

25.3 Simple events

If an event cannot be divided further into events it is called a simple event. Hence when an event is a simple event, it contains only one element.

Example 3

(i) When a coin is tossed, getting a head is a simple event. It has only H as an element.
(ii) In the random experiment of throwing a dice the sample space is S ={1, 2, 3, 4, 5, 6} Simple events of this can be written as {1}, {2}, {3}, {4}, {5}, {6}

Any event can be expressed as a union of simple events.

Even the sample space is an event. From the above example (ii)

$S = \{1\} \cup \{2\} \cup \{3\} \cup \{4\} \cup \{5\} \cup \{6\}$

25.4 Compound events

If an event can be further divided into two or more events it is called a compound event.

Example 4

(i) When a dice is thrown , getting an odd number is a compound event.
A = {Getting an odd number when a dice is thrown.}
A = {1, 3, 5}

This can be divided into a number of events such as

{1}, {3}, {5}, {1,3}, {1,5}, {3,5}

25.5 Mutually exclusive events

If there are no common simple events in two or more events in a sample space then the events are considered as mutually exclusive events. For any two events A and B,

$A \cap B = \varnothing$, then A and B are mutually exclusive events.

Example 5

In the random event of throwing a dice

A = {Getting an odd number}

B = {Getting an even number}

A= {1, 3, 5} and B = {2, 4, 6}

then $A \cap B = \varnothing$,

(Getting an odd number and getting an even number cannot occur at the same time)

$\therefore$ A and B are mutually exclusive events.

25.6 Probability

Recollect what you have learnt so far about probability. Probability of an event is the possibilities of an event occuring.

This is originally defined for events which are equally likely.

Example 6

Consider the random event of throwing a dice.

S={1, 2, 3, 4, 5, 6}

Given below are the simple events corresponding to this sample space

{1}, {2}, {3}, {4}, {5}, {6}

If A = {2}, probability of A is given as P(A). You will remember that $P(A)$ is defined as

$$P(A) = \frac{n(A)}{n(s)} = \frac{1}{6}$$

Here $n(S)$ denotes the number of elements in the sample space S.

If all the simple events in the sample space has the same probability as above, these events are called **equally likely events.**

If all the simple events are mutually exclusive and also if they are equally likely, then the sum of their probabilities is equal to one.

Now consider a compound event, which consists of equally likely simple events

$X = \{\text{Getting an odd number}\}$

$X = \{ 1, 3, 5 \}$

The probability of a compound event as above is

$$P(X) = \frac{n(x)}{n(S)} = \frac{3}{6} = \frac{1}{2}$$

Consider the sample space of a random experiment consisting of equally likely simple events as S and any compound even in it as M.

If $\quad n(S) = N$ and $n(M) = m$

$$P(M) = \frac{n(M)}{n(S)} = \frac{m}{N}$$

Here $0 \leq P(M) \leq 1$

Also if A and B are any two events,

then $P(A \cup B) = P(A) + P(B) - P(A \cap B)$

and If A and B are mutually exclusive events,

then $P(A \cup B) = P(A) + P(B)$.

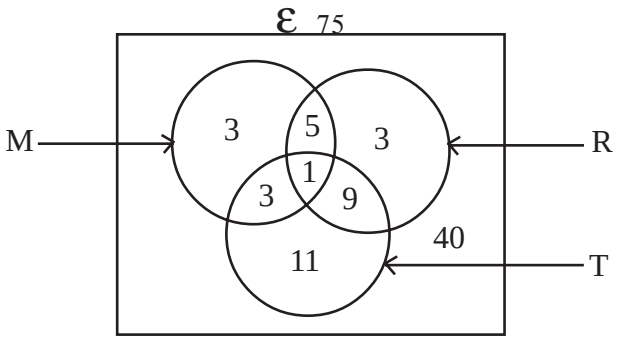
Example 7

A survey was done among 75 customers and the following information was collected. 12 buy new washing machines, 18 buy new refrigerators, 24 buy new television sets, 6 buy a washing machines and a refrigerator, 4 buy a washing machines and a television set and 10 buy a television set and a refrigerator. One person buys all three appliances.

(i) Show the above information in a Venn diagram.
(ii) If one of these customers is selected at random,
Find the probability that the person selected
(a) does not buy any of the commodities
(b) buys only washing machines
(c) buys only a television set
(d) buys only a refrigerator
(e) at least one of the two commodities, a television and a refrigerator

M - Washing machines
T - Television
R - Refrigerator

(i)



(ii) (a) Probability of being a person who does not buy any of the commodities

$$= P\left(M \cup R \cup T\right)'$$

$$= \frac{n\left(M \cup R \cup T\right)'}{n\left(S\right)} = \frac{40}{75} = \frac{8}{15}$$

(b) Probability of being a person who buys only a washing machine

$$P\left[M \cap (R \cup T)'\right] = \frac{3}{75} = \frac{1}{25}$$

(c) Probability of being a person who buys only a television set

$$P\left[T \cap (M \cup R)'\right] = \frac{11}{75}$$

(d) Probability of being a person who buys only a refrigerator

$$P\left[R \cap (M \cup T)'\right] = \frac{3}{75} = \frac{1}{25}$$

(e) Probability of being a person who buys at least one of the two appliances television set and a refrigerator.

$$= P(C \cup R) = \frac{n(C \cup R)}{n(S)}$$

$$= \frac{32}{75}$$

25.1 Activity

Using the above example (7) show that

$$P(M \cup R \cup C) = P(M) + P(R) + P(C) - P(M \cap R) - P(M \cap C) - P(R \cap C) + P(M \cap R \cap C)$$

Exercise 25.1

(1) 46 students were asked as to which one of the force, Army, Navy and Air force they would like to join. There were 21 who liked to join Army 14 to join Air force, 23 for Navy, 5 who liked to join all three, 7 to join Army and Airfoce. 8 to join Army and Navy only, and 4 who liked Air force only.

- Show this information in a Venn diagram
- When a student is chosen at random, find the probability that
  - (a) he likes only to join the Army
  - (b) he likes only to join the Navy
  - (c) he does not like to join any one of these

(2) In a bag there are 10 identical beads, of which 5 are white, 3 are red and 2 are black. A bead is taken out at random from the bag and without replacing it another bead is taken.

- Show the sample space for this random experiment in a Cartesian plane.
- Find the probability that
  - (a) both beads are white
  - (b) both are red
  - (c) both are black
  - (d) one is white and the other is red
  - (e) they are of different colours.

25.7 Independent events

This is an important concept in probability.
It can be explained from the examples given below.

Example 8

Consider a group of students consisting of 36 children.
A = {A person with blue eyes}
B = {Being a boy}
The table below given information regarding them.

	A	$A^/$	Sum
B	6	6	12
$B^/$	12	12	24
Sum	18	18	36

Here $A^/$ = {A person without blue eyes}
$B^/$ = {Not a boy}

When a child is selected at random, the following probabilities can be found.

$$P(A) = \frac{18}{36} = \frac{1}{2}$$

$$P(B) = \frac{12}{36} = \frac{1}{3}$$

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

$$\text{Also } P(A) \times P(B) = \frac{1}{2} \times \frac{1}{3}$$

$$= \frac{1}{6}$$

$$= P(A \cap B)$$

$$\therefore P(A \cap B) = P(A).P(B)$$

In the above events A and B, A does not affect the occurrence of B, ie. if a child is selected from the group, that child being a boy does not affect him having blue eyes or not

Events of this nature are called **independent events.**

If A and B are independent events,

then $P(A \cap B) = P(A).\ P(B)$

The converse is also true

ie. for the events A and B, if

$P(A \cap B) = P(A).\ P(B)$ then

A and B are independent events.

Example 9

(1) If two identical coins are tossed at once, then

S = { HH, HT, TH, TT }

A = Getting a Head in the first coin

B = Getting a Head in the second coin

C = Getting a Head in only one coin

$\therefore A = \{HH, HT\}$, $B = \{HH, TH\}$, $C = \{HT, TH\}$

$$\therefore P(A) = P(B) = P(C) = \frac{2}{4} = \frac{1}{2}$$

$$P(A \cap C) = \frac{1}{4}, P(A \cap B) = \frac{1}{4}, P(B \cap C) = \frac{1}{4}$$

$$\therefore P(A \cap C) = P(A)\,P(A)$$

$$, P(A \cap B) = P(A).P(B)$$

$$P(B \cap C) = P(B).P(C)$$

$\therefore$ the pairs A and C, A and B, and B and C are independent events

Discuss whether

$P(A \cap B \cap C) = P(A).\ P(B).\ P(C)$ is true in the above example.

Exercise 25.2

(1) Two dice, one red and the other green with their sides numbered from 1 to 6 are rolled. Show the sample space in a graph.
If A = {Getting a 5 in the red dice}
B = {Getting a 6 in the green dice}
Show that A and B are independent events.

(2) An unbiased coin is tossed thrice.
(i) A = {Getting a Tail in the first toss}
B = {Getting a Tail in the second toss}
C = {Getting only two heads in all three tosses.}
Which of the events A, B and C are independent ?

(3) The boxes A and B contain a certain item,
The box A has 8, of which 3 are faulty and box B has 5, of which 2 are faulty.
If one item from each box is taken at random find the probability that
(a) Both items are faulty ones
(b) One is faulty and the other is good
(c) Getting a faulty item from A
(d) Getting faulty item from B

(4) In an event of shooting at target, of the two people *A* and *B*, the probability of A, shooting at a target is $\frac{1}{4}$ and for B it is $\frac{1}{3}$.

What is the probability that

(i) both shoot at the target?
(ii) At least one of them shoot at the target?

(5) Three horses namely A, B and C are to complete in a race.
The probability of winning the race for each horse is given as

$$P(A)=\frac{1}{2},\ P(B)=\frac{1}{3}\ \text{ and }\ P(C)=\frac{1}{6}$$

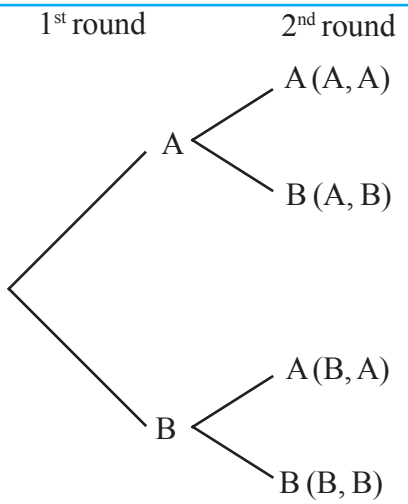
If they had the competition twice, write the set of all the possible results.

If AB indicates that A wins the first race and B wins the second, then find the following probabilities.

$$P(AB), P(AC), P(BA), P(BB), P(BC),$$
$$P(AA), P(CA), P(CB), P(CC)$$

Example 10

Two people A and B are competing in a tennis match. The person who wins two rounds will be the champion.



The sample space can be shown as

$$S = \{(A, A), (A, B), (B, A), (B, B)\}$$
$$n(S) = 4$$

The way they are shown in the example given above, the sample space can be clearly shown by these diagrams which are called Tree diagrams.

This is very useful in random experiments where there are more than one step. And it is very easy to find the probability of such an event using the tree diagram.

Example 11

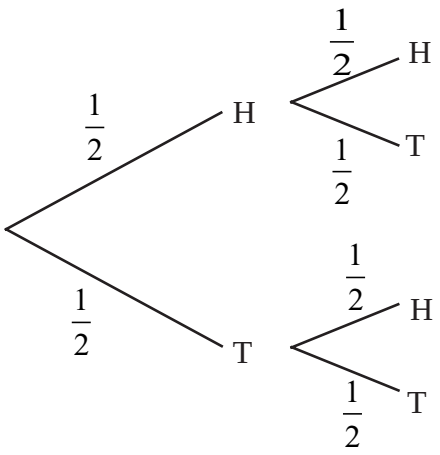
When two unbiased coins, a two rupee coin and an one rupee coin are tossed show all the possible results in a tree diagram

(i) Find the probability that both coins will show the heads

(ii) Find the probability that at least one will show the head.

Consider H as the head and T as the tail then,

Two rupee coin	One rupee coin	Result	Probability



$H,H \rightarrow \frac{1}{2}\times\frac{1}{2}=\frac{1}{4}$

$H,T \rightarrow \frac{1}{2}\times\frac{1}{2}=\frac{1}{4}$

$T,H \rightarrow \frac{1}{2}\times\frac{1}{2}=\frac{1}{4}$

$T,T \rightarrow \frac{1}{2}\times\frac{1}{2}=\frac{1}{4}$

S = {HH, HT, TH, TT}

Probability of getting a head on both coins = $P(HH)$

$$P(HH)=P(H)\times P(H)=\frac{1}{2}\times\frac{1}{2}=\frac{1}{4}$$

Getting a tail in the one rupee coin and getting a tail in the two rupee coin are independent events.

[Note:- In the tree diagram, at the end of each branch, the relevant probability is written]

Probability of getting a tail at least in one coin

$$=P(T,T)+P(H,T)+P(T,H)$$

$$=\frac{1}{4}+\frac{1}{4}+\frac{1}{4}=\frac{3}{4}$$

This also can be calculated as follows

S = {(H, H), (H, T), (T, H), (T, T)}

P (S) = 1

Getting a tail in at least one coin

$$=1-P(H,H)=1-\frac{1}{2}\times\frac{1}{2}=1-\frac{1}{4}=\frac{3}{4}$$

Note :-

- Tossing two unbiased coins together

or • Tossing one coin after the other

or • Tossing the same coin twice, are experiments which will give the same sample space.

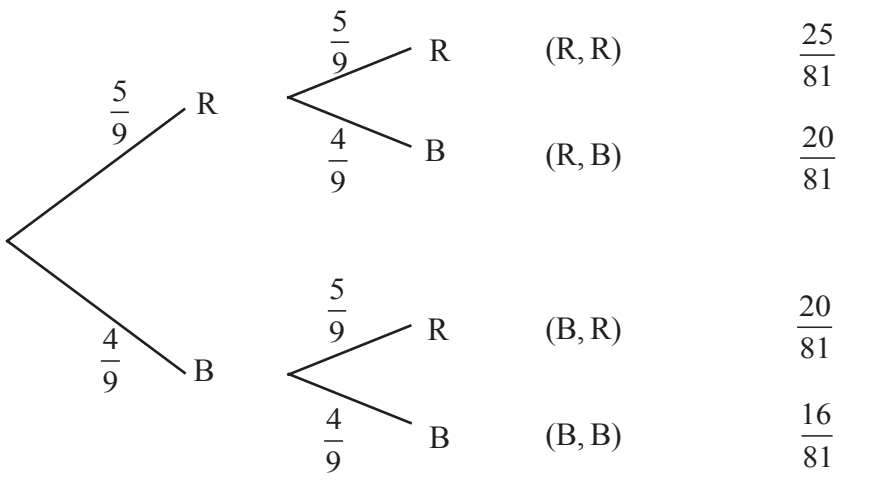
25.9 Random experiments with replacement

Example 12

There are 9 identical balls in a bag, of which 5 are red and 4 are blue. A ball is taken out from the bag at random, the colour is noted down and then the ball is replaced. Then a second ball is taken out at random.

Find the following probabilities using a tree diagram

1. Both balls will be red
2. Both balls will be blue
3. One ball will be blue and the other red
4. At least one ball will be red
5. First ball taken out will be red



(i) $P(R,R) = \frac{25}{81}$

(ii) $P(B,B) = \frac{16}{81}$

(iii) $P(R,B) + P(B,R) = \frac{20}{81} + \frac{20}{81} = \frac{40}{81}$

(iv) $P(R,R) + P(B,R) + P(R,B) = \frac{25}{81} + \frac{20}{81} + \frac{20}{81} = \frac{65}{81}$

or

$$1 - P(B,B) = 1 - \frac{16}{81} = \frac{65}{81}$$

(v) $P(R,R) + P(R,B) = \frac{25}{81} + \frac{20}{81} = \frac{45}{81} = \frac{5}{9}$

Exercise 25.3

(1) Out of 5 identical marbles in a bag, 4 are green and other is yellow in colour. A marble is taken out at random, the colour is noted and then replaced. A second marble is then taken out at random.
   (i) Show the sample space for the above experiment in a tree diagram.
   (ii) Find the probability of the following events
      (a) Both are green
      (b) Both are yellow
      (c) Both are of the same colour

(2) In a competition of shooting at a target, the probability of shooting at a target for a particular person is $\frac{4}{7}$
   (i) If he shoots twice at the target, show the sample space in a tree diagram.
   (ii) Find the probability of the following events.
      (a) He succeeds in both attempts
      (b) He does not succeed in any of the two attempts
      (c) He succeeds in at least one attempt
      (d) He succeeds only in one attempt

(3) An institute where electric bulbs are manufactured states that the probability of the life time of a bulb to be less than 1000 hours is $\frac{1}{100}$.

Draw a tree diagram to show the life time of two bulbs, a customer has purchased.

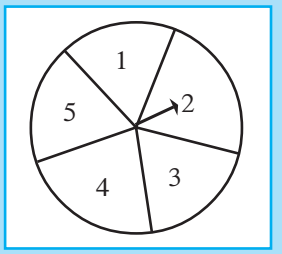
Find the probability

(i) that both bulbs will be worn out before 1000 hours

(ii) that both bulbs will have a life time more than 1000 hours

(iii) At least one of the two bulbs will last for more than 1000 hours

(4)



The figure shows a circle divided into 5 equal sectors which are numbered from 1 to 5. A pointer attached to the centre is free to spin.

When the pointer stops, it is noted whether it stops at an odd number or an even number. When this is done by spinning the pointer twice,

(i) Show the result on a tree diagram

(ii) Find the probability that at both instances it will be an odd number.

(iii) Find the probability that it will stop at an even number in the first instance

(5) The table given below shows how 35 students in grade 11 followed the subjects Art and Music.

	Art	Music
Boys	3	12
Girls	7	13

(i) Draw a tree diagram to show the above information
(ii) If a student from this class is selected at random,
(a) find the probability that, this student is a boy
(b) find the probability that, this student studies Art
(c) find the probability that, this student studies Music

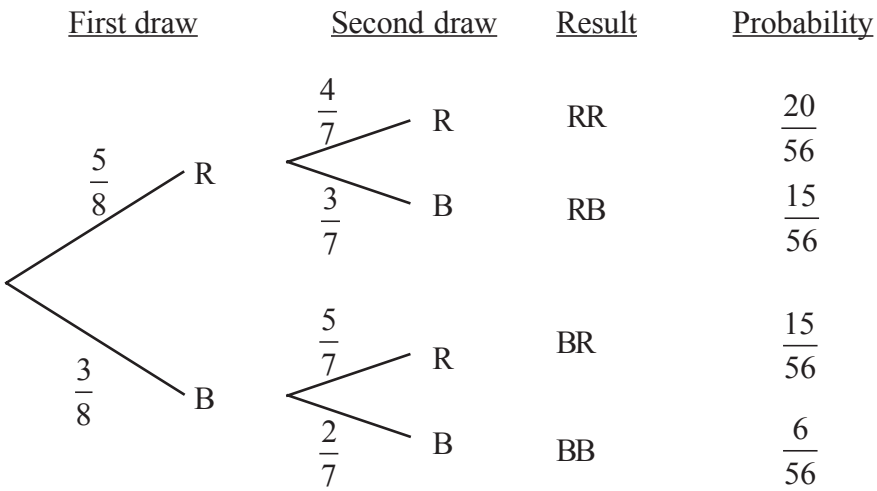
25.9 Random experiment without replacement

Example 13

In a bag containing identical balls, there are 5 red balls and 3 blue balls. One ball is taken out at random and without replacing it another ball is taken out at random.

By drawing a probability tree,

(i) find the probability that both are red
(ii) find the probability that only one ball is red



$$(i)\ P(R,R) = \frac{20}{56}$$

$$(ii)\ P(R,B) + P(B,R) = \frac{15}{56} + \frac{15}{56} = \frac{30}{56} = \frac{15}{28}$$

Exercise 25.4

(1) A box contains identical ball point pens of which 6 are black and 3 are red. Two pens are taken out in succession and not replaced.
Show the sample space in a tree diagram.
Find the probability that
(i) both pens are black
(ii) both pens are red
(iii) One is red and the other is black

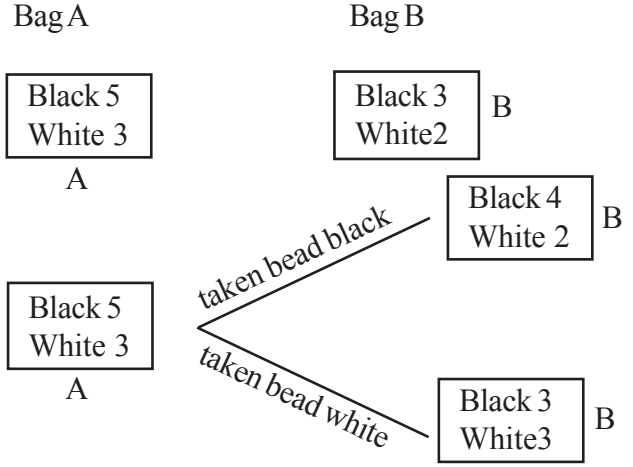
(2) There are 10 identical balls in a paper bag. 6 are white, 3 are red and 1 is black. Two balls are taken out in succession without replacing. Show the sample space in a tree diagram.
Find the probability that
(i) both balls are white
(ii) both balls are red
(iii) one is white and the other is red
(iv) they are of different colours

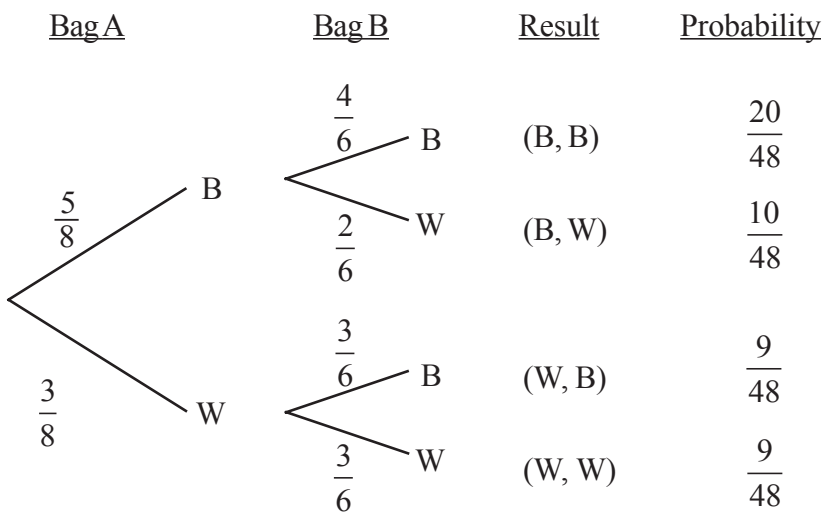
(3) In an office, the staff consists of 7 males and 4 females. Two of them left the office on short leave. Show the sample space for this event in a tree diagram.
Hence find the probability that the two who left the office are
(i) males
(ii) females
(iii) at least one of them is a female

(4) In a bus all the seats are occupied by passengers. 6 men and a woman were standing. At a certain bus halt, two of the passengers who were seated, got down. Two of those who were standing took the seats thus vacated.
Show the relevant sample space in a tree diagram.
Find the probability that out of the two who took the vacant seats,
(i) both are men
(ii) at least one of them is a man

Example 14

The bags 'A' and 'B' contain identical beads. Bag 'A' has 5 black beads and 3 white beads. The bag B has 3 black beads and 2 white beads. A bead is taken out at random, from bag 'A' and put into bag B and then a bead is taken out at random from bag B. Draw a tree diagram relevant to this experiment and hence find the probability that the bead taken from B is a black bead.





Probability of getting a black bead from bag 'B' is

$$P(B,B)+P(W,B)=\frac{20}{48}+\frac{9}{48}=\frac{29}{48}$$

Exercise 25.5

(1) A blue box contains 5 black beads and 3 white beads. A yellow box contains 2 black beads and 3 white beads. All the beads are identical. A bead is taken from blue box, colour noted and put into the yellow box. Then a bead is taken from yellow box.

Show the relevant sample space in a tree diagram.
Hence find the probability that
(i) both beads taken out are black.
(ii) the bead taken from the yellow box is yellow

(2) A box contains ball point pens of which 5 are red and 2 are blue. Another box contains 2 blue ball point pens of the same type. A pen is taken out at random from the first box and put into the second box. Then a pen is taken out at random from the second box. Show the relevant sample space in a tree diagram.

Find the probability that
(i) both pens taken out are blue
(ii) the pen taken out from the second box is red

(3) In farm 'A' there are 6 male animals and 5 female animals. In farm 'B' there are 7 male animals and 2 female animals. A animal is randomly selected from farm 'A' and is sent to farm 'B'. Then an animal is randomly selected from farm 'B' and is sent to farm 'A'.

(i) Draw the relevant tree diagram to represent the sample space.
(ii) Find the probability that the animal taken from farm 'B' is a female.

ලඝුගණක
மடக்கைகள்
LOGARITHMS

	0	1	2	3	4	5	6	7	8	9	මධ්‍යනා අන්තරය / இடை வித்தியாசங்கள் / Mean Differences 1	2	3	4	5	6	7	8	9
10	0000	0043	0086	0128	0170	0212	0253	0294	0334	0374	4	8	12	17	21	25	29	33	37
11	0414	0453	0492	0531	0569	0607	0645	0682	0719	0755	4	8	11	15	19	23	26	30	34
12	0792	0828	0864	0899	0934	0969	1004	1034	1072	1106	3	7	10	14	17	21	24	28	31
13	1139	1173	1206	1239	1271	1303	1335	1367	1399	1430	3	6	10	13	16	19	23	26	29
14	1461	1492	1523	1553	1584	1614	1644	1673	1703	1732	3	6	9	12	15	18	21	24	27
15	1761	1790	1818	1847	1875	1903	1931	1959	1987	2014	3	6	8	11	14	17	20	22	25
16	2041	2068	2095	2122	2148	2175	2201	2227	2253	2279	3	5	8	11	13	16	18	21	24
17	2304	2330	2355	2380	2405	2430	2455	2480	2504	2529	2	5	7	10	12	15	17	20	22
18	2553	2577	2601	2625	2648	2672	2695	2718	2742	2765	2	5	7	9	12	14	16	19	21
19	2788	2810	2833	2856	2878	2900	2923	2945	2967	2989	2	4	7	9	11	13	16	18	20
20	3010	3032	3054	3075	3096	3118	3139	3160	3181	3201	2	4	6	8	11	13	15	17	19
21	3222	3243	3263	3284	3304	3324	3345	3365	3385	3404	2	4	6	8	10	12	14	16	18
22	3424	3444	3464	3483	3502	3522	3541	3560	3579	3598	2	4	6	8	10	12	14	15	17
23	3617	3636	3655	3674	3692	3711	3729	3747	3766	3784	2	4	6	7	9	11	13	15	17
24	3802	3820	3838	3856	3874	3892	3909	3927	3945	3962	2	4	5	7	9	11	12	14	16
25	3979	3997	4014	4031	4048	4065	4082	4099	4116	4133	2	3	5	7	9	10	12	14	15
26	4150	4166	4183	4200	4216	4232	4249	4265	4281	4298	2	3	5	7	8	10	11	13	15
27	4314	4330	4346	4362	4378	4393	4409	4425	4440	4456	2	3	5	6	8	9	11	13	14
28	4472	4487	4502	4518	4533	4548	4564	4579	4594	4609	2	3	5	6	8	9	11	12	14
29	4624	4639	4654	4669	4683	4698	4713	4728	4742	4757	1	3	4	6	7	9	10	12	13
30	4771	4786	4800	4814	4829	4843	4857	4871	4886	4900	1	3	4	6	7	9	10	11	13
31	4914	4928	4942	4955	4969	4983	4997	5011	5024	5038	1	3	4	6	7	8	10	11	12
32	5051	5065	5079	5092	5105	5119	5132	5145	5159	5172	1	3	4	5	7	8	9	11	12
33	5185	5198	5211	5224	5237	5250	5263	5276	5289	5302	1	3	4	5	6	8	9	10	12
34	5315	5328	5340	5353	5366	5378	5391	5403	5416	5428	1	3	4	5	6	8	9	10	11
35	5441	5453	5465	5478	5490	5502	5514	5527	5539	5551	1	2	4	5	6	7	9	10	11
36	5563	5575	5587	5599	5611	5623	5635	5647	5658	5670	1	2	4	5	6	7	8	10	11
37	5682	5694	5705	5717	5729	5740	5752	5763	5775	5786	1	2	3	5	6	7	8	9	10
38	5798	5809	5821	5832	5843	5855	5866	5877	5888	5899	1	2	3	5	6	7	8	9	10
39	5911	5922	5933	5944	5955	5966	5977	5988	5999	6010	1	2	3	4	5	7	8	9	10
40	6021	6031	6042	6053	6064	6075	6085	6096	6107	6117	1	2	3	4	5	6	8	9	10
41	6128	6138	6149	6160	6170	6180	6191	6201	6212	6222	1	2	3	4	5	6	7	8	9
42	6232	6243	6253	6263	6274	6284	6294	6304	6314	6325	1	2	3	4	5	6	7	8	9
43	6335	6345	6355	6365	6375	6385	6395	6405	6415	6425	1	2	3	4	5	6	7	8	9
44	5435	6444	6454	6464	6474	6484	6493	6503	6513	6522	1	2	3	4	5	6	7	8	9
45	6532	6542	6551	6561	6571	6580	6590	6599	6609	6618	1	2	3	4	5	6	7	8	9
46	6628	6637	6646	6656	6665	6675	6684	6693	6702	6712	1	2	3	4	5	6	7	7	8
47	6721	6730	6739	6749	6758	6767	6776	6785	6794	6803	1	2	3	4	5	5	6	7	8
48	6812	6821	6830	6839	6848	6857	6866	6875	6884	6893	1	2	3	4	4	5	6	7	8
49	6902	6911	6920	6928	6937	6946	6955	6964	6972	6981	1	2	3	4	4	5	6	7	8
50	6990	6898	7007	7016	7024	7033	7042	7050	7059	7067	1	2	3	3	4	5	6	7	8
51	7076	7084	7093	7101	7110	7118	7126	7135	7143	7152	1	2	3	3	4	5	6	7	8
52	7160	7168	7177	7185	7193	7202	7210	7218	7226	7235	1	2	2	3	4	5	6	7	8
53	7243	7251	7259	7267	7275	7284	7292	7300	7308	7316	1	2	2	3	4	5	6	6	7
54	7324	7332	7340	7348	7356	7364	7372	7380	7388	7396	1	2	2	3	4	5	6	6	7
0	0	1	2	3	4	5	6	7	8	9	1	2	3	4	5	6	7	8	9

	0	1	2	3	4	5	6	7	8	9	මධ්‍යන්‍ය අන්තරය இடை வித்தியாசங்கள் Mean Differences 1	2	3	4	5	6	7	8	9
55	7404	7412	7419	7427	7435	7443	7451	7459	7466	7474	1	2	2	3	4	5	5	6	7
56	7482	7490	7497	7505	7513	7520	7528	7536	7543	7551	1	2	2	3	4	5	5	6	7
57	7559	7566	7574	7582	7589	7597	7604	7612	7619	7627	1	2	2	3	4	5	5	6	7
58	7634	7642	7649	7657	7664	7672	7679	7686	7694	7701	1	2	2	3	4	4	5	6	7
59	7709	7716	7723	7731	7738	7745	7752	7760	7767	7774	1	1	2	3	4	4	5	6	7
60	7782	7789	7796	7803	7810	7818	7825	7832	7839	7846	1	1	2	3	4	4	5	6	6
61	7853	7860	7868	7875	7882	7889	7896	7903	7910	7917	1	1	2	3	4	4	5	6	6
62	7924	7931	7938	7945	7952	7959	7966	7973	7980	7987	1	1	2	3	3	4	5	6	6
63	7993	8000	8007	8014	8021	8028	8035	8041	8048	8055	1	1	2	3	3	4	5	5	6
64	8062	8069	8075	8082	8089	8096	8102	8109	8116	8122	1	1	2	3	3	4	5	5	6
65	8129	8136	8142	8149	8156	8162	8169	8176	8182	8189	1	1	2	3	3	4	5	5	6
66	8195	8202	8209	8215	8222	8228	8235	8341	8248	8254	1	1	2	3	3	4	5	5	6
67	8261	8267	8274	8280	8287	8293	8299	8306	8312	8319	1	1	2	3	3	4	5	5	6
68	8325	8331	8338	8344	8351	8357	8363	8370	8376	8382	1	1	2	3	3	4	4	5	6
69	8388	8395	8401	8407	8414	8420	8426	8432	8439	8445	1	1	2	2	3	4	4	5	6
70	8451	8457	8463	8470	8476	8482	8488	8494	8500	8506	1	1	2	2	3	4	4	5	6
71	8513	8519	8525	8531	8537	8543	8549	8555	8561	8567	1	1	2	2	3	4	4	5	5
72	8573	8579	8585	8591	8597	8603	8609	8615	8621	8627	1	1	2	2	3	4	4	5	5
73	8633	8639	8645	8651	8657	8663	8669	8675	8681	8686	1	1	2	2	3	4	4	5	5
74	8692	8698	8704	8710	8716	8722	8727	8733	8739	8745	1	1	2	2	3	4	4	5	5
75	8751	8756	8762	8768	8774	8779	8785	8791	8797	8802	1	1	2	2	3	3	4	5	5
76	8808	8814	8820	8825	8831	8837	8842	8848	8854	8859	1	1	2	2	3	3	4	5	5
77	8865	8871	8876	8882	8887	8893	8899	8904	8910	8915	1	1	2	2	3	3	4	4	5
78	8921	8927	8932	8938	8943	8949	8954	8960	8965	8971	1	1	2	2	3	3	4	4	5
79	8976	8982	8987	8993	8998	9004	9009	9015	9020	9025	1	1	2	2	3	3	4	4	5
80	9031	9036	9042	9047	9053	9058	9063	9069	9074	9079	1	1	2	2	3	3	4	4	5
81	9085	9090	9096	9101	9106	9112	9117	9122	9128	9133	1	1	2	2	3	3	4	4	5
82	9138	9143	9149	9154	9159	9165	9170	9175	9180	9186	1	1	2	2	3	3	4	4	5
83	9191	9196	9201	9206	9212	9217	9222	9227	9232	9238	1	1	2	2	3	3	4	4	5
84	9243	9348	9253	9258	9263	9269	9274	9279	9284	9289	1	1	2	2	3	3	4	4	5
85	9294	9299	9304	9309	9315	9320	9325	9330	9335	9340	1	1	2	2	3	3	4	4	5
86	9345	9350	9355	9360	9365	9370	9375	9380	9385	9390	1	1	2	2	3	3	4	4	5
87	9395	9400	9405	9410	9415	9420	9425	9430	9435	9440	0	1	1	2	2	3	3	4	4
88	9445	9450	9455	9460	9465	9469	9474	9479	9484	9489	0	1	1	2	2	3	3	4	4
89	9494	9499	9504	9509	9513	9518	9523	9528	9533	9538	0	1	1	2	2	3	3	4	4
90	9542	9547	9552	9557	9562	9566	8571	9576	9581	9586	0	1	1	2	2	3	3	4	4
91	9590	9595	9600	9605	9609	9614	9619	9624	9628	9633	0	1	1	2	2	3	3	4	4
92	9638	9643	9647	9652	9657	9661	9666	9671	9675	9680	0	1	1	2	2	3	3	4	4
93	9685	9689	9694	9699	9703	9708	9713	9717	9722	9727	0	1	1	2	2	3	3	4	4
94	9731	9736	9741	9745	9750	9754	9759	9763	9768	9773	0	1	1	2	2	3	3	4	4
95	9777	9782	9786	9791	9795	9800	9805	9809	9814	9818	0	1	1	2	2	3	3	4	4
96	9823	9827	9832	9836	9841	9845	9850	9854	9859	9863	0	1	1	2	2	3	3	4	4
97	9868	9872	9877	9881	9886	9890	9894	9899	9903	9908	0	1	1	2	2	3	3	4	4
98	9912	9917	9921	9926	9930	9934	9939	9943	9948	9952	0	1	1	2	2	3	3	4	4
99	9956	9961	9965	9969	9974	9978	9983	9987	9991	9996	0	1	1	2	2	3	3	3	4
	0	1	2	3	4	5	6	7	8	9	1	2	3	4	5	6	7	8	9

ஒழுகி வகை
இயற்கைச் சைன்கள்
NATURAL SINES

	0′	10′	20′	30′	40′	50′	60′		මධ්‍යන්‍ය අන්තරය இடை வித்தியாசங்கள் Mean Differences								
									1′	2′	3′	4′	5′	6′	7′	8′	9′
0°	0·0000	0·0029	0·0058	0·0087	0·0116	0·0145	0·0175	89°	3	6	9	12	15	17	20	23	26
1	·0175	·0204	·0233	·0262	·0291	·0320	·0349	88	3	6	9	12	15	17	20	23	26
2	·0349	·0378	·0407	·0436	·0465	·0494	·0523	87	3	6	9	12	15	17	20	23	26
3	·0523	·0552	·0581	·0610	·0640	·0669	·0698	86	3	6	9	12	15	17	20	23	26
4	·0698	·0727	·0756	·0785	·0814	·0843	·0872	85	3	6	9	12	15	17	20	23	26
5	0·0872	0·0901	0·0929	0·0958	0·0987	0·1016	0·1045	84	3	6	9	12	14	17	20	23	26
6	·1045	·1074	·1103	·1132	·1161	·1190	·1219	83	3	6	9	12	14	17	20	23	26
7	·1219	·1248	·1276	·1305	·1334	·1363	·1392	82	3	6	9	12	14	17	20	23	26
8	·1392	·1421	·1449	·1478	·1507	·1536	·1564	81	3	6	9	11	14	17	20	23	26
9	·1564	·1593	·1622	·1650	·1679	·1708	·1736	80°	3	6	9	11	14	17	20	23	26
10	0·1736	0·1765	0·1794	0·1822	0·1851	0·1880	0·1908	79	3	6	9	11	14	17	20	23	26
11	·1908	·1937	·1965	·1984	·2022	·2051	·2079	78	3	6	9	11	14	17	20	23	26
12	·2079	·2108	·2136	·2164	·2193	·21212	·2250	77	3	6	9	11	14	17	20	23	26
13	·2250	·2278	·2306	·2334	·2363	·2391	·2419	76	3	6	8	11	14	17	20	23	25
14	·2419	·2447	·2476	·2504	·2532	·2560	·2588	75	3	6	8	11	14	17	20	23	25
15	0·2588	0·2616	0·2644	0·2672	0·2700	0·2728	0·2756	74	3	6	8	11	14	17	20	22	25
16	·2756	·2784	·2812	·2840	·2868	·2896	·2924	73	3	6	8	11	14	17	20	22	25
17	·2924	·2952	·2979	·3007	·3035	·3062	·3090	72	3	6	8	11	14	17	19	22	25
18	·3090	·3118	·3145	·3173	·3201	·3228	·3256	71	3	6	8	11	14	17	19	22	25
19	·3256	·3283	·3311	·3338	·3365	·3393	·3420	70°	3	5	8	11	14	16	19	22	25
20	0·3420	0·3448	0·3475	0·3502	0·3529	0·3557	0·3584	69	3	5	8	11	14	16	19	22	25
21	·3584	·3611	·3638	·3665	·3692	·3719	·3746	68	3	5	8	11	14	16	19	22	24
22	·3746	·3773	·3800	·3827	·3854	·3881	·3907	67	3	5	8	11	13	16	19	21	24
23	·3907	·3934	·3961	·3987	·4014	·4041	·4067	66	3	5	8	11	13	16	19	21	24
24	·4067	·4094	·4120	·4148	·4173	·4200	·4226	65	3	5	8	11	13	16	19	21	24
25	0·4226	0·4253	0·4279	0·4305	0·4331	0·4358	0·4384	64	3	5	8	10	13	16	18	21	24
26	·4384	·4410	·4436	·4462	·4488	·4514	·4540	63	3	5	8	10	13	16	18	21	23
27	·4540	·4566	·4592	·4617	·4643	·4669	·4695	62	3	5	8	10	13	15	18	21	23
28	·4695	·4720	·4746	·4772	·4797	·4823	·4848	61	3	5	8	10	13	15	18	20	23
29	·4848	·4874	·4899	·4924	·4950	·4975	·5000	60°	3	5	8	10	13	15	18	20	23
30°	0·5000	0·5025	0·5050	0·5075	0·5100	0·5125	0·5150	59	3	5	8	10	13	15	18	20	23
31	·5150	·5175	·5200	·5225	·5250	·5275	·5299	58	2	5	7	10	12	15	17	20	22
32	·5299	·5324	·5348	·5373	·5398	·5422	·5446	57	2	5	7	10	12	15	17	20	22
33	·5446	·5471	·5495	·5519	·5544	·5568	·5592	56	2	5	7	10	12	15	17	19	22
34	·5592	·5616	·5640	·5664	·5688	·5712	·5736	55	2	5	7	10	12	14	17	19	22
35	0·5736	0·5760	0·5783	0·5807	0·5831	0·5854	0·5878	54	2	5	7	9	12	14	17	19	21
36	·5878	·5901	·5925	·5948	·5972	·5995	·6018	53	2	5	7	9	12	14	16	19	21
37	·6018	·6041	·6065	·6088	·6111	·6134	·6157	52	2	5	7	9	12	14	16	18	21
38	·6157	·6180	·6102	·6225	·6248	·6271	·6293	51	2	5	7	9	11	14	16	18	20
39	·6293	·6316	·6338	·6361	·6383	·6406	·6428	50°	2	4	7	9	11	13	16	18	20
40°	0·6428	0·6450	0·6472	0·6494	0·6517	0·6539	0·6561	49	2	4	7	9	11	13	15	18	20
41	·6561	·6583	·6604	·6626	·6648	·6670	·6691	48	2	4	7	9	11	13	15	17	20
42	·6691	·6713	·6734	·6756	·6777	·6799	·6820	47	2	4	6	9	11	13	15	17	19
43	·6820	·6841	·6862	·6884	·6905	·6926	·6947	46	2	4	6	8	11	13	15	17	19
44	·6947	·6967	·6988	·7009	·7030	·7050	·7071	45	2	4	6	8	10	12	15	17	19
	60′	50′	40′	30′	20′	10′	0′		1′	2′	3′	4′	5′	6′	7′	8′	9′

ஒழுகி கோவை
இயற்கைக் கோசைன்கள்
NATURAL COSINES

ප්‍රකෘති සයින
இயற்கைச் சைன்கள்
NATURAL SINES

									මධ්‍යන්‍ය අන්තරය இடை வித்தியாசங்கள் Mean Differences								
	0′	10′	20′	30′	40′	50′	60′		1′	2′	3′	4′	5′	6′	7′	8′	9′
45°	0·7071	0·7092	0·7112	0·7133	0·7153	0·7173	0·7193	44°	2	4	6	8	10	12	14	16	18
46	·7193	·7214	·7234	·7254	·7274	·7294	·7314	43	2	4	6	8	10	12	14	16	18
47	·7314	·7333	·7353	·7373	·7392	·7412	·7431	42	2	4	6	8	10	12	14	16	18
48	·7431	·7451	·7470	·7490	·7509	·7528	·7547	41	2	4	6	8	10	12	13	15	17
49	·7547	·7566	·7585	·7604	·7623	·7642	·7660	40	2	4	6	8	9	11	13	15	17
50°	0·7660	0·7679	0·7698	0·7716	0·7735	0·7753	0·7771	39	2	4	6	7	9	11	13	15	17
51	·7771	·7790	·7808	·7826	·7844	·7862	·7880	38	2	4	5	7	9	11	13	14	16
52	·7880	·7898	·7916	·7934	·7951	·7969	·7986	37	2	4	5	7	9	11	12	14	16
53	·7986	·8004	·8021	·8039·	·8056	·8073	·8090	36	2	3	5	7	9	10	12	14	16
54	·8090	·8107	·8124	·8141	·8158	·8175	·8192	35	2	3	5	7	8	10	12	14	15
55°	0·8192	0·8208	0·8225	0·8241	0·8258	0·8274	0·8290	34	2	3	5	7	8	10	12	13	15
56	·8290	·8307	·8323	·8339	·8355	·8371	·8387	33	2	3	5	6	8	10	11	13	14
57	·8387	·8403	·8418	·8434	·8450	·8465	·8480	32	2	3	5	6	8	9	11	13	14
58	·8480	·8496	·8511	·8526	·8542	·8557	·8572	31	2	3	5	6	8	9	11	12	14
59	·8572	·8587	·8601	·8616	·8631	·8646	·8660	30°	1	3	4	6	7	9	10	12	13
60°	0·8660	0·8675	0·8689	0·8704	0·8718	0·8732	0·8746	29	1	3	4	6	7	9	10	11	13
61	·8746	·8760	·8774	·8788	·8802	·8816	·8829	28	1	3	4	6	7	8	10	11	12
62	·8829	·8843	·8857	·8870	·8884	·8897	·8910	27	1	3	4	5	7	8	9	11	12
63	·8910	·8923	·8936	·8949	·8962	·8975	·8988	26	1	3	4	5	6	8	9	10	12
64	·8988	·9001	·9013	·9026	·9038	·9051	·9063	25	1	3	4	5	6	8	9	10	11
65°	0·9063	0·9075	0·9088	0·9100	0·9112	0·9124	0·9135	24	1	2	4	5	6	7	8	10	11
66	·9135	·9147	·9159	·9171	·9182	·9194	·9205	23	1	2	3	5	6	7	8	9	10
67	·9205	·9216	·9228	·9239	·9250	·9261	·9272	22	1	2	3	4	6	7	8	9	10
68	·9272	·9283	·9293	·9304	·9315	·9325	·9336	21	1	2	3	4	5	6	7	9	10
69	·9336	·9346	·9356	·9367	·9377	·9387	·9397	20°	1	2	3	4	5	6	7	8	9
70°	0·9397	0·9407	0·9417	0·9426	0·9436	0·9446	0·9455	19	1	2	3	4	5	6	7	8	9
71	·9455	·9465	·9474	·9483	·9492	·9502	·9511	18	1	2	3	4	5	6	6	7	8
72	·9511	·9520	·9528	·9537	·9546	·9555	·9563	17	1	2	3	4	4	5	6	7	8
73	·9563	·9572	·9580	·9588	·9596	·9605	·9613	16	1	2	2	3	4	5	6	7	7
74	·9613	·9621	·9628	·9636	·9644	·9652	·9659	15	1	2	2	3	4	5	5	6	7
75°	0·9659	0·9667	0·9674	0·9681	0·9689	0·9696	0·9703	14	1	1	2	3	4	4	5	6	7
76	·9703	·9710	·9717	·9724	·9730	·9737	·9744	13	1	1	2	3	3	4	5	5	6
77	·9744	·9750	·9757	·9763	·9769	·9775	·9781	12	1	1	2	3	3	4	4	5	6
78	·9781	·9787	·9793	·9799	·9805	·9811	·9816	11	1	1	2	2	3	3	4	5	5
79	·9816	·9822	·9827	·9833	·9838	·9843	·9848	10°	1	1	2	2	3	3	4	4	5
80°	0·9848	0·9853	0·9858	0·9863	0·9868	0·9872	0·9877	9	0	1	1	2	2	3	3	4	4
81	·9877	·9881	·9886	·9890	·9894	·9899	·9903	8	0	1	1	2	2	3	3	3	4
82	·9903	·9907	·9911	·9914	·9918	·9922	·9925	7	0	1	1	2	2	2	3	3	3
83	·9925	·9929	·9932	·9936	·9939	·9942	·9945	6	0	1	1	1	2	2	2	3	3
84	·9945	·9948	·9951	·9954	·9957	·9959	·9962	5	0	1	1	1	1	2	2	2	3
85°	0·9962	0·9964	0·9967	0·9969	0·9971	0·9974	0·9976	4	0	1	1	1	1	1	2	2	2
86	·9976	·9978	·9980	·9981	·9983	·9985	·9986	3	0	0	1	1	1	1	1	1	2
87	·9986	·9988	·9989	·9990	·9992	·9993	·9994	2	0	0	0	1	1	1	1	1	1
88	·9994	·9995	·9996	·9997	·9997	·9998	·9998	1									
89	0·9998	0·9999	0·9999	1·0000	1·0000	1·0000	1·0000	0									
	60′	50′	40′	30′	20′	10′	0′		1′	2′	3′	4′	5′	6′	7′	8′	9′

ප්‍රකෘති කෝසයින
இயற்கைக் கோசைன்கள்
NATURAL COSINES

ප්‍රකෘති වැදුම
இயற்கைத் தான்சன்கள்
NATURAL TANGENTS

									මධ්‍යන්‍ය අන්තරය / இடை வித்தியாசங்கள் / Mean Differences								
	0′	10′	20′	30′	40′	50′	60′		1′	2′	3′	4′	5′	6′	7′	8′	9′
0°	0·0000	0·0029	0·0058	0·0087	0·0116	0·0145	0·0175	89°	3	6	9	12	15	17	20	23	26
1	·0175	·0204	·0233	·0262	·0291	·0320	·0349	88	3	6	9	12	15	17	20	23	26
2	·0349	·0378	·0407	·0437	·0466	·0495	·0524	87	3	6	9	12	15	18	20	23	26
3	·0524	·0553	·0582	·0612	·0641	·0670	·0699	86	3	6	9	12	15	18	20	23	26
4	·0699	·0729	·0758	·0787	·0816	·0846	·0875	85	3	6	9	12	15	18	21	23	26
5	0·0875	0·0904	0·0934	0·0963	0·0992	0·1022	0·1051	84	3	6	9	12	15	18	21	24	26
6	·1051	·1080	·1110	·1139	·1169	·1198	·1228	83	3	6	9	12	15	18	21	24	27
7	·1228	·1257	·1287	·1317	·1346	·1376	·1405	82	3	6	9	12	15	18	21	24	27
8	·1405	·1435	·1465	·1495	·1524	·1554	·1584	81	3	6	9	12	15	18	21	24	27
9	·1584	·1614	·1644	·1673	·1703	·1733	·1763	80°	3	6	9	12	15	18	21	24	27
10°	0·1763	0·1793	0·1823	0·1853	0·1883	0·1914	0·1944	79	3	6	9	12	15	18	21	24	27
11	·1944	·1974	·2004	·2035	·2065	·2095	·2126	78	3	6	9	12	15	18	21	24	27
12	·2126	·2156	·2186	·2217	·2247	·2278	·2309	77	3	6	9	12	15	18	21	24	27
13	·2309	·2339	·2370	·2401	·2432	·2462	·2493	76	3	6	9	12	15	18	22	25	28
14	·2493	·2524	·2555	·2586	·2617	·2648	·2679	75	3	6	9	12	15	15	22	25	28
15	0·2679	0·2711	0·2742	0·2773	0·2805	0·2836	0·2867	74	3	6	9	13	16	19	22	25	28
16	·2867	·2899	·2931	·2962	·2994	·3026	·3057	73	3	6	9	13	16	19	22	25	28
17	·3057	·3089	·3121	·3153	·3185	·3217	·3249	72	3	6	10	13	16	19	22	26	29
18	·3249	·3281	·3314	·3346	·3378	·3411	·3443	71	3	6	10	13	16	19	23	26	29
19	·3443	·3476	·3508	·3541	·3574	·3607	·3640	70°	3	7	10	13	16	20	23	26	29
20°	0·3640	0·3673	0·3706	0·3739	0·3772	0·3805	0·3839	69	3	7	10	13	17	20	23	27	30
21	·3839	·3872	·3906	·3939	·3973	·4006	·4040	68	3	7	10	13	17	20	24	27	30
22	·4040	·4074	·4108	·4142	·4176	·4210	·4245	67	3	7	10	14	17	20	24	27	31
23	·4245	·4279	·4214	·4348	·4383	·4417	·4452	66	3	7	10	14	17	21	24	28	31
24	·4452	·4487	·4522	·4557	·4592	·4628	·4663	65	4	7	11	14	18	21	25	28	32
25	0·4663	0·4699	0·4734	0·4770	0·4806	0·4841	0·4877	64	4	7	11	14	18	21	25	29	32
26	·4877	·4913	·4950	·4986	·5022	·5059	·5095	63	4	7	11	15	18	22	25	29	33
27	·5095	·5132	·5169	·5206	·5243	·5280	·5317	62	4	7	11	15	18	22	26	30	33
28	·5317	·5354	·5392	·5430	·5467	·5505	·5543	61	4	8	11	15	19	23	26	30	34
29	·5543	·5581	·5619	·5658	·5696	·5735	·5774	60°	4	8	12	15	19	23	27	31	35
30°	0·5774	0·5812	0·5851	0·5890	0·5930	0·5969	0·6009	59	4	8	12	16	20	24	27	31	35
31	·6009	·6048	·6088	·6128	·6168	·6208	·6249	58	4	8	12	16	20	24	28	32	36
32	·6249	·6289	·6330	·6371	·6412	·6453	·6494	57	4	8	12	16	20	25	29	33	37
33	·6494	·6536	·6577	·6619	·6661	·6703	·6745	56	4	8	13	17	21	25	29	33	38
34	·6745	·6787	·6830	·6873	·6916	·6959	·7002	55	4	9	13	17	21	26	30	34	39
35	0·7002	0·7046	0·7089	0·7133	0·7177	0·7221	0·7265	54	4	9	13	18	22	26	31	35	40
36	·7265	·7310	·7335	·7400	·7445	·7490	·7536	53	5	9	14	18	23	27	32	36	41
37	·7536	·7581	·7627	·7673	·7720	·7766	·7813	52	5	9	14	19	23	28	32	37	42
38	·7813	·7860	·7907	·7954	·8002	·8050	·8098	51	5	10	14	19	24	29	33	38	43
39	·8098	·8146	·8195	·8243	·8292	·8342	·8391	50°	5	10	15	20	24	29	34	39	44
40°	0·8391	0·8441	0·8491	0·8541	0·8591	0·8642	0·8693	49	5	10	15	20	25	30	35	40	45
41	·8693	·8744	·8796	·8847	·8899	·8952	·9004	48	5	10	16	21	26	31	36	41	47
42	·9004	·9057	·9110	·9163	·9217	·9271	·9325	47	5	11	16	21	27	32	37	43	48
43	·9325	·9380	·9435	·9490	·9545	·9601	·9657	46	6	11	17	22	28	33	39	44	50
44	·9657	·9713	·9770	·9827	·9884	·9942	1·000	45	6	11	17	23	29	34	40	46	51
	60′	50′	40′	30′	20′	10′	0′		1′	2′	3′	4′	5′	6′	7′	8′	9′

ප්‍රකෘති කොටැදුම
இயற்கைத் தொங்கன்சன்கள்
NATURAL COTANGENTS

ප්‍රකෘති වැඳුන
இயற்கைத் தான்சன்கள்
NATURAL TANGENTS

									මධ්‍යන්‍ය අන්තරය இடை வித்தியாசங்கள் Mean Differences								
	0′	10′	20′	30′	40′	50′	60′		1′	2′	3′	4′	5′	6′	7′	8′	9′
45°	1·0000	1·0058	1·0117	1·0176	1·0235	1·0295	1·0355	44	6	12	18	24	30	36	41	47	53
46	·0355	·0416	·0477	·0538	·0599	·0661	·0724	43	6	12	18	25	31	37	43	49	55
47	·0724	·0786	·0850	·0913	·0977	·1041	·1106	42	6	13	19	26	32	38	45	51	57
48	·1106	·1171	·1237	·1303	·1369	·1436	·1504	41	7	13	20	27	33	40	46	53	60
49	·1504	·1571	·1640	·1708	·1778	·1847	·1918	40°	7	14	21	28	34	41	48	55	62
50°	1·1918	1·1988	1·2059	1·2059	1·2131	1·2203	1·2349	39	7	14	22	29	36	43	50	58	65
51	·2349	·2423	·2497	·2572	·2647	·2723	·2799	38	8	15	23	30	38	45	53	60	68
52	·2799	·2876	·2954	·3932	·3111	·3190	·3270	37	8	16	24	31	39	47	55	63	71
53	·3270	·3351	·3432	·3514	·3597	·3680	·3764	36	8	16	25	33	41	49	58	66	74
54	·3764	·3848	·3934	·4019	·4106	·4193	·4281	35	9	17	26	35	43	52	60	69	78
55	1·4281	1·4370	1·4460	1·4550	1·4641	1·4733	1·4826	34	9	18	27	36	45	54	63	73	82
56	·4826	·4919	·5013	·5108	·5204	·5301	·5399	33	10	19	29	38	48	57	67	77	86
57	·5399	·5497	·5597	·5697	·5798	·5900	·6003	32	10	20	30	40	50	60	71	81	91
58	·6003	·6107	·6212	·6319	·6426	·6534	·6643	31	11	21	32	43	53	64	75	85	96
59	·6643	·6753	·6864	·6977	·7090	·7205	·7321	30°	11	23	34	45	56	68	79	90	102
60°	1·732	1·744	1·756	1·767	1·780	1·792	1·804	29	1	2	4	5	6	7	8	10	11
61	1·804	1·816	1·829	1·842	1·855	1·868	1·881	28	1	3	4	5	6	8	9	10	12
62	1·881	1·894	1·907	1·921	1·935	1·949	1·963	27	1	3	4	5	7	8	10	11	12
63	1·963	1·977	1·981	2·006	2·025	2·035	2·050	26	1	3	4	6	7	9	10	12	13
64	2·050	2·066	2·081	2·097	2·112	2·128	2·145	25	2	3	5	6	8	9	11	13	14
65	2·145	2·161	2·177	2·194	2·211	2·229	2·246	24	2	3	5	7	8	10	12	14	15
66	2·246	2·264	2·282	2·300	2·318	2·337	2·356	23	2	4	5	7	9	11	13	15	16
67	2·356	2·375	2·394	2·414	2·434	2·455	2·475	22	2	4	6	8	10	12	14	16	18
68	2·475	2·496	2·517	2·539	2·560	2·583	2·605	21	2	4	6	9	11	13	15	17	20
69	2·605	2 628	2·651	2·675	2·699	2·723	2·747	20°	2	5	7	9	12	14	17	19	21
70°	2·747	2·773	2·798	2·824	2·850	2·877	2·904	19	3	5	8	10	13	16	18	21	23
71	2·904	2·932	2·960	2·989	2·018	2·047	3·078	18	3	6	9	12	14	17	20	23	26
72	3·078	3·108	3·140	3·172	3·204	3·237	3·271	17	3	6	10	13	16	19	23	26	29
73	3·271	3·305	3·340	3·376	3·412	3·450	3·487	16	4	7	11	14	18	22	25	29	32
74	3·487	3·526	3·566	3·606	3·647	3·689	3·732	15	4	8	12	16	20	24	29	33	37
75	3·732	3·776	3·821	3·867	3·914	3·962	4·011	14	5	9	14	19	23	28	33	37	42
76	4·011	4·061	4·113	4·165	4·219	4·275	4·331	13	5	11	16	21	27	32	37	43	48
77	4·331	4·390	4·449	4·511	4·574	4·638	4·705	12	6	12	19	25	31	37	44	50	56
78	4·705	4·773	4·843	4·915	4·989	5·066	5·145	11	7	15	22	29	37	44	51	59	66
79	5·145	5·226	5·309	5·396	5·485	5·576	5·671	10°	9	18	26	35	44	53	61	70	79
80°	5·671	5·769	5·871	5·976	6·084	6·197	6·314	9									
81	6·314	6·435	6·561	6·691	6·827	6·968	7·115	8									
82	7·115	7·269	7·429	7·596	7·770	7·953	8·144	7									
83	8·144	8·345	8·556	8·777	9·010	9·255	9·514	6									
84	9·514	9·788	10·078	10·385	10·712	11·059	11·430	5	අන්තර ඔසුයෙන් වෙනස් වෙයි.								
85	11·43	11·83	12·25	12·71	13·20	13·73	14·30	4	வித்தியாசங்கள் விரைந்து மாறுவன								
86	14·30	14·92	15·60	16·35	17·17	18·07	19·08	3									
87	19·08	20·21	21·47	22·90	24·54	26·43	28·64	2	Differences change rapidly								
88	28·64	31·24	34·37	38·19	42·96	49·10	57·29	1									
89	57·29	68·75	85·94	114·59	171·89	343·77	∞	0°									
	60′	50′	40′	30′	20′	10′	0′		1′	2′	3′	4′	5′	6′	7′	8′	9′

ප්‍රකෘති කෝවැඳුන
இயற்கைக் கொதான்சன்கள்
NATURAL COTANGENTS