

## Introduction

Pie charts are the pictorial presentation of data in which data is presented in the form of a circle. In a pie chart, a circle is divided into various segments in such a way that each segment shows certain proportion of the total. In a pie chart, the total of all the data is  $360^\circ$ .

Formula to calculate central angle for a component:

$$\text{Central angle of a component} = \frac{\text{value of the component}}{\text{Total value}} \times 360^\circ$$

Steps for the construction of a pie chart:

- 1) First we calculate the central angle for each component using by above mentioned formula.
- 2) Draw a circle of any radius.
- 3) Then, within this circle, draw a horizontal radius.
- 4) Starting with the horizontal radius, draw radii making central angles corresponding to the values of respective components
- 5) Repeat the process for all components till all the components get exhausted.
- 6) These radii divide the complete circle into various sectors.
- 7) We can shade each sector with different colors or design.
- 8) At the end, we obtain the required pie chart of the given data.

## Examples

**Example 1 – A man with a monthly salary of Rs 21600 plans his budget for a month as given below:**

Item	Food	Rent	Education	Savings	Miscellaneous
Amount (in Rs)	6300	4200	3900	4800	2400

**Represent the above data by a pie chart.**

Solution - Total monthly salary = Rs 21600

We first calculate the central angles for each component by using the formula:

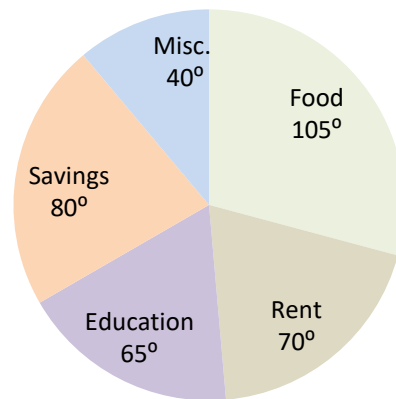
$$\text{Central angle of a component} = \frac{\text{value of the component}}{\text{Total value}} \times 360^\circ$$

Item	Amount (in Rs)	Central angle
Food	6300	$\frac{6300}{21600} \times 360 = 105^\circ$
Rent	4200	$\frac{4200}{21600} \times 360 = 70^\circ$
Education	3900	$\frac{3900}{21600} \times 360 = 65^\circ$
Savings	4800	$\frac{4800}{21600} \times 360 = 80^\circ$
Miscellaneous	2400	$\frac{2400}{21600} \times 360 = 40^\circ$

Steps of construction of pie chart for the above data:

- 1) Draw circle of any radius
- 2) Draw horizontal radius of circle
- 3) Starting with the horizontal radius, draw sectors whose central angles are  $105^\circ$ ,  $70^\circ$ ,  $65^\circ$ ,  $80^\circ$  and  $40^\circ$  respectively.

4) Now shade the sectors with different colors and label each of them.



**Example 2 – The data on the mode of transport used by 720 students are given below:**

Mode of transport	Bus	Cycle	Train	Car	Scooter
Number of students	120	180	240	80	100

**Represent the above data by a pie chart**

Solution - Total number of students = 720

We first calculate the central angles for each component by using the formula:

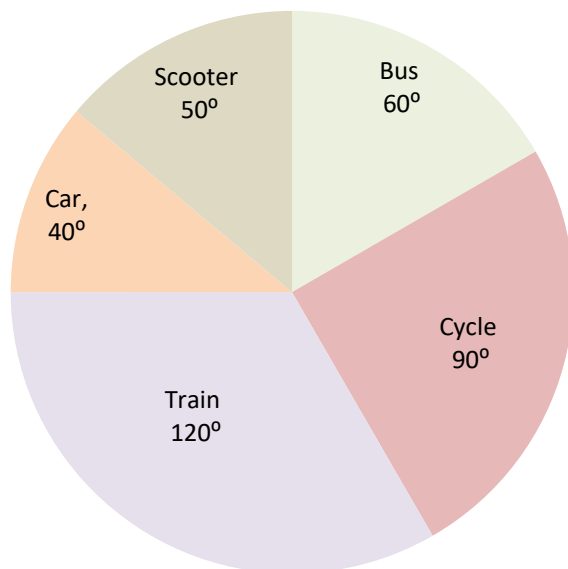
$$\text{Central angle of a component} = \frac{\text{value of the component}}{\text{Total value}} \times 360^\circ$$

Mode of transport	Number of students	Central angle
Bus	120	$\frac{120}{720} \times 360 = 60^\circ$
Cycle	180	$\frac{180}{720} \times 360 = 90^\circ$
Train	240	$\frac{240}{720} \times 360 = 120^\circ$

Car	80	$\frac{80}{720} \times 360 = 40^\circ$
Scooter	100	$\frac{100}{720} \times 360 = 50^\circ$

Steps of construction of pie chart for the above data:

- 1) Draw circle of any radius
- 2) Draw horizontal radius of circle
- 3) Starting with the horizontal radius, draw sectors whose central angles are  $60^\circ$ ,  $90^\circ$ ,  $120^\circ$ ,  $40^\circ$  and  $50^\circ$  respectively.
- 4) Now shade the sectors with different colors and label each of them.



**Example 3 – There are 216 workers in a factory as per list given below:**

Cadre	Labourer	Machanic	Fitter	Supervisor	Clerk
Number of workers	75	60	36	27	18

**Represent the above data by a pie chart**

Solution -Total number of workers = 216

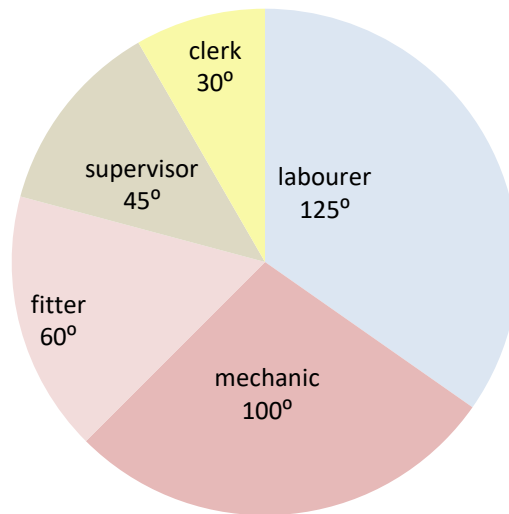
We first calculate the central angles for each component by using the formula:

$$\text{Central angle of a component} = \frac{\text{value of the component}}{\text{Total value}} \times 360^\circ$$

Cadre	Number of workers	Central angle
Labourer	75	$\frac{75}{216} \times 360 = 125^\circ$
Mechanic	60	$\frac{60}{216} \times 360 = 100^\circ$
Filter	36	$\frac{36}{216} \times 360 = 60^\circ$
Supervisor	27	$\frac{27}{216} \times 360 = 45^\circ$
Clerk	18	$\frac{18}{216} \times 360 = 30^\circ$

Steps of construction of pie chart for the above data:

- 1) Draw circle of any radius
- 2) Draw horizontal radius of circle
- 3) Starting with the horizontal radius, draw sectors whose central angles are  $125^\circ$ ,  $100^\circ$ ,  $60^\circ$ ,  $45^\circ$  and  $30^\circ$  respectively.
- 4) Now shade the sectors with different colors and label each of them.



**Example 4 – The following table shows the expenditure in percentage incurred on the construction of a house in a city:**

Item	Brick	Cement	Steel	Labour	Miscellaneous
Expenditure (in %)	15%	20%	10%	25%	30%

**Represent the above data by a pie chart.**

Solution - Total percentage = 100

We first calculate the central angles for each component by using the formula:

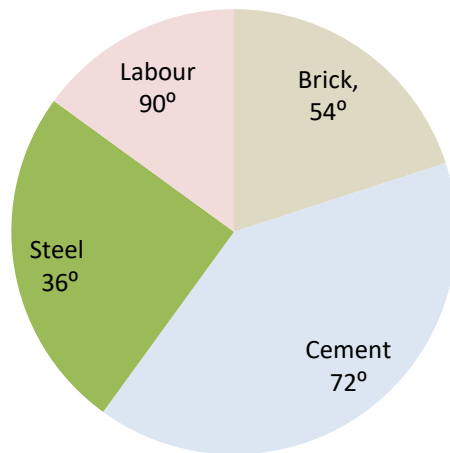
$$\text{Central angle of a component} = \frac{\text{value of the component} \times 360^\circ}{\text{Total value}}$$

Item	Expenditure (in %)	Central angle
Labourer	15%	$\frac{15}{100} \times 360 = 54^\circ$
Mechanic	20%	$\frac{20}{100} \times 360 = 72^\circ$
Fitter	10%	$\frac{10}{100} \times 360 = 36^\circ$

Supervisor	25%	$\frac{25}{100} \times 360 = 90^\circ$
Clerk	30%	$\frac{30}{100} \times 360 = 108^\circ$

Steps of construction of pie chart for the above data:

- 1) Draw circle of any radius
- 2) Draw horizontal radius of circle
- 3) Starting with the horizontal radius, draw sectors whose central angles are  $54^\circ$ ,  $72^\circ$ ,  $36^\circ$ ,  $90^\circ$  and  $108^\circ$  respectively.
- 4) Now shade the sectors with different colors and label each of them.



### Exercise 24A

**Question 1 – The monthly income of a family is Rs 28800. The monthly expenditure of the family on various items is given below:**

Item	Rent	Food	Clothing	Education	Savings
Expenditure (in Rs)	8000	10800	5600	3600	800

**Represent the above data by a pie chart.**

Solution - Total monthly income = Rs 28800

We first calculate the central angles for each component by using the formula:

$$\text{Central angle of a component} = \frac{\text{value of the component}}{\text{Total value}} \times 360^\circ$$

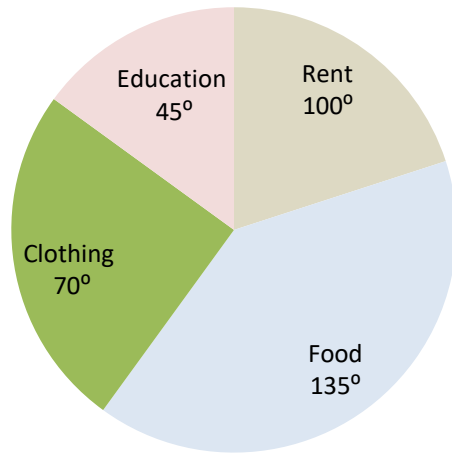
Item	Expenditure (in Rs)	Central angle
Rent	8000	$\frac{8000}{28800} \times 360 = 100^\circ$
Food	10800	$\frac{10800}{28800} \times 360 = 135^\circ$
Clothing	5600	$\frac{5600}{28800} \times 360 = 70^\circ$
Education	3600	$\frac{3600}{28800} \times 360 = 45^\circ$
Savings	800	$\frac{800}{28800} \times 360 = 10^\circ$

Steps of construction of pie chart for the above data:

- 1) Draw circle of any radius
- 2) Draw horizontal radius of circle
- 3) Starting with the horizontal radius, draw sectors whose central angles are  $100^\circ$ ,  $135^\circ$ ,  $70^\circ$ ,  $45^\circ$  and  $10^\circ$  respectively.



4) Now shade the sectors with different colors and label each of them.



**Question 2 – There are 900 creatures in a zoo as per list given below:**

Beast animals	Other land animals	Birds	Water animals	Reptiles
150	400	175	125	50

**Represent the above data by a pie chart.**

Solution - Total number of creatures = 900

We first calculate the central angles for each component by using the formula:

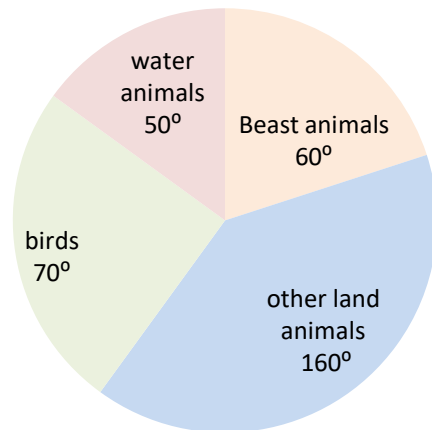
$$\text{Central angle of a component} = \frac{\text{value of the component}}{\text{Total value}} \times 360^\circ$$

Different creatures	Number of creatures	Central angle
Beast animals	150	$\frac{150}{900} \times 360 = 60^\circ$
Other land animals	400	$\frac{400}{900} \times 360 = 160^\circ$
Birds	175	$\frac{175}{900} \times 360 = 70^\circ$

Water animals	125	$\frac{125}{900} \times 360 = 50^\circ$
Reptiles	50	$\frac{50}{900} \times 360 = 20^\circ$

Steps of construction of pie chart for the above data:

- 1) Draw circle of any radius
- 2) Draw horizontal radius of circle
- 3) Starting with the horizontal radius, draw sectors whose central angles are  $60^\circ$ ,  $160^\circ$ ,  $70^\circ$ ,  $50^\circ$  and  $20^\circ$  respectively.
- 4) Now shade the sectors with different colors and label each of them.



**Question 3 – Various modes of transport used by 1260 students in a given school are given below:**

School bus	Private bus	Bicycle	Rickshaw	On foot
350	245	210	175	280

**Represent the above data by a pie chart.**

Solution - Total number of students = 1260

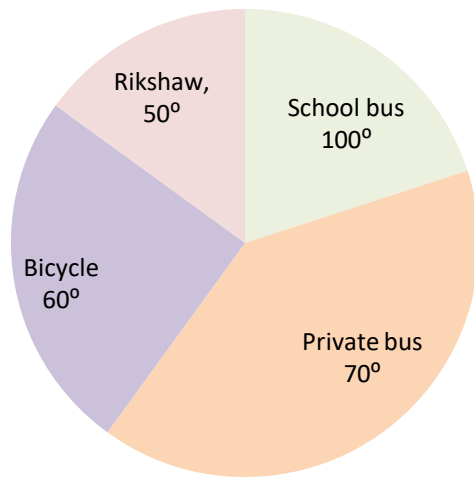
We first calculate the central angles for each component by using the formula:

$$\text{Central angle of a component} = \frac{\text{value of the component}}{\text{Total value}} \times 360^\circ$$

Mode of transport	Number of students	Central angle
School bus	350	$\frac{350}{1260} \times 360 = 100^\circ$
Private bus	245	$\frac{245}{1260} \times 360 = 70^\circ$
Bicycle	210	$\frac{210}{1260} \times 360 = 60^\circ$
Rickshaw	175	$\frac{175}{1260} \times 360 = 50^\circ$
On foot	280	$\frac{280}{1260} \times 360 = 80^\circ$

Steps of construction of pie chart for the above data:

- 1) Draw circle of any radius
- 2) Draw horizontal radius of circle
- 3) Starting with the horizontal radius, draw sectors whose central angles are  $100^\circ$ ,  $70^\circ$ ,  $60^\circ$ ,  $50^\circ$  and  $80^\circ$  respectively.
- 4) Now shade the sectors with different colors and label each of them.



**Question 4 – The data given below shows number of hours spent by a school boy on different activities on a working day.**

Activity	School	Homework	Play	Sleep	Others	Total
Number of hours	7	4	2	8	3	24

**Represent the above data by a pie chart.**

Solution - Total number of hours = 24

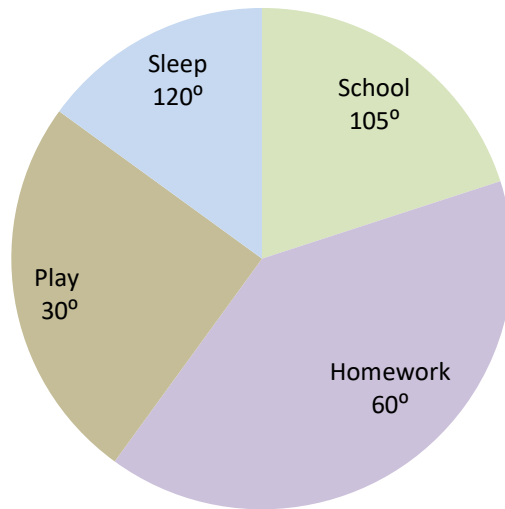
We first calculate the central angles for each component by using the formula:

$$\text{Central angle of a component} = \frac{\text{value of the component}}{\text{Total value}} \times 360^\circ$$

Activity	Number of hours	Central angle
School	7	$\frac{7}{24} \times 360 = 105^\circ$
Homework	4	$\frac{4}{24} \times 360 = 60^\circ$
Play	2	$\frac{2}{24} \times 360 = 30^\circ$
Sleep	8	$\frac{8}{24} \times 360 = 120^\circ$
Others	3	$\frac{3}{24} \times 360 = 45^\circ$

Steps of construction of pie chart for the above data:

- 1) Draw circle of any radius
- 2) Draw horizontal radius of circle
- 3) Starting with the horizontal radius, draw sectors whose central angles are  $105^\circ$ ,  $60^\circ$ ,  $30^\circ$ ,  $120^\circ$  and  $45^\circ$  respectively.
- 4) Now shade the sectors with different colors and label each of them.



**Question 5 – The data on religion wise division of 1080 workers of a factory are given below:**

Religion	Hindu	Muslim	Sikh	Christian
Number of workers	450	270	255	105

**Draw a pie chart to represent the above data.**

Solution - Total number of workers = 1080

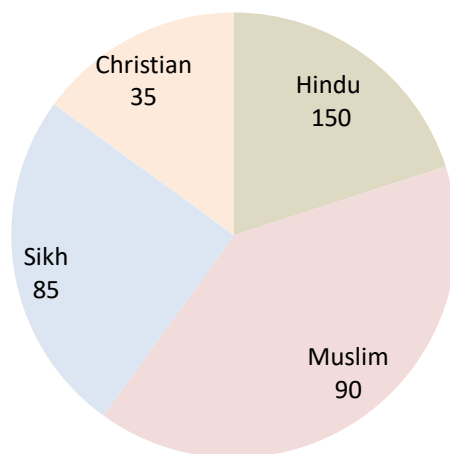
We first calculate the central angles for each component by using the formula:

$$\text{Central angle of a component} = \frac{\text{value of the component}}{\text{Total value}} \times 360^\circ$$

Religion	Number of workers	Central angle
Hindu	450	$\frac{450}{1080} \times 360 = 150^\circ$
Muslim	270	$\frac{270}{1080} \times 360 = 90^\circ$
Sikh	255	$\frac{255}{1080} \times 360 = 85^\circ$
Christian	105	$\frac{105}{1080} \times 360 = 35^\circ$

Steps of construction of pie chart for the above data:

- 1) Draw circle of any radius
- 2) Draw horizontal radius of circle
- 3) Starting with the horizontal radius, draw sectors whose central angles are  $150^\circ$ ,  $90^\circ$ ,  $85^\circ$  and  $35^\circ$  respectively.
- 4) Now shade the sectors with different colors and label each of them.



**Question 6 – The marks obtained by Sudhir in an examination are given below:**

Subject	English	Hindi	Mathematics	Science	Social Science
Marks obtained	105	75	150	120	90

**Represent the above data by a pie chart**

Solution - Total marks obtained =  $105+75+150+120+90 = 540$

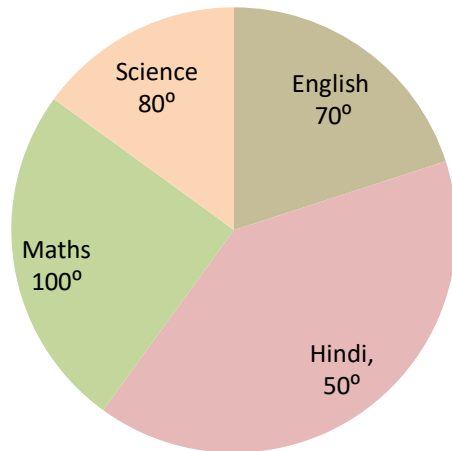
We first calculate the central angles for each component by using the formula:

Central angle of a component =  $\frac{\text{value of the component}}{\text{Total value}} \times 360^\circ$

Subject	Marks obtained	Central angle
English	105	$\frac{105}{540} \times 360 = 70^\circ$
Hindi	75	$\frac{75}{540} \times 360 = 50^\circ$
Mathematics	150	$\frac{150}{540} \times 360 = 100^\circ$
Science	120	$\frac{120}{540} \times 360 = 80^\circ$
Social Science	90	$\frac{90}{540} \times 360 = 60^\circ$

Steps of construction of pie chart for the above data:

- 1) Draw circle of any radius
- 2) Draw horizontal radius of circle
- 3) Starting with the horizontal radius, draw sectors whose central angles are  $70^\circ$ ,  $50^\circ$ ,  $100^\circ$ ,  $80^\circ$  and  $60^\circ$  respectively.
- 4) Now shade the sectors with different colors and label each of them.



**Question 7 – The following table gives the number of different fruits kept in a hamper:**

Type of fruit	Mangoes	Apples	Oranges	Coconuts	Pomegranates
Number	26	30	21	5	8

**Represent the above data by a pie chart**

Solution - Total number of fruits =  $26+30+21+5+8 = 90$

We first calculate the central angles for each component by using the formula:

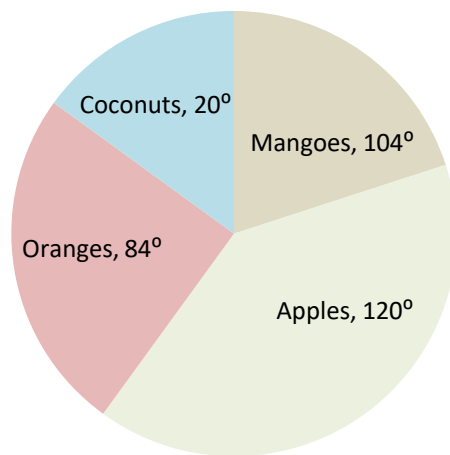
$$\text{Central angle of a component} = \frac{\text{value of the component}}{\text{Total value}} \times 360^\circ$$

Type of fruit	Marks obtained	Central angle
Mangoes	26	$\frac{26}{90} \times 360 = 104^\circ$
Apples	30	$\frac{30}{90} \times 360 = 120^\circ$
Oranges	21	$\frac{21}{90} \times 360 = 84^\circ$
Coconuts	5	$\frac{5}{90} \times 360 = 20^\circ$
Pomegranates	8	$\frac{8}{90} \times 360 = 32^\circ$



Steps of construction of pie chart for the above data:

- 1) Draw circle of any radius
- 2) Draw horizontal radius of circle
- 3) Starting with the horizontal radius, draw sectors whose central angles are  $104^\circ$ ,  $120^\circ$ ,  $84^\circ$ ,  $20^\circ$  and  $32^\circ$  respectively.
- 4) Now shade the sectors with different colors and label each of them.



**Question 8 – The following data shows the agricultural production in India during a certain year.**

Food grain	Rice	Wheat	Coarse cereals	Pulses
Production(in millions of tonnes)	57	76	38	19

**Draw a pie chart to represent the above data.**

Solution - Total Production =  $(57+76+38+19)$  million tonnes = 190 million tonnes

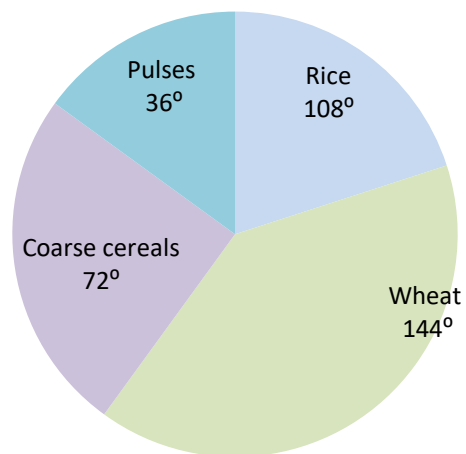
We first calculate the central angles for each component by using the formula:

$$\text{Central angle of a component} = \frac{\text{value of the component}}{\text{Total value}} \times 360$$

Food grain	Production (in millions of tonnes)	Central angle
Rice	57	$\frac{57}{190} \times 360 = 108^\circ$
Wheat	76	$\frac{76}{190} \times 360 = 144^\circ$
Coarse cereals	38	$\frac{38}{190} \times 360 = 72^\circ$
Pulses	19	$\frac{19}{190} \times 360 = 36^\circ$

Steps of construction of pie chart for the above data:

- 1) Draw circle of any radius
- 2) Draw horizontal radius of circle
- 3) Starting with the horizontal radius, draw sectors whose central angles are  $108^\circ$ ,  $144^\circ$ ,  $72^\circ$  and  $36^\circ$  respectively.
- 4) Now shade the sectors with different colors and label each of them.



**Question 9 – Given below is the result of an annual examination of a class, showing the percentage of students in each category.**

First division	Second division	Third division	Failed
25%	45%	20%	10%

**Represent the above data by a pie chart.**

Solution - Total percentage = 100

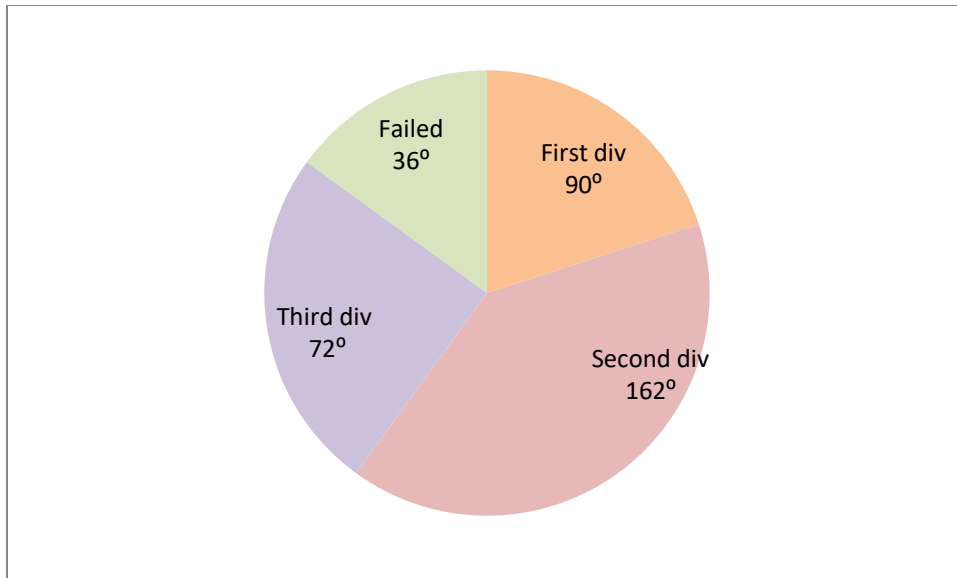
We first calculate the central angles for each component by using the formula:

$$\text{Central angle of a component} = \frac{\text{value of the component}}{\text{Total value}} \times 360^\circ$$

Result	Percentage of students	Central angle
First division	25%	$\frac{25}{100} \times 360 = 90^\circ$
Second division	45%	$\frac{45}{100} \times 360 = 162^\circ$
Third division	20%	$\frac{20}{100} \times 360 = 72^\circ$
Failed	10%	$\frac{10}{100} \times 360 = 36^\circ$

Steps of construction of pie chart for the above data:

- 1) Draw circle of any radius
- 2) Draw horizontal radius of circle
- 3) Starting with the horizontal radius, draw sectors whose central angles are  $90^\circ$ ,  $162^\circ$ ,  $72^\circ$  and  $36^\circ$  respectively.
- 4) Now shade the sectors with different colors and label each of them.



**Question 10 – The following table shows the percentage of buyers of four different brands of bathing soaps.**

Brand	A	B	C	D
Percentage of buyers	20%	40%	25%	15%

**Represent the above data by a pie chart.**

Solution - Total percentage = 100

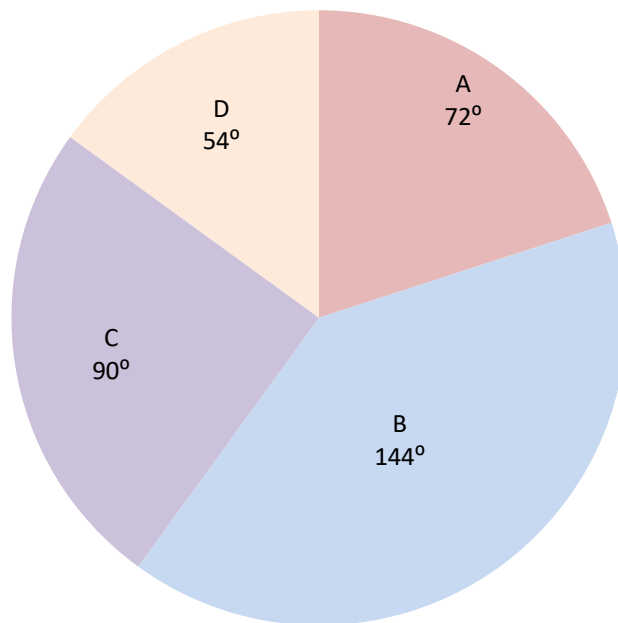
We first calculate the central angles for each component by using the formula:

$$\text{Central angle of a component} = \frac{\text{value of the component}}{\text{Total value}} \times 360^\circ$$

Brand	Percentage of buyers	Central angle
A	20%	$\frac{20}{100} \times 360 = 72^\circ$
B	40%	$\frac{40}{100} \times 360 = 144^\circ$
C	25%	$\frac{25}{100} \times 360 = 90^\circ$
D	15%	$\frac{15}{100} \times 360 = 54^\circ$

Steps of construction of pie chart for the above data:

- 1) Draw circle of any radius
- 2) Draw horizontal radius of circle
- 3) Starting with the horizontal radius, draw sectors whose central angles are  $90^\circ$ ,  $162^\circ$ ,  $72^\circ$  and  $36^\circ$  respectively.
- 4) Now shade the sectors with different colors and label each of them.



### Exercise 24B

**Question 1 – A man’s monthly salary is Rs 24000 and his monthly expenses on travel are Rs 2500. The central angle of the sector representing travel expenses in the pie chart would be?**

Solution - Total monthly salary = Rs 24000

Monthly expenses on travel = Rs 2500

Central angle of a component =  $\frac{\text{value of the component} \times 360^\circ}{\text{Total value}}$

$$\begin{aligned}\text{Central angle of sector representing travel expenses} &= \frac{\text{value of the component} \times 360^\circ}{\text{Total value}} \\ &= \frac{2500 \times 360}{24000} = 37.5^\circ\end{aligned}$$

**Question 2 – If 35% of the people residing in a locality are Sikhs then the central angle of the sector representing the Sikh community in the pie chart would be?**

Solution - Total Percentage of People = 100%

Percentage of Sikhs = 35%

Central angle of a component =  $\frac{\text{value of the component} \times 360^\circ}{\text{Total value}}$

$$\begin{aligned}\text{Central angle of sector representing Sikh community} &= \frac{\text{value of the component} \times 360^\circ}{\text{Total value}} \\ &= \frac{35 \times 360}{100} = 126^\circ\end{aligned}$$

**Question 3 – If in the pie chart representing the number of students opting for different streams of study out of a total strength of 1650 students, the central angle of the sector representing arts students is  $48^\circ$  then what is the number of students who opted for arts stream?**

Solution - Total strength of students = 1650

Central angle representing arts students =  $48^\circ$

We know that Central angle of a component =  $\frac{\text{value of the component}}{\text{Total value}} \times 360^\circ$

$$\Rightarrow \frac{\text{Number of arts students} \times 360}{1650} = 48$$

$$\Rightarrow \text{Number of arts students} = (48 \times 1650) / 360 = 220$$

**Question 4 – In the pie chart representing the percentage of students having interest in reading various kinds of books, the central angle of the sector representing students reading novel is  $81^\circ$ . What is the percentage of students interested in reading novels?**

Solution - Total Percentage of Students = 100%

Central angle representing students reading novels =  $81^\circ$

We know that Central angle of a component =  $\frac{\text{value of the component}}{\text{Total value}} \times 360^\circ$

$$\Rightarrow \frac{\text{Number of students reading novels} \times 360}{100} = 81$$

$$\Rightarrow \text{Number of students reading novels} = (81 \times 100) / 360 = 22.5\%$$