DATA HANDLING

3 CHAPTER

CONTENTS

- Data
- Circle Graph or Pie Chart
- Organising Data
- Grouping Data
- Definitions
- Chance And Probability
- Outcomes As Events
- Probability of An Event

➤ DATA

The information collected by observation for experiments is called **data**.

Data can represented graphically, by

(i) Picto Graph

(ii) Bar Graph

(iii) Double Bar Graph

(iv) Histogram

(v) Polygon (Class IX)

and also tabular form, by

(i) Raw data

(ii) Frequency distribution table, and by Pie Chart

Pictograph : Pictorial representation of data using symbols.

Ex.1

(i) How many balloons were produced in the month of July ?

Ans. 250

(ii) In which month were maximum number of balloons produced ?

Ans. September

A bar graph : A display of information using bars of uniform width, their heights being proportional to the respective values.

Ex.2
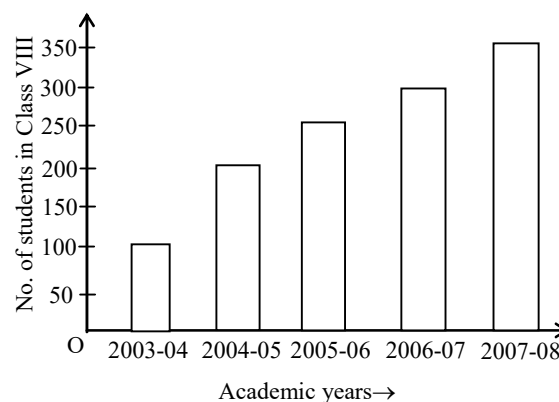
Note : Bar heights give the quantity for each category.

Bars are of equal width with equal gaps in between.

(i) What is the information given by the bar graph ?

Ans. About students of class VIII in academic years

(ii) In which year is the increase in the number of students maximum ?

Ans. 2004-05

(iii) In which year is the number of students maximum?

Ans. 2007-08

(iv) State whether true or false :

'The number of students during 2005-06 is twice that of 2003-04.

Ans. False (2005-06 → 250, 2003-04 → 100)

Double Bar Graph : A bar graph showing two sets of data simultaneously. It is useful for the comparison of the data.

Ex.3
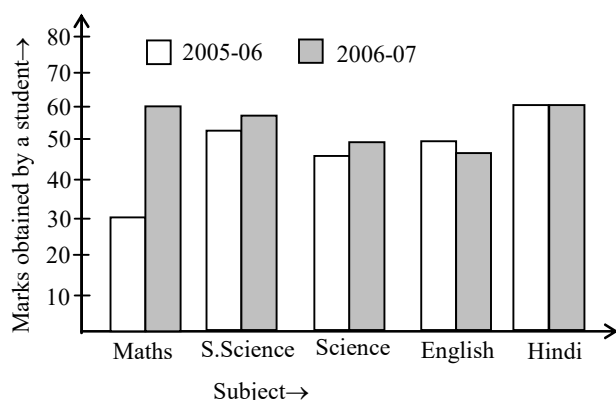
(i) What is the information given by the double bar graph ?

Ans. Marks of a student in various subjects in two successive academic years.

(ii) In which subject has the performance improved the most ?

Ans. Maths

(iii) In which subject has the performance deteriorated?

Ans. English

(iv) In which subject is the performance at par ?

Ans. Hindi

Ex.4

Class Interval	*Frequency*
0-10	*2*
10-20	*10*
20-30	*21*
30-40	*19*
40-50	*7*
50-60	*1*
Total	*60*

Ans.

Marks of the students →
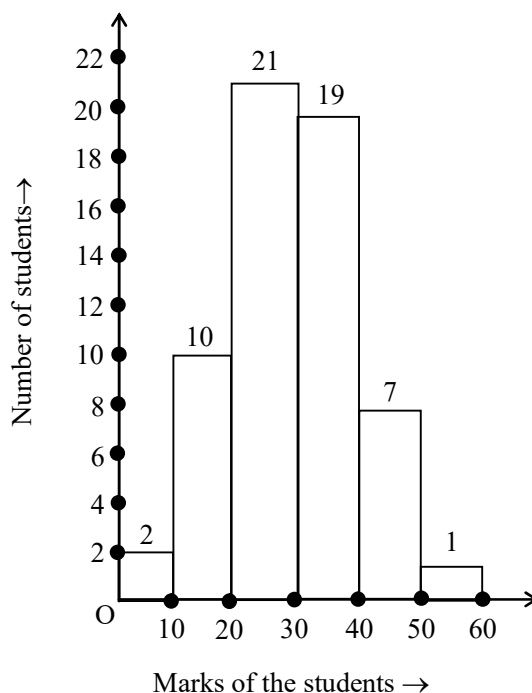
The **height** of the bars show the **frequency** of the class-interval. Also, there is no gap between the bars as there is no gap between the class-intervals.

The graphical representation of data in this manner is called a **histogram**.

Note :

Bars of equal width with no gaps in between.

Height of bar gives the number of data items in a particular group and is the frequency.

Age of 25 teachers of a school

Jagged line(⌐⌐)(or broken line) (or kink) has been used along the horizontal line to indicate that we are not showing the numbers between 0 to 20.

The range is divided in equal intervals (of 5 years in the case)

> ## CIRCLE GRAPH OR PIE CHART

This is a very clourful way. A pie chart would mean that the data is represented in a circle and not as bars or lines. A circle has a centre and the angle around the centre is 360º. So all the data will be represented in terms of angles. The circle is divided out into different parts. Each part is called a *sector* and the angle at the centre is the *central angle*.
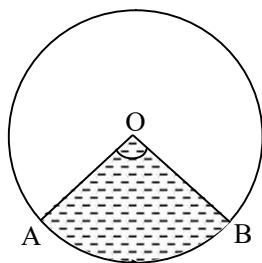
AOB is a sector where OA and OB are the radii and ∠AOB is the central angle.

Reading a Pie Chart

Ex.5 Let us consider the following pie chart. It represents the number of students speaking different languages in the 3 sections of Std VIII in a school.

The pie chart reads.

Language	Angle
Hindi	*150º*
Punjabi	*90º*
Tamil	*60º*
Bengali	*20º*
Telugu	*40º*

If the total number of students surveyed is 252, find the number of students for each language.

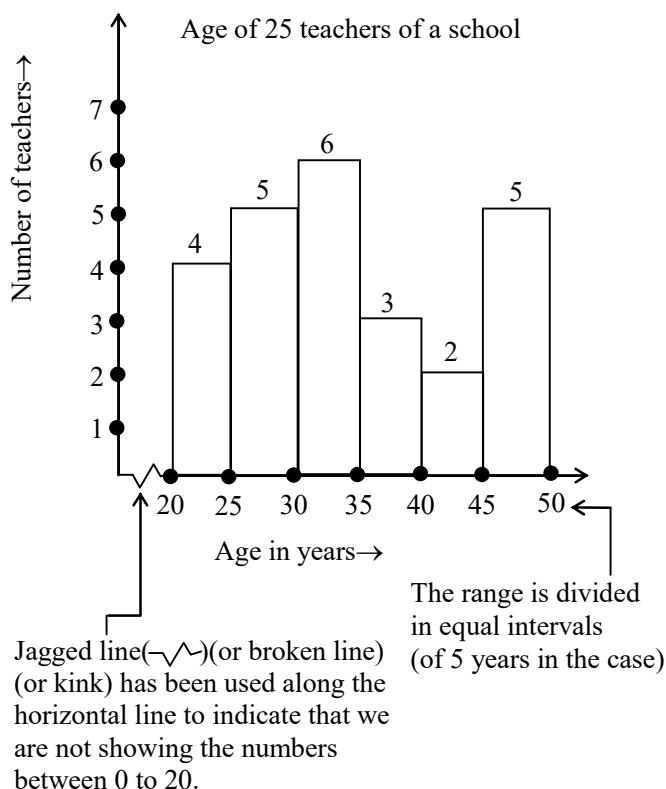**Sol.** Here, we observe that 252 students are represented by 360º
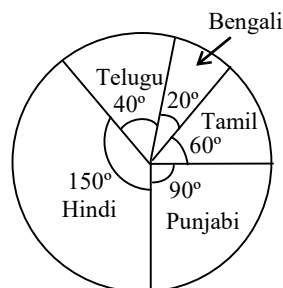
$\therefore$ 1º represents $\dfrac{252}{360} = 0.7$ students.

Hence, the number of students are :

Language	Central Angle	*No. of students*
Hindi	150º	$\dfrac{252}{360} \times 150 = 105$
Punjabi	90º	$\dfrac{252}{360} \times 90 = 63$
Tamil	60º	$\dfrac{252}{360} \times 60 = 42$
Bengali	20º	$\dfrac{252}{360} \times 20 = 14$
Telugu	40º	$\dfrac{252}{360} \times 40 = 28$
Total	*360º*	*252*

Note : When the number of students in each category is added, the total should be the same as total students surveyed.

Ex.6 Read the following pie chart and answer the following questions :

Candidate	*Central Angle*
A	*90°*
B	*55°*
C	*120°*
D	*60°*
E	*35°*

The survey conducted in a village where 5 candidates were standing for elections is represented in the Pie chart.

(a) Who is the most popular candidate ?

(b) Which candidate is least popular ?

(c) If 2880 people were surveyed, how many people preferred the candidate B ?

Sol.

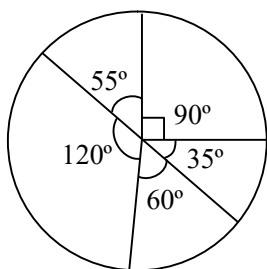| Candidate	Angle	*Votes*
A	90°	$\dfrac{2880}{360} \times 90 = 720$
B	55°	$\dfrac{2880}{360} \times 55 = 440$
C	120°	$\dfrac{2880}{360} \times 120 = 960$
D	60°	$\dfrac{2880}{360} \times 60 = 480$
E	35°	$\dfrac{2880}{360} \times 35 = 280$

Check to see if total votes add up to 2880.

(a) most popular candidate is C.

(b) least popular is E.

(c) 440 people preferred B.

Constructing a Pie Chart

Ex.7 In a survey, it was found that a student spends his 24 hours of a day in the following manner. Draw a pie chart to represent the various activities.

Activity	*Number of Hours*
Sleep	8
School	7
Games	2
Homework	3
Others	4

Sol. Here the 24 hours is represented by 360º.

$$\therefore 1 \text{ hour is } \frac{360}{24} = 15º$$

Hence

Activity	Number of Hours	*Angle*
Sleep	8	$\dfrac{360}{24} \times 8 = 120º$
School	7	$\dfrac{360}{24} \times 7 = 105º$
Games	2	$\dfrac{360}{24} \times 2 = 30º$
Homework	3	$\dfrac{360}{24} \times 3 = 45º$
Others	4	$\dfrac{360}{24} \times 4 = 60º$
Total	24	*360º*
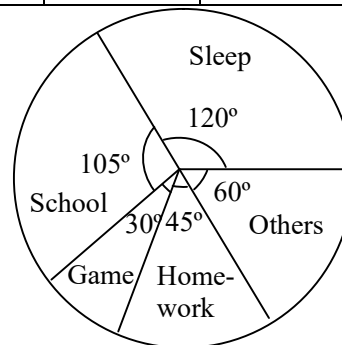
Note : The data is shown as different sectors of a circle after converting it into degrees of central angle.

Ex.8 Adjoining pie chart gives the expenditure (in percentage) on various items and savings of a family during a month.
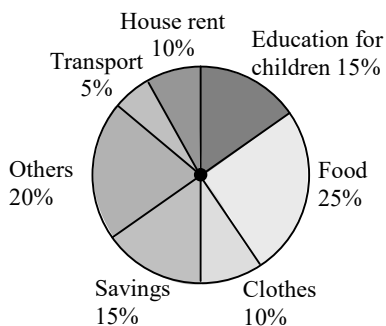
(i) On which item, the expenditure was maximum?

(ii) Expenditure on which item is equal to the total savings of the family ?

(iii) If the monthly savings of the family is Rs 3000, what is the monthly expenditure on clothes?

Sol. (i) Expenditure is maximum on food.

(ii) Expenditure on Education of children is the same (i.e. 15%) as the savings of the family.

(iii) 15% represents Rs. 3000

Therefore, 10% represents

Rs. $\dfrac{3000}{15} \times 10 =$ Rs. 2000

Ex.9 On a particular day, the sales (in rupees) of different items of a baker's shop are given below.

|	
ordinary bread	: 320
fruit bread	: 80
cakes & pastries	: 160
biscuits	: 120
others	: 40
Total	: 720

Draw a pie chart for this data.

Sol. We find the central angle of each sector. Here the total sale = Rs 720. We thus have this table.

Item	Sales (in Rs.)	In Fraction	*Central Angle*
Ordinary Bread	320	$\dfrac{320}{720} = \dfrac{4}{9}$	$\dfrac{4}{9} \times 360° = 160°$
Biscuits	120	$\dfrac{120}{720} = \dfrac{1}{6}$	$\dfrac{1}{6} \times 360° = 60°$
Cakes & pastries	160	$\dfrac{160}{720} = \dfrac{2}{9}$	$\dfrac{2}{9} \times 360° = 80°$
Fruit Bread	80	$\dfrac{80}{720} = \dfrac{1}{9}$	$\dfrac{1}{9} \times 360° = 40°$
Others	*40*	$\dfrac{40}{720} = \dfrac{1}{18}$	$\dfrac{1}{18} \times 360° = 20°$

Now, we make the pie chart
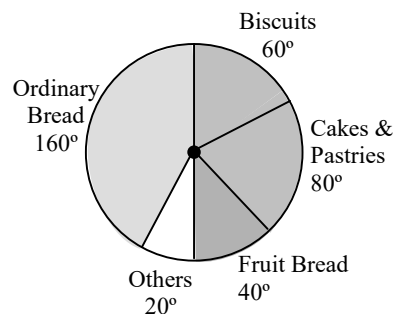
> ➤ **ORGANISING DATA**

Data available to us is in an unorganised form called **raw data**. To draw meaningful inferences, we need to organise the data systematically. For example, a group of students was asked for their favourite subject. The results were as listed below :

Art, Mathematics, Science, English, Mathematics, Art, English, Mathematics, English, Art, Science, Art, Science, Science, Mathematics, Art, English, Art, Science, Mathematics, Science, Art.

Which is the most liked subject and the one least liked ?

It is not easy to answer the question looking at the choices written haphazardly. We arrange the data in Table using tally marks.

Table

Subject	Tally marks	Number of students
Art	卌 ‖	7
Mathematics	卌	5
Science	卌 ‖	6
English	‖‖	4

The number of tallies before each subject gives the number of students who like that particular subject.

This is known as the **frequency** of that subject.

Frequency gives the number of times that a particular entry occurs.

From Table

Frequency of students who like English is 4

Frequency of students who like Mathematics is 5

The table made is known as **frequency distribution table** as it gives the number of times an entry occurs.

➤ GROUPING DATA

The data regarding choice of subjects showed the occurrence of each of the entries several times. For example, Art is liked by 7 students. Mathematics is liked by 5 students and so on (Table). This information can be displayed graphically using a pictograph or a bargraph. Sometimes, however, we have to deal with a large data. For example, consider the following marks (out of 50) obtained in Mathematics by 60 students of Class VIII.

21, 10, 30, 22, 33, 5, 37, 12, 25, 42, 15, 39, 26, 32, 18, 27, 28, 19, 29, 35, 31, 24, 36, 18, 20, 38, 22, 44, 16, 24, 10, 27, 39, 28, 49, 29, 32, 23, 31, 21, 34, 22, 23, 36, 24, 36, 33, 47, 48, 50, 39, 20, 7, 16, 36, 45, 47, 30, 22, 17.

If we make a frequency distribution table for each observation, then the table would be too long, so, for convenience, we make groups of observations say, 0-10, 10-20 and so on, and obtain a frequency distribution of the number of observations falling in each group. Thus, the frequency distribution table for the above data can be.

Groups	Tally marks	Frequency
0 - 10	‖	2
10 - 20	卌 卌	10
20 - 30	卌 卌 卌 卌 ‖	21
30 - 40	卌 卌 卌 ‖‖	19
40 - 50	卌 ‖	7
50 - 60	‖	1
	Total	60

Data presented in this manner is said to be **grouped** and the distribution obtained is called **grouped frequency distribution**. It helps us to draw meaningful inferences like-

(1) Most of the students have scored between 20 and 40

(2) Seven students have scored more than 40 marks out of 50 and so on.

Each of the groups 0-10, 10-20, 20-30, etc., is called a **Class Interval** (or briefly a class).

➤ DEFINITIONS

1. **Upper limit & Lower limits :**

The value of classes from above examples 0, 10, 20, 30, 40, 50 are lower class limits and 10, 20, 30, 40, 50, 60 are called upper class limits.

i.e.   0   –   10

         ↓   ↓

     Lower   Upper

*Upper limit element is always count in next class.

2. **Class Interval :** (Upper limit-Lower limit) is called class interval. In above eg. class interval is 10 for all classes. This interval is called class width or size of class.

3. **Class marks or mid points :**

   The mean number of both upper limit & lower limit for each class.

   $\therefore$ If a class is "x – y" then class mark $= \dfrac{x+y}{2}$

Ex.10 Find class marks of 112.7 – 119.9

Sol.   Class mark $= \dfrac{112.7+119.9}{2}$

   $= \dfrac{232.6}{2} = 116.3$

4. **Range :**

   The range of frequency distribution data is equal to upper limit of last class – lower limit of first class.

Ex.11 Study the following frequency distribution table and answer the questions given below.

Frequency Distribution of Daily Income of 550 workers of a factory.

Class Interval (Daily Income in Rupees)	Frequency (Number of workers)
100 – 125	45
125 – 150	25
150 – 175	55
175 – 200	125
200 – 225	140
225 – 250	55
250 – 275	35
275 – 300	50
300 – 325	20
Total	550

(i)   What is the size of the class ?

Ans. '125 – 100 = 25'

(ii) Which class has the highest frequency ?

Ans. '200 – 225'

(iii) Which class has the lowest frequency ?

Ans. '300 – 325'

(iv) What is the upper limit of the class interval 250-275?

Ans. '275'

(v) Which two classes have the same frequency ?

Ans. '150 – 175, 225 – 250'

Ex.12 Construct a frequency distribution table for the data on weights (in kg) of 20 students of a class using intervals 30-35, 35-40 and so on.

   40, 38, 33, 48, 60, 53, 31, 46, 34, 36, 49, 41, 55, 49, 65, 42, 44, 47, 38, 39

Sol.

Classes	Frequency	Tally marks
30-35	3	|||
35-40	4	||||
40-45	4	||||
45-50	5	卌
50-55	1	|
55-60	1	|
60-65	1	|
65-70	1	|

➤ **CHANCE AND PROBABILITY**

❖ **Experiment :** An operation which can produce some well defined outcome(s)

❖ **Types of experiment :**

   (i) Deterministic experiment

   (ii) Random experiment

(i) **Deterministic experiment** : which have a fixed outcome or result no matter any number of times they are repeated, are known as deterministic experiment.

Eg. from the set of all Δs in a plane if Δ is choosen then even without knowing the three angles, we can definitely say that the sum of the measures of the angles is 180°.

(ii) **Random experiment :** If an experiment, when repeated under identical conditions, do not produce the same outcome every time but the outcome in a trial is one of the several possible outcomes then such an experiment is known as random experiment or an experiment whose outcomes cannot be predicted in advance is called a random experiment.

❖ **Outcomes :** The possible results is/are called outcome for any experiment.

❖ **Elementry events:** If a random experiment is performed, then each of its outcomes is known as an elementry events.

❖ **Sample space:** The set of all possible outcomes of a random experiment is called the sample space.

Ex.13 A coin is tossed find the outcomes and make sample space.

Sol. Head(H) and Tail(T) are outcomes and sample space S = {H, T}

Ex.14 If a die is thrown. Find its outcomes and make sample space.

Sol. 1,2,3,4,5,6 are outcomes
Sample space : {1, 2, 3, 4, 5, 6}

❖ **Equally likely outcomes:** If chance is same for each result or outcome then it is called equally likely outcomes.

Eg. From a well shuffled deck of cards, we put a card

Eg. From tossing a fair coin, getting H or T.

Eg. By throwing a die whose two faces having number 4 and other four faces having 1, 2, 3, 5 then these are not equally likely outcomes.

Each outcome of an experiment or a collection of outcomes make an **event**.

For example in the experiment of tossing a coin, getting a Head is an event and getting a Tail is also an event.

In case of throwing a die, getting each of the outcomes 1, 2, 3, 4, 5 or 6 is an event.

Is getting an even number an event ? Since an even number could be 2, 4 or 6, getting an even number is also an event.

Ex.15 What will be the probability of getting an even number on through a die.

Sol. $\dfrac{3}{6}$ ← Number of outcomes that make the event.
← Total number of outcomes of the experiment.

Ex.16 A bag has 4 red balls and 2 yellow balls. (The balls are identical in all respects other than colour). A ball is drawn from the bag without looking into the bag. What is probability of getting a red ball ? Is it more or less than getting a yellow ball ?

Sol. There are in all (4 + 2 =) 6 outcomes of the event. Getting a red ball consists of 4 outcomes.

Therefore, the probability of getting a red ball is $\dfrac{4}{6} = \dfrac{2}{3}$. In the same way the probability of getting a yellow ball = $\dfrac{2}{6} = \dfrac{1}{3}$

Therefore, the probability of getting a red ball is more than that of getting a yellow ball.

➢ **PROBABILITY OF AN EVENT**

For any event A, probability of getting A is

$$P(A) = \dfrac{\text{Favourable outcomes}}{\text{Total outcomes}}$$

and for not getting A, $P(\overline{A}) = 1 - P(A)$

$$\therefore P(A) + P(\overline{A}) = 1$$

EXERCISE # 1

Q.1 For which of these would you use a histogram to show the data ?

(a) The number of letters for different areas in a postman's bag.

(b) The height of competitors in an athletics meet.

(c) The number of cassettes produced by 5 companies.

(d) The number of passengers boarding trains from 7 : 00 a.m. to 7 : 00 p.m. at a station.

Give reasons for each.

Q.2 The shoppers who come to a departmental store are marked as : man (M), woman(W), boy(B) or girl(G). The following list gives the shoppers who came during the first hour in the morning :

W W W G B W W M G G M M W W W W
G B M W B G G M W W M M W W W M
W B W G M W W W W W G W M M W W M
W G W M G W M M B G G W

Make a frequency distribution table using tally marks. Draw a bar graph to illustrate it.

Q.3 The weekly wages (in Rs) of 30 workers in a factory are.

830, 835, 890, 810, 835, 836, 869, 845, 898, 890, 820, 860, 832, 833, 855, 845, 804, 808, 812, 840, 885, 835, 835, 836, 878, 840, 868, 890, 806, 840

Using tally marks make a frequency table with intervals as 800-810, 810-820 and so on.

Q.4 Draw a histogram for the frequency table made for the data in Question 3, and answer the following questions.

(i) Which group has the maximum number of workers ?

(ii) How many workers earn Rs 850 and more ?

(iii) How many workers earn less than Rs 850 ?

Q.5 The number of hours for which students of a particular class watched television during holidays is shown through the given graph. Answer the following

(i) For how many hours did the maximum number of students watch TV ?

(ii) How many students watched TV for less than 4 hours ?

(iii) How many students spent more than 5 hours in watching TV ?

Hours of TV watched per day →
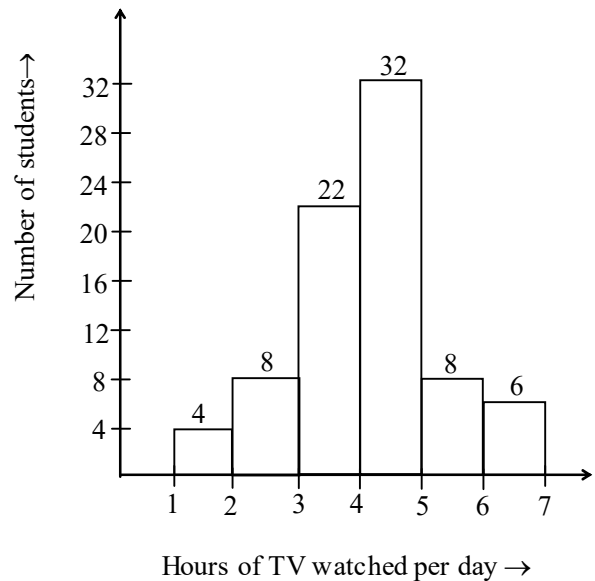
Q. 6 A survey was made to find the type of music that a certain group of young people liked in a city. Adjoining pie chart shows the findings of this survey.

Semi Classical 20%
Classical 10%
Light 40%
Folk 30%
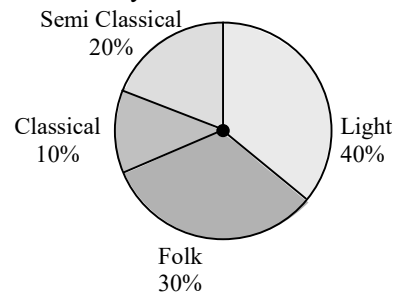
From this pie chart answer the following :

(i) If 20 people liked classical music, how many young people were surveyed ?

(ii) Which type of music is liked by the maximum number of people ?

(iii) If a cassette company were to make 1000 CD's, how many of each type would they make ?

Q.7 A group of 360 people were asked to vote for their favourite season from the three seasons rainy, winter and summer.

Season		No. of votes
Summer		90
Rainy		120
Winter		150

(i) Which season got the most votes ?

(ii) Find the central angle of each sector.

(iii) Draw a pie chart to show this information.

Q.8 The adjoining pie chart gives the marks scored in an examination by a student in Hindi, English, Mathematics, Social Science and Science. If the total marks obtained by the students were 540, answer the following questions.
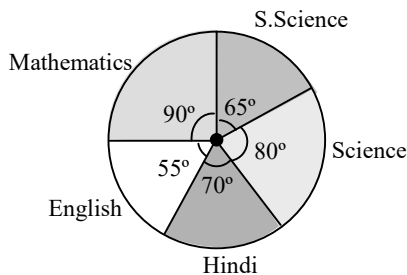

(i) In which subject did the student score 105 marks ?

(**Hint** : for 540 marks, the central angle = 360°. So, for 105 marks, what is the central angle ?)

(ii) How many more marks were obtained by the student in Mathematics than in Hindi ?

(iii) Examine whether the sum of the marks obtained in Social Science and Mathematics is more than that in Science and Hindi.

(**Hint** : Just study the central angles)

Q.9 The number of students in a hostel, speaking different languages is given below. Display the data in a pie chart.

Language	*Number of students*
Hindi	*40*
English	*12*
Marathi	*9*
Tamil	*7*
Bengali	*4*
Total	*72*

**Q.10** List the outcomes you can see in these experiments.
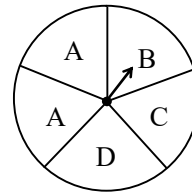
(a) Spinning a wheel

(b) Tossing two coins together

Q.11 When a die is thrown, list the outcomes of an event of getting

(i) (a) a prime number

(b) not a prime number

(ii) (a) a number greater than 5

(b) a number not greater than 5

Q.12 Find the

(a) Probability of the pointer stopping on D in (Question 1-(a)) ?

(b) Probability of getting an ace from a well shuffled deck of 52 playing cards ?

(c) Probability of getting a red apple.(see figure below)
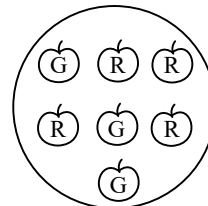
Q.13 Numbers 1 to 10 are written on ten separate slips (one number on one slip), kept in a box and mixed well. One slip is chosen from the box without looking into it. What is the probability of-

(i) getting a number 6 ?

(ii) getting a number less than 6 ?

(iii) getting a number greater than 6 ?

(iv) getting a 1-digit number ?

Q.14 If you have a spinning wheel with 3 green sectors, 1 blue sector and 1 red sector, what is the probability of getting a green sector ? What is the probability of getting a non blue sector ?

Q.15 In a pack of cards there are 52 cards. 4 suits-2 black, 2 red. So each suit has 13 cards. What is the probability of drawing a red card ?

ANSWER KEY

EXERCISE # 1

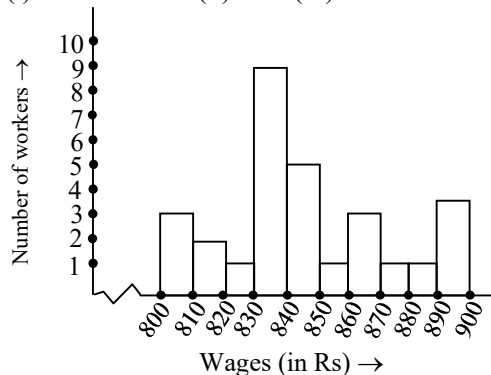**1.** (b), (d). In all these cases data can be divided into class intervals.

2.

Shopper	Tally marks	Number
W	ҬHL ҬHL ҬHL ҬHL ҬHL III	28
M	ҬHL ҬHL ҬHL	15
B	ҬHL	5
G	ҬHL ҬHL II	12

3.

Interval	Tally marks	Frequency
800 - 810	III	3
810 - 820	II	2
820 - 830	I	1
830 - 840	ҬHL IIII	9
840 - 850	ҬHL	5
850 - 860	I	1
860 - 870	III	3
870 - 880	I	1
880 - 890	I	1
890 - 900	IIII	4
Total		**30**

4. (i) 830 – 840 (ii) 10 (iii) 20

5. (i) 4 – 5 hours (ii) 34 (iii) 14
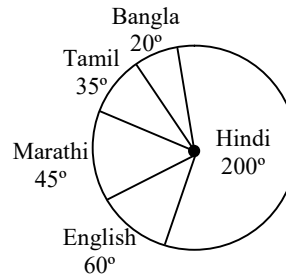

Wages (in Rs) →

6. (i) 200 (ii) Light music
(iii) Classical – 100, Semi classical – 200,
Light – 400, Folk - 300

7. (i) Winter (ii) Winter – 150º, Rainy – 120º,
Summer – 90º
(iii)
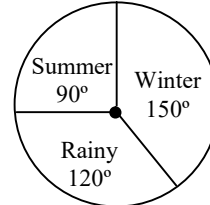
8. (i) Hindi (ii) 30 marks (iii) Yes

9.

10. (a) Outcomes → A, B, C, D
(b) HT, HH, TH, TT (Here HT means Head on first coin and Tail on the second coin and so on).

11. Outcomes of an event of getting
(i) (a) 2, 3, 5 (b) 1, 4, 6
(ii) (a) 6 (b) 1, 2, 3, 4, 5

12. (a) 1/5 (b) 1/13 (c) 4/7

13. (i) 1/10 (ii) 1/2 (iii) 2/5 (iv) 9/10

14. Probability of getting a green sector = $\dfrac{3}{5}$,

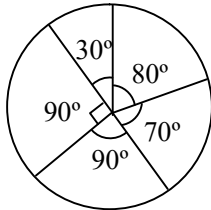probability of getting a non-blue sector = $\dfrac{4}{5}$

15. $\dfrac{1}{2}$

EXERCISE # 2

Q.1 Read the following pie chart and answer the questions that follow :

| Game	Angle
Cricket	90°
Football	70°
Table Tennis	80°
Tennis	30°
Hockey	90°

If the school spent Rs 72000 on sports,

(a) how much did they spend on cricket ?

(b) how much more was spent on table tennis than tennis ?

(c) how much did they spend on football ?

Q.2 The marks in different subjects of a student of Class VIII are given in the pie chart. If the total marks is 600, find his marks in each subject.

Subject	Angle
Maths	150°
English	60°
Science	84°
Social Science	36°
Language	30°
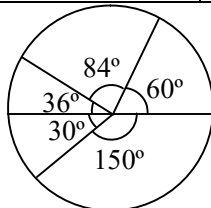
Q.3 A survey was conducted on the expenses that an average man incurs through the year. Read the given pie chart and answer the questions given

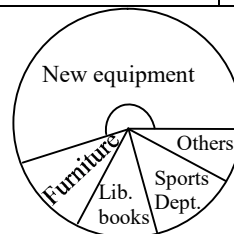| Item	Angle
Food	80°
Clothing	60°
Others	120°
Education	65°
Rent	35°
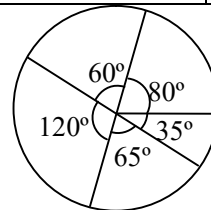
If his annual income is Rs 360000, find

(a) the amount spent on Education.

(b) how much did he spend on food ?

(c) whether the amount spent on others is more or less than that spent on food and clothing and by how much ?

Q.4 The following pie chart represents the expenses of a school in the month of June. Calculate the central angle in each case.

| Item	Expenses (Rs)
New equipment	40000
Furniture	6000
Lib. books	10000
Sports	12000
Others	4000

Q.5 From the pie chart given below, find the amount spent on different sports in a club for the year. The total expense is Rs 720000.

Item	Angle
Athletic team	120°
Football team	85°
Volleyball team	50°
Cricket team	45°
Hockey team	60°
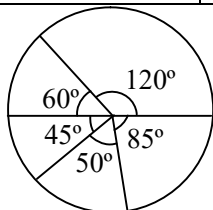
Q. 6 The pie chart depicts the marks obtained by a student in his final exams. Write what percentage he got in each subject.

Item	Angle
Maths	90°
Science	90°
Lang.	50°
English	40°
Soc. Science	90°
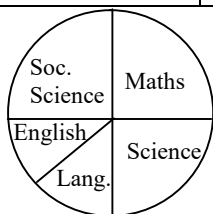
Q.7 Fill in the blanks in the following data :

(a)

Item	Angle	Expenses
Clothing	–	2800
Rent	90°	–
Education	–	1800
Food	–	3600
Travel	65°	–
Total	360°	14400

(b)

Item	Students	Angle
Bus	120	–
Cycle	–	90°
Car	–	40°
Van	240	–
Scooter	–	50°
Total	720	360°

(c)

Item	Angle	No. of students
Bhangra	90°	–
Odissi	–	180
Kathak	80°	–
Kathakali	–	150
Bharatanatyam	–	240

Total number of students learning dance is 1080.

Q.8 Find the probability of a 6 appearing when a dice is thrown.

Q.9 What is the probability of drawing a red ball in a bag with 6 red balls, 8 white and 4 blue balls ?

Q.10 Cards are marked with the letters M, A, T, H, S and shuffled well. What is the probability of M being taken out?

Q.11 The letters of the word 'experiment' are marked on cards. Find the probability of drawing the following cards marked :
(a) e   (b) m   (c) t

Q.12 A spinner, circular in shape, is divided into 8 equal sectors. The colours red, blue, green and white are marked on two sectors each. Find the probability of the pointer showing white.

Q.13 What is the probability of getting a sum of 3 when two dice are thrown together ? Write the favourable outcomes.

Q.14 Write the sample space when two coins are thrown together.

Q.15 What is the probability of getting one head when two coins are thrown together ?

Q.16 Fill in the blanks with the probability in each of the following cases of :

(a) A dice

P(4) = _____

(b) A spinner with 18 markings

P(7) = _____

(c) A pack of cards

P(Red K) = _____

P(K) = _____

(d) Two dice

P(Sum 5) = _____

(e) A bag of 3 red, 2 white, 4 yellow balls

P(White ball) = _____

ANSWER KEY

EXERCISE # 2

1.   (a) Rs 18000   (b) Rs 10000   (c) 140000

2.   Maths = 250,   English = 100,   Science = 140,   SST = 60, Language = 50

3.   (a) Education = Rs 65000   (b) Food = Rs 80000   (c) more by Rs 80000

4.   New equipment = 200º, Furniture = 30º, Library books = 50º, Sports = 60º, Other = 20º

5.   Athletic = Rs 240000, Football = Rs 170000, Volleyball = Rs 100000,

    Cricket = Rs 90000, Hockey = Rs 120000

6.   SST = 25%, Maths = 25%, English = 11.11%, Sc = 25%, Language = 13.88 %

7.   (a) 70º, 3600, 45º, 90º 2600   (b) 60º, 180, 80, 120º, 100   (c) 270, 60º, 240, 50º, 80º

8.   1/6   **9.** 6/18   **10.** 1/5   **11.** (a) 3/10 (b) 1/10 (c) 1/10   **12.** 2/8

13. $\dfrac{2}{36}$ {(2, 1), (1, 2)}   **14.** {HT, TH, HH, TT}   **15.** 2/4

16.   (a) 1/6   (b) 1/18   (c) 2/52, 4/52   (d) 4/36 (e) 2/9