DATA HANDLING

CONTENTS

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)

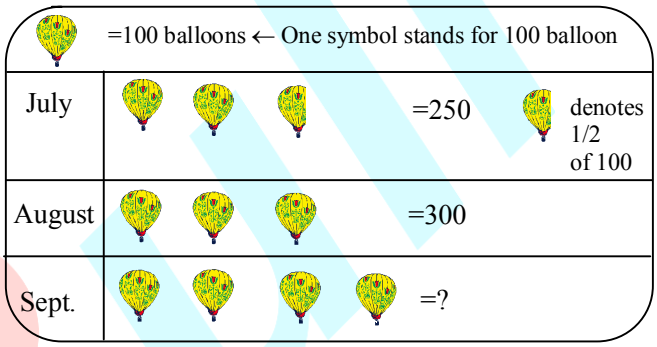
and also tabular form, by

(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 ?

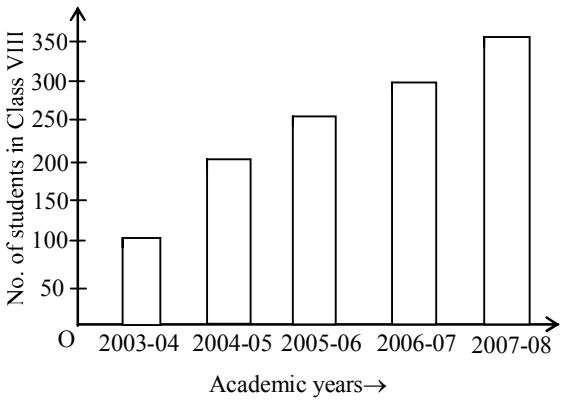
Ans. 250

(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

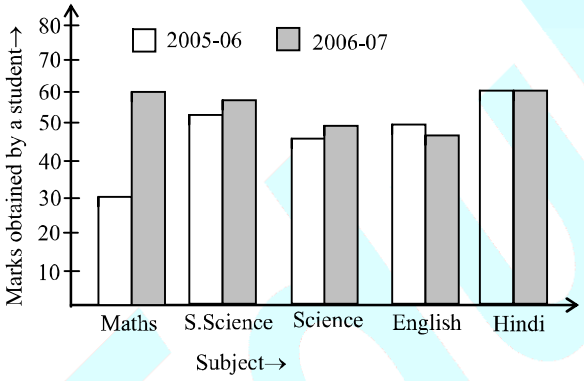
(iv) State whether true or false :

'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

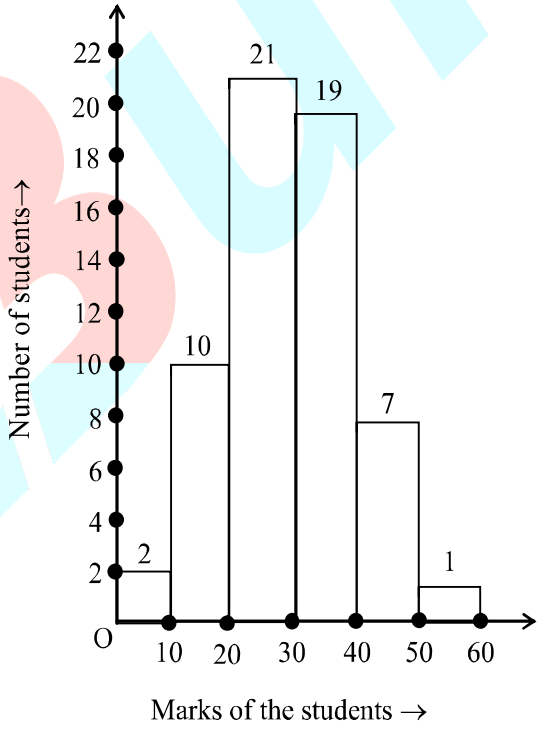
(iv) In which subject is the performance at par ?

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.



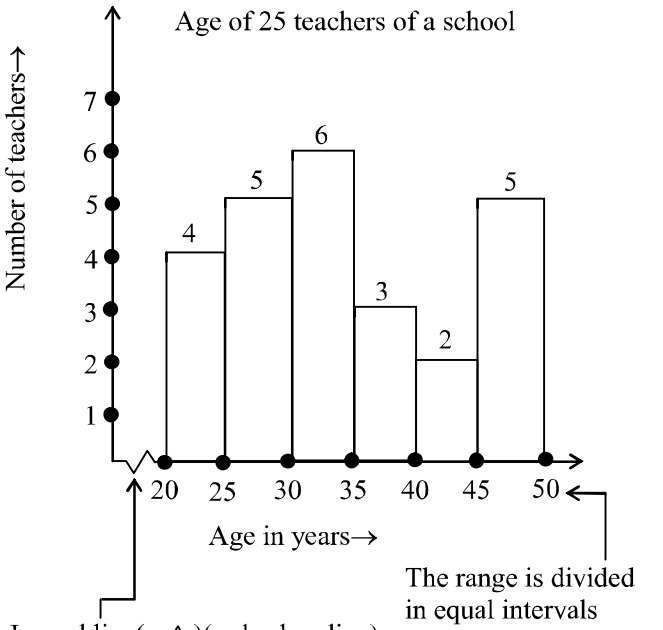
The **height** of the bars show the **frequency** of the class-interval. Also, there is no gap between the bars as there is no gap between the class-intervals.

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

Note :

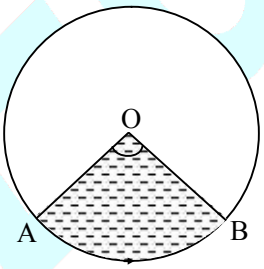
Bars of equal width with no gaps in between.

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



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

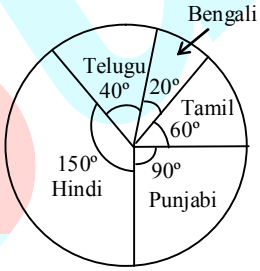
Ex.5 Let us consider the following pie chart. It represents the number of students speaking different languages in the 3 sections of Std VIII in a school.

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 $\frac{252}{360} = 0.7$ students.

Hence, the number of students are :

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

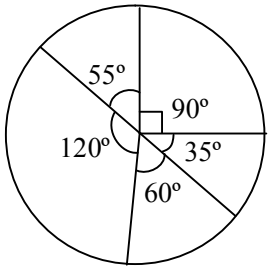
Candidate	*Central Angle*
A	*90°*
B	*55°*
C	*120°*
D	*60°*
E	*35°*

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°	$\frac{2880}{360} \times 90 = 720$
B	55°	$\frac{2880}{360} \times 55 = 440$
C	120°	$\frac{2880}{360} \times 120 = 960$
D	60°	$\frac{2880}{360} \times 60 = 480$
E	*35°*	$\frac{2880}{360} \times 35 = 280$

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

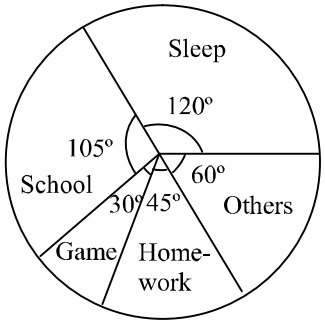
Ex.7 In a survey, it was found that a student spends his 24 hours of a day in the following manner. Draw a pie chart to represent the various activities.

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

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

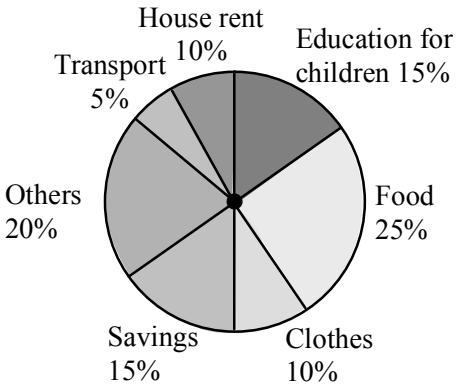
$\therefore$ 1 hour is $\frac{360}{24} = 15°$ Hence

Activity	Number of Hours	*Angle*
Sleep	8	$\frac{360}{24} \times 8 = 120°$
School	7	$\frac{360}{24} \times 7 = 105°$
Games	2	$\frac{360}{24} \times 2 = 30°$
Homework	3	$\frac{360}{24} \times 3 = 45°$
Others	4	$\frac{360}{24} \times 4 = 60°$
Total	*24*	*360°*



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

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

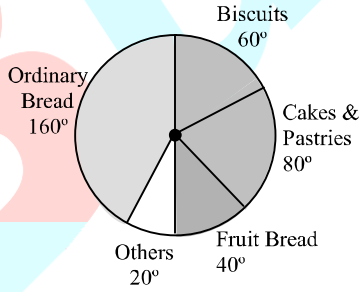
ordinary bread	: 320
fruit bread	: 80
cakes & pastries	: 160
biscuits	: 120
others	: 40
Total	: 720

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	$\frac{320}{720}=\frac{4}{9}$	$\frac{4}{9}\times 360^o=160^o$
Biscuits	120	$\frac{120}{720}=\frac{1}{6}$	$\frac{1}{6}\times 360^o=60^o$
Cakes & pastries	160	$\frac{160}{720}=\frac{2}{9}$	$\frac{2}{9}\times 360^o=80^o$
Fruit Bread	80	$\frac{80}{720}=\frac{1}{9}$	$\frac{1}{9}\times 360^o=40^o$
Others	*40*	$\frac{40}{720}=\frac{1}{18}$	$\frac{1}{18}\times 360^o=20^o$

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	𝍸 ||	7
Mathematics	𝍸	5
Science	𝍸 |	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	𝍸 𝍸	10
20 - 30	𝍸 𝍸 𝍸 𝍸 |	21
30 - 40	𝍸 𝍸 𝍸 ||||	19
40 - 50	𝍸 ||	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 = $\frac{x+y}{2}$

Ex.10 Find class marks of 112.7 – 119.9

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

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

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	𝍸
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 180º.

(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.

➢ OUTCOMES AS EVENTS

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. $\frac{3}{6}$ ← 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 $\frac{4}{6} = \frac{2}{3}$. In the same way the probability of getting a yellow ball $= \frac{2}{6} = \frac{1}{3}$

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

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

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

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