

## CHAPTER

## 3

## VII-MATHEMATICS-NCERT

## 3. DATA HANDLING (NOTES)

PREPARED BY: BALABHADRA SURESH

1. A data is a collection of numbers gathered to give some information.
2. A pictograph represents data through pictures of objects.
3. To get a particular information from the given data quickly, the data can be arranged in a tabular form using tally marks

**ARITHMETIC MEAN**

$$\text{Arithmetic mean (Average)} = \frac{\text{Sum of all observations}}{\text{number of observations}}$$

Mean lies in between the **greatest** and the **smallest** observations.

**Exp 1:** Ashish studies for 4 hours, 5 hours and 3 hours respectively on three consecutive days. How many hours does he study daily on an average?

$$\text{Sol: average time} = \frac{\text{Total hours}}{\text{Total days}} = \frac{4 + 5 + 3}{3} = \frac{12}{3} = 4 \text{ hours}$$

**Exp 2:** A batsman scored the following number of runs in six innings: 36, 35, 50, 46, 60, 55

$$\text{Sol: Mean} = \frac{\text{Sum of all observations}}{\text{number of observations}} = \frac{36 + 35 + 50 + 46 + 60 + 55}{6} = \frac{282}{6} = 47$$

The mean runs scored in an inning are 47

1. Find at least 5 numbers between  $\frac{1}{2}$  and  $\frac{1}{3}$

$$\text{Sol: A number between } x \text{ and } y = \frac{1}{2}(x + y)$$

$$\text{A number between } \frac{1}{2} \text{ and } \frac{1}{3} = \frac{1}{2}\left(\frac{1}{2} + \frac{1}{3}\right) = \frac{1}{2} \times \frac{5}{6} = \frac{5}{12}$$

$$\text{A number between } \frac{1}{2} \text{ and } \frac{5}{12} = \frac{1}{2}\left(\frac{1}{2} + \frac{5}{12}\right) = \frac{1}{2} \times \frac{11}{12} = \frac{11}{24}$$

$$\text{A number between } \frac{1}{2} \text{ and } \frac{11}{24} = \frac{1}{2}\left(\frac{1}{2} + \frac{11}{24}\right) = \frac{1}{2} \times \frac{23}{24} = \frac{23}{48}$$

$$\text{A number between } \frac{5}{12} \text{ and } \frac{1}{3} = \frac{1}{2}\left(\frac{5}{12} + \frac{1}{3}\right) = \frac{1}{2} \times \frac{9}{12} = \frac{9}{24}$$

A number between  $\frac{9}{24}$  and  $\frac{1}{3} = \frac{1}{2} \left( \frac{9}{24} + \frac{1}{3} \right) = \frac{1}{2} \times \frac{17}{24} = \frac{17}{48}$

**Range:**

Range = Highest observation – Lowest observation

**Exp 3:** The ages in years of 10 teachers of a school are: 32, 41, 28, 54, 35, 26, 23, 33, 38, 40

**(i) What is the age of the oldest teacher and that of the youngest teacher?**

**Sol:** The age of the oldest teacher = 54 years ; The youngest teacher = 23 years

**(ii) What is the range of the ages of the teachers?**

**Sol:** Range of the ages of the teachers = (54 – 23) years = 31 years

**(iii) What is the mean age of these teachers?**

**Sol:** Mean =  $\frac{\text{Sum of all observations}}{\text{number of observations}} = \frac{23 + 26 + 28 + 32 + 33 + 35 + 38 + 40 + 41 + 54}{10}$

$$= \frac{350}{10} = 35$$

Mean age of the teachers = 35 years.

### **EXERCISE 3.1**

**1. Find the range of heights of any ten students of your class.**

**Sol:**

**2. Organise the following marks in a class assessment, in a tabular form.**

4, 6, 7, 5, 3, 5, 4, 5, 2, 6, 2, 5, 1, 9, 6, 5, 8, 4, 6, 7

**Sol:**

Marks	Tally Marks	Frequency
1		1
2		2
3		1
4		3
5		5
6		4
7		2

8		1
9		1

(i) Which number is the highest?

Sol: 9

(ii) Which number is the lowest?

Sol: 1

(iii) What is the range of the data?

Sol: Range = Highest value – Lowest value = 9 – 1 = 8

(iv) Find the arithmetic mean.

Sol: Mean =  $\frac{\text{Sum of all observations}}{\text{number of observations}}$

$$= \frac{4 + 6 + 7 + 5 + 3 + 5 + 4 + 5 + 2, +6 + 2 + 5 + 1 + 9 + 6 + 5 + 8 + 4 + 6 + 7}{5}$$

$$= \frac{100}{20} = 5$$

3. Find the mean of the first five whole numbers.

Sol: First 5 whole numbers : 0,1,2,3,4

$$\text{Mean} = \frac{\text{Sum of all observations}}{\text{number of observations}} = \frac{0 + 1 + 2 + 3 + 4}{5} = \frac{10}{5} = 2$$

4. A cricketer scores the following runs in eight innings: 58, 76, 40, 35, 46, 45, 0, 100 Find the mean score.

$$\text{Sol: Mean} = \frac{\text{Sum of all observations}}{\text{number of observations}} = \frac{58 + 76 + 40 + 35 + 46 + 45 + 0 + 100}{8} = \frac{400}{8} = 50$$

5. Following table shows the points of each player scored in four games:

Player	Game 1	Game 2	Game 3	Game 4
A	14	16	10	10
B	0	8	6	4
C	8	11	Did not play	13

Now answer the following questions: (i) Find the mean to determine A's average number of points scored per game. (ii) To find the mean number of points per game for C, would you divide the total points by 3 or by 4? Why? (iii) B played in all the four games. How would you find the mean? (iv) Who is the best performer?

**Sol:** (i) Mean score of A =  $\frac{\text{Sum of all observations}}{\text{number of observations}} = \frac{14 + 16 + 10 + 10}{4} = \frac{50}{4} = 12.5$

(ii) Player C played only three games. So, we divide the total points by 3

(iii) Mean score of B =  $\frac{\text{Sum of all observations}}{\text{number of observations}} = \frac{0 + 8 + 6 + 4}{4} = \frac{18}{4} = 4.5$

(iv) Mean score of C =  $\frac{\text{Sum of all observations}}{\text{number of observations}} = \frac{8 + 11 + 13}{3} = \frac{32}{3} = 10.67$

The mean score of A is the highest of all three players. So, A is best performer.

**6. The marks (out of 100) obtained by a group of students in a science test are 85, 76, 90, 85, 39, 48, 56, 95, 81 and 75. Find the:**

**(i) Highest and the lowest marks obtained by the students.**

**(ii) Range of the marks obtained.**

**(iii) Mean marks obtained by the group.**

**Sol:** (i) Highest marks=95 and Lowest marks=39

(ii) Range= Highest marks- Lowest marks=95 -39=56.

(iii) Mean marks =  $\frac{\text{Sum of marks}}{\text{number of students}}$

$$= \frac{85 + 76 + 90 + 85 + 39 + 48 + 56 + 95 + 81 + 75}{10}$$

$$= \frac{730}{10} = 73$$

**7. The enrolment in a school during six consecutive years was as follows:**

**1555, 1670, 1750, 2013, 2540, 2820 Find the mean enrolment of the school for this period.**

**Sol:** Mean enrolment =  $\frac{\text{Sum of enrollments}}{\text{Number of years}}$

$$= \frac{1555 + 1670 + 1750 + 2013 + 2540 + 2820}{6}$$

$$= \frac{12348}{6} = 2058$$

**8. The rainfall (in mm) in a city on 7 days of a certain week was recorded as follows:**



Day	Mon	Tue	Wed	Thurs	Fri	Sat	Sun
Rainfall (in mm)	0.0	12.2	2.1	0.0	20.5	5.5	1.0

- (i) Find the range of the rainfall in the above data.  
(ii) Find the mean rainfall for the week.  
(iii) On how many days was the rainfall less than the mean rainfall?

**Sol:** (i) Range of the rainfall=Highest value-Lowest value=20.5-0.0=20.5 mm

$$\begin{aligned} \text{(ii) Mean rainfall} &= \frac{\text{Sum of rainfalls}}{\text{Number of days}} = \frac{0.0 + 12.2 + 2.1 + 0.0 + 20.5 + 5.5 + 1.0}{7} \\ &= \frac{41.3}{7} = 5.9 \text{ mm} \end{aligned}$$

(iii) 5 days ( Mon, Wed, Thurs, Sat, Sun)

9. The heights of 10 girls were measured in cm and the results are as follows: 135, 150, 139, 128, 151, 132, 146, 149, 143, 141.

- (i) What is the height of the tallest girl? (ii) What is the height of the shortest girl? (iii) What is the range of the data? (iv) What is the mean height of the girls? (v) How many girls have heights more than the mean height.

**Sol:** (i) The height of the tallest girl=151 cm

(ii) The height of the shortest girl=128 cm.

(iii) Range=Highest value-Lowest value=151-128=23 cm

$$\begin{aligned} \text{(iv) Mean height of the girl} &= \frac{\text{Sum of heights}}{\text{Number of girls}} \\ &= \frac{135 + 150 + 139 + 128 + 151 + 132 + 146 + 149 + 143 + 141}{10} = \frac{1414}{10} = 141.4 \text{ cm} \end{aligned}$$

(v) 5 girls

### MODE

The mode of a set of observations is the observation that occurs most often.

**Exp4:** Find the mode of the given set of numbers: 1, 1, 2, 4, 3, 2, 1, 2, 2, 4.

**Sol:** Arranging the numbers with same values together, we get 1, 1, 1, 2, 2, 2, 2, 3, 4, 4

Mode of this data = 2

### TRY THESE

(i) Find the mode of 2, 6, 5, 3, 0, 3, 4, 3, 2, 4, 5, 2, 4.

**Sol:** Arranging the numbers in order: 0,2,2,2,3,3,3,4,4,4,5,5,6

2,3 and 4 occurs most frequently . So, mode of the data is 2,3 and 4

(ii) Find the mode of 2, 14, 16, 12, 14, 14, 16, 14, 10, 14, 18, 14.

**Sol:** Arranging the numbers:2,10,12,14,14,14,14,14,14,16,16,18

Mode of the data =14

**Exp 5:** Following are the margins of victory in the football matches of a league

1, 3, 2, 5, 1, 4, 6, 2, 5, 2, 2, 2, 4, 1, 2, 3, 1, 1, 2, 3, 2, 6, 4, 3, 2, 1, 1, 4, 2, 1, 5, 3, 3, 2, 3, 2, 4, 2, 1, 2

**Sol:**

Margins of Victory	Tally Bars	Number of Matches
1		9
2		14
3		7
4		5
5		3
6		2
	<b>Total</b>	<b>40</b>

**Exp 6:** Find the mode of the numbers: 2, 2, 2, 3, 3, 4, 5, 5, 5, 6, 6, 8

**Sol:** Here, 2 and 5 both occur three times.

Mode of the data is 2 and 5.

### TRY THESE

1. Find the mode of the following data

12, 14, 12, 16, 15, 13, 14, 18, 19, 12, 14, 15, 16, 15, 16, 16, 15, 17, 13, 16, 16, 15, 15, 13, 15, 17, 15,  
14, 15, 13, 15, 14

**Sol:**

Data	Tally marks	Frequency
12		3
13		4
14		5
15		10
16		6
17		2
18		1
19		1
	Total	32

15 occurs highest number of times(10 times)

Mode of the data=15

**2. Heights (in cm) of 25 children are given below:**

168, 165, 163, 160, 163, 161, 162, 164, 163, 162, 164, 163, 160, 163, 160, 165, 163, 162, 163, 164,  
163, 160, 165, 163, 162

**What is the mode of their heights? What do we understand by mode here?**

**Sol:**

Height of the children(in cm)	Tally marks	Frequency
160		3
161		1
162		4
163		10
164		3
165		3
168		1
	total	25

Highest frequency is 10. Corresponding height is 163 cm

Mode=163 cm

## MEDIAN

Given data, arranged in ascending or descending order, the median gives us the middle observation.

### TRY THESE

**Your friend found the median and the mode of a given data. Describe and correct your friend's error if any: 35, 32, 35, 42, 38, 32, 34 Median = 42, Mode = 32**

**Sol:** Data in ascending order : 32, 32, 34, 35, 35, 38, 42.

Median=35, Mode=32 and 35

**Exp7:Find the median of the data: 24, 36, 46, 17, 18, 25, 35.**

**Sol :** Data in ascending order: 17, 18, 24, **25**, 35, 36, 46

Median=25

### EXERCISE 3.2

**1. The scores in mathematics test (out of 25) of 15 students is as follows**

**19, 25, 23, 20, 9, 20, 15, 10, 5, 16, 25, 20, 24, 12, 20 Find the mode and median of this data. Are they same?**

**Sol:** Arranging scores in ascending order:

5,9,10,12,15,16,19,20,20,20,20,23,24,25,25

The score 20 occurs most frequently.

Mode=20

Total observations =15

Median=Middle observation= 8<sup>th</sup> observation

Median=20

Yes, The mode and median are same

**2. The runs scored in a cricket match by 11 players is as follows:**

**6, 15, 120, 50, 100, 80, 10, 15, 8, 10, 15 Find the mean, mode and median of this data. Are the three same?**

**Sol:** Mean =  $\frac{\text{Sum of all observations}}{\text{number of observations}}$

$$= \frac{6 + 15 + 120 + 50 + 100 + 80 + 10 + 15 + 8 + 10 + 15}{11}$$



$$= \frac{429}{11} = 39$$

Mean = 39

Arranging the scores in ascending order: 6,8,10,15,15,15,50,80,100,120.

The score 15 occurs most frequently

Mode=15

Number of observations=11

Median=Middle most observation=6<sup>th</sup> observation=15

No, the three are not same.

- 3. The weights (in kg.) of 15 students of a class are: 38, 42, 35, 37, 45, 50, 32, 43, 43, 40, 36, 38, 43, 38, 47**

**(i) Find the mode and median of this data. (ii) Is there more than one mode?**

**Sol:** Arranging the weights in ascending order:

32,35,36,37,38,38,38,40,42,43,43,43,45,47,50

The heights 38 kg and 43 kg occur most frequently

Mode= 38 and 43

Total observations=15

Median= 8<sup>th</sup> observation=40

(ii) Yes , there are two modes

- 4. Find the mode and median of the data: 13, 16, 12, 14, 19, 12, 14, 13, 14**

**Sol:** The data in ascending order:12,12,13,13,14,14,14,16,19.

14 occurs most frequently

Mode=14

Total observations=9

Median=5<sup>th</sup> observation=14

5. Tell whether the statement is true or false:

(i) The mode is always one of the numbers in a data.

Sol: True

(ii) The mean is one of the numbers in a data.

Sol: False

(iii) The median is always one of the numbers in a data.

Sol: True

(iv) The data 6, 4, 3, 8, 9, 12, 13, 9 has mean 9.

Sol: False

$$\text{Mean} = \frac{\text{Sum of all observations}}{\text{number of observations}} = \frac{6 + 4 + 3 + 8 + 9 + 12 + 13 + 9}{8} = \frac{64}{8} = 8$$

## BAR GRAPHS

**Exp 8:** Two hundred students of 6th and 7th classes were asked to name their favourite colour so as to decide upon what should be the colour of their school building. The results are shown in the following table. Represent the given data on a bar graph.

Favourite Colour	Red	Green	Blue	Yellow	Orange
Number of Students	43	19	55	49	34

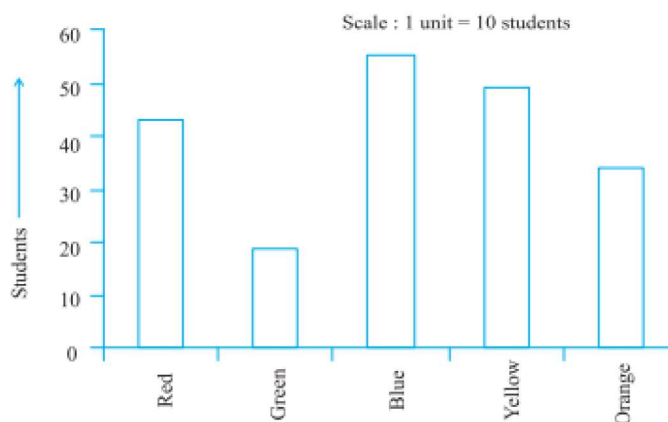
Answer the following questions with the help of the bar graph:

(i) Which is the most preferred colour and which is the least preferred? (ii) How many colours are there in all? What are they?

Sol: (i) The most preferred colour=Blue

The least preferred colour=Green

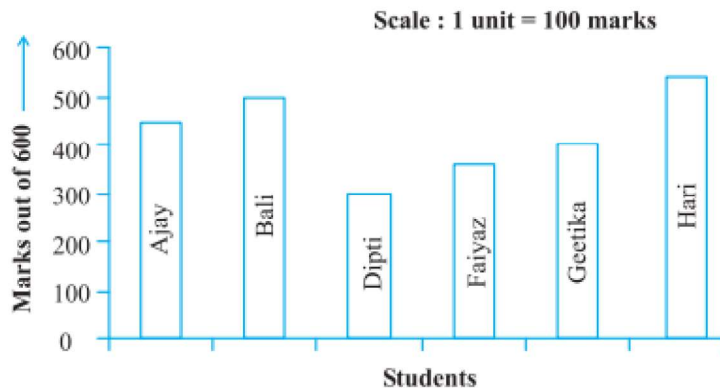
(ii) There are 5 colours in all. They are red, green, blue, yellow, orange.



Exp 9: Following data gives total marks (out of 600) obtained by six children of a particular class. Represent the data on a bar graph.

Students	Ajay	Bali	Dipti	Faiyaz	Geetika	Hari
Marks Obtained	450	500	300	360	400	540

Sol:



(i) On horizontal axis take student names. On vertical axis take marks

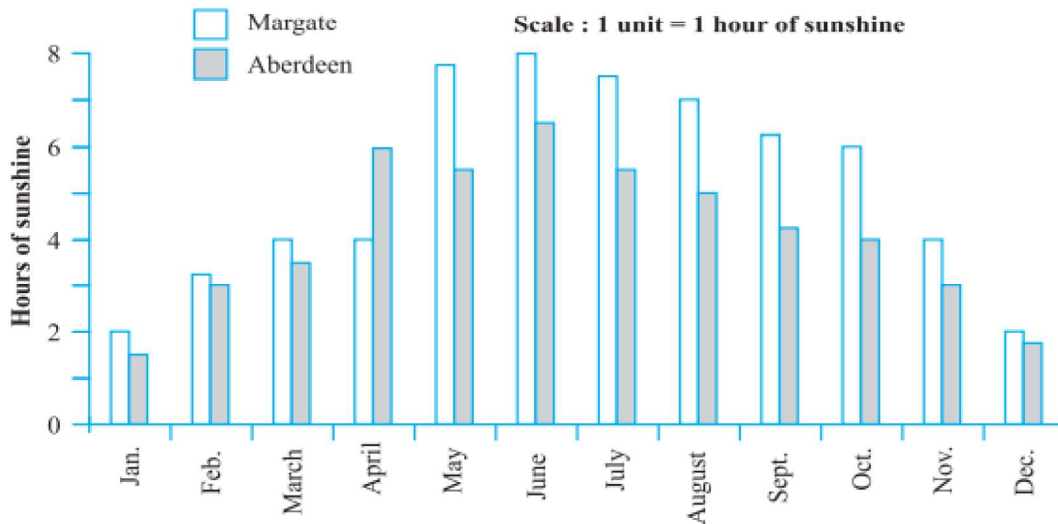
(ii) On vertical axis 1 unit=100 marks

### Drawing double bar graph

In Margate												
	Jan.	Feb.	Mar.	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
Average hours of Sunshine	2	$3\frac{1}{4}$	4	4	$7\frac{3}{4}$	8	$7\frac{1}{2}$	7	$6\frac{1}{4}$	6	4	2
In Aberdeen												
Average hours of Sunshine	$1\frac{1}{2}$	3	$3\frac{1}{2}$	6	$5\frac{1}{2}$	$6\frac{1}{2}$	$5\frac{1}{2}$	5	$4\frac{1}{2}$	4	3	$1\frac{3}{4}$

By drawing individual bar graphs you could answer questions like

Sol:



(i) In which month does each city has maximum sunlight?

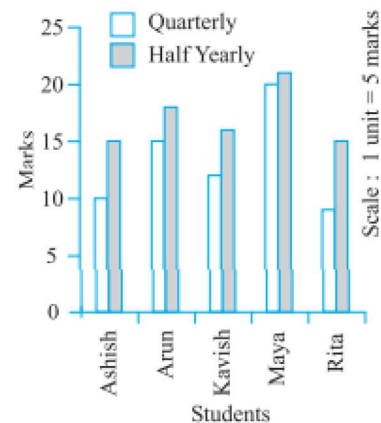
Sol: June

(ii) In which months does each city has minimum sunlight?

Sol: January

**Exp 10 :** A mathematics teacher wants to see, whether the new technique of teaching she applied after quarterly test was effective or not. She takes the scores of the 5 weakest children in the quarterly test (out of 25) and in the half yearly test (out of 25)

Students	Ashish	Arun	Kavish	Maya	Rita
Quarterly	10	15	12	20	9
Half yearly	15	18	16	21	15

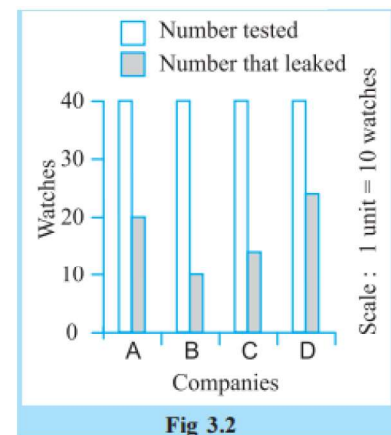


Sol: She draws the adjoining double bar graph and finds a marked improvement in most of the students, the teacher

decides that she should continue to use the new technique of teaching.

**TRY THESE**

1. The bar graph (Fig 3.2) shows the result of a survey to test water resistant watches made by different companies. Each of these





companies claimed that their watches were water resistant. After a test the above results were revealed.

(a) Can you work out a fraction of the number of watches that leaked to the number tested for each company?

**Sol:**

Company	Tested	Leaked	fraction
A	40	20	$\frac{20}{40} = \frac{1}{2}$
B	40	10	$\frac{10}{40} = \frac{1}{4}$
C	40	15	$\frac{15}{40} = \frac{3}{8}$
D	40	25	$\frac{25}{40} = \frac{5}{8}$

(b) Could you tell on this basis which company has better watches?

**Sol:** From the above  $\frac{10}{40}$  is the least fraction. So, Company B has better watches.

2. Sale of English and Hindi books in the years 1995, 1996, 1997 and 1998 are given below:

Years	1995	1996	1997	1998
English	350	400	450	620
Hindi	500	525	600	650

Draw a double bar graph and answer the following questions: (a) In which year was the difference in the sale of the two language books least?.

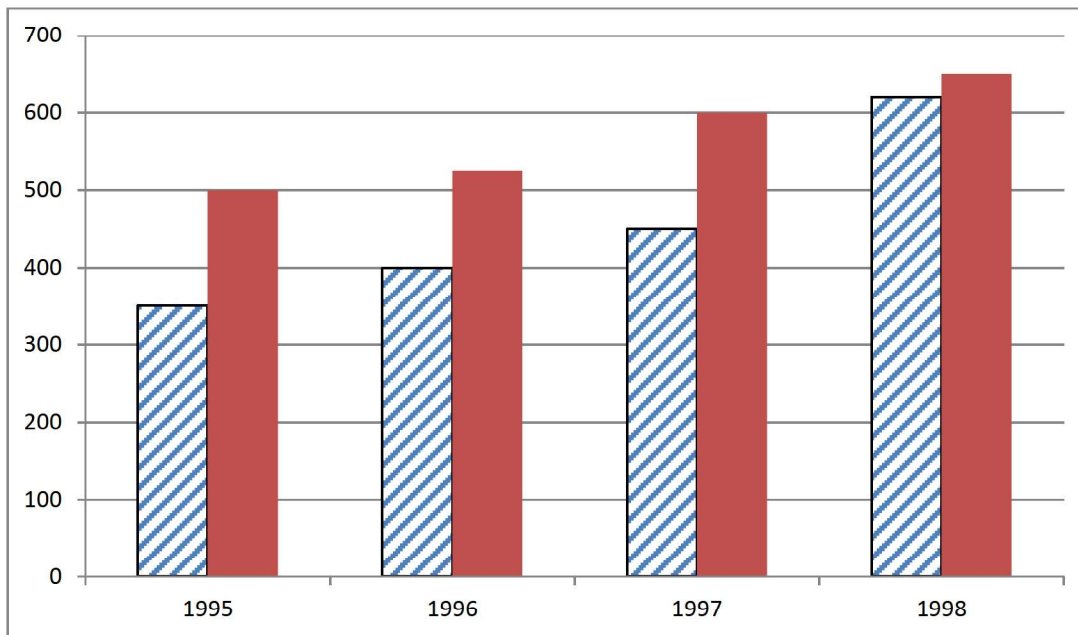
**Sol:**1998

(b) Can you say that the demand for English books rose faster? Justify

**Sol:** Yes, I can say that the demand for English books rose faster.

The demand of English books from 1995 to 1998 =  $620 - 350 = 270$

The demand of Hindi books from 1995 to 1998 =  $650 - 500 = 150$



### EXERCISE 3.3

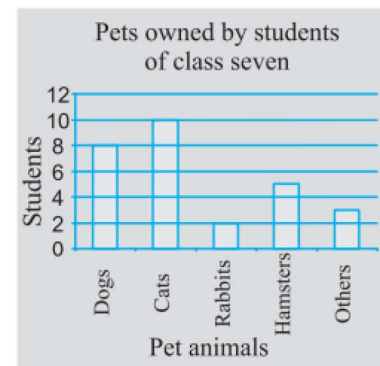
1. Use the bar graph (Fig 3.3) to answer the following questions

(a) Which is the most popular pet?

Sol: Cat

(b) How many students have dog as a pet?

Sol: 8 students



2. Read the bar graph (Fig 3.4) which shows the number of books sold by a bookstore during five consecutive years and answer the following questions:

(i) About how many books were sold in 1989? 1990? 1992?

Sol: Number of books sold in 1989=180

Number of books sold in 1990=475

Number of books sold in 1992=225

(ii) In which year were about 475 books sold? About 225 books sold?

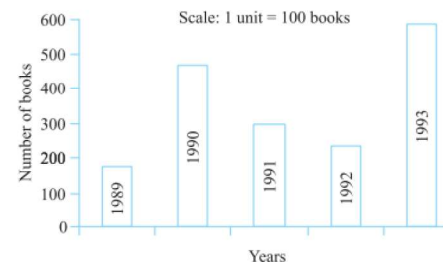
Sol: In 1990, about 475 books sold . In 1992, about 225 books sold.

(iii) In which years were fewer than 250 books sold?

Sol: In 1989 and 1992 fewer than 250 books were sold.

(iv) Can you explain how you would estimate the number of books sold in 1989?

Sol: From the graph, I can estimate 180 books sold in 1989.

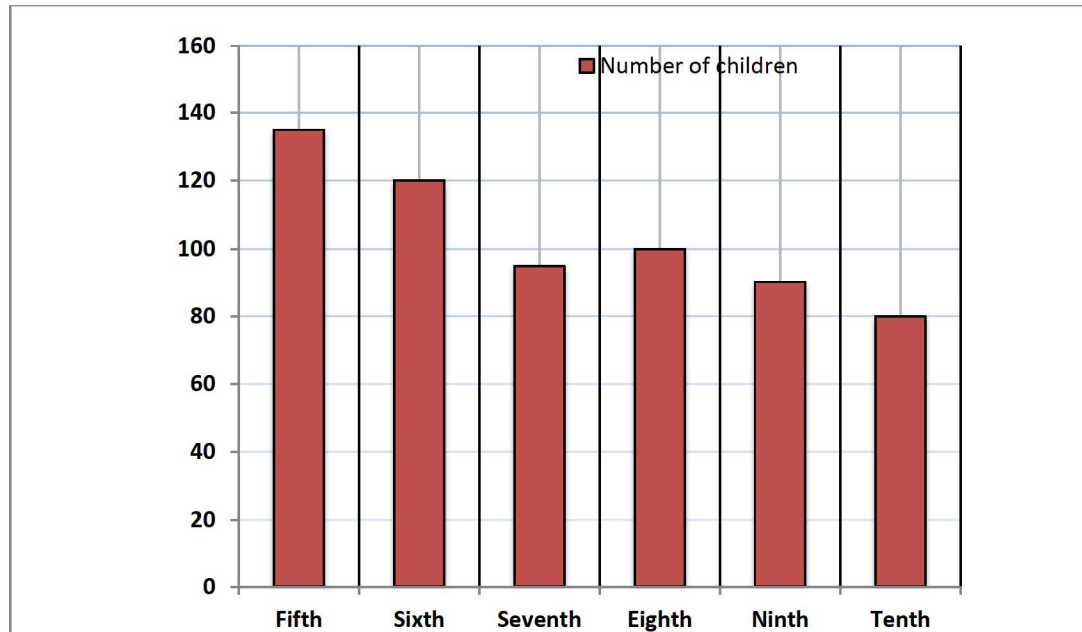


3. Number of children in six different classes are given below. Represent the data on a bar graph

Class	Fifth	Sixth	Seventh	Eighth	Ninth	Tenth
Number of Children	135	120	95	100	90	80

(a) How would you choose a scale? (b) Answer the following questions: (i) Which class has the maximum number of children? And the minimum? (ii) Find the ratio of students of class sixth to the students of class eight.

Sol:



(a) Scale: on Y-axis 1 unit=10 children

(b) (i) Fifth class has the maximum number of children and tenth class has the minimum number of children.

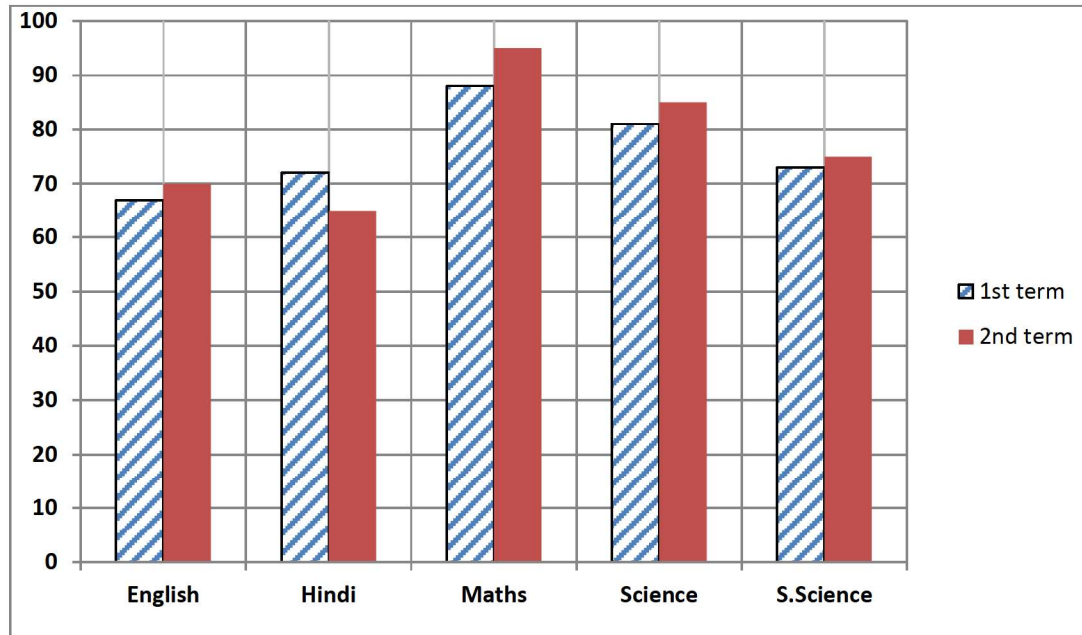
(ii) The ratio of students of class sixth to the students of class eighth= $120:100=6:5$

4. The performance of a student in 1st Term and 2nd Term is given. Draw a double bar graph choosing appropriate scale and answer the following:

Subject	English	Hindi	Maths	Science	S. Science
1 <sup>st</sup> Term (M.M. 100)	67	72	88	81	73
2 <sup>nd</sup> Term (M.M. 100)	70	65	95	85	75

(i) In which subject, has the child improved his performance the most? (ii) In which subject is the improvement the least? (iii) Has the performance gone down in any subject?

Sol:



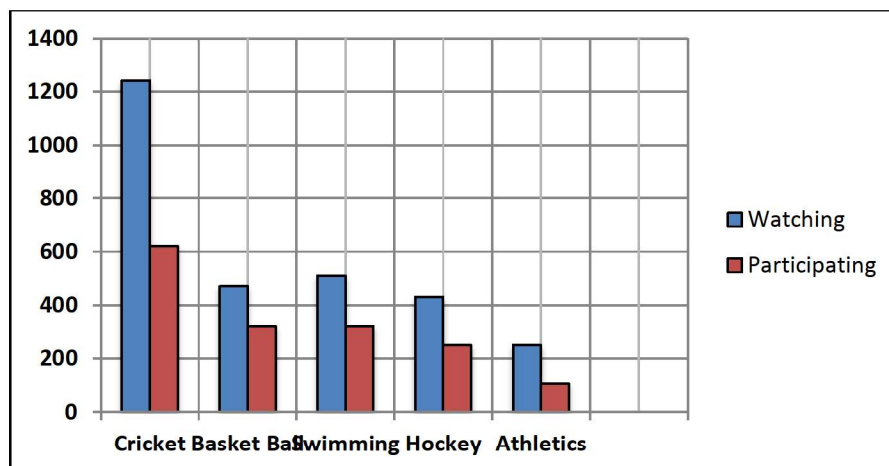
5. Consider this data collected from a survey of a colony.

Favourite Sport	Cricket	Basket Ball	Swimming	Hockey	Athletics
Watching	1240	470	510	430	250
Participating	620	320	320	250	105

(i) Draw a double bar graph choosing an appropriate scale. What do you infer from the bar graph?

(ii) Which sport is most popular? (iii) Which is more preferred, watching or participating in sports?

Sol:





6. Take the data giving the minimum and the maximum temperature of various cities given in the beginning of this Chapter (Table 3.1). Plot a double bar graph using the data and answer the following:
- (i) Which city has the largest difference in the minimum and maximum temperature on the given date? (ii) Which is the hottest city and which is the coldest city? (iii) Name two cities where maximum temperature of one was less than the minimum temperature of the other. (iv) Name the city which has the least difference between its minimum and the maximum temperature.

Sol:

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