4 DATA HANDLING AND PRESENTATION

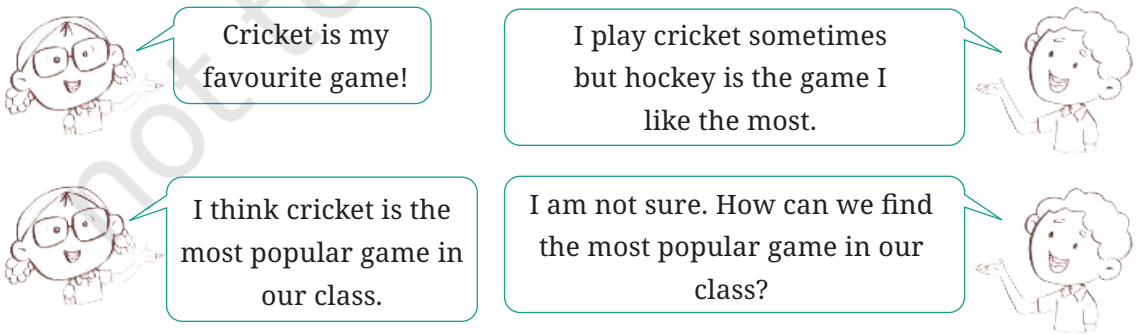
If you ask your classmates about their favourite colours, you will get a list of colours. This list is an example of data. Similarly, if you measure the weight of each student in your class, you would get a collection of measures of weight—again data.

Any collection of facts, numbers, measures, observations or other descriptions of things that convey *information* about those things is called **data**.

We live in an age of information. We constantly see large amounts of data presented to us in new and interesting ways. In this chapter, we will explore some of the ways that data is presented, and how we can use some of those ways to correctly display, interpret and make inferences from such data!

4.1 Collecting and Organising Data

Navya and Naresh are discussing their favourite games.



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To figure out the most popular game in their class, what should Navya and Naresh do? Can you help them?

Naresh and Navya decided to go to each student in the class and ask what their favourite game is. Then they prepared a list.

Navya is showing the list:



Mehnoor – *Kabaddi*	Pushkal – *Satoliya* (*Pittu*)	Anaya – *Kabaddi*
Jubimon – Hockey	Densy – Badminton	Jivisha – *Satoliya* (*Pittu*)
Simran – *Kabaddi*	Jivika – *Satoliya* (*Pittu*)	Rajesh – Football
Nand – *Satoliya* (*Pittu*)	Leela – Hockey	Thara – Football
Ankita – *Kabaddi*	Afshan – Hockey	Soumya – Cricket
Imon – Hockey	Keerat – Cricket	Navjot – Hockey
Yuvraj – Cricket	Gurpreet – Hockey	Hemal – *Satoliya* (*Pittu*)
Rehana – Hockey	Arsh – *Kabaddi*	Debabrata – Football
Aarna – Badminton	Bhavya – Cricket	Ananya – Hockey
Kompal – Football	Sarah – *Kabaddi*	Hardik – Cricket
Tahira – Cricket		

She says (happily), “I have collected the data. I can figure out the most popular game now!”.

A few other children are looking at the list and wondering, “We can’t yet see the most popular game. How can we get it from this list?”.

Figure it Out

1. What would you do to find the most popular game among Naresh’s and Navya’s classmates?
2. What is the most popular game in their class?
3. Try to find out the most popular game among your classmates.
4. Pari wants to respond to the questions given below. Put a tick (✓) for the questions where she needs to carry out data collection and

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put a cross (×) for the questions where she doesn't need to collect data. Discuss your answers in the classroom.

a. What is the most popular TV show among her classmates? ☐

b. When did India get independence? ☐

c. How much water is getting wasted in her locality? ☐

d. What is the capital of India? ☐

Shri Nilesh is a teacher. He decided to bring sweets to the class to celebrate the new year. The sweets shop nearby has *jalebi*, *gulab jamun*, *gujiya*, *barfi*, and *rasgulla*. He wanted to know the choices of the children. He wrote the names of the sweets on the board and asked each child to tell him their preference. He put a tally mark '|' for each student and when the count reached 5, he put a line through the previous four and marked it as 𝍸.

Sweets	Tally Marks	No. of Students
Jalebi	𝍸 |	6
Gulab jamun	𝍸 ||||	9
Gujiya	𝍸 𝍸 |||	_____
Barfi	|||	_____
Rasgulla	𝍸 ||	_____

Figure it Out

1. Complete the table to help Shri Nilesh to purchase the correct numbers of sweets:

   a. How many students chose jalebi? ☐

   b. Barfi was chosen by ☐ students?

   c. How many students chose gujiya? ☐

   d. Rasgulla was chosen by ☐ students?

   e. How many students chose gulab jamun? ☐

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Shri Nilesh requested one of the staff members to bring the sweets as given in the table. The above table helped him to purchase the correct numbers of sweets.

2. Is the above table sufficient to distribute each type of sweet to the correct student? Explain. If it is not sufficient, what is the alternative?

To organise the data, we can write the name of each sweet in one column and using tally signs, note the number of students who prefer that sweet. The numbers 6, 9, ... are the **frequencies** of the sweet preferences for *jalebi*, *gulab jamun* ... respectively.

Sushri Sandhya asked her students about the sizes of the shoes they wear. She noted the data on the board.

4	5	3	4	3	4	5	5	4
5	5	4	5	6	4	3	5	6
4	6	4	5	7	5	6	4	5

She then arranged the shoe sizes of the students in ascending order —
3, 3, 3, 4, 4, 4, 4, 4, 4, 4, 4, 4, 5, 5, 5, 5, 5, 5, 5, 5, 5, 5, 6, 6, 6, 6, 7

Figure it Out

1. Help her to figure out the following:
   a. The largest shoe size in the class is _____.
   b. The smallest shoe size in the class is _____.
   c. There are _____ students who wear shoe size 5.
   d. There are _____ students who wear shoe sizes larger than 4.
2. How did arranging the data in ascending order help to answer these questions?
3. Are there other ways to arrange the data?



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4. Write the names of a few trees you see around you. When you observe a tree on the way from your home to school (or while walking from one place to another place), record the data and fill in the following table:

Tree	No. of Trees
Peepal	
Neem	
...	
....	

a. Which tree was found in the greatest number?

b. Which tree was found in the smallest number?

c. Were there any two trees found in the same numbers?

5. Take a blank piece of paper and paste any small news item from a newspaper. Each student may use a different article. Now, prepare a table on the piece of paper as given below. Count the number of each of the letters 'c', 'e', 'i', 'r', and 'x' in the words of the news article, and fill in the table.

Letter	c	e	i	r	x	Any other letter of your choice
Number of times found in the news item						

a. The letter found the most number of times is _____.

b. The letter found the least number of times is _____.

c. List the five letters 'c', 'e', 'i', 'r', 'x' in ascending order of frequency. Now, compare the order of your list with that of your classmates. Is your order the same or nearly the same as theirs? (Almost everyone is likely to get the order 'x, c, r, i, e'.) Why do you think this is the case?

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d. Write the process you followed to complete this task.

e. Discuss with your friends the processes they followed.

f. If you do this task with another news item, what process would you follow?

Teacher's Note

Provide more opportunities to collect and organise data. Ask students to guess what is the most popular colour, game, toy, school subject, etc., amongst the students in their classroom and then collect the data for it. It can be a fun activity in which they also learn about their classmates. Discuss how they can organise the data in different ways, each way having its own advantages and limitations. For all these tasks and the tasks under 'Figure it Out', discuss the tasks with the children and let them understand the tasks, and then let them plan and present their research processes and conclusions in the class.

4.2 Pictographs

Pictographs are one visual and suggestive way to represent data without writing any numbers. Look at this picture—you may be familiar with it from previous classes.

Modes of Travelling	Number of Students ☺ = 1 Student
Private car	☺ ☺ ☺ ☺
Public bus	☺ ☺ ☺ ☺ ☺
School bus	☺ ☺ ☺ ☺ ☺ ☺ ☺ ☺ ☺ ☺ ☺ ☺
Cycle	☺ ☺ ☺
Walking	☺ ☺ ☺ ☺ ☺ ☺ ☺

This picture helps you understand at a glance the different modes of travel used by students. Based on this picture, answer the following questions:

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- Which mode of travel is used by the most number of students?
- Which mode of travel is used by the least number of students?

A pictograph represents data through pictures of objects. It helps answer questions about data with just a quick glance.

In the above pictograph, one unit or symbol (☺) is used to represent one student. There are also other pictographs where one unit or symbol stands for many people or objects.

Example: Nand Kishor collected responses from the children of his middle school in Berasia regarding how often they slept at least 9 hours during the night. He prepared a pictograph from the data:

Response	Number of Children (▲ = 10 Children)
Always	▲ ▲ ▲ ▲ ▲
Sometimes	▲ ▲ ◢
Never	▲ ▲ ▲ ▲

Answer the following questions using the pictograph:

1. What is the number of children who always slept at least 9 hours at night?
2. How many children sometimes slept at least 9 hours at night?
3. How many children always slept less than 9 hours each night? Explain how you got your answer.

Solutions

1. In the table, there are 5 pictures ▲ for 'Always'. Each picture ▲ represents 10 children. Therefore, 5 pictures indicate 5 × 10 = 50 children.
2. There are 2 complete pictures ▲ (2 × 10 = 20) and a half picture ◢ (half of 10 = 5). Therefore, the number of children who sleep at least 9 hours only sometimes is 20 + 5 = 25.

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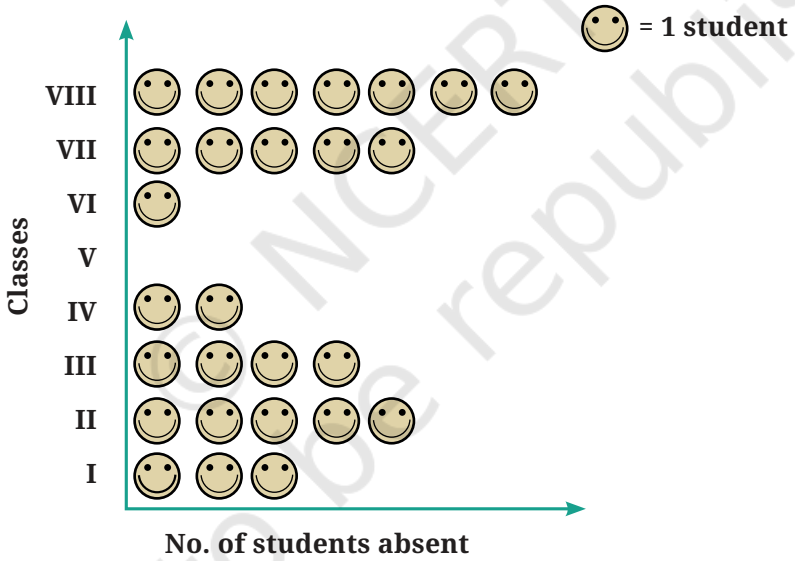
3. There are 4 complete pictures for 'Never'. Hence, 4 × 10 = 40 children never sleep at least 9 hours in a night, i.e., they always sleep less than 9 hours.

Drawing a Pictograph

One day, Lakhanpal collected data on how many students were absent in each class:

Class	I	II	III	IV	V	VI	VII	VIII
No. of students	3	5	4	2	0	1	5	7

He created a pictograph to present this data and decided to show 1 student as ☺ in the pictograph—



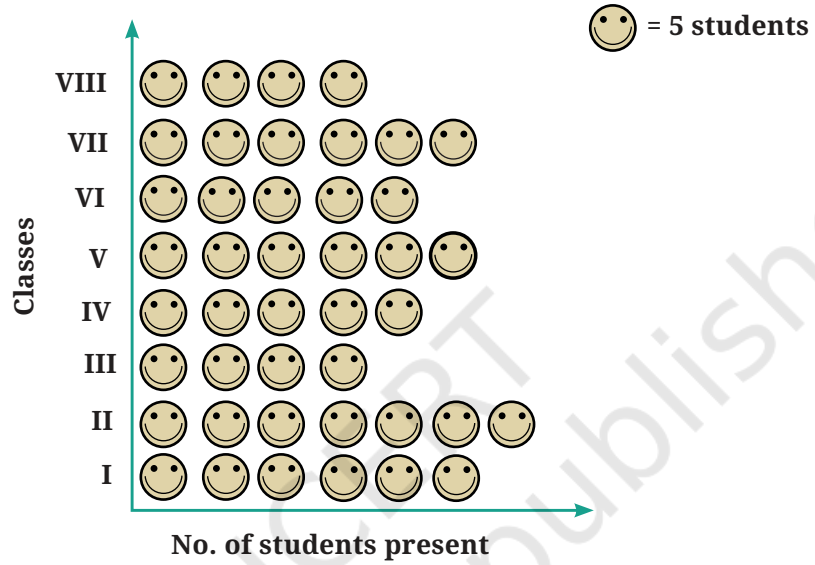
Meanwhile, his friends Jarina and Sangita collected data on how many students were present in each class:

Class	I	II	III	IV	V	VI	VII	VIII
No. of students	30	35	20	25	30	25	30	20

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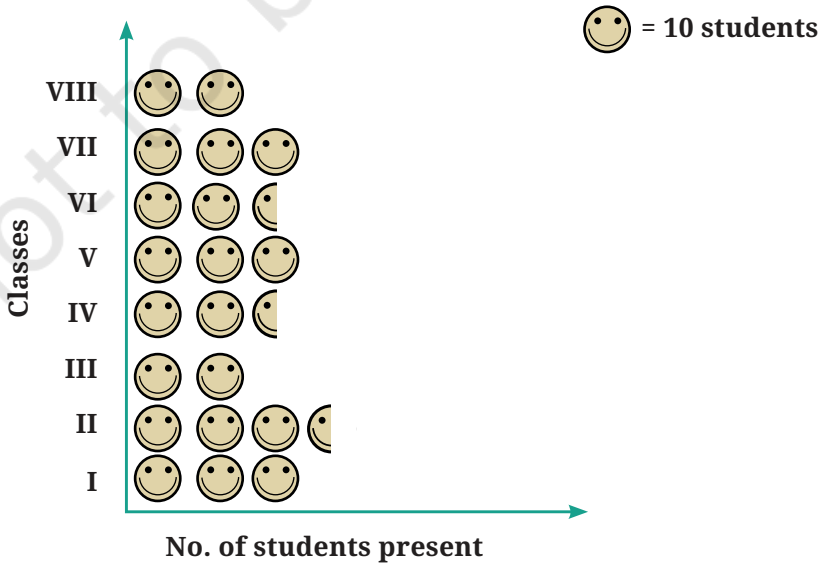
If they want to show their data through a pictograph, where they also use one symbol ☺ for each student, as Lakhanpal did, what are the challenges they might face?

Jarina made a plan to address this — since there were many students, she decided to use ☺ to represent 5 students. She figured that would save time and space too.



Sangita decided to use one ☺ to represent 10 students instead.

Since she used one ☺ to show 10 students, she had a problem in showing 25 students and 35 students in the pictograph. Then, she realised she could use ☾ to show 5 students.



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What could be the problems faced in preparing such a pictograph, if the total number of students present in a class is 33 or 27?



- **Pictographs** are a nice visual and suggestive way to represent data. They represent data through pictures of objects.
- Pictographs can help answer questions and make inferences about data with just a quick glance (in the examples above—about favourite games, favourite colours, most common modes of conveyance, number of students absent, etc.).
- By reading a pictograph, we can quickly understand the frequencies of the different categories (for example, cricket, hockey, etc.) and the comparisons of these frequencies.
- In a pictograph, the categories can be arranged horizontlly or vertically. For each category, simple pictures and symbols are then drawn in the designated columns or rows according to the frequency of that category.
- A **scale** or **key** (for example, ☺ : 1 student or ☺ : 5 students) is added to show what each symbol or picture represents. Each symbol or picture can represent one unit or multiple units.
- It can be more challenging to prepare a pictograph when the amount of data is large or when the frequencies are not exact multiples of the scale or key.

Figure it Out

1. The following pictograph shows the number of books borrowed by students, in a week, from the library of Middle School, Ginnori:

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Day	Number of Books Borrowed ( =1 Book)
Monday	
Tuesday	
Wednesday	
Thursday	
Friday	
Saturday	

a. On which day were the minimum number of books borrowed?
b. What was the total number of books borrowed during the week?
c. On which day were the maximum number of books borrowed? What may be the possible reason?

2. Magan Bhai sells kites at Jamnagar. Six shopkeepers from nearby villages come to purchase kites from him. The number of kites he sold to these six shopkeepers are given below —

Shopkeeper	Number of Kites Sold
Chaman	250
Rani	300
Rukhsana	100
Jasmeet	450
Jetha Lal	250
Poonam Ben	700

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Prepare a pictograph using the symbol ◈ to represent 100 kites.

Answer the following questions:

a. How many symbols represent the kites that Rani purchased?

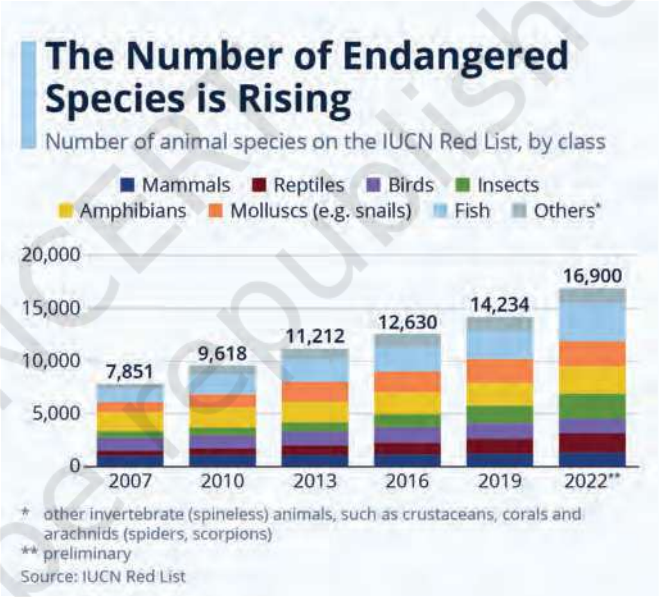
b. Who purchased the maximum number of kites?

c. Who purchased more kites, Jasmeet or Chaman?

d. Rukhsana says Poonam Ben purchased more than double the number of kites that Rani purchased. Is she correct? Why?

4.3 Bar Graphs

Have you seen graphs like this on TV or in a newspaper?



Source: https://www.statista.com/chart/17122/number-of-threatened-species-red-list/

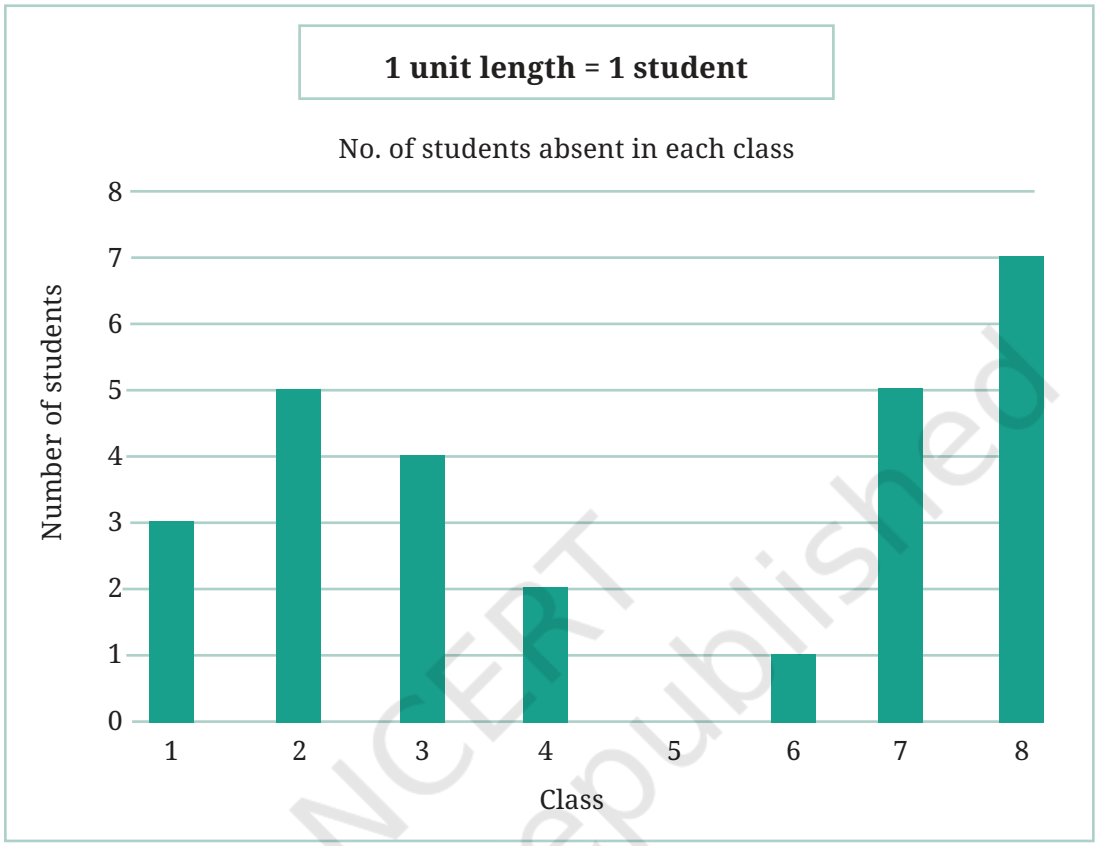
Like pictographs, such **bar graphs** can help us to quickly understand and interpret information, such as the highest value, the comparison of values of different categories, etc. However, when the amount of data is large, presenting it by a pictograph is not only time consuming but at times difficult too. Let us see how data can be presented instead using a bar graph.

Let's take the data collected by Lakhanpal earlier, regarding the number of students absent on one day in each class:

Class	I	II	III	IV	V	VI	VII	VIII
No. of students	3	5	4	2	0	1	5	7

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He presented the same data using a bar graph:



Teacher's Note

If the students have not noticed, please point out the equally spaced horizontal lines. Explain that this means that each pair of consecutive numbers on the left has the same gap.

Answer the following questions using the bar graph:

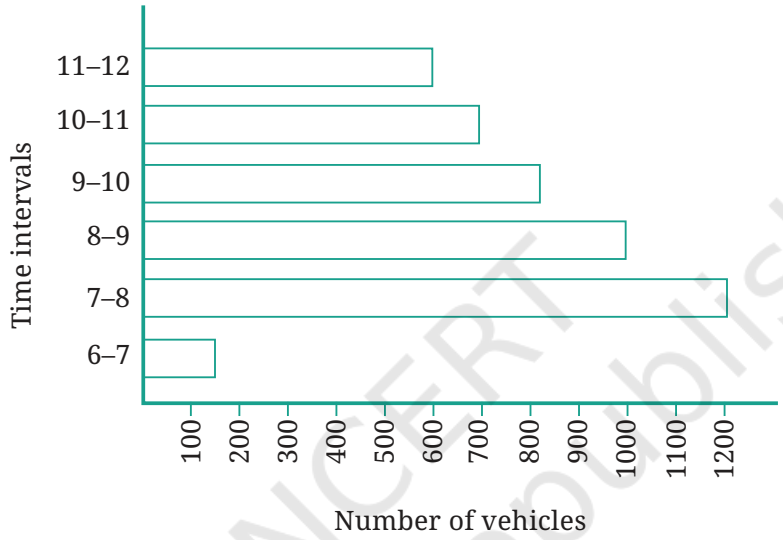
1. In Class 2, _____ students were absent that day.
2. In which class were the maximum number of students absent? _____
3. Which class had full attendance that day? _____

When making bar graphs, bars of uniform width can be drawn horizontally or vertically with equal spacing between them; then the

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length or height of each bar represents the given number. As we saw in pictographs, we can use a scale or key when the frequencies are larger.

Let us look at an example of vehicular traffic at a busy road crossing in Delhi, which was studied by the traffic police on a particular day. The number of vehicles passing through the crossing each hour from 6 a.m. to 12:00 noon is shown in the bar graph. One unit of length stands for 100 vehicles.



We can see that the maximum traffic at the crossing is shown by the longest bar, i.e., for the time interval 7–8 a.m. The bar graph shows that 1200 vehicles passed through the crossing at that time. The second longest bar is for 8–9 a.m. During that time, 1000 vehicles passed through the crossing. Similarly, the minimum traffic is shown by the smallest bar, i.e., the bar for the time interval 6–7 a.m. During that time, only about 150 vehicles passed through the crossing. The second smallest bar is that for the time interval 11 a.m.–12 noon, when about 600 vehicles passed through the crossing.

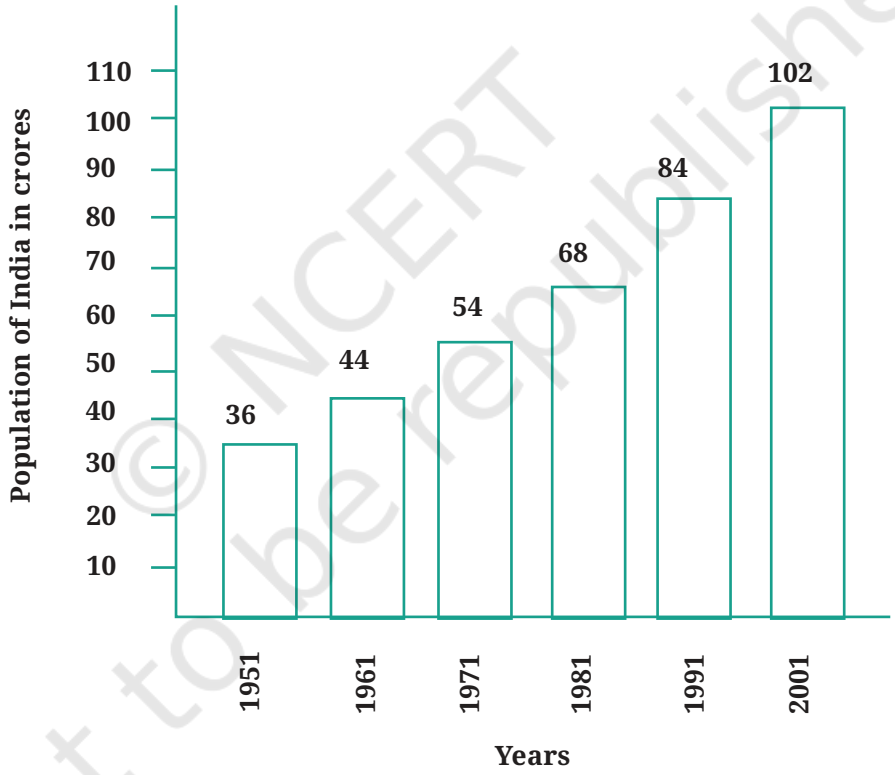
The total number of cars passing through the crossing during the two-hour interval 8.00–10.00 a.m. as shown by the bar graph is about 1000 + 800 = 1800 vehicles.

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Figure it Out

1. How many total cars passed through the crossing between 6 a.m. and noon?
2. Why do you think so little traffic occurred during the hour of 6–7 a.m., as compared to the other hours from 7 a.m.–noon?
3. Why do you think the traffic was the heaviest between 7–8 a.m.?
4. Why do you think the traffic was lesser and lesser each hour after 8 a.m. all the way until noon?

Example:



Population of India in crores

This bar graph shows the population of India in each decade over a period of 50 years. The numbers are expressed in crores. If you were to take 1 unit length to represent one person, drawing the bars will

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be difficult! Therefore, we choose the scale so that 1 unit represents 10 crores. The bar graph for this choice is shown in the figure. So a bar of length 5 units represents 50 crores and of 8 units represents 80 crores.

- On the basis of this bar graph, what may be a few questions you may ask your friends?
- How much did the population of India increase over 50 years? How much did the population increase in each decade?

4.4 Drawing a Bar Graph

In a previous example, Shri Nilesh prepared a frequency table representing the sweet preferences of the students in his class. Let's try to prepare a bar graph to present his data —

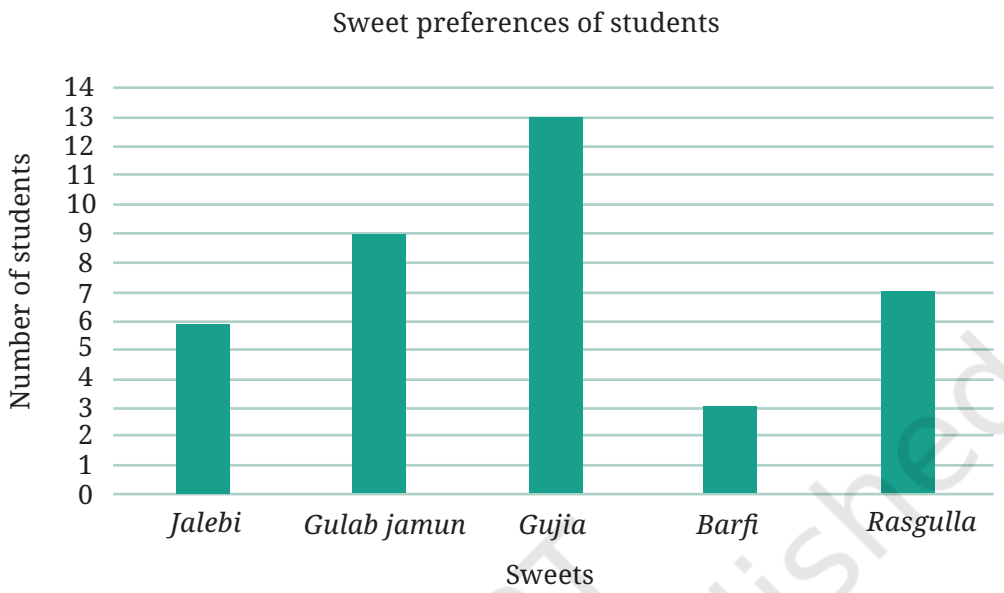
Sweet	No. of Students
Jalebi	6
Gulab jamun	9
Gujiya	13
Barfi	3
Rasgulla	7

1. First, we draw a horizontal line and a vertical line. On the horizontal line, we will write the name of each of the sweets, equally spaced, from which the bars will rise in accordance with their frequencies; and on the vertical line we will write the frequencies representing the number of students.
2. We must choose a scale. That means we must decide how many students will be represented by a unit length of a bar so that it fits nicely on our paper. Here, we will take 1 unit length to represent 1 student.
3. For *jalebi*, we therefore need to draw a bar having a height of 6 units (which is the frequency of the sweet *jalebi*), and similarly for the other sweets we have to draw bars as high as their frequencies.

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4. We, therefore, get a bar graph as shown below —



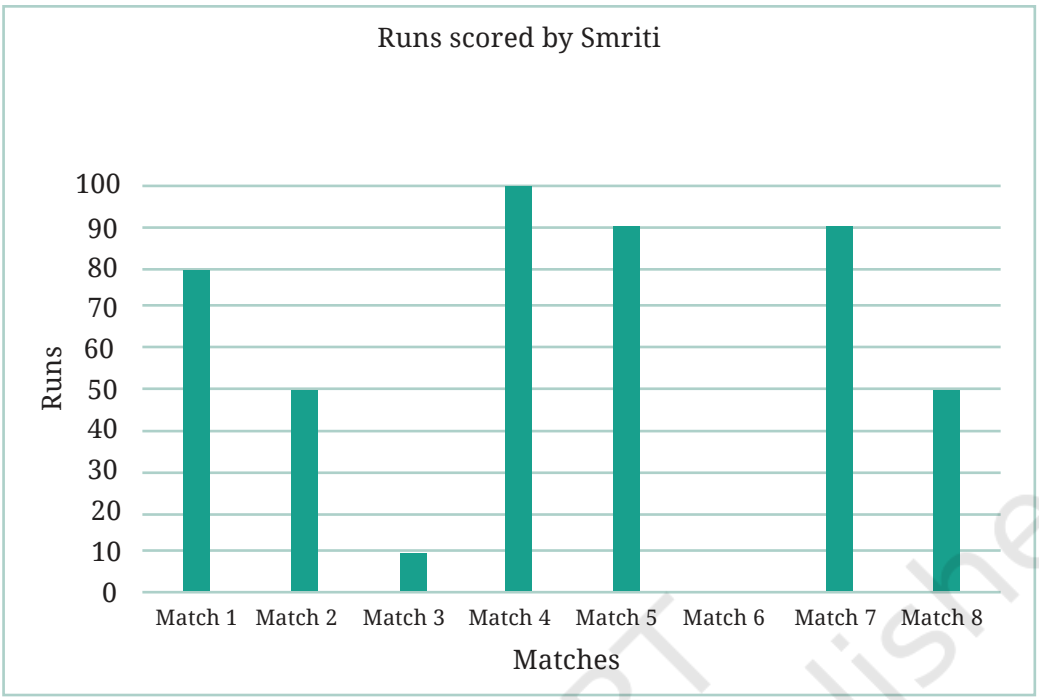
When the frequencies are larger and we cannot use the scale of 1 unit length = 1 number (frequency), we need to choose a different scale like we did in the case of pictographs.

Example: The number of runs scored by Smriti in each of the 8 matches are given in the table below:

Match	Match 1	Match 2	Match 3	Match 4	Match 5	Match 6	Match 7	Match 8
Runs	80	50	10	100	90	0	90	50

In this example, the minimum score is 0 and the maximum score is 100. Using a scale of 1 unit length = l run would mean that we have to go all the way from 0 to 100 runs in steps of l. This would be unnecessarily tedious. Instead, let us use a scale where 1 unit length = 10 runs. We mark this scale on the vertical line and draw the bars according to the scores in each match. We get the following bar graph representing the above data.

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Example: The following table shows the monthly expenditure of Imran's family on various items:

Items	Expenditure (in ₹)
House rent	3000
Food	3400
Education	800
Electricity	400
Transport	600
Miscellaneous	1200

To represent this data in the form of a bar graph, here are the steps—

- Draw two perpendicular lines, one horizontal and one vertical.
- Along the horizontal line, mark the 'items' with equal spacing between them and mark the corresponding expenditures along the vertical line.

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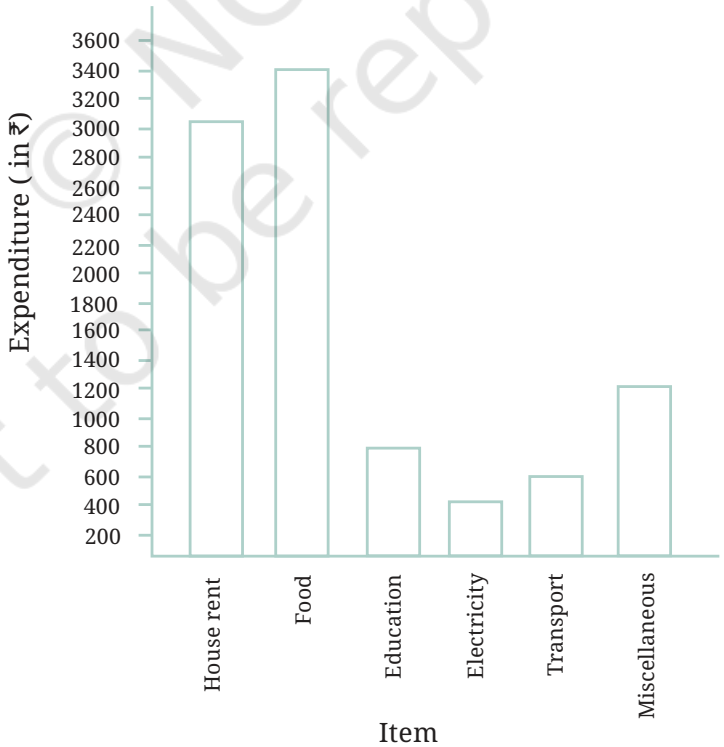
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- Take bars of the same width, keeping a uniform gap between them.
- Choose a suitable scale along the vertical line. Let, 1 unit length = ₹ 200, and then mark and write the corresponding values (₹ 200, ₹ 400, etc.) representing each unit length.

Finally, calculate the heights of the bars for various items as shown below —

House rent	3000 ÷ 200	15 units
Food	3400 ÷ 200	17 units
Education	800 ÷ 200	4 units
Electricity	400 ÷ 200	2 units
Transport	600 ÷ 200	3 units
Miscellaneous	1200 ÷ 200	6 units

Here is the bar graph that we obtain based on the above steps:



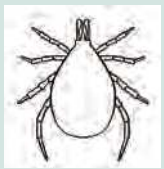
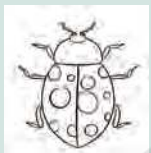
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Use the bar graph to answer the following questions:

1. On which item does Imran's family spend the most and the second most?
2. Is the cost of electricity about one-half the cost of education?
3. Is the cost of education less than one-fourth the cost of food?

Figure it Out

1. Samantha visited a tea garden, and collected data of the insects and critters she saw there. Here is the data she collected:

				
Mites	Caterpillars	Beetles	Butterflies	Grasshoppers
6	10	5	3	2

Help her prepare a bar graph representing this data.

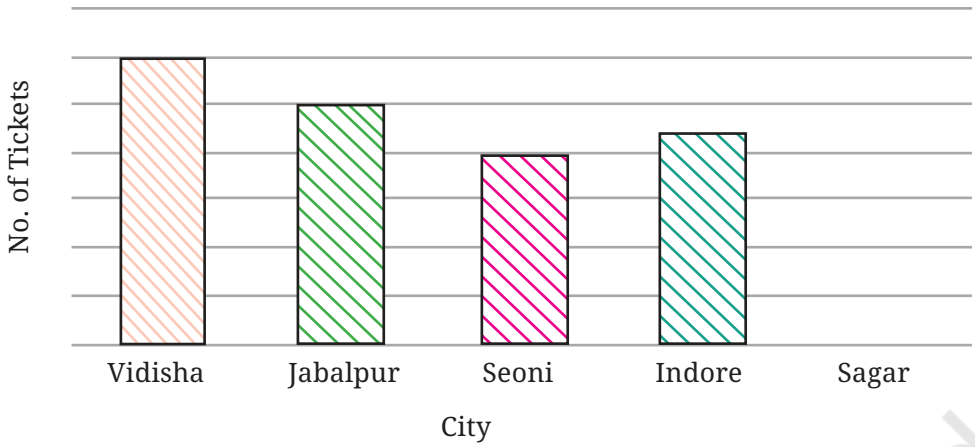
2. Pooja collected data on the number of tickets sold at the Bhopal railway station for a few different cities of Madhya Pradesh over a two-hour period.

City	Vidisha	Jabalpur	Seoni	Indore	Sagar
Number of tickets	24	20	16	28	16

She used this data and prepared a bar graph on the board to discuss the data with her students, but someone erased a portion of the graph.

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a. Write the number of tickets sold for Vidisha above the bar.

b. Write the number of tickets sold for Jabalpur above the bar.

c. The bar for Vidisha is 6 unit lengths and the bar for Jabalpur is 5 unit lengths. What is the scale for this graph?

d. Draw the correct bar for Sagar.

e. Add the scale of the bar graph by placing the correct numbers on the vertical axis.

f. Are the bars for Seoni and Indore correct in this graph? If not, draw the correct bar(s).

3. Chinu listed the various means of transport that passed across the road in front of his house from 9 a.m. to 10 a.m.:

bike	car	bike	bus	bike	bike
bike	auto rickshaw	bicycle	bullock cart	bicycle	auto rickshaw
car	scooter	car	auto rickshaw	bicycle	bike
car	auto rickshaw	bike	scooter	bike	car
bicycle	scooter	bicycle	scooter	bike	bus
auto rickshaw	auto rickshaw	bike	bicycle	bus	bike
bicycle	scooter	bus	scooter	auto rickshaw	bike
scooter	bicycle	bike	bullock cart	auto rickshaw	scooter
car	scooter				

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a. Prepare a frequency distribution table for the data.

b. Which means of transport was used the most?

c. If you were there to collect this data, how could you do it? Write the steps or process.

4. Roll a die 30 times and record the number you obtain each time. Prepare a frequency distribution table using tally marks. Find the number that appeared:

a. The minimum number of times.

b. The maximum number of times.

c. Find numbers that appeared an equal number of times.

5. Faiz prepared a frequency distribution table of data on the number of wickets taken by Jaspreet Bumrah in his last 30 matches:

Wickets Taken	Number of Matches
0	2
1	4
2	6
3	8
4	3
5	5
6	1
7	1

a. What information is this table giving?

b. What may be the title of this table?

c. What caught your attention in this table?

d. In how many matches has Bumrah taken 4 wickets?

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e. Mayank says, "If we want to know the total number of wickets he has taken in his last 30 matches, we have to add the numbers 0, 1, 2, 3 ..., up to 7." Can Mayank get the total number of wickets taken in this way? Why?

f. How would you correctly figure out the total number of wickets taken by Bumrah in his last 30 matches, using this table?

6. The following pictograph shows the number of tractors in five different villages.

Villages	Number of Tractors ( = 1 Tractor)
Village A	
Village B	
Village C	
Village D	
Village E	

Observe the pictograph and answer the following questions—

a. Which village has the smallest number of tractors?

b. Which village has the most tractors?

c. How many more tractors does Village C have than Village B?

d. Komal says, "Village D has half the number of tractors as Village E." Is she right?

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7. The number of girl students in each class of a school is depicted by the pictograph:

Classes	Number of Girl Students ( = 4 Girls)
1	
2	
3	
4	
5	
6	
7	
8	

Observe this pictograph and answer the following questions:

a. Which class has the least number of girl students?

b. What is the difference between the number of girls in Classes 5 and 6?

c. If two more girls were admitted in Class 2, how would the graph change?

d. How many girls are there in Class 7?

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8. Mudhol Hounds (a type of breed of Indian dogs) are largely found in North Karnataka's Bagalkote and Vijaypura districts. The government took an initiative to protect this breed by providing support to those who adopted these dogs. Due to this initiative, the number of these dogs increased. The number of Mudhol dogs in six villages of Karnataka are as follows—

   Village A : 18, Village B : 36, Village C : 12, Village D : 48, Village E : 18, Village F : 24

   Prepare a pictograph and answer the following questions:

   a. What will be a useful scale or key to draw this pictograph?

   b. How many symbols will you use to represent the dogs in Village B?

   c. Kamini said that the number of these dogs in Village B and Village D together will be more than the number of these dogs in the other 4 villages. Is she right? Give reasons for your response.

9. A survey of 120 school students was conducted to find out which activity they preferred to do in their free time:

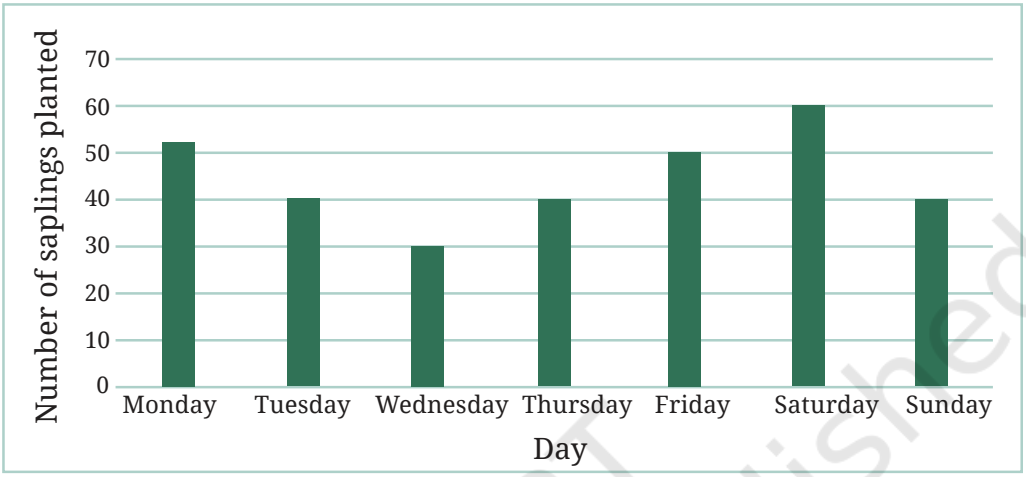
Preferred Activity	Number of Students
Playing	45
Reading story books	30
Watching TV	20
Listening to music	10
Painting	15

   Draw a bar graph to illustrate the above data taking the scale of 1 unit length = 5 students. Which activity is preferred by most students other than playing?

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10. Students and teachers of a primary school decided to plant tree saplings in the school campus and in the surrounding village during the first week of July. Details of the saplings they planted are as follows—



a. The total number of saplings planted on Wednesday and Thursday is _____.

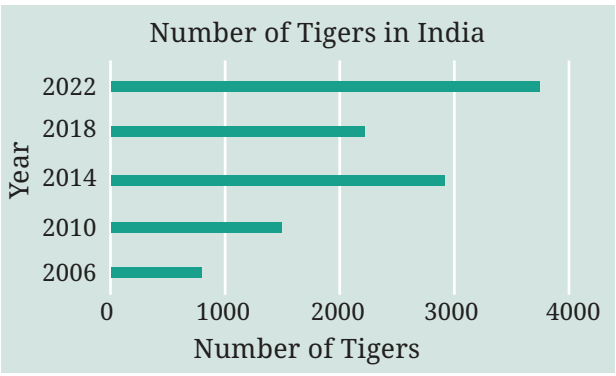
b. The total number of saplings planted during the whole week is _____.

c. The greatest number of saplings were planted on _____ and the least number of saplings were planted on _____. Why do you think that is the case? Why were more saplings planted on certain days of the week and less on others? Can you think of possible explanations or reasons? How could you try and figure out whether your explanations are correct?

11. The number of tigers in India went down drastically between 1900 and 1970. Project Tiger was launched in 1973 to track and protect the tigers in India. Starting in 2006, the exact number of tigers in India was tracked. Shagufta and Divya looked up information about the number of tigers in India between 2006 and 2022 in four-year intervals. They prepared a frequency table for this data and a bar graph to present this data, but there are a few mistakes in the graph. Can you find those mistakes and fix them?

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Year	Number of Tigers (approx.)
2006	1400
2010	1700
2014	2200
2018	3000
2022	3700



- Like pictographs, bar graphs give a nice visual way to represent data. They represent data through equally-spaced bars, each of equal width, where the lengths or heights give frequencies of the different categories.
- Each category is represented by a bar where the length or height depicts the corresponding frequency (for example, cost) or quantity (for example, runs).
- The bars have uniform spaces between them to indicate that they are free standing and represent equal categories.
- The bars help in interpreting data much faster than a frequency table. By reading a bar graph, we can compare frequencies of different categories at a glance.
- We must decide the scale (for example, 1 unit length = 1 student or 1 unit length = ₹ 200) for a bar graph on the basis of the data including the minimum and maximum frequencies, so that the resulting bar graph fits nicely and looks visually appealing on the paper or poster we are preparing. The markings of the unit lengths as per the scale must start from zero.

Teacher's Note

The main focus of this chapter is to learn how to handle data to find answers to specific questions or inquiries, to test hypotheses or to take specific decisions. This should be kept in mind when providing practice opportunities to collect, organise and analyse data.

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4.5 Artistic and Aesthetic Considerations

In addition to the steps described in previous sections, there are also some other more artistic and aesthetic aspects one can consider when preparing visual presentations of data to make them more interesting and effective. First, when making a visual presentation of data such as a pictograph or bar graph, it is important to make it fit in the intended space; this can be controlled, for example, by choosing the scale appropriately, as we have seen earlier. It is also desirable to make the data presentation visually appealing and easy-to-understand, so that the intended audience appreciates the information being conveyed.

Let us consider an example. Here is a table naming the tallest mountain on each continent, along with the height of each mountain in meters.

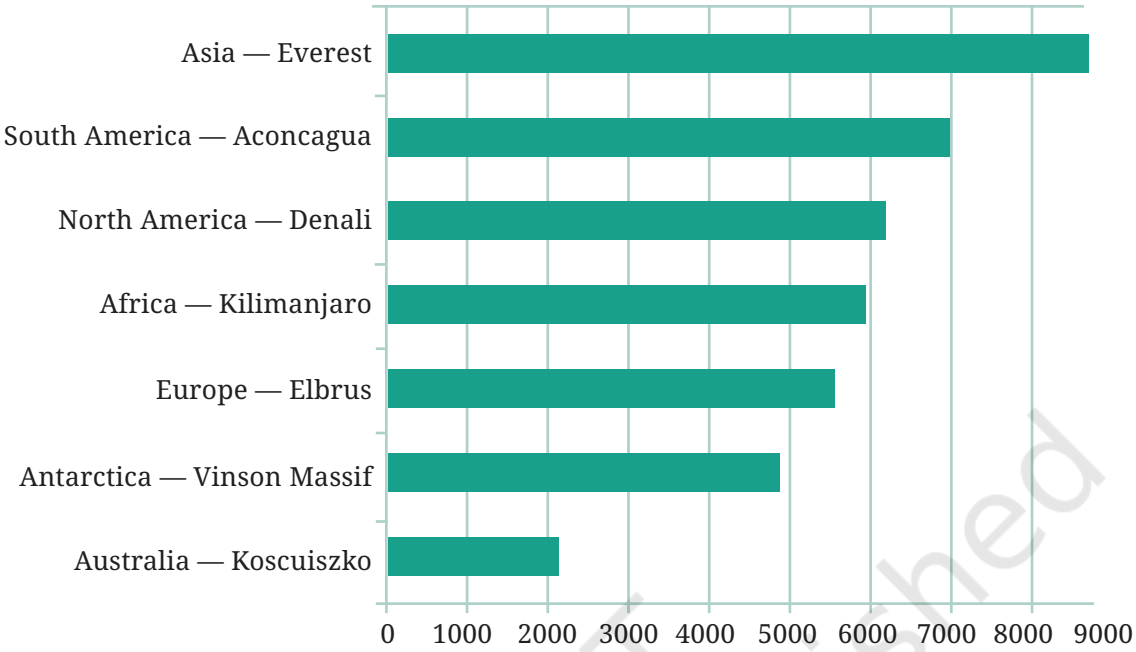
Continent	Asia	South America	North America	Africa	Europe	Antarctica	Australia
Tallest Mountain	Everest	Aconcagua	Denali	Kiliman-jaro	Elbrus	Vinson Massif	Koscuiszko
Height	8848m	6962m	6194m	5895m	5642m	4892m	2228m

How much taller is Mount Everest than Mount Koscuiszko? Are Mount Denali and Mount Kilimanjaro very different in height? This is not so easy to quickly discern from a large table of numbers.

As we have seen earlier, we can convert the table of numbers into a bar graph, as shown on the right. Here, each value is drawn as a horizontal box. These are longer or shorter depending on the number they represent. This makes it easier to compare the heights of all these mountains at a glance.

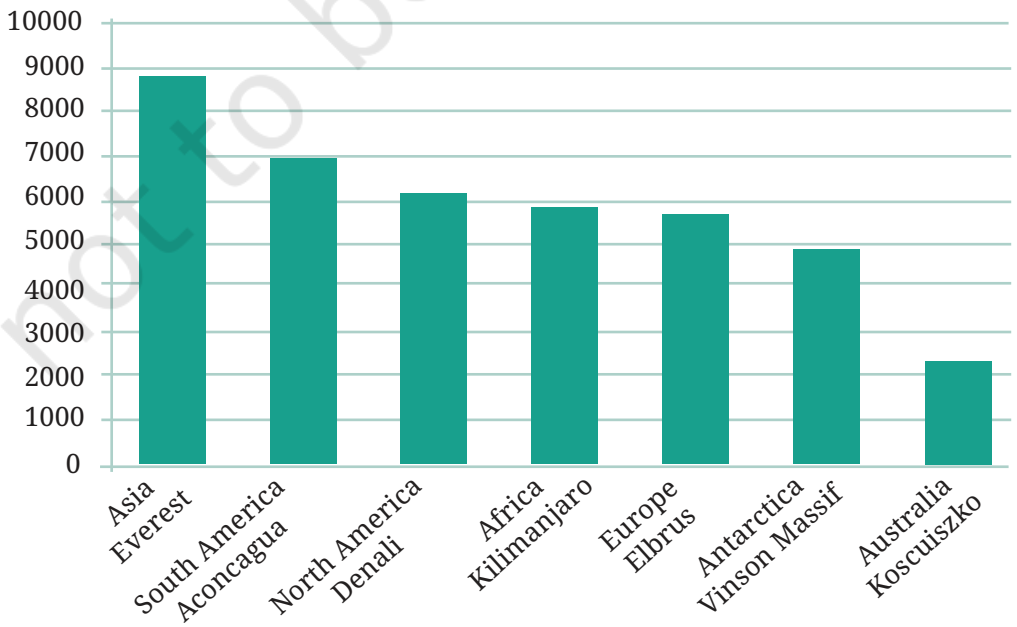
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However, since the boxes represent heights, it is better and more visually appealing to rotate the picture, so that the boxes grow upward, vertically from the ground like mountains. A bar graph with vertical bars is also called a column graph. Columns are the pillars you find in a building that hold up the roof.

Below is a column graph for our table of tallest mountains. From this column graph, it becomes easier to compare and visualise the heights of the mountains.



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In general, it is more intuitive, suggestive and visually appealing to represent heights, that are measured upwards from the ground, using bar graphs that have vertical bars or columns. Similarly, lengths that are parallel to the ground (for example, distances between location on Earth) are usually best represented using bar graphs with horizontal arcs.

Figure it Out

1. If you wanted to visually represent the data of the heights of the tallest persons in each class in your school, would you use a graph with vertical bars or horizontal bars? Why?
2. If you were making a table of the longest rivers on each continent and their lengths, would you prefer to use a bar graph with vertical bars or with horizontal bars? Why? Try finding out this information, and then make the corresponding table and bar graph! Which continents have the longest rivers?

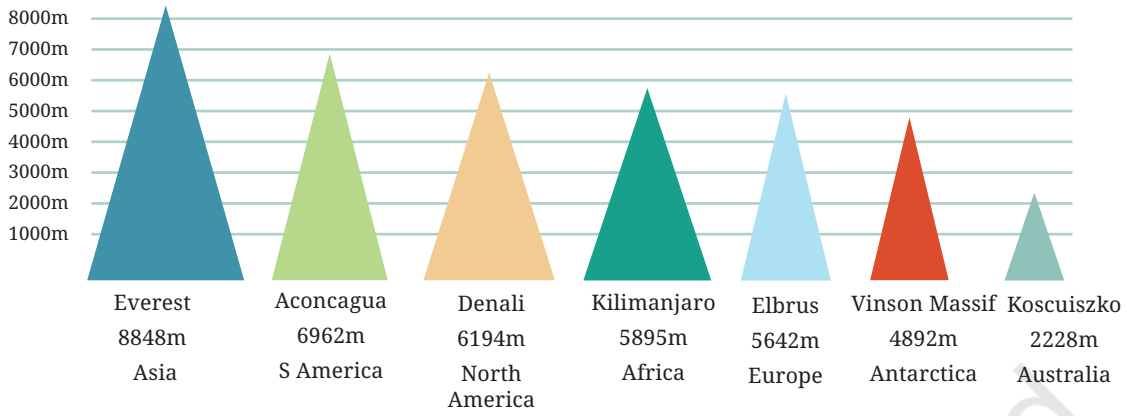
Infographics

When data visualisations such as bar graphs are further beautified with more extensive artistic and visual imagery, they are called **information graphics** or **infographics** for short. The aim of infographics is to make use of attention-attracting and engaging visuals to communicate information even more clearly and quickly, in a visually pleasing way.

As an example of how infographics can be used to communicate data even more suggestively, let us go back to the table above listing the tallest mountain on each continent. We drew a bar graph with vertical bars (columns) rather than horizontal bars, to be more indicative of mountains. But instead of rectangles, we could use triangles, which look a bit more like mountains. And, we can add a splash of colour as well. Here is the result.

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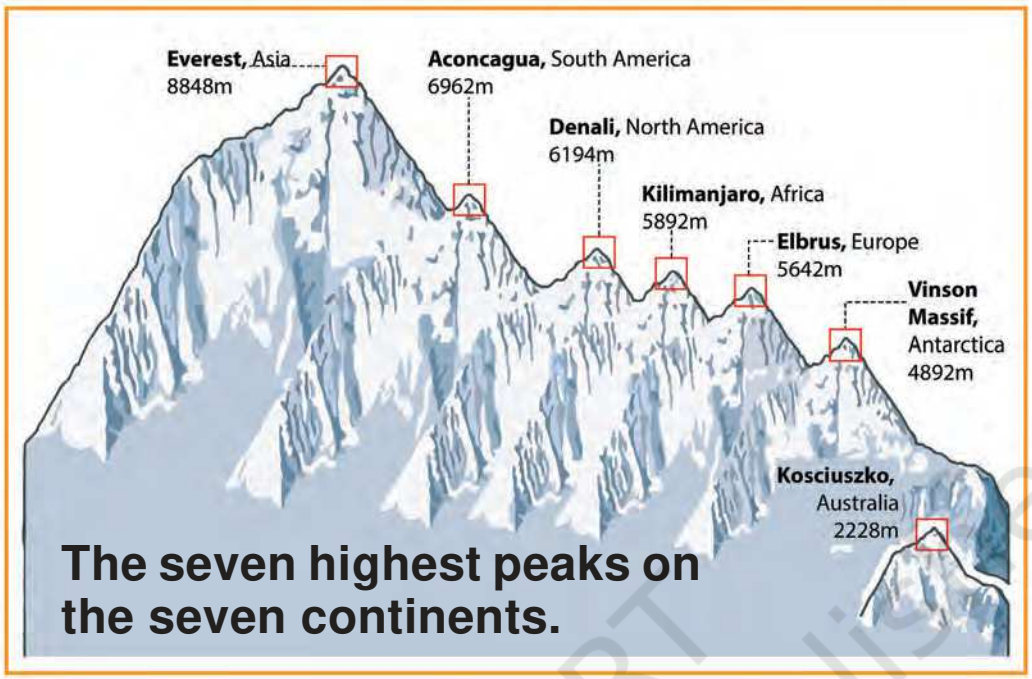
While this infographic might look more appealing and suggestive at first glance, it does have some issues. The goal of our bar graph earlier was to represent the heights of various mountains — using bars of the appropriate heights but the same widths. The purpose of using the same widths was to make it clear that we are only comparing heights. However, in this infographic, the taller triangles are also wider! Are taller mountains always wider? The infographic is implying additional information that may be misleading and may or may not be correct. Sometimes going for more appealing pictures can also accidentally mislead.

Taking this idea further, and to make the picture even more visually stimulating and suggestive, we can further change the shapes of the mountains to make them look even more like mountains, and add other details, while attempting to preserve the heights. For example, we can create an imaginary mountain range that contains all these mountains.

Is the infographic below better than the column graph with rectangular columns of equal width? The mountains look more realistic, but is the picture accurate?

For example, Everest appears to be twice as tall as Elbrus.

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The seven highest peaks on the seven continents.

What is 5642×2?

While preparing visually-appealing presentations of data, we also need to be careful that the pictures we draw do not mislead us about the facts. In general, it is important to be careful when making or reading infographics, so that we do not mislead our intended audiences and we, ourselves, are not misled.

SUMMARY

- Facts, numbers, measures, observations and other descriptions of things that convey information about those things is called **data**.
- Data can be organised in a tabular form using tally marks for easy analysis and interpretation.
- **Frequencies** are the counts of the occurrences of values, measures or observations.

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- **Pictographs** represent data in the form of pictures, or objects or parts of objects. Each picture represents a frequency which can be 1 or more than 1 — this is called the **scale** and it must be specified.
- **Bar graphs** have bars of uniform width; the length or height that indicates the total frequency of occurrence. The **scale** that is used to convert length or height to frequency again, must be specified.
- Choosing the appropriate scale for a pictograph or bar graph is important to accurately and effectively convey the desired information or data and to also make it visually appealing.
- Other aspects of a graph also contribute to its effectiveness and visual appeal such as how colours are used, what accompanying pictures are drawn, and whether the bars are horizontal or vertical. These aspects correspond to the artistic and aesthetic side of data handling and presentation.
- However, making visual representations of data 'fancy' can also sometimes be misleading.
- By reading pictographs and bar graphs accurately, we can quickly understand and make inferences about the data presented.

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CHAPTER 4 — SOLUTIONS

Data Handling and Presentation

Section 4.1

Page No. 75

Figure it Out

Q.1. What would you do to find the most popular game among Naresh's and Navya's classmates?

Ans. One of the ways could be to arrange and organize the given data in a table. Think of some other ways.

Q.2. What is the most popular game in their class?

Ans. Hockey (frequency – 8).

Q.4. Pari wants to respond to the questions given below. Put a tick (✔) for the questions where she needs to carry out data collection and put a cross (×) for the questions where she doesn't need to collect data. Discuss your answers in the classroom.

a. What is the most popular TV show among her classmates? ☐
b. When did India get independence? ☐
c. How much water is getting wasted in her locality? ☐
d. What is the capital of India? ☐

Ans. a. ✔
b. ×
c. ✔
d. ×

Page No. 76

Figure it Out

Q.1. Complete the table to help Shri Nilesh to purchase the correct numbers of sweets:

- **How many students chose jalebi?** ☐
- **Barfi was chosen by** ☐ **students?**
- **How many students chose gujiya?** ☐
- **Rasgulla was chosen by** ☐ **students?**

- **How many students chose gulab jamun?** ☐

Shri Nilesh requested one of the staff members to bring the sweets as given in the table. The above table helped him to purchase the correct numbers of sweets.

Ans.

- 6
- 3
- 13
- 7
- 9

Q.2. Is the above table sufficient to distribute each type of sweet to the correct student? Explain. If it is not sufficient, what is the alternative?

Ans. No.

It shows only the number of students who chose a particular sweet, and not about the sweet chosen by a particular student.

One of the alternatives could be, students should be categorized according to their choice of sweet.

Section 4.1

Page No. 77

Figure it Out

Q.1. Help her to figure out the following –

- **The largest shoe size in the class is _____**
- **The smallest shoe size in the class is _____**
- **There are _____ students who wear shoe size 5.**
- **There are _____ students who wear shoe sizes larger than 4.**

Ans.

- 7
- 3
- 10
- 15

Q.2. How did arranging the data in ascending order help to answer these questions?

Ans. Ordered data is helpful because in this form, frequency of any data is easy to count and the given information can be used easily.

Q.3. Are there other ways to arrange the data?

Ans. Yes, the data can be arranged in a frequency table.

Section 4.2

Page No. 83

Q. What could be the problems faced in preparing such a pictograph, if the total number of students present in a class is 33 or 27?

Ans.  represents 10 students and  represent 5 students. But to represent 3 or 7 students accurately by dividing these symbols is not possible.

Figure it Out

Q.1. The following pictograph shows the number of books borrowed by students, in a week, from the library of Middle School, Ginnori —

a. On which day were the minimum number of books borrowed?

b. What was the total number of books borrowed during the week?

c. On which day were the maximum number of books borrowed? What may be the possible reason?

Ans. a. Thursday

b. 24

c. Saturday. One of the reasons could be that Sunday being a holiday students can read the borrowed books on Sunday.

Q.2. Magan Bhai sells kites at Jamnagar. Six shopkeepers from nearby villages come to purchase kites from him. The number of kites he sold to these six shopkeepers are given below —

Prepare a pictograph using the symbol  **to represent 100 kites.**

Shopkeeper	**No. of Kites sold** **(**  **=100 Kits)**
Chaman	
Rani	

Rukhsana	
Jasmeet	
Jetha Lal	
Poonam Ben	

Answer the following questions:

a. How many symbols represent the kites that Rani purchased?

b. Who purchased the maximum number of kites?

c. Who purchased more kites, Jasmeet or Chaman?

d. Rukhsana says Poonam Ben purchased more than double the number of kites that Rani purchased. Is she correct? Why?

Ans. a. 3 symbols
b. Poonam Ben
c. Jasmeet
d. Yes. Number. of kites purchased by Poonam Ben = 700 = 2 x 300 +100

Section 4.3

Page no. 86

Q1. In Class 2, _____ students were absent that day.

Ans. 5

Q2. In which class were the maximum number of students absent? _____

Ans. Class 8

Q3. Which class had full attendance that day? _____

Ans. Class 5

Page no. 88

Figure it Out

Q.1. How many total cars passed through the crossing between 6 am and noon?

Ans. 4450 cars

Section 4.4

Page No. 93

Q. On which item does Imran's family spend the most and the second most?

Ans. Imran's family spends the most on food and the second most on house rent.

Q.2. Is the cost of electricity about one-half the cost of education?

Ans. Yes,

Q.3. Is the cost of education less than one-fourth the cost of food?

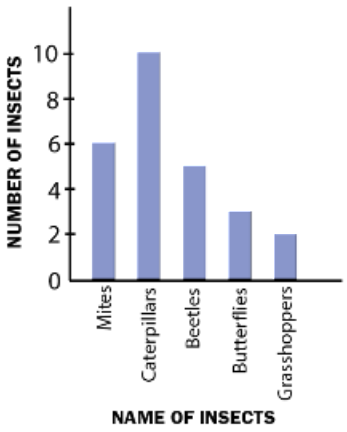
Ans. Yes. Cost of education = Rs. 800 and cost of food = Rs 3400 =4 x Rs 850

So, cost of education = less than one-fourth of cost of food.

Figure it Out

Q.1. Samantha visited a tea garden and collected data of the insects and critters she saw there. Here is the data she collected —
Help her prepare a bar graph representing this data.

Ans.



Q.2. Pooja collected data on the number of tickets sold at the Bhopal railway station for a few different cities of Madhya Pradesh over a 2-hour period.

She used this data and prepared a bar graph on the board to discuss the data with her students, but someone erased a portion of the graph.

a. Write the number of tickets sold for Vidisha above the bar.

b. Write the number of tickets sold for Jabalpur above the bar.

c. The bar for Vidisha is 6 unit lengths and the bar for Jabalpur is 5 unit lengths. What is the scale for this graph?

d. Draw the correct bar for Sagar.

e. Add the scale of the bar graph placing the correct numbers on the vertical axis.

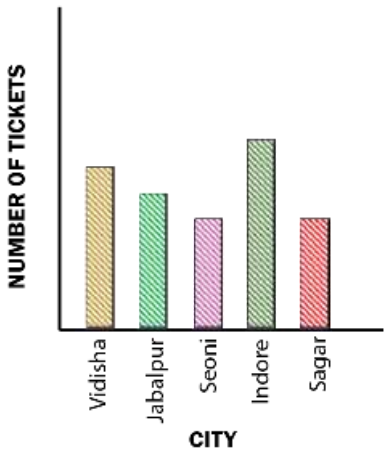
f. Are the bars for Seoni and Indore correct in this graph? If not, draw the correct bar(s).

Ans. a. 24

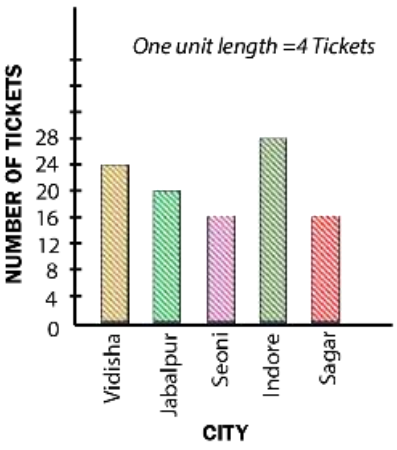
b. 20

c. 1unit length = 4 tickets

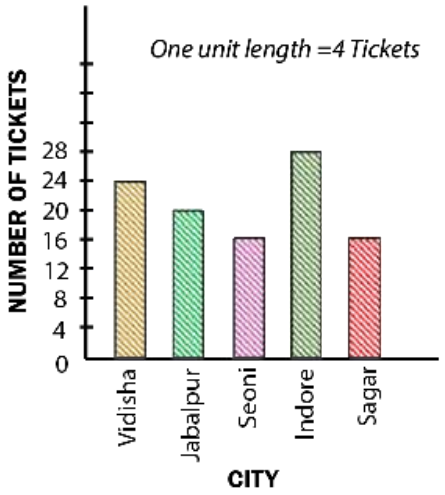
d.



e.



f. The bar for Seoni is correct but for Indore is incorrect.



Q.3. Chinu listed the various means of transport that passed across the road in front of his house from 9 am to 10 am:

a. Prepare a frequency distribution table for the data.

b. Which means of transport was used the most?

c. If you were there to collect this data, how could you do it? Write the steps or process.

Ans. a.

Means of Transport	Number
Bike	13
Car	6
Bicycle	8
Auto Rickshaw	8
Scooter	9
Bus	4
Bullock Cart	2

b. Bike

c. To collect the data of various means of transport, one of the ways could be –

(i) Prepare a table with 2 columns. First for means of transport and second for its frequency.

(ii) List the various means of transport as they pass across the road.

(iii) Frequency should be presented using tally marks.

Q.5. Faiz prepared a frequency distribution table of data on the number of wickets taken by Jaspreet Bumrah in his last 30 matches:

a. What information is this table giving?

b. What may be the title of this table?

c. What caught your attention in this table?

d. In how many matches has Bumrah taken 4 wickets?

e. Mayank says "If we want to know the total number of wickets he has taken in his last 30 matches, we have to add the numbers 0, 1, 2, 3 …, up to 7." Can Mayank get the total number of wickets taken in this way? Why?

f. How would you correctly figure out the total number of wickets taken by Bumrah in his last 30 matches, using this table?

Ans. a. This table is giving the information about different number of wickets taken by Jaspreet Bumrah in different number of matches.

b. The title of this table may be: Wickets Taken by Jaspreet Bumrah in Last 30 Matches.(think of more!)

c. In this table, attention seeking point is that in 1 match 7 wickets were taken by Jaspreet Bumrah only.(think of more!)

d. In 3 matches Bumrah has taken 4 wickets.

e. No, Mayank can't get the total number of wickets taken in this way. For example, 3 wickets per match were taken in 8 matches, which means total 24 wickets were taken.

f. To know the total number of wickets, prepare a next column of total wickets .It will have products of corresponding numbers of the two given columns. Then the sum of the numbers in the 3rd column, will be the total number of wickets. Total number of wickets =90

Q.6. The following pictograph shows the number of tractors in five different villages. Observe the pictograph and answer the following questions—

a. Which village has the smallest number of tractors?

b. Which village has the most tractors?

c. How many more tractors does Village C have than Village B?

d. Komal says, "Village D has half the number of tractors as Village E." Is she right?

Ans. a. Village D.

b. Village C.

c. 3.

d. Yes

Q.7. The number of girl students in each class of a school is depicted by a pictograph:

Observe this pictograph and answer the following questions:

a. Which class has the least number of girl students?

b. What is the difference between the number of girls in Classs 5 and 6?

c. If 2 more girls were admitted in Class 2, how would the graph change?

d. How many girls are there in Class 7?

Ans. a. Class 8.

b. 6.

c. If 2 more girls were admitted in class 2, the last half symbol will be converted into full symbol.

d. 12.

Q.8. Mudhol Hounds (a type of breed of Indian dogs) are largely found in North Karnataka's Bagalkote and Vijaypura districts. The government took an initiative to protect this breed by providing support to those who adopted these dogs. Due to this initiative, the number of these dogs increased. The number of Mudhol dogs in six villages of Karnataka are as follows —

Village A : 18, Village B : 36, Village C : 12, Village D : 48, Village E : 18, Village F : 24

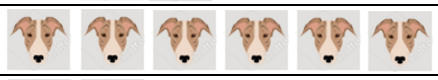
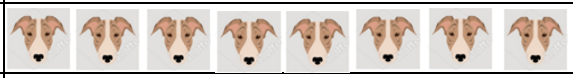
Prepare a pictograph and answer the following questions:

a. What will be a useful scale or key to draw this pictograph?

b. How many symbols will you use to represent the dogs in Village B?

c. Kamini said that the number of dogs in Village B and Village D together will be more than the number of dogs in the other 4 villages. Is she right? Give reasons for your response.

Ans.

Village	Number of Mudhol Hounds ( = 6 dogs)
Village A	
Village B	
Village C	
Village D	
Village E	
Village F	

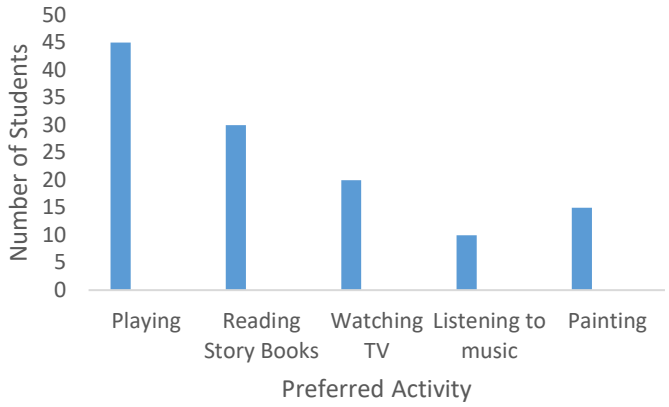
a. Scale is  = 6 dogs, as numbers of dogs are multiples of 6.

b. 6 symbols.

c. Yes, Kamini is right as the number of dogs in village B and village D together is 84 which is more than the number of dogs in the other 4 villages (72).

Q.9 A survey of 120 school students was conducted to find out which activity they preferred to do in their free time.
Draw a bar graph to illustrate the above data taking the scale of 1 unit length = 5 students. Which activity is preferred by most students other than playing?

Ans.



Other than playing, reading story books is preferred by most students.

Q.10 Students and teachers of a primary school decided to plant tree saplings in the school campus and in the surrounding village during the first week of July. Details of the saplings they planted are as follows —

a. The total number of saplings planted on Wednesday and Thursday is _____.

b. The total number of saplings planted during the whole week is _____.

c. The greatest number of saplings were planted on _____, and the least number of saplings were planted on _____. Why do you think that is the case? Why were more saplings planted on certain days of the week and less on others? Can you think of possible explanations or reasons? How could you try and figure out whether your explanations are correct?

Ans. a. 70
b. 310
c. Saturday, Wednesday
The variation in the number of saplings planted on different days may be because of rainy season or different number of students present on different days. (Discuss for other reasons.)

Q.11. The number of tigers in India went down drastically between 1900 and 1970. Project Tiger was launched in 1973 to track and protect tigers in India. Starting in 2006, the exact number of tigers in India was tracked. Shagufta and Divya looked up information about the number of tigers in India between 2006 and 2022 in 4-year intervals. They prepared a frequency table for this data and a bar graph to present this data, but there are a few mistakes in the graph. Can you find those mistakes and fix them?

Ans. There are mistakes in the bars of 2006, 2010, 2014, 2018.

Section 4.5
Page no. 103
Figure it out

Q.1. If you wanted to visually represent the data of the heights of the tallest persons in each class in your school, would you use a graph with vertical bars or horizontal bars? Why?

Ans. To present the data of the heights of the tallest persons in each class in a school, vertical bar graph is useful as heights of persons can be compared by heights of bars easily. (Although both bar graphs can be used.) (Think of more reasons!)

Q.2. If you were making a table of the longest rivers on each continent and their lengths, would you prefer to use a bar graph with vertical bars or with horizontal bars? Why? Try finding out this information, and then make the corresponding table and bar graph! Which continents have the longest rivers?

Ans. In this case, bar graph with horizontal bars is useful as length of a river is a horizontal feature, so lengths of rivers can be compared with lengths of horizontal bars easily. (Although both bar graphs can be used.) (can you think of any other reasons?)