PRACTICALS

CONTENTS

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Practical No. 1 - Data Collection : Surveying Through App

Introduction :

The study of geographic phenomena often requires the application of statistical methods to produce new insights into the study. If geographical studies make use of statistical analysis to arrive at their conclusions, then study of geographic problems becomes easier. In Geography, data of various types is used such as data related to climate, relief, population, land use, migration, distance between cities, length of roads, health, etc. Geographers often work on many issues related to these aspects. They need to collect information regarding the same. Data collection can be done by selecting some people from the whole population. Few selected ones represent the sample.

Use your brain power!

You're interested in knowing what percent of all households in a large city, have women working as teachers or professors. To estimate this percentage, you conduct a survey with 200 households and determine how many of these 200 are teachers or professors. In this example, what is the population? In this example, what is the sample?

Collecting information and analysing the data and drawing conclusions from it is a systematic process. It has the following steps :

DATA COLLECTION :

Collecting data regarding the identified geographical problem is known as surveying. For example, if you are studying the migration patterns in various talukas of your district, you need to collect data about the migrants. For that, you need to go and survey them through questionnaires. Surveys are one of the most common means of data collection. Data collection process involves planning a survey, selecting a representative sample of individuals to survey and carrying out the survey properly.

Aim : To design a questionnaire for a survey and conduct the survey

Objectives :

1) To decide the aim and scope of a survey
2) To understand the characteristics of a well-designed questionnaire
3) To design a good questionnaire for the survey

Surveys are one of the key ways to gather quantitative data for analysis. Surveys rely on asking the same question in the same way to a large number of people and obtaining a lot of responses. These responses are then analysed using statistical techniques to obtain information that can be generalised about the whole population. To obtain this information, a good questionnaire is very necessary. The design of a questionnaire will depend on whether the researcher wishes to collect qualitative information for the purpose of better understanding or quantitative information for data representation. **Following are the steps to make a good questionnaire :**

STEP 1 : Decide the information required. Each question or item should express only one idea. Make your questions to make sure that they only cover one idea. If necessary, split one question into two. Avoid difficult words and abbreviations. Use simple language and expressions.

STEP 2 : Define the target respondents.

STEP 3 : Choose the mode of reaching your target respondents.

STEP 4 : Decide on question content.

STEP 5 : Develop the question wording.

STEP 6 : Put questions into a meaningful order and format.

STEP 7 : Check the length of the questionnaire.

STEP 8 : Pre-test the questionnaire.

STEP 9 : Develop the final survey form.

Sample Questionnaire

1) Name of the Head of the Family _____

2) Gender of the Head of the family: Male ☐ Female ☐ Other ☐

3) Age of the Head of the family :

   a) 0-14 years ☐

   b) 14-39 years ☐

   c) 39-60 years ☐

   d) More than 60 years ☐

4) Educational level of the head of the family

   a) Illiterate ☐ b) Primary ☐ c) High School ☐

   d) Higher Secondary ☐ e) Graduate ☐ f) Post Graduate ☐

   g) Higher than PG (PhD, etc.) ☐

5) Occupation of the head of the family _____

6) Annual Income of the family : (in ₹)

   a) 0-50,000

   b) 50,001-2,00,000

   c) 2,00,001-5,00,000

   d) 5,00,001-10,00,000

   e) More than 10,00,000

7) Information about the family

   a) Number of family members – ☐

   b) Fill the table :

Sr. No.	Name of the family member	Relation with the head of the family	Age	Gender	Education level	Occupation

8) Type of House

a) Clay Tiles/ Hut type ☐ b) Bungalow ☐

c) Apartment /Flat ☐ d) Other ☐

9) What all do you own in the house : (tick all that are applicable) (enter the number also)

a) Cycle ☐ b) Two wheeler ☐

c) Four wheeler ☐ d) Auto rickshaw ☐

e) Refrigerator ☐ f) TV ☐

g) Radio ☐ h) A.C ☐

i) Microwave /Oven ☐ j) Water filter ☐

k) Washing Machine ☐ l) Mixer/Grinder/Food processor ☐

m) High Speed internet ☐ n) Home theatre /DVD player/Music System ☐

o) Agricultural Land ☐ p) Landline phone ☐

q) Mobile phone ☐

10) What is your means of transport commonly?

a) Two wheeler ☐ b) Four wheeler ☐

c) Auto ☐ d) Cycle ☐

e) Walk ☐ f) Public transport ☐

g) Animals ☐ h) Ola/uber/taxi/privately hired vehicle ☐

Note : Students may add more questions.

Carrying out Socio-economic surveys with the help of an App :

Aim : With help of mobile app, survey the household/families and analyse the data and draw conclusions.

Objectives :

1) To survey 15 household families and collect information with the help of mobile app.
2) To analyse collected data with the help of graphs and diagrams and to draw conclusions.

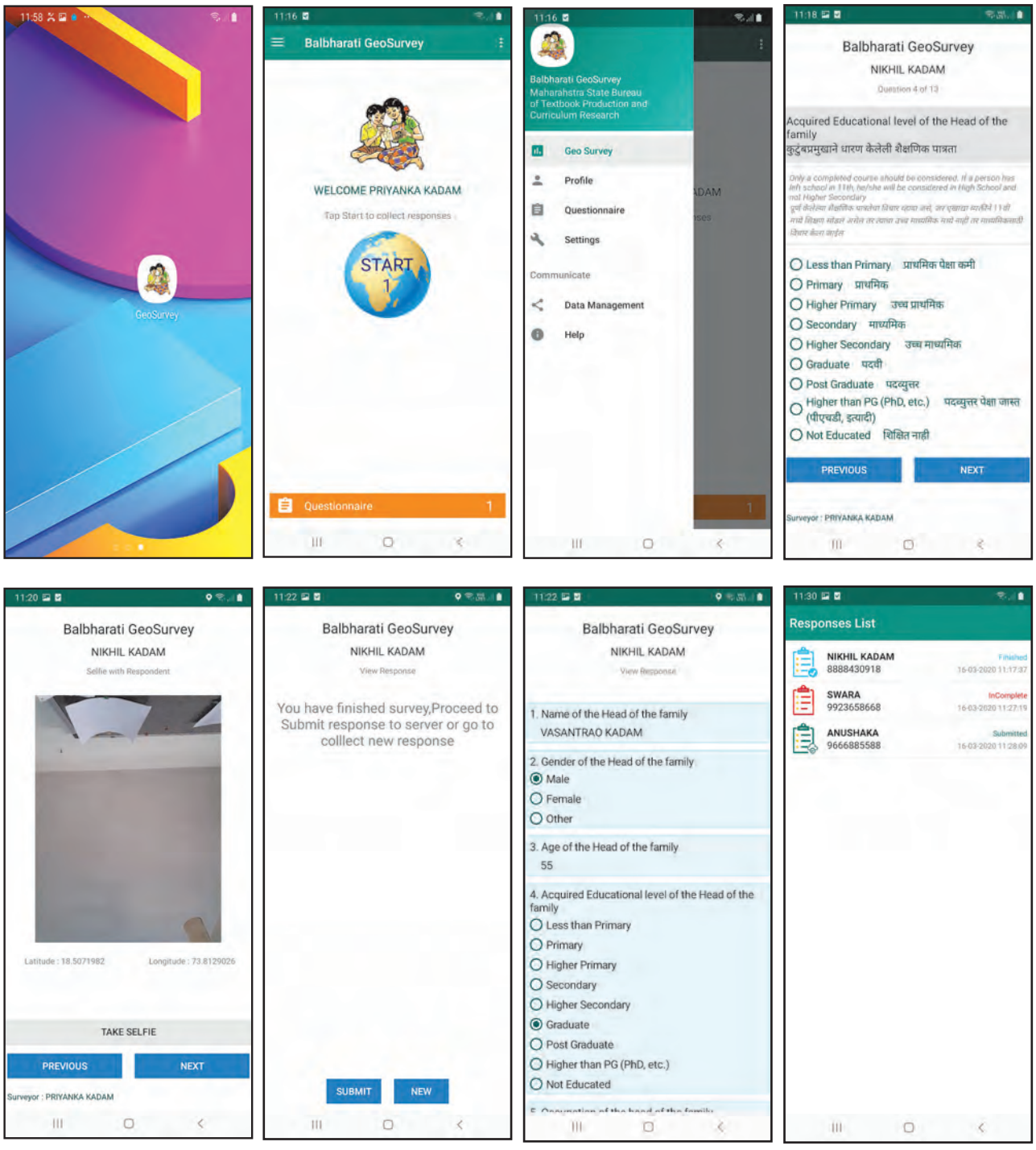
This practical consists of 3 stages :

STEP 1 : The students should first download the app and register themselves. They can start surveying as per the screen shots given on page 89. (only few have been given for reference).

STEP 2 : You have to survey minimum 15 households/ families. They should be residing in the same city/ village but their houses should be at least 20 m away from each other. In urban areas, do not take households in the same building. Take only one household in one building. You have to collect all their information through questions in the app. You can also add some more questions. After data of all the 15 families have been collected, download the file from the app.

STEP 3 : You have to analyse the data after you download the file. For analysis, you have to use the diagrams you have learnt till now in earlier classes and also to be taught in the practicals in this class. Population pyramid, types of graphs, etc., have to be used and submitted to your teachers before Diwali vacation. This analysis has to be in hard copy (on paper).

Please refer to the screenshots of the App (P.Fig 1.1) for your easy reference as given hereafter :



P. Fig. 1.1

After you complete these three stages, your work will be considered as complete.

Sample analysis :

STEP 1 : Get registered after downloading the App from Google Playstore. You will have to enter all details in the App. Do not change your number which is used for registration, until your practical is submitted to the teacher. You will get access to your surveys only after you enter Teacher's code. Verify your school/college, and start the surveys. Please keep your GPS location 'on' to get the geo-points of your households.

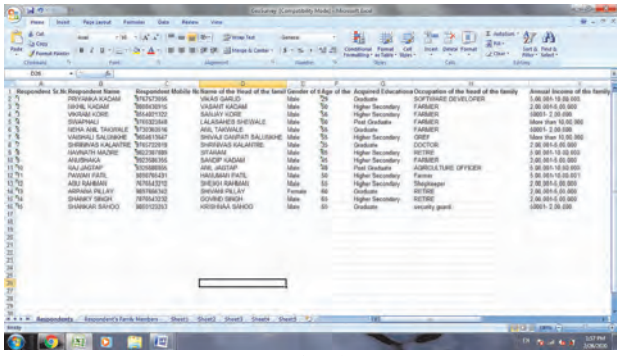
STEP 2 : You can choose one language out of English and Marathi for your convenience though the questions are bilingual. Hints are also given so that you can understand the question better before asking. When you click submit, you cannot edit it. You can save and move ahead with all your surveys. You can submit at the end when you finish all your surveys. Before that

make sure you take a selfie with the respondent.

STEP 3 : After you complete 15 surveys and submit them, you can download the data in two formats:

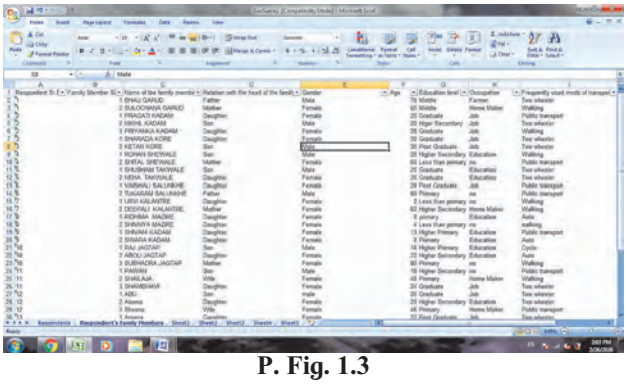
Excel (xml) and 'kml ' formats. Excel format will be used for data analysis for the collected data . The 'kml' file which you download will help you to make a map of the households you surveyed.

STEP 4 : Open the downloaded xml file in Microsoft Excel. You will see the collected data in a table format. It will look as shown in P. Fig.1.2. There will be two sheets in Excel. One sheet will have details of 15 families and data related to the questions asked to the Respondent. The other sheet will contain data of family members as shown in P. Fig.1.3



P. Fig. 1.2

You can take printouts of both the tables so that handling the data will be easier for you.



P. Fig. 1.3

The data of family members will be connected with the respondent's number on the first sheet and second sheet. This will help you to identify the respective family's data.

Now you will have to carefully analyse and represent it using suitable graphs. Look at the data carefully. Now you will have to organize the data into various categories according to different questions asked.

Following are some of the basic suggestive points for the analysis. You can also add more points according to the questions you have added.

1) **Start with the basic calculations :** Calculate the total number of males and females in your sample. Also, calculate the total number of people you have surveyed in the 15 families. Make a table like this.

No. of males	No. of females	Others	Total
26	27	0	53

You can also calculate the sex ratio for your sample.

Sex ratio for the sample = No of females / No of males × 1000 = 27 /26 × 1000 = 1038

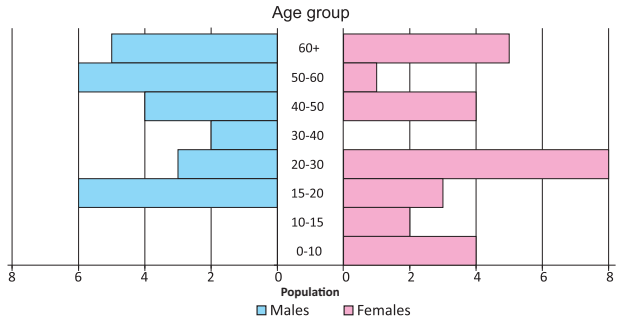
Conclusion : Thus, 1038 is the sex ratio for this given sample. This suggests that sex ratio is good. (You will calculate the same for your own collected data.)

2) **Age and Sex of the samples :** You have the data of 15 families. You know the ages and gender of all the family members. Make the age groups according to their ages and show them in a population pyramid. Sample analysis is as follows:

Table : Table showing distribution of age and sex in the sample

Age groups (in years)	Females	Males	Total
0-10	4	0	4
10-15	2	0	2
15-20	3	6	9
20-30	8	3	11
30-40	0	2	2
40-50	4	4	8
50-60	1	6	7
60+	5	5	10

This is how we will make age-sex table and then make the pyramid accordingly as shown in the P. Figure 1.4.



P. Fig. 1.4

Conclusions : After drawing the pyramid you can analyse what the pyramid shows about your collected data. Comment upon the age-structure of the collected data as you have learnt in Chapter 2. Here, for this data, we can see that the working population is more than the dependent population. Hence, dependency ratio is less. But, we can see that there are a lot of old people in this sample. This will mean that the medical costs will be high in these families.

(You can write your conclusions accordingly for your dataset.)

3) **Educational level of family members :** From the excel sheet or the print out, you can organise the data according to their acquired education level. You can make a table first and then show the data with the help of a suitable diagram as follows:

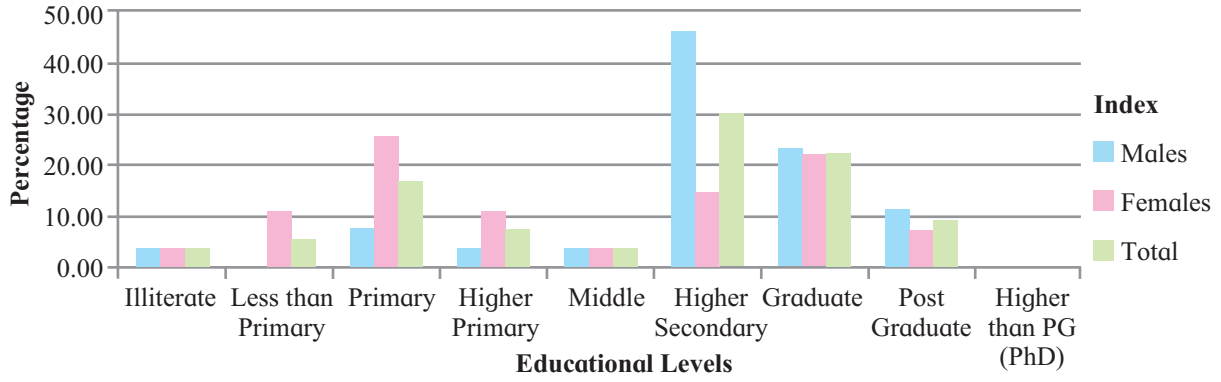
Acquired Educational Level	No of Males	No of Females	Total
Illiterate	1	1	2
Less than Primary	0	3	3
Primary	2	7	9
Higher Primary	1	3	4
Secondary	1	1	2
Higher Secondary	12	4	16
Graduate	6	6	12
Post Graduate	3	2	5
Higher than PG (PhD, etc.)	0	0	0
Total	26	27	53

You can show this through a graph but calculating percentages will give a better idea than just showing actual numbers.

Calculate the percentage of acquired educational level for males and females. as given in the following table.

Acquired Educational Level	Males	Percentage of educated males in that level out of total males	Females	Percentage of educated females in that level out of total females	Total	Percentage of educated persons in that level out of total persons
Illiterate	1	1/26×100= 3.85	1	1/ 27 × 100 = 3.71	2	2/53×100= 3.78
Less than Primary	0	0	3	3/ 27× 100= 11.11	3	3/53×100= 5.67
Primary	2	2/ 26 ×100= 7.70	7	7 / 27×100= 25.93	9	9/53×100= 16.98
Higher Primary	1	1/26×100= 3.85	3	3/ 27× 100= 11.11	4	4/53×100= 7.54717
Secondary	1	1/26×100= 3.85	1	1/ 27× 100 = 3.71	2	2/53×100= 3.78
Higher Secondary	12	12/26×100= 46.16	4	4/ 27 ×100= 14.82	16	16/ 53×100= 30.19
Graduate	6	6 / 26 × 100 = 23.08	6	6 / 27 ×100= 22.22	12	12/53×100= 22.65
Post Graduate	3	3/26× 100 = 11.54	2	2/27× 100= 7.41	5	5/53×100= 9.44
Higher than PG (PhD, etc.)	0	0	0	0	0	0
Total	26	100	27	100	53	100

Now you can show with a compound bar graph or any other suitable diagram :



P. Fig. 1.5

Conclusions : Here, we can see that only 3.9% of the population is illiterate. Illiteracy is more in males than in females. After Higher Secondary level, the Primary level has been acquired by around 16% of the population. Here too, more females have completed their primary education than males. Most of the males have completed education upto Higher Secondary level. There was no one in the sample who has completed education beyond Post Graduation.

(Similarly, analyse and draw conclusions for your collected data.)

4) **Occupation followed by the Head of the Family :** You have collected data about what occupation is the Head of the family engaged in. Classify these occupations into primary, secondary and tertiary as you have learnt in the textbook. If there are retired persons or home-makers who are heads of the families, then take them as non –working . Following analysis has been done for the collected sample.

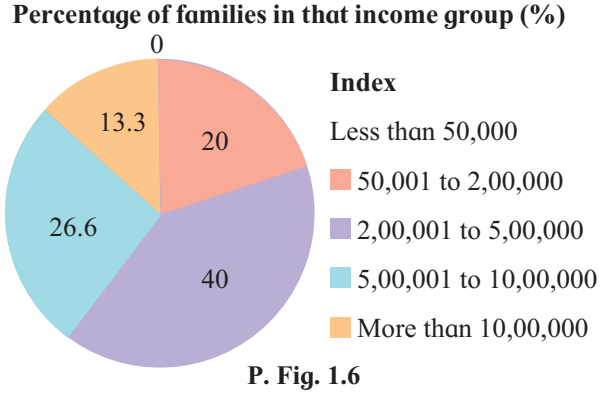
Acivities	Number of head of the families	Percentage
People engaged in Primary Activities	6	40
People engaged in Secondary Activities	2	13.33
People Engaged in Tertiary Activities	6	40
Not working	1	6.67
Total	15	100

Conclusions : This shows that 40% of the heads of the families are engaged in Primary and Tertiary activities while only 13.3% of the families are engaged in secondary activities. Around 6% of the heads were not working anywhere. This means that 93.3% of the head of the family are under working population.

5) **Income of the families :** You have collected the data about annual incomes of the families. Organise the data as shown in the table :

Income groups	No of families	Percentage of families in that income group (%)
Less than ₹ 50000	0	0
₹ 50001- 200000	3	3/ 15×100 = 20
₹ 2,00,001- 500000	6	6/15 ×100 = 40
₹ 500001- 10,00,000	4	4/15× 100= 26.6
More than ₹ 10,00,000	2	2/15× 100= 13.3
Total	15	100

You can show this with the help of a suitable diagram, say, a pie chart, as follows (P.Fig.1.6) :



P. Fig. 1.6

Conclusions : The pie chart shows that there is no family in the age group of less than ₹ 50000. Around 40% of the families fall into the income group of ₹ 2 lakh to ₹ 5 lakhs. Around 26.6% of the surveyed families fall into the category of ₹ 5 lakh to 10 lakhs. Around 13.3% of the families fall into the category of more than ₹10,00,000.

Similarly, you can organize data for the following :

5) Percentage of people living in own house or rented house
6) Percentage of people using various means of transport
7) Percentage of people having various items in their households
8) Percentage of people having access to toilet within their households

These are just hints and you can analyse the data using various indicators based on the data that you have collected.

You can also calculate mean of your data- For e.g mean income, mean age, mean education, etc. You can also calculate Standard Deviation using mean. You can also calculate correlation using Rank Correlation for the transport data. You can find out if there is any correlation between distance travelled and cost incurred for distance travelled.

Rank Correlation has been derived for the sample data.

Distance travelled daily for work (X) Kms	**Cost of travelling (Y) ₹**	**R_1**	**R_2**	**R_1-R_2**	**$(R_1- R_2)^2$**
40	250	1	2	-1	1
10	35	14	11	3	9
15	15	10	14	-4	16
25	65	5	9	-4	16
20	150	7	6	-1	1
24	180	6	5	1	1
12	60	12	10	2	4
11	25	13	13	0	0
2	0	15	15	0	0
18	30	8	12	-4	16
28	220	3	3	0	0
14	100	11	7	4	16
16	75	9	8	1	1
30	280	2	1	1	1
26	200	4	4	0	0
					$\Sigma = 82$

Thus, $R= 1- \{6 (\Sigma (R_1- R_2)^2 /n (n^2- 1)\}$

$= 1- \{6\times82) / 15 (15^2 -1)\}$

$= 1- \{492/ 15(225-1)\}$

$= 1- \{492/ 15\times224\}$

$= 1- \{492/3360\}$

$= 1- \{0.15\}= 0.85$

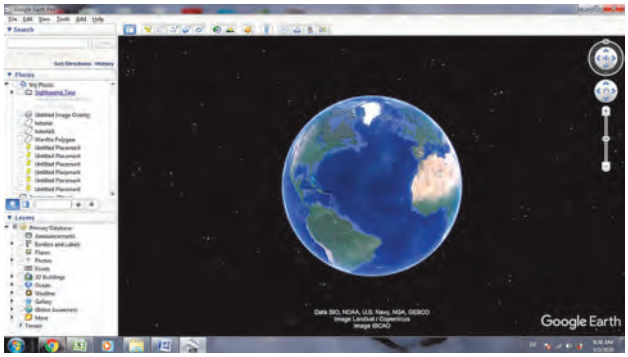
Conclusions : This implies that there is a high positive correlation between distance travelled daily and cost incurred for travelling. It means if distance increases, cost of travelling also increases.

STEP 5 : Now after you finish the analysis See the location where your 'kml' file has been downloaded. From there, copy the file on to a computer. It is easier to use this format on a computer than a mobile phone.

STEP 6 : There are two ways to make a map with the help of computer.

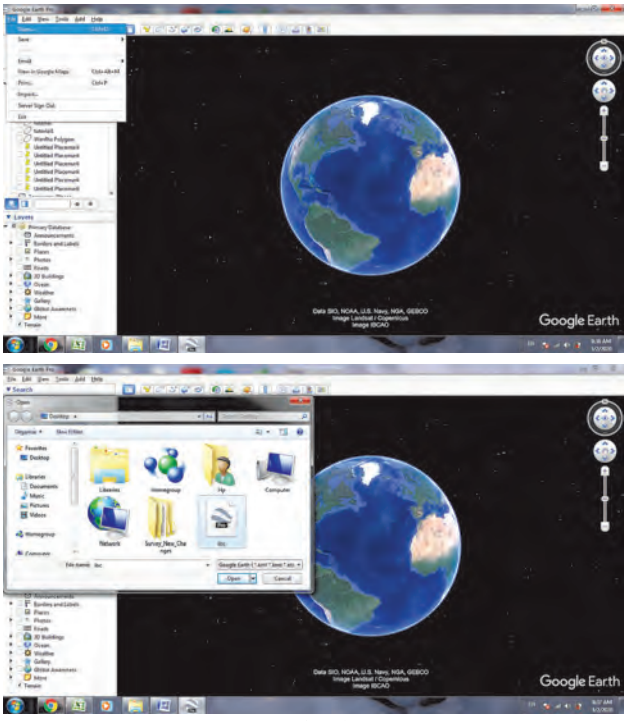
a) Using Google Earth:

STEP 6.a1 : Go to Google and put Google Earth in Search. Download Google Earth onto your computer. After you download it, open it. You will get the following screen:



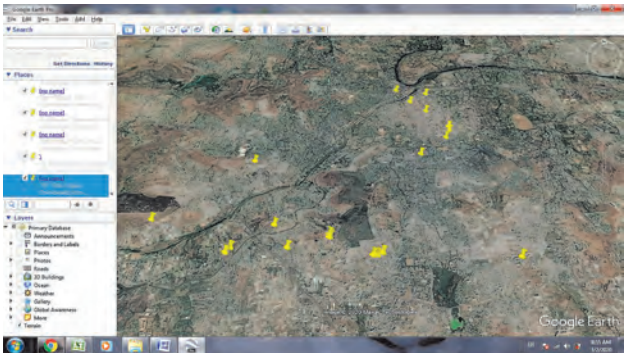
P. Fig. 1.7

STEP 6.a2 : Now go to File Tab and click open. Open the 'kml' file location and this will add your file to Google Earth.



P. Fig. 1.8

STEP 6.a3 : As you select the file and open it, you will see all the houses you surveyed with pinpointed locations.



P. Fig. 1.9

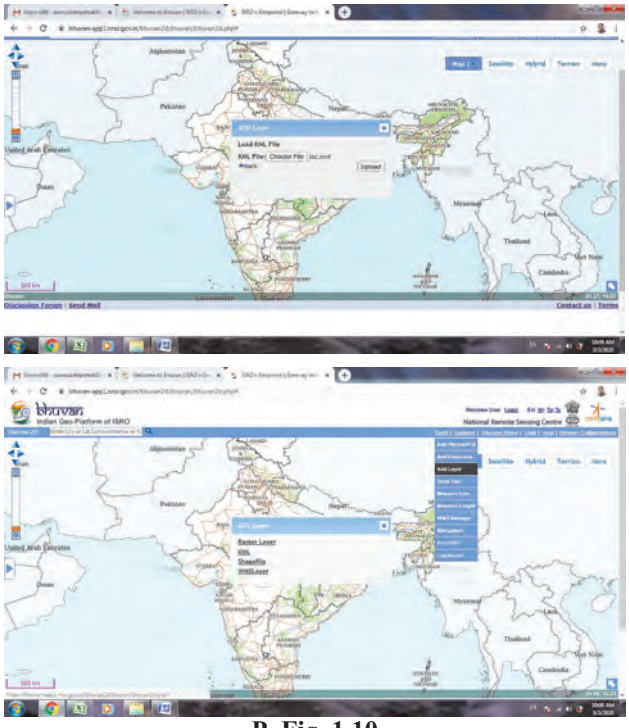
STEP 6.a4 : Take a screenshot (using prt sc on your keyboard) and paste it in a word file or make a jpeg image. Make sure your area is clearly visible when you take a screenshot. Take a print of this screenshot. Use Powerpoint, Photoshop, Paintbrush to make JPEG or you can click a photo of the screen with your mobile. Take a print of the JPEG or Tiff image and submit it with your submission of the analysis.

b) Using Bhuvan Website :

STEP 6.b1 : Go to Bhuvan portal : https://bhuvan.nrsc.gov.in/bhuvan_links.php

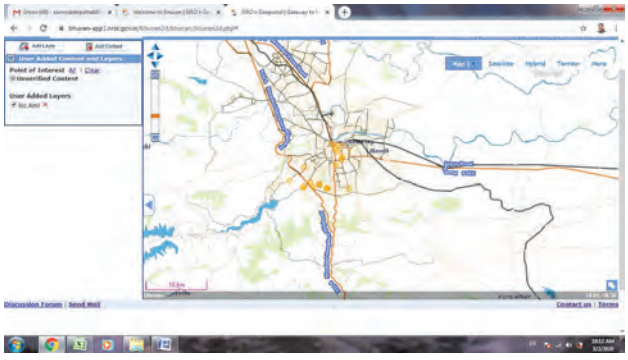
STEP 6.b2 : Click on Bhuvan 3D or Bhuvan 2D

STEP 6.b3 : On the left side of the page, you can see the icon "Tool". Click on the icon Tool and then choose "Add Layer" and then add the file from the saved location. Then click Upload.



P. Fig. 1.10

STEP 6.b4 : When you click upload, wait for some time and then you will see you points on that map. Zoom in more if needed.



P. Fig. 1.11

STEP 6.b5 : Take a screenshot using prt sc on your keybaord. Save the file and take a print of the screenshot. Then submit this hard copy of your map with your main submission.

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Practical No. 2 - Data Organisation

DATA ORGANISATION :

After you collect and review data, you should check whether it really makes sense. You need to check how much of the collected data is really useful. This step is known as data organisation. The way to do that is two-fold : (1) Organize the data in a visual manner, so that you can see it clearly and (2) think, how by using some statistical techniques, you can draw conclusions. To do this, you can organise the collected data into tables according to various variables or items as per your needs. For example, if you have collected data about age of few 100 people, then you can classify the ages into various age-groups like 0-15, 16-30, 31-45, 46-60 and 60+ or if you have collected data about their incomes , then you can count how many people have their incomes in that class or range. This can be done manually or one can also use softwares like Excel or SPSS for doing so and draw the conclusion.

Types of data for data organisation :

After collecting data, it needs to be organized. Hence, data organisation can be done as per requirment from your collected sample. Thus, the need to separate grouped data from ungrouped data. Both are useful forms of data but the difference between them is that ungrouped data is raw data. This means that it has just been collected but not sorted into any group or classes. On the other hand, grouped data is data that has been organized into groups from the raw data.

If there are some values in the data which are recurring and the amount of collected data is large, then data can be grouped into classes with ranges. If the data is small, then it can be kept ungrouped. For example, if we survey 100 people and ask them their monthly incomes, it will be difficult to keep a track of all 100. You will instead divide the incomes into various class intervals and see how many people have the income in a particular range. This is how your grouped data will look :

Income Categories	No of people who have incomes in these categories
0-10000	20
10000-20000	25
20000-30000	28
30001-40000	20
40000 and more	7
Total	100

Thus, this will be grouped data. On the other hand , the following example shows ungrouped data where only 10 people have been surveyed and incomes have not been classified.

Person	Income (in ₹)
A	2500
B	3000
C	4000
D	12000
E	8000
F	7400
G	6500
H	8780
I	9000
J	4500

When we analyse data given in grouped or ungrouped data, calculation of mean, standard deviation or any other statistical measure may differ by few steps.

Practice more : Your mother has given you the following list of items to be brought from the market. Organise the given data :

Dataset - 1	
Items	**Quantity**
Kolam Rice	1 kg
Split Black gram	1/2 kg
Beans	1/4 kg
Coriander Seeds	100 gms
Chillies	200 gms
Soap Nut	100 gms
Coconut Oil	1/2 liters
Soaps	5

Dataset - 2	
Items	**Quantity**
Basmati Rice	1 kg
Kolam Rice	5 kg
Indrayani Rice	10 kg
Lokvan Wheat	10 kg
Sihor Wheat	10 kg
Pearl Millet	5 kg
Sorghum	5 kg
Pigeon Pea	2 kg
Bengal Gram	2 kg
Split Black Gram	1 kg
Red Lentils Dal	1 kg
Soap	10
Washing Powder	1/2 kg
Liquid Soap	1 kg
Coriander Seeds	100 gms
Pepper	100 gms
Clove	100 gms
Coconut Oil	1/4 liters
Groundnut Oil	2 liters
Soybean Oil	2 liters
Sesame Oil	1 liters
Beans	1/4 kg
Black-eyed Peas	1/4 kg
Red Lentils Pulse	1/4 kg
White Gram	1/4 kg
Green Pea	1/4 kg
Black Peas	1/4 kg

Q. 2. Given the following set of data, we want to organize the data into groups. We have decided that we want to have an interval of 5.

26 18 21 34 18 38 22 27 22 30 25 25 38 29 20 24 28 32 33 18

Q. 3. Given data is about Time taken (in seconds) by a group of students to answer a simple geography question. Group the data in an interval of 10.

20 25 24 33 13 26 8 19 31 11 16 21 17 11 34 14 15 21 18 17

Q. 4. Read the given paragraph and complete the table. Following data is given about the size of holdings in a village. (in hectares). There are 2000 households in the village who own these holdings. Half of the households own the holdings between 1 to 3 hectares. Out of the remaining, 200 households hold land in the category of 3 to 5 hectares. Out of the remaining, 50% of the households own in the category 5 -10 hectares and 50 % hold 10 -20 hectares. No one holds land in the category of 20 and above.

Holdings (in hectores)	No of households holding the land
1-3	
3-5	
5-10	
10-20	
20 and above	
Total	2000

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Practical No. 3 - Data Analysis : Measures of Dispersion

DATA ANALYSIS :

After you organise, you have to analyse the data. For that you can use various variables in the data and see how you can explore relationships between them. You can do that by looking at and comparing percentages, calculating mean or by using correlation and use them to make predictions (one variable predicting the other) by using regression. Studying relationships helps you get at the essence of how statistics is applied in Geography. For example, you can say, out of the data collected, 60% of the people were in the age-group of 20-40 years or 20% had income of more than Rs.10,000 per month. You can also say that there is a high correlation between income and ownership of the house and so on. All these analysis depends on the data you have collected and the parameters you select for the analysis.

Introduction :

In class X, you have already studied about the measures of central tendency, i.e. averages such as the mean, median and mode. These are all 'central' or 'middle' values. Mean is the average of all values while median is the midpoint of an arrangement of all values in increasing or decreasing manner. Mode is the maximum times a value is recurring (frequency) in the data.

Thus, we see that the data may consist of extreme values on both sides, but these central values or averages often misinterpret the data. These values are insufficient to examine the nature of the data. There must be some value which will associate the variation in each value with the central value. This phenomenon of varying from central value is known as dispersion. The various values which tell us dispersion, are called measures of dispersion.

We will study two measures of dispersion : range and standard deviation.

Range :

It is the simplest measure of variation. It is simply the difference of maximum and minimum values of the given data. You have already studied range of temperature in class XI, where you subtracted the lowest value from highest value for calculating the diurnal or annual range of temperature. It is the difference of two extreme values, hence, it does not take into consideration the mid-values. Other examples of calculating the range would be difference in relief features, fluctuation in water table of a city or a village, etc.

Solved example :

Calculate the range of the population densities of the given data. Also calculate the mean of the data.

Solution :

Range = Maximum value – Minimum value

States	Population Density (2011)
Uttar Pradesh	829
Madhya Pradesh	308
Himachal Pradesh	123
Jharkhand	414
Tamil Nadu	555
Gujarat	308
Punjab	551
Uttarakhand	189
Arunachal Pradesh	17

Maximum value = 829

Minimum value = 17

Range = Maximum value – Minimum value = 829 – 17 = 812

(Mean = 366)

Calculate the range of literacy rates of various countries :

Country	Literacy Rate (%) (2018)
Argentina	98.1
Bangladesh	73.9
Bhutan	64.9
Brazil	91.7
China	96.4
India	74.4
Kenya	78
Malaysia	94.6
Zimbabwe	86.5

Highest value = 98.1%

Lowest value = 64.9%

Range = 98.1 – 64.9 = 33.2

Discuss the merits and demerits of using range.

2) Standard Deviation : The main idea behind the measures of dispersion is to get to know, how the data values are spread. It shows how much the data vary from its average value. There are various such measures used and we will learn now about standard deviation (S. D.).

S. D. is the average distance between each value and the mean value. This value tells you, if the data is clustered around the mean or scattered. It can also, therefore, assess the mean and tell if it really represents the data well. Sometimes, we have different sets of data, whose means are of the same value, though data values are very different. In such a case, standard deviation gives us the real picture.

The significance of the S. D. is assessed by comparing it to the mean :

Low S. D. value : Values are tightly clustered and the mean is a reliable representation of the entire sample.

High S. D. value : Values are scattered apart and mean is not a reliable representation of the entire sample.

Solved example :

Calculate the standard deviation for the given data.

Cities	Distance of rural-urban fringe from city center (in kms.)
A	4
B	9
C	11
D	12
E	15
F	5
G	8
H	12
I	14

First we will calculate the mean (x).

$$x = \frac{\text{Sum of all values } (x_1 + x_2 + x_3 + x_i)}{\text{No. of Values}}$$

$$= \frac{(4 + 9 + 11 + 12 + 15 + 5 + 8 + 12 + 14)}{9}$$

$$= \frac{90}{9} = 10$$

Now subtract the mean from each value ($x_i - x$), then square the result. Follow the table :

Cities	Dist (x_i)	($x_i - x$)	$(x_i - x)^2$
A	4	4 – 10 = – 6	36
B	9	9 – 10 = – 1	1
C	11	11 – 10 = 1	1
D	12	12 – 10 = 2	4
E	15	15 – 10 = 5	25
F	5	5 – 10 = – 5	25
G	8	8 – 10 = – 2	4
H	12	12 – 10 = 2	4
I	14	14 – 10 = 4	16
			$\Sigma = 116$

Now, Calculate the sum of all squares. Divide it by the number of values (x) = 9
Then, find the square root.

Thus, S. D. = $\sqrt{\left(\frac{116}{9}\right)}$

$= \sqrt{12.89}$

$\cong 3.59$

This is more than half away from mean. Thus, it shows high dispersion or scattering of data.

Practice more :

Q. 1. Suppose you have surveyed few youngsters in your village/city. They have all migrated to other places. These are the distances of their migration. Find out the average distance of migration and the standard deviation. Interpret your data.

Youth	Distance migrated (kms.)
A	9
B	2
C	5
D	4
E	12
F	7
G	8
H	11
I	9
J	3
K	7
L	4
M	12

N	5
O	4
P	10
Q	9
R	6
S	9
T	4

Q. 2. Following data shows the percentage of land use under residential category in different cities.

Find the standard derivation.

Cities	A	B	C	D	E	F	G	H	I	J
% of land use under residential category	57	64	63	67	49	59	44	47	61	59

Interpret your data.

Q. 3. Use standard deviation for your data collected through App.

Coefficient of Variance :

To know how much dispersion is there in the data, we use coefficient of variance (C. V.).

$$\text{C. V.} = \frac{\text{S.D.}}{\text{Mean}} \times 100$$

In the solved example, S.D. = 3.59, Mean = 10,

$$\therefore \text{ C. V.} = \frac{3.59}{10} \times 100 = 35.9\%$$

Thus, C. V. expresses the S. D. as a percentage mean and shows dispersion in the data in a better way.

Q. 4.Calculate Standard Deviation for the following data. Interpret your results

Wards in a city	% of people who are graduates
A	3.4
B	2.3
C	5.6
D	7.8
E	10.0
F	12.2
G	8.4
H	5.6

Do you know ?

Finding the square root :

We will learn how to find the square root using log tables. You can easily calculate the square root of certain numbers like 36, 49, etc. which are perfect squares. You may even know their square roots. But when it comes to decimal figures, it becomes difficult estimating or calculating square roots. One way of finding square roots is using log tables which have tables showing square roots ready for using. (see page 111 and 112)

Solved example :

Calculate the square root of 18..

STEP 1 : Take a log table and take out the page which shows square roots. Generally, log tables show square roots from 1 to 100. We have to use them to find out the square roots of any number within or outside this range.

STEP 2 : Now see the table and check the column on the leftmost side which has numbers from 1 to 100. Now we consider 18 to be 18.0 and hence when we check the row which contains 18 and the column showing 0, we get the answer as 4.243.

STEP 3 : Now suppose we have to find the square root of 18.3. Then we will take the row which shows 18 and take the column which shows values under 3. Then the square root of 18.3 will be 4.278. Similarly for 18.8, it will be 4.336.

STEP 4 : Suppose we want to find out the square root of 180. Now, 180 is not given in the table. Then we follow the followings steps.

We write 180 as $180 = 18 * 10$

therefore $\sqrt{180} = \sqrt{18} * \sqrt{10}$

You find the square root of 18 from the table = 4.243

we find the square root of 10 from the table= 3.16

Therefore, square root of 180 = 4.243 * 3.16 = 13.41

Q.5. Find the standard deviation. Interpret your result.

Name the village	Population
A	500
B	200
C	300
D	400
E	250
F	350
G	500

Q. 6. Following data shows dates of the first snowfall in Shimla, for 10 years. The dates are given in year days, i.e., January 1st is day 1, January 2nd is day 2, and so on throughout the year. Calculate the range. Further , calculate the mean and standard deviation. Interpret your data.

Day of First Snow * (Xi)
291
299
279
302
280
303
299
304
307
314

Q. 7. Following data shows the number of days of precipitation in Chennai in the month of December. Find the standard deviation. Interpret your result.

Year	No of rainy days in December
1967	10
1968	12
1969	9
1970	7
1971	10
1972	11
1973	9
1974	10
1975	9
1976	13
1977	8
1978	9
1979	10
1980	8
1981	9

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Practical No. 4 - Data Analysis : Rank Correlation

Introduction :

We discussed till now about a single variable. But sometimes, in Geography, we need to understand the relationship between 2 variables. For example, high temperature and low pressure, population density and availability of water, literacy rate and per capita GDP, etc. We will now see how these relationships between two variables can be explained numerically. We need to understand that with data for 2 variables, change in one set will affect the other. To know this, correlation is useful to us. Correlation refers to the strength and nature of relationship between two variables.

Three types of relationships can be seen :

i) Increase in one variable, leads to increase in the other.

ii) Increase in one variable, leads to decrease in the other.

iii) Change in one variable, does not change the other.

In first case, the direction of the relationship between the first and the second is the same.

Both are positively correlated. In second case, the direction of relation is opposite. Both are negatively correlated. In third case, there is no correlation between the two. For example, Increase in distance from market increases transportation cost, is an example of first case. Higher the temperature, lower is the pressure is example of second case.

Increase in education investment has no relationship with number of clothes each one wears is an example of third kind.

Degree of correlation can go to 1 in mathematical terms. This is perfect positive correlation. The other extreme is -1, perfect negative correlation. Between the two points, lies zero correlation or point of no correlation. At other times, correlation values can be between -1 and 1.

There are various methods by which correlation can be calculated. Now we will discuss the Spearman's Rank correlation method. This is used for variables for whom data is in the form of ranks or preferences.

Method : Calculate the Spearman's Rank correlation with the help of following data :

Wards in a city	A	B	C	D	E	F	G	H	I	J
No. of people BPL	20	80	00	200	120	160	60	180	90	100
No. of people unem-ployed	40	120	60	240	160	180	80	200	90	100

Here we have to see if there is any correlation between the two variables.

STEP 1 : Copy the data in a table and put them in another column with ranks.

Ward	X_i	R_1	Y_i	R_2	$R_1 - R_2$	$(R_1 - R_2)^2$
A	20	9	40	10	-1	1
B	80	7	120	5	2	4
C	00	10	60	9	1	1
D	200	1	240	1	0	0
E	120	4	160	4	0	0
F	160	3	180	3	0	0
G	60	8	80	8	0	0
H	180	2	200	2	0	0
I	90	6	90	7	-1	1
J	100	5	100	6	-1	1
						$\sum = 8$

STEP 2 : Arrange the data according to ranks and put 1, 2, 3, 4 accordingly. Highest value gets Rank 1.

STEP 3 : Find the difference between the two ranks. $(R_1 - R_2)$.

STEP 4 : Square the values. $(R_1 - R_2)^2$.

STEP 5 : Find the sum of all squares.

STEP 6 : Now find the correlation with the following formula :

$$R = 1 - \frac{6\sum(R_1 - R_2)^2}{n(n^2-1)}$$

Where, R = Rank correlation

$\sum(R_1 - R_2)^2$ = Sum of squares of differences between two ranks

n = Number of data values

$$R = 1 - \frac{(6 \times 8)}{10\,(10^2 - 1)}$$

$$= 1 - \frac{48}{10(100 - 1)}$$

$$= 1 - \frac{48}{10 \times 99}$$

$$= 1 - \frac{48}{990}$$

$$= \frac{990 - 48}{990} = \frac{942}{990} = 0.95$$

Thus, there is a positive high correlation between population BPL and unemployment in the 10 Wards of a city. This means that if BPL population increases, unemployment also increases.

Practice more :

Urban population and literacy ratio of 10 areas is given in these two data. Interpret your results.

Areas	1	2	3	4	5	6	7	8	9	10
Urban population (%)	60	35	15	22	18	38	47	5	12	9
Literacy rate (%)	73	29	36	14	20	48	45	12	13	10

Do you know ?

How to divide easily?

Suppose we have to divide 890 by 920. How can we do that easily?

Here the number of digits in both the dividend and the divisor are same. Consider their first digits. As dividend is smaller than the divisor, we know that 8 will not be divided by 9. In that case, we get 0 in our quotient. Now 8 becomes 80. As we have added a zero we can now put a decimal point in quotient (0.). Now, in the table of 9, the number closest to 80 is 9*9= 81 which is larger than 80 so we take 9*8 = 72. Thus, our quotient becomes 0.8. Thus, 890/ 920 = 0.8 (approximately).

Thus, by choosing only first digits of both the numbers you can divide easily. Another example, 726 by 878. In this case too, the dividend is smaller than the divisor. Let's take the first digits. As 7 cannot be divided by 8, we put a 0 in the quotient and assume it to be 70. Now, quotient becomes 0. As we put a decimal. Multiple of 8 nearest to 70 is 8*8 = 64 or 8*9= 72. Since 72 is larger than 70, we take 8. Therefore, quotient becomes 0.8. Thus, 726/ 878 = 0.8 (approx.)

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Practical No. 5 - Data Representation : Divided Circles

DATA REPRESENTATION :

An old saying goes, " A picture is worth a thousand words". The analyses that you have done need to be presented well. You can use line graphs, bar graphs , scatter plots and various other ways to present your analysis which will be easy to understand at one go. For example, you can use a population pyramid to show the age and sex distribution of the sample you have collected. You can show incomes by line graphs and use compound bar graphs to show how many people are engaged in primary, secondary and tertiary activities.

Aim : To represent the given data using a pie-chart.

Objectives :

1) To understand that pie charts can be used to show various types of data and its components.
2) To understand how they can be shown on a map and used for data interpretation.
3) Analyse the data represented by pie diagrams.

Introduction :

In a divided circle, a specific circle is created, showing the statistics of different geographical constituents in a numerical way. For example, land use, agricultural products, irrigation areas under different sources, financial products etc. The statistics of the geographical factors can be shown in a split circle manner.

Materials required : Data (given), pencil, scale, compass, protractor, paper.

STEPS :

Represent the given statistical information with the help of a pie chart following these steps :

Q.1. Area under various crops in Satara district

Crops	Area (in 000 hectares)
Grains	42698.3
Pulses	5629.9
Sugarcane	2746.8
Oilseeds	6685.4
Other crops	14716.1
Total	72476.5

STEP 1 : Calculate the total of all the given sub-components of the data for all the years.

STEP 2 : Calculate the value of sub-components of the data in degrees using the following formula:

$$\text{Value of sub-component in degrees} = \frac{\text{Data of the sub-component value}}{\text{Sum total of all the components}} \times 360°$$

For example,

$$\text{Value of Grains in Degrees} = \frac{42698.3}{72476.5} \times 360° = 212.0°$$

Sr. No.	Crops	Area (in 000 hectares)	Value in degrees
1	Grains	42698.3	212.0
2	Pulses	5629.9	28.0
3	Sugarcane	2746.8	14.0
4	Oilseeds	6685.4	33.0
5	Other crops	14716.1	73.0
6	Total	72476.5	360.0

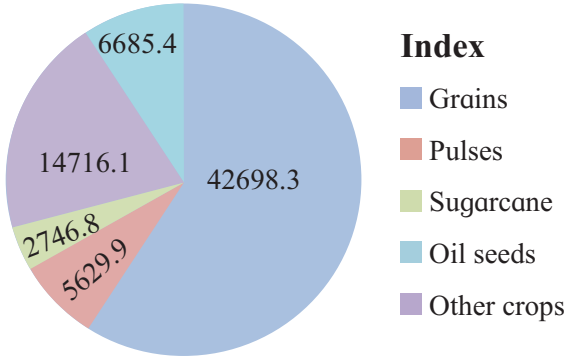
STEP 3 : Decide the radius of the circle depending on the paper size given to you or space available.

STEP 4 : With the help of a protractor, mark the respective angles and divide the circle accordingly showing all the sub-components.

STEP 5 : Shade or colour every sub-component so that they appear distinctively.

STEP 6 : Give the title and prepare an index for the shades or colours.

Area under various crops in Satara district



Write the conclusions in your own words.

Observations and learnings :

Complete the table below in your journal. Here is an example.

Sr. No.	Merits of pie-chart	Demerits of pie-chart	Uses of pie-chart
1	Useful for comparing information	Looking at the diagram, it only gives a comparative picture but the exact value cannot be drawn from the figure	Useful for classification of components
2			
3			
4			

Practice :

Show the following data with the help of pie chart.

Q. 2. Length of Roads Built in the State (in kms.)

Sr. No.	Type of Roads	Length of roads (in kms.)
1	National Highways	2970
2	State Highways	30548
3	Major District Roads	37234
4	Other District Roads	36403
5.	Rural Roads	76602

Q. 3. Draw a pie chart to show the following data. Write your conclusions at the end.

India's exports to various countries / regions of the world (%)

Region /Country	Percentage of exports
European Union	22.3
USA and Canada	20.1
OPEC	15
African countries	4.5
South East Asian countries	28.9
Caribbean countries	2.2
Others	7

Q. 4. Following data shows distribution of visitors to various destinations in a region in a year. Draw a pie chart to show the data. Interpret your results.

Places of Interest	Number of visitors
Wildlife Parks and Zoos	300
Historic Monuments	200
Theme Parks	350

Museums and Art Galleries	150
Riverfronts and beaches	250

Q. 5. The following data shows land use division in a city. Represent the data using pie charts. Interpret your results.

Land Use category	Total Land under (%)
Residential	52
Commercial	15
Industrial	8
Agricultural	2
Green spaces	5
Mixed Land Use	18

Q. 6. In a region, data about the land under various physical features is given. Show the data with the help of a divided circle and interpret your result.

Physical Features	Land (%)
Hills	10
Plains	40
Plateaus	30
Very High Mountains	20

***

Practical No. 6 - Data Representation : Divided Bar Graphs

Aim : To represent the given data using divided bar graph.

Objectives :

1) To understand that, information regarding more than two sub-components can be represented using divided bar graph.
2) Analyse the data represented by divided bar graphs.

Introduction :

A divided bar graph is used to represent geographical sub-components in different time periods. Land use pattern, types of occupation, cropping pattern or production of various crops, information about means of irrigation, etc. are shown through this graph.

Materials required : Data (given), pencil, scale, paper.

Represent the given statistical information with the help of a divided bar graph following these steps :

Q. 1. Estimated Production of various crops (in million tonnes)

Crops	Production (Million tonnes)
Cereals	95.98
Pulses	43.68
Oilseeds	18.24
Cotton	32.48
Other crops	33.00
Total	223.38

STEP 1 : Convert the components given in the data into percentage. Use the following formula

Formula :

Percentage of the sub-component = data of the component/ total of all components × 100

For example,

$$\text{value of cereals in percentage} = \frac{95.98}{223.38} \times 100 = 42.97\%$$

Crops	Production (Million tonnes)	Percentage
Cereals	95.98	42.97
Pulses	43.68	19.55
Oilseeds	18.24	8.17
Cotton	32.48	14.54
Other crops	33.00	14.77
Total	223.38	100

STEP 2 : Decide the length of the graph to be drawn according to the size of the paper.

STEP 3 : Decide the scale as per percentage. For example, if the total bar graph is 10 cm then 10cm = 100%. Accordingly, calculate the lengths of all sub components.

STEP 4 : After you finish drawing the graph with all its components, show them with proper shades or colours.

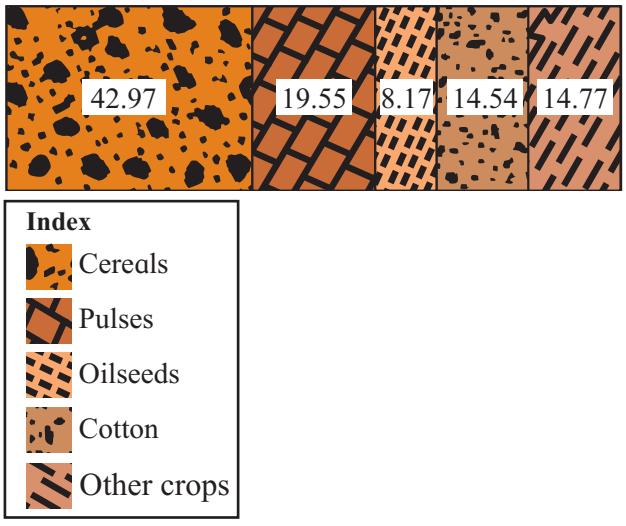
STEP 5 : Complete the graph by marking the axes, giving title and preparing the legend.

STEP 6 : Shade or colour every sub-component so that they appear distinctively.

STEP 7 : Give the title and prepare an index for the shades or colours.

STEP 8 : Interpret the graph and write conclusions in your own words.

Observations and learnings :



Complete the table in your journals :

Sr. No.	Merits	Demerits	Uses

Practice more :

Represent the following data with the help of divided bar graph :

Area under different fruits crop in the State

Sr. No.	Fruits	Area (in hectares)
1	Mango	527147
2	Jackfruit	1451
3	Coconut	26325
4	Orange	168979
5	Pomegranate	33280
	Total	757182

Q. 2. Given below is the data showing number of people in different age groups who visited a Zoo in the month of April 2019. Draw a bar graph to represent the data and interpret the data at the end.

0-5	150
5-10	200
10-15	150
15-20	125
20-40	100
40-50	50
50-60	50
60+	50

Q. 3. Draw a divided bar graph to show the following data. A traffic surveyor stood at a major square in a city. He surveyed the number of vehicles that passed at various timings. Given is the data. Draw divided bar graphs to show the data. Interpret your results.

Time of survey	Vehicles surveyed			
	Cars	Buses	Heavy Vehicles	Bikes
8.30 a.m. to 9.30 a.m.	20	5	2	60
9.30 a.m. to 10.30 a.m.	30	8	1	100
10.30 a.m. to 11.30 a.m.	40	10	1	120

Q. 4. In a region X, the following table shows data about breakup of the population engaged in various tertiary services practised there. Show the data with the help of divided circles. Interpret your result.

Type of Tertiary Services	Population engaged (%)
Banking	20
Transport	25
Tourism	10
Retail Trade	22
Wholesale trade	15
Communication	8

***

Practical No. 7 - Data Representation : Construction of a Population Pyramid

Aim : To represent age-sex data of population data through population pyramid.

Objectives :

1) Understand that age and sex data of a given population can be presented through population pyramid.
2) Interpretation of data shown in such diagrams.

Introduction :

The Pyramid diagram is virtually a variant of a bar graph, where columns, constructed to represent specific qualitative population data and are arranged in a tier structure simultaneously. It is called a pyramid because in many cases, it has a triangular shape, although it is not always true. The length of the bar represents a proportion of the total. A vertical line divided the males from the females in the population. It is customary to represent males on the left and the females on the right side.

Only one pyramid will represent data of one year of one region or country. To represent the data of another year, another pyramid has to be drawn.

Materials Required : dataset (given), scale, pencil, graph paper.

Methodology :

Question : Represent the following data with the help of population pyramid.

Age Group	% of male	% of female
0-9	14.6	13.3
10-19	10.6	10.0
20-29	7.8	7.6
30-39	6.8	6.5
40-49	5.2	5.0
50-59	3.7	3.2
60-69	2.1	2.2
70+	0.2	0.2

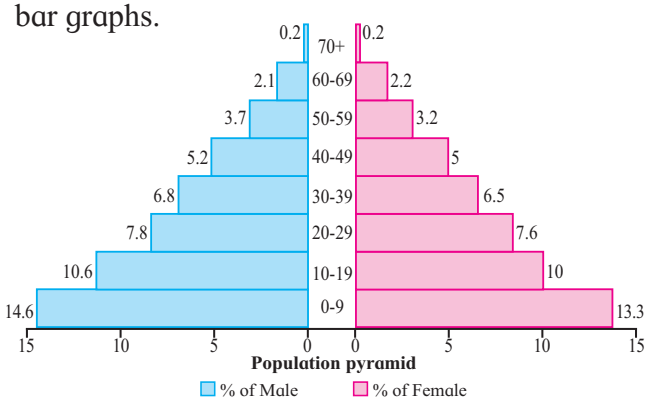
STEP 1 : If the data is given in actual numbers, then convert them into percentage out of total population for the sake of convenience. Write the percentages in the respective columns.

STEP 2 : Select a suitable scale to mark these percentages on the horizontal plane. Convert these percentages into a suitable scale. For example, if the scale is 1cm = 10 % , then each percentage should be converted accordingly in cm. This scale is for X-axis.

STEP 3 : On a graph paper, draw a vertical bar showing age-groups in the centre such that on both the sides, the male and the female percentages can be represented. For this, select a scale. Suppose 1 cm = 1 age group. This will depend on number of age groups given. This scale is for the Y-axis. Keep in mind that the lower age groups will be below at the base of the pyramid, the higher age groups will be at the apex.

STEP 4 : On X-axis, mark percentages from 0-100 according to the scale from the centre to the left and similarly from centre to the right. The left markings will represent male percentages and right ones will show female percentages.

STEP 5 : Mark the respective percentages of each group on the respective points and then complete the bar graphs, as we do in constructing bar graphs.



Practice more :

Q. 1. Represent the following data of India through population pyramids.

Age Group	No. of males	No. of females
0-14	186,087,665	164,398,204
15-24	121,879,786	107,583,437
25-54	271,744,709	254,834,569
55-64	47,846,122	47,632,532
65+	37,837,801	42,091,086

Q. 2. Draw a population pyramid to show the following data. Interpret your results at the end.

Age groups	Male (%)	Female (%)
0-15	24	22.3
15-25	21.4	19.2
25-35	18.2	16.3
35-45	14.6	13.4
45-55	11.3	13.7
55-65	7.1	8.9
65+	3.4	6.2

Q. 3. Draw a population pyramid for the following data. Interpret your results.

Age groups	Men (%)	Women (%)
0-14	30	29
14-25	22	21
25-45	21	20
45-65	20	19
65+	7	11

Q. 4. Represent the following data through population pyramids.

Age Group	No. of males	No. of females
0-14	37,847,801	42,091,086
15-24	47,846,122	47,832,532
25-54	271,700,709	254,854,569
55-64	180,087,665	174,398,204
65+	121,879,786	107,593,437

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Practical No. 8 - Interpretation of Toposheet : Human Settlements

We have studied and interpreted toposheet with reference to physical factors in previous standard. In this standard, we will study toposheets with respect to human elements. We will know how distribution of human elements can be done, symbols and signs that can be used and how do we interprets them and draw conclusions.

Aim :

To analyse toposheet according to human elements.

Objective :

1) To understand the types and patterns of human settlements in the area.

2) To identify the relationship between physical factors and human settlements.

Introduction :

You know that toposheets contain a lot of information. After giving the preliminary information, one starts with interpreting the toposheet. To interpret a toposheet, one needs to see the following items :

1) Relief
2) Drainage
3) Vegetation
4) Human Settlements
5) Occupations
6) Transport and Communication

Materials required :

Any toposheet preferably 1:50000 scale. Teachers can download the toposheets of respective districts from https://soinakshe.uk.gov.in/ and print them for use in the class. We have taken one as example (63K/12).

Procedure :

STEP 1 : After looking at the marginal information, relief, drainage and natural vegetation, we turn to the human aspect to be interpreted in the toposheet. We look for the natural vegetation in the area. Make use of conventional signs and symbols given in marginal information, which are important in interpreting the human settlements. Settlements are generally shown in red.

STEP 2 : Identify major settlements and clusters, if any. See whether they are nucleated or dispersed. What could be the reason behind their being nucleated or sparse?

STEP 3 : Identify the types of settlements -

urban and rural. Identify major cities and towns.

STEP 4 : Identify patterns of settlements which have been already taught to you in earlier classes. Comment upon the reason behind their shapes - Star-shaped, circular, linear, etc.

STEP 5 : Relate relief, drainage, vegetation with human settlements.

The teachers should ask questions in such a way that students will interpret the vegetation aspects. Some sample questions are given here for toposheet number 63 K /12.

1) Which major city is found on the toposheet?
2) Is the area largely rural or urban?
3) What type of settlements is mainly found on the plateau region? Why?
4) What type of settlements is mainly found in the plain region? Why?
5) In which direction does the Mirzapur town extend?
6) Which major town is located to the West of Mirzapur?
7) Name two market towns located to the North of Ganga.
8) Name the town located in the North-West corner of the map.
9) Why are there hardly no settlements in forested areas of the plateau?
10) Which part of the toposheet shows dense population distribution?
11) Comment upon the nature of population distribution in the plateaus.

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Practical No. 9 - Interpretation of Toposheet : Land Use and Occupations

Aim :

1) To understand the land use and occupations in the area.
2) To identify the relationship between physical factors and land use and occupations.

Introduction :

You know that toposheets contain a lot of information. After giving the preliminary information, one starts with interpreting the toposheet. To interpret a toposheet, one needs to see the following items :

1) Relief
2) Drainage
3) Vegetation
4) Human Settlements
5) Land use and Occupations
6) Transport and Communication

Materials required : Any toposheet preferably 1:50000 scale. Teachers can download the toposheets of respective districts from https://soinakshe.uk.gov.in/ and print them for use in the class. We have taken one as example.

Procedure :

STEP 1 : After looking at human settlements and physical aspects in a region, we can now talk upon the occupations. Make use of the conventional signs and the symbols given in marginal information, which are important in interpreting the occupations followed by the people living in the region. Occupations are a function of relief, drainage, vegetation and land use in the area.

STEP 2 : Identify the major land uses in the area - agricultural, forest, commercial, industrial, pastures, meadows, etc.

STEP 3 : Identify the major types of occupations - primary, secondary and tertiary. Ponder upon the reason behind people following these occupations at the place.

The teachers should ask questions in such a way that students will interpret the land use aspects. Some sample questions are given here for toposheet number 63 K /12.

1) What could be the major occupation of the people living in the plain region?
2) What occupations are followed in the plateau region?

3) What occupations are followed by the people living in the Mirzapur town?
4) Identify the fallow land patches along the Nalas.
5) Which industries are found in Jaunpur?
6) In which part are quarries found in the map? Why ?
7) Which colour shows agricultural land in the map?
8) Where are cotton textiles found?
9) Is ferrying an occupation? What type of occupation is it?
10) In which part can tourism be developed in this region ?
11) Identify the major market areas in the region. What type of activities happen in such areas?
12) What type of facilities do you find in Vindhyachal town?
13) Comment upon the nature of occupations followed by the people looking at the relief.
14) Identify the tertiary activities carried in the area.
15) Name the major primary activities in the region.

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Practical No. 10 - Interpretation of Toposheet : Transport and Communication

Aim :

1) To identify the different means of transport and communication available in the region.
2) To identify the relationship between physical factors and transport.
3) To understand the role of transport and communication in the region.

Introduction :

You know that toposheets contain a lot of information. After giving the preliminary information, one starts with interpreting the toposheet. To interpret a toposheet, one needs to see the following items :

1) Relief
2) Drainage
3) Vegetation
4) Human Settlements
5) Land use and Occupations
6) Transport and Communication

Materials required :

Any toposheet preferably 1:50000 scale. Teachers can download the toposheets of respective districts from https://soinakshe.uk.gov.in/ and print them for use in the class. We have taken one as example.

Procedure :

STEP 1 : After looking at human settlements and physical aspects in a region, we can now talk upon the transport and communication facilities available in the region. Make use of conventional signs and symbols given in marginal information which are important in interpreting the various means of transportation and communication.

STEP 2 : Identify the major railway lines. Identify the towns or cities which they connect. Identify their directions. In case of railways, identify the types of gauge as per the marginal information.

STEP 3 : Identify the types of roads shown on the map. Identify the major National and State highways and the cities they connect.

STEP 4 : Identify the major airports if any.

STEP 5 : If there are rivers, lakes, dams or creeks or other water bodies in the region, look for various means of water transportation in the region.

STEP 6 : Look for major facilities available in the region. Post office, Telegraph office, Dak Bungalow, Rest House, Police station, power supply, dispensaries, Hospitals, burial ground, graveyard, etc. are generally found. There can be temples, mosques, forts, churches, etc.