B.Sc. GEOGRAPHY LAB MANUAL

2nd Semester

Prepared By

Pure & Applied Science Dept.

Geography

MIDNAPORE CITY COLLEGE

MIDNAPORE CITY COLLEGE

DEPARTMENT OF PURE AND APPLIED SCIENCES

LABORATORY MANUAL FOR B.SC (HONOURS)

IN

GEOGRAPHY

SEMESTER - II

PREFACE TO THE FIRST EDITION

This is the first edition of Lab Manual for BSc Honours in Geography (Second Semester). Hope this edition will help you during practical. This edition mainly tried to cover the whole syllabus. Some hard topic are not present here that will be guided by responsive teachers at the time of practical.

ACKNOWLEDGEMENT

We are really thankful to our students, teachers, and non-teaching staffs to make this effort little bit complete. Mainly thanks to Director and Principal Sir to motivate for making this lab manual.

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C4 P: Cartography (Lab)

A Project File, Comprising one Exercise Each is to be submitted

1. Traverse Survey Using Prismatic Compass

2. Levelling by Dumpy Level and Prismatic Compass

3. Thematic Maps: Proportional Squares, Pie Diagrams with Proportional Circles, Dots and Spheres

4. Thematic Maps: Choropleth Map, Isoline Map, Chorochromatic Map

1. Traverse Survey Using Prismatic Compass

A prismatic compass is navigation and surveying instrument which is extensively used to find out the bearing of the traversing and included angles between them, waypoints (an endpoint of the lcourse) and direction. The compass calculates the bearings in whole circle bearing system which determines the angle which the survey line makes with the magnetic north in the clockwise direction. The whole circle bearing system also known as the azimuthal system varies from 0 degrees to 360 degrees in the clockwise direction. The included angles can be calculated by the formulas F-P ±180 in case of anti-clockwise traverse and P-F ±180 in case of clockwise traverse, where 'F' is the fore bearing of forward line in the direction of survey work and 'P' is the fore bearing of previous line.

Example

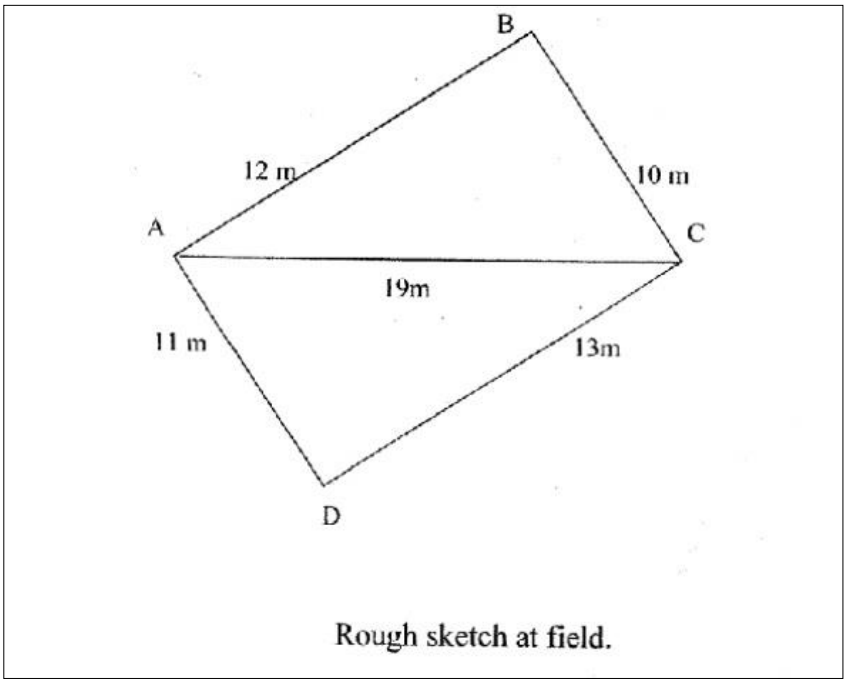
Make a closed traverse survey (ABCDA) with the help of Prismatic Compass.

1. Prepare a field hook and enter the data.
2. Complete the field book with necessary corrections.
3. Plot the traverse on a suitable scale with proper annotations.
4. Calculate the area of the traverse and represent by circle.

FIELD BOOK
CLOSED TRAVERSE SURVEY BY PRISMATIC COMPASS
CLOCKWISE CIRCUIT

Place:.....
Date:..... Roll
No.:.....
Time:..... Instrument
No.:.....

Station	Line	Length on Ground (M)	Observed Whole Circle Bearing		Remarks
			Fore	Back	
A	AB	12	70°15′	249°15′	All stations are affected by local attractions. Survey done clockwise direction. Diagonal Distance, AC = 19 m.
B	BC	10	130°00′	311°00′	
C	CD	13	240°30′	57°30′	
D	DA	11	314°00′	136°00′	



Rough sketch at field.

COMPUTATION TABLE
CLOSED TRAVERSE SURVEY BY PRISMATIC COMPASS
CLOCKWISE CIRCUIT

Place:.....
Date:..... Roll No.:.....
Time:..... Instrument No.:.....

Station	Line	Length on Ground (M)	Observed Whole Circle Bearing		Difference (d) FB - BB	Error (E) d - 180°	c = E/2	Corrected Whole Circle Bearing		Remarks
			Fore	Back				Fore	Back	
A	AB	12	70°15′	249°15′	179°	-1°	-30′	69°45′	249°45′	All stations are affected by local attractions. Survey done clockwise direction. Diagonal Distance, AC = 19 m.
B	BC	10	130°00′	311°00′	181°	+1°	+30′	130°30′	310°30′	
C	CD	13	240°30′	57°30′	183°	+3°	+1°30′	239°00′	59°00′	
D	DA	11	314°00′	136°00′	178°	-2°	-1°	315°00′	135°00′	

Calculation of Including Angle of the Traverse

Angle	FB of a line~BB of the Preceding Line (Measured in the Direction of Survey)		Calculated Including Angle	Corrected Including Angle
A	CFB of AB ~ CBB of DA	69°45′ ~ 135°00′	65°15′	65°15′
B	CFB of BC ~ CBB of AB	130°30′ ~ 249°45′	119°15′	119°15′
C	CFB of CD ~ CBB of BC	239°00′ ~ 310°30′	71°30′	71°30′
D	CFB of DA ~ CBB of CD	315°00′~ (59°00′ + 360′)	104°00′	104°00′
			Σ360°00′	**Σ360°00′**
Checking Including Angle: **Σθ = (2n – 4) X 90° (n = Side of Traverse)** **= (2 X 4 - 4) X 90°** **= (8 – 4) X 90°** **= 4 X 90°** **=360°**			**Checks are applied and found satisfactory.**	
Note: CFB = Corrected Fore Bearing, CBB = Corrected Back Bearing				

FORMULA

1. General Error Correction:

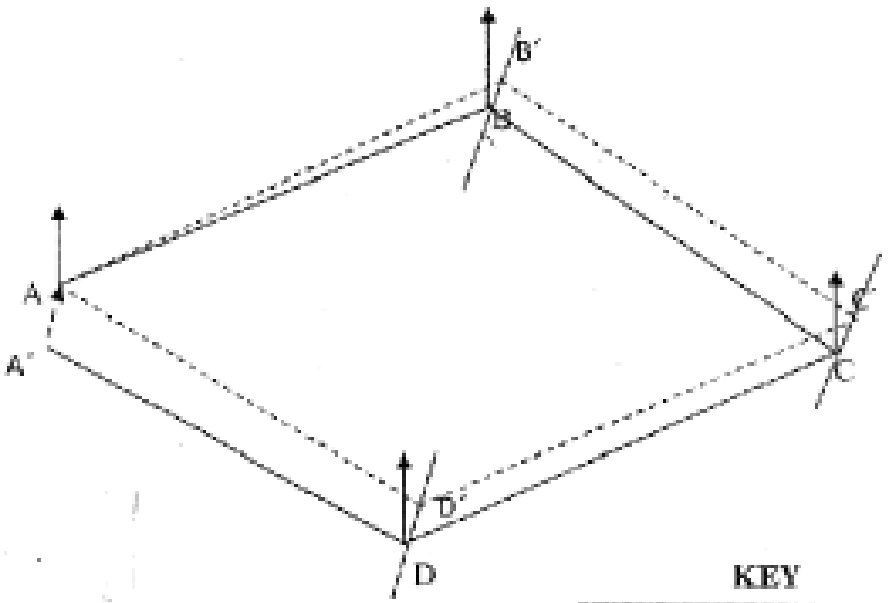
- If error is negative, deduct e/2 from the smaller readings and add e/2 to the larger one.
- If error is positive, deduct e/2 from the larger readings and add e/2 to the smaller one.

2. For Including Angle Correction:

- *In case of clock wise survey if corrected BB is less than corrected FB then 360° added to corrected BB.
- In case of anti-clock wise survey if corrected FB is less than corrected BB then 360° added to corrected FB.

PLOTTING OF A CLOSED TRAVERSE (ABCDA)

Method: Parallel Meridian (Clockwise Circuit)



KEY

N

Magnetic North

Observed Traverse

Corrected Traverse

AA' Closing Error

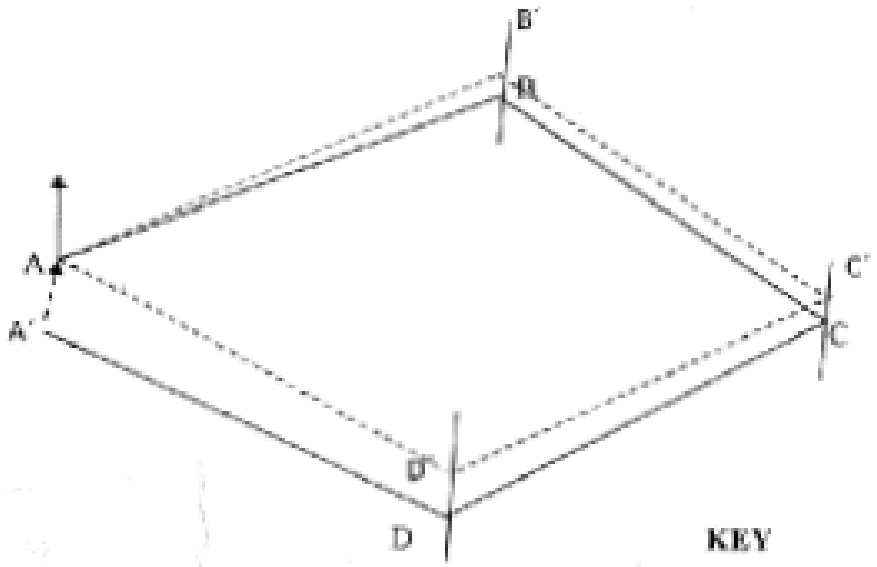
Scale: 1cm to 2m

Distribution of closing error after Bowditch method

Scale: 1 cm to 4m

PLOTTING OF A CLOSED TRAVERSE (ABCDA)

Method: Including Angle (Clockwise Circuit)



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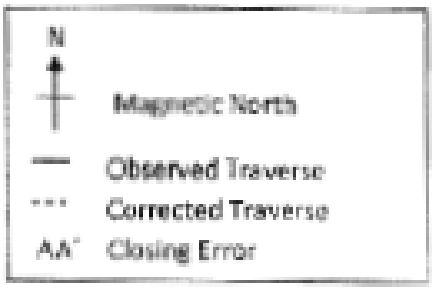


Scale: 1cm to 2m

Distribution of closing error after Bowditch method

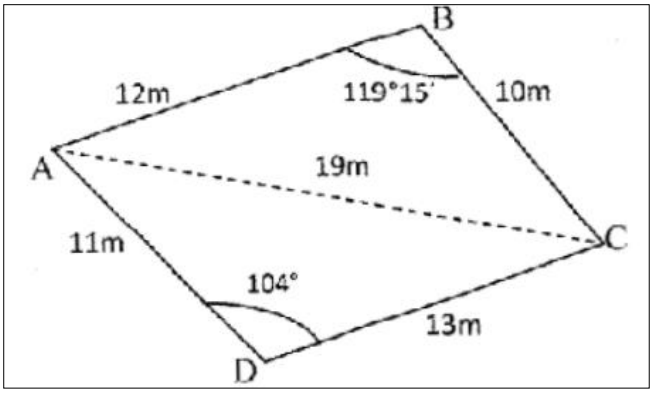
Scale: 1 cm to 4m

Determination of the ground area of the traverse:

Area of the traverse can he calculated by two methods.

1. On the basis of including angle.
2. On the basis of length.

1. <u>On the basis of including angle:</u>



The area of the traverse ABCDA = AABC + AADC

Area of the ΔABC = $\frac{1}{2} \times l_{AB} \times l_{BC}\, Sin\angle B$

$= \frac{1}{2} \times 12\text{m} \times 10\text{m} \times \text{Sin } 119°15'$

$= 52.35 \text{ sq. m.}$

Area of the ΔADC = $\frac{1}{2} \times l_{AD} \times l_{CD}\, Sin\angle D$

$= \frac{1}{2} \times 11\text{m} \times 13\text{m} \times \text{Sin } 104°00'$

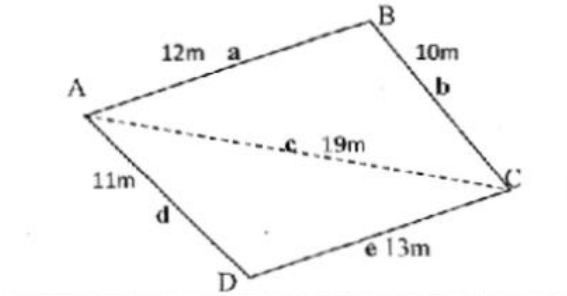
$= 69.38 \text{ sq. m.}$

Therefore, the area of the traverse ABCDA = ΔABC + ΔADC

= 52.35 sq. m. + 69.38 sq. m.

= 121.73 sq. m.

2. <u>On the basis of length:</u>



TRIANGLE	LENGTH OF SIDE	REMARKS
ΔABC	AB(a) = 12m BC(b) = 10m AC(C) = 19m	Scalene Triangle
ΔADC	AD(d) = 11m DC(e) = 13m AC(C) = 19m	Scalene Triangle

The area of the traverse ABCDA = ΔABC + ΔADC

Area of the ΔABC = $\sqrt{\boldsymbol{S \times (S-a) \times (S-b) \times (S-c)}}$

Where, a, b, c are the sides of the triangle and S is semiperemetre.

$$S = \frac{1}{2}(a + b + c)$$

$$S = \frac{1}{2}(1 + 10 + 19)m.$$

$$\mathrm{S} = 20.5 \text{ m.}$$

$$\Delta ABC = \sqrt{S \times (S-a) \times (S-b) \times (S-c)}$$

$$= \sqrt{20.5 \times (20.5-12) \times (20.5-10) \times (20.5-19)}$$

$$= 52.38 \text{ sq. m.}$$

Area of the ΔADC = $\sqrt{\boldsymbol{S \times (S-d) \times (S-e) \times (S-c)}}$

Where, d, e, c are the sides of the triangle and S is semiperemetre.

$$\mathbf{S} = \frac{\mathbf{1}}{\mathbf{2}}(\mathbf{d} + \mathbf{e} + \mathbf{c})$$

$$S = \frac{1}{2}(11 + 13 + 19)m.$$

$S = 21.5$ m.

$\Delta ADC = \sqrt{S \times (S-d) \times (S-e) \times (S-c)}$

$= \sqrt{20.5 \times (20.5-11) \times (20.5-13) \times (20.5-19)}$

$= 69.26$ sq. m.

Therefore, area of the traverse ABCDA

= 52.38 sq. m. + 69.26 sq. m.

=121.64 sq. m.

DETERMINATION OF AREA POF DIFFERENT TRAINGLE

1. EQUILATERAL TRAINGLE (LENGTH OF THE THREE SIDE ARE WQUAL

$$Area = \frac{\sqrt[3]{}}{4} \times Side^2$$

2. ISOSCELES TRAINGLE: (LENGTH OF TWO SIDES ARE EQUAL)

$$Area = \frac{b}{4} \times \sqrt{4a^2 - b^2}$$

Where, b = Ground, a = Length of any one of remaining same two sides.

3. SCALENE TRAINGLE: (LENGTH OF THREE SIDES ARE UNEQUAL)

$$Area = \sqrt{S \times (S-a) \times (S-b) \times (S-c)}$$

a, b, c are the triangle and S is semiperemetre.

$$S = \frac{1}{2}(a+b+c)$$

Diagrammatic Representation of Area:

1. Representation by square:

Computation of one side of square for the traverse ABCDA

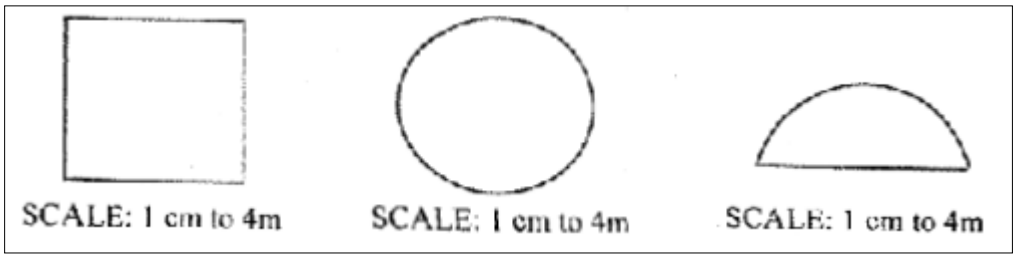
$$l = \sqrt{A} = \sqrt{121.64\ sq.m.} = 11.03\ m.$$

2. Representation by a circle:

$$r = \sqrt{\frac{A}{\pi}} = \sqrt{\frac{1211.64\ sq.m.}{\pi}} = 6.22\ m.$$

3. <u>Representation by a semi-circle:</u>

$$r = \sqrt{\frac{2A}{\pi}} = \sqrt{\frac{2 \times 121.64\ sq.m.}{\pi}} = 8.80\ m.$$



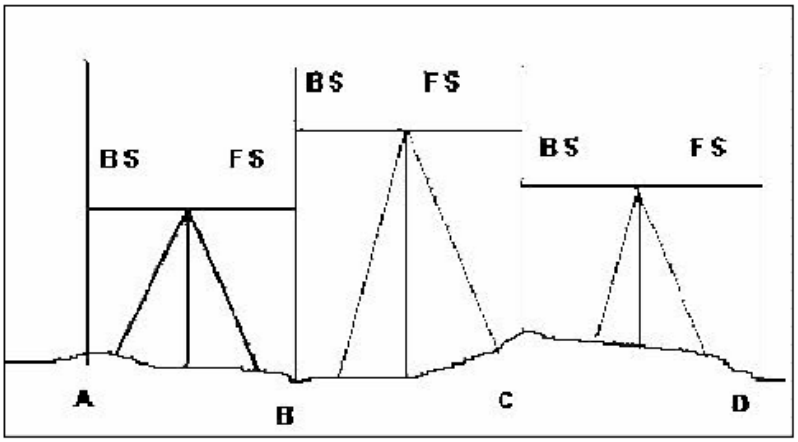
2. Levelling by Dumpy Level and Prismatic Compass

Aim

To find the difference in elevation between two points.

Instruments

1. Dumpy level
2. Levelling staff



Procedure

1. Let A and B be the two given points whose difference is elevation is to be found.
2. Set the level at convenient point O1 carryout temporary adjustments and take B.S on A
3. Take FS on the Point C
4. Shift the instrument to point O2 and perform temporary adjustments.
5. Take B.S on C.
6. Take F.S. on D.
7. Shift the instrument to point O3 and perform temporary adjustments.
8. Take B.S on D
9. Take F.S on B.
10. Find the difference in elevation between A and B by both the methods.

Result: Difference in elevation between A and B = ……

Page of Level-Book										
Name of work survey for:-									Page No:-	
Levelling from ----------To----------										
Instrument No----------							Conducted by:-			
Station	Distance In meters	Bearings		Staff Reading			Height of Instrument or		Reduced Level	Remarks
		FORE	BACK	Back (B.S)	Inter (I.S)	Fore (F.S)	Rise	Fall		

LEVELLING/ CONTOUR PLAN

A contour is an imaginary fine joining places with equal elevation above sea level. Technically, it is defined as the line of intersection of a level surface with the surface of the ground. The vertical distance between two consecutive contours is called contour interval while the horizontal distance between the two is known as horizontal equivalent. Normally, the nature of the ground, the purpose and extent of survey, the map scale and the amount of time and financial investment involved together determine the contour interval. The smaller the map scale, the larger is the contour interval and the smaller the interval, the larger is the amount of field and office works. The contour maps are useful both for the engineering, hydrological and geomorphological studies.

Methods

The preparation of a contour plan or map requires first, the surveying and plotting of a traverse plan, second, levelling operations to find the reduced levels of all the points on the traverse and finally, the interpolation of contours on the traverse plan.

- **Traverse Survey**

If the area to be contoured is not very extensive, a traverse may be so laid that it consists of a set of radial lines diverging from the apparently highest or lowest point of the area. The lengths and directions of each line may be fixed by the traverse surveying with either a prismatic compass or a theodolite. The points at a regular distance apart on each line are then marked on the ground by pegs.

In some cases, the area may be divided into rectangular or square grids; each corner of which is marked by a peg. The position of these points can be easily fixed by traversing.

- **Levelling Operations**

The equipments for levelling consist of a level (commonly a dumpy level), a tripod, a levelling staff, a tape and a well laid and neatly drawn field book for recording the staff readings, distances and field notes.

Procedure

I. The instrument is first set up at a convenient height and at a place, from where maximum number of stations can be sighted.
II. With the help of the bubble tub (s), the instrument is then perfectly levelled by turning the foot screws right in and left out in positions when the telescope is: a) parallel to a line through two foot screws and b) perpendicular to it. This operation is successively repeated taking other foot screws until the bubble remains stationary at the centre of the level tube for any position of the telescope.
III. The telescope is then directed towards the staff held vertically over the station (within or outside the traverse) with a known reduced level (Bench Mark). The eye piece and the object are focused properly and the staffs reading for the middle stadia is taken and the first reading is entered as a back sight reading (BS).
IV. Similarly the staff readings for all the stations visible are taken successively. The last reading of the set up is entered as a fore sight reading (FS) while all others as intermediated sight readings (IS).
V. The instrument is then shifted to some other position(s) from where the readings of the remaining stations (not covered in the first set up) can be taken. After precise levelling of the instrument, the reading is to be taken on the staff held at the last station of the former set up; it is a back sight reading of course. This station is called a change point (cp).
VI. vi. Following the same procedure staff reading are then taken on the remaining stations.

Computation

The reduced levels of the stations can be calculated in either of the two common methods— the collimation method and the rise and fall method.

Example

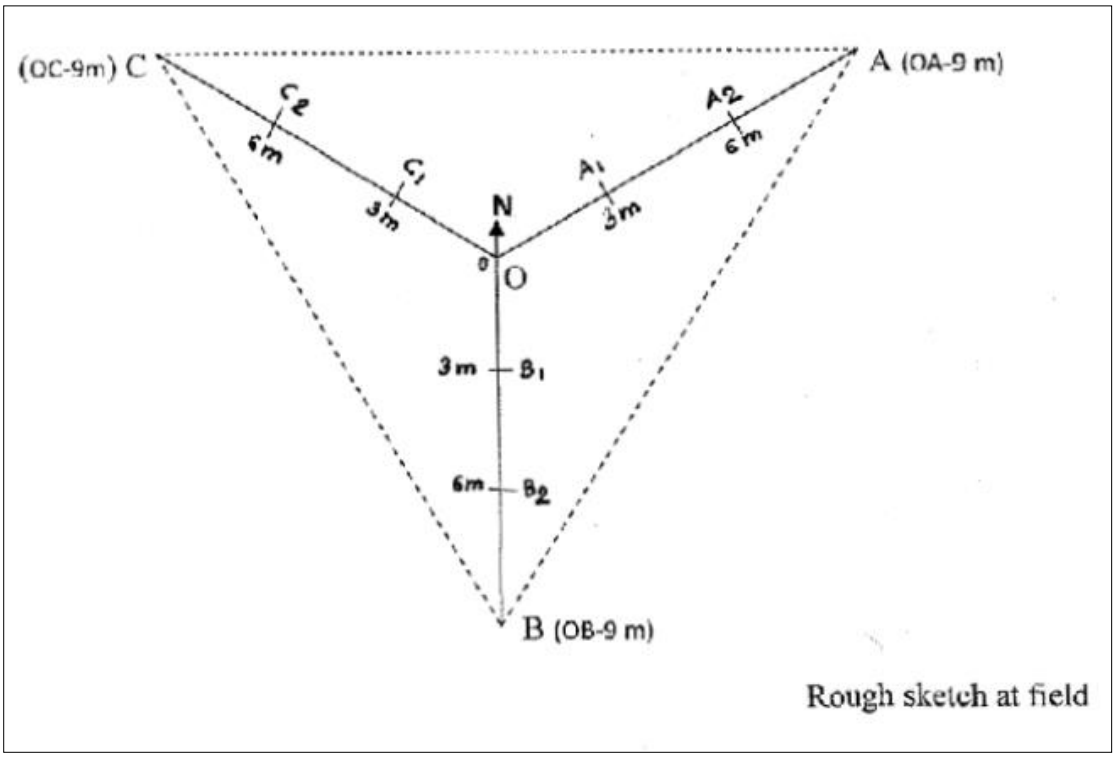
1. Prepare a contour plan of an area traversed by 3 radial lines (OA, OB. OC) each being 9 m. long. Each radial line is divided into 3 equal parts.
2. Enter the readings oil a neatly drawn field book.
3. Find out the reduced level of the stations (when BM of the central station is 7.00 m). At least one CP is in line OB at 9 m distance from central station.
4. Draw at least 3 contours with equal interval.

FIELD BOOK

CONTOURING BY DUMPY LICVEL & PRISMATIC COMPASS

Place: Instrument No.:
Date: Surveyor's Name
Time: Roll No.:

Stations	Distance from O (m.)	Staff Reading (m.)			Remarks
		B.S.	I.S.	F.S.	
O	0	0.850			B.M.(7.00m) Mg Bg of OA = 60° Mg Bg of OB = 180°30' Mg Bg of OC = 300°
A_1	3		1.015		
A_2	6		1.200		
A	9		1.350		
B_1	3		1.105		
B_2	6		1:205		
B	9	1.115		1.360	C.P.
C_1	3		0.775		
C_2	6		0.960		
C	9		.	1.115	



FIELD BOOK

CONTOURING BY DUMPY LICVEL & PRISMATIC COMPASS

Place: Instrument No.:

Date: Surveyor's Name

Time: Roll No.:

Stations	Distance from O on ground (m.)	Distance from O on map (cm.)	Staff Reading (m.)			Collimation Level (m.)	Reduced Level (m.)	Remarks
			B.S.	I.S.	F.S.			
O	0	0	0.850			7.850	7.000	B.M.(7.00m)
A_1	3	2		1.015		7.850	6.835	Mg Bg of OA = 60°
A_2	6	4		1.200		7.850	6.650	Mg Bg of OB = 180°30'
A	9	6		1.350		7.850	6.500	Mg Bg of OC = 300°
B_1	3	2		1.105		7.850	6.745	
B_2	6	4		1.205		7.850.	6.600	
B	9	6	1.115		1.360	7.850 / 7.605	6.490	
C_1	3	2		0.775		7.605	6.830	C.P.
C_2	6	4		0.960		7.605	6.645	
C	9	6			1.115	7.605	6.490	Collimation Method applied
$\sum$			1.965		2.475			

Arithmetical Check:

ΣB.S ~ ΣF.S = Last R.L.~ First R.L.

1.965 ~ 2.475 = 6.490 ~ 7.0

0.51 = 0.51 (Checks are applied and found satisfactory)

Note

1. Collimation method is applied, B.M. at first station.
2. R.L. is same at first station at B.M. at first station is 7.000 m
3. After that CL is calculated at first station. CL = RL of 1st station + Staff Reading of that station / 1st instrument. Here 7.000 + 0.850 = 7.850. It should be continue up to CP.
4. RL is calculated of these stations from given formula. RL = CL Staff Readings.
5. After CP same method is applied for calculating CL. CL = RL of CP + Staff Reading of that station/ 2nd instrument. Here 6.490 + 1.115 = 7.605
6. Same method is applied for calculating remaining RL.
7. Arithmetic check can be done.
8. At last select the contour.

Selection of Contour Value

Range = (Highest RL - Lowest RL) = (7.000 m. - 6.490 m.) = 0.510 m.

Interval of contour = $\frac{Range}{n+1}$ (n = Desired no. of contours. Here 3) = $\frac{0.510\ m.}{3+1} = \frac{0.510\ m.}{4} = 0.1275\ m.$

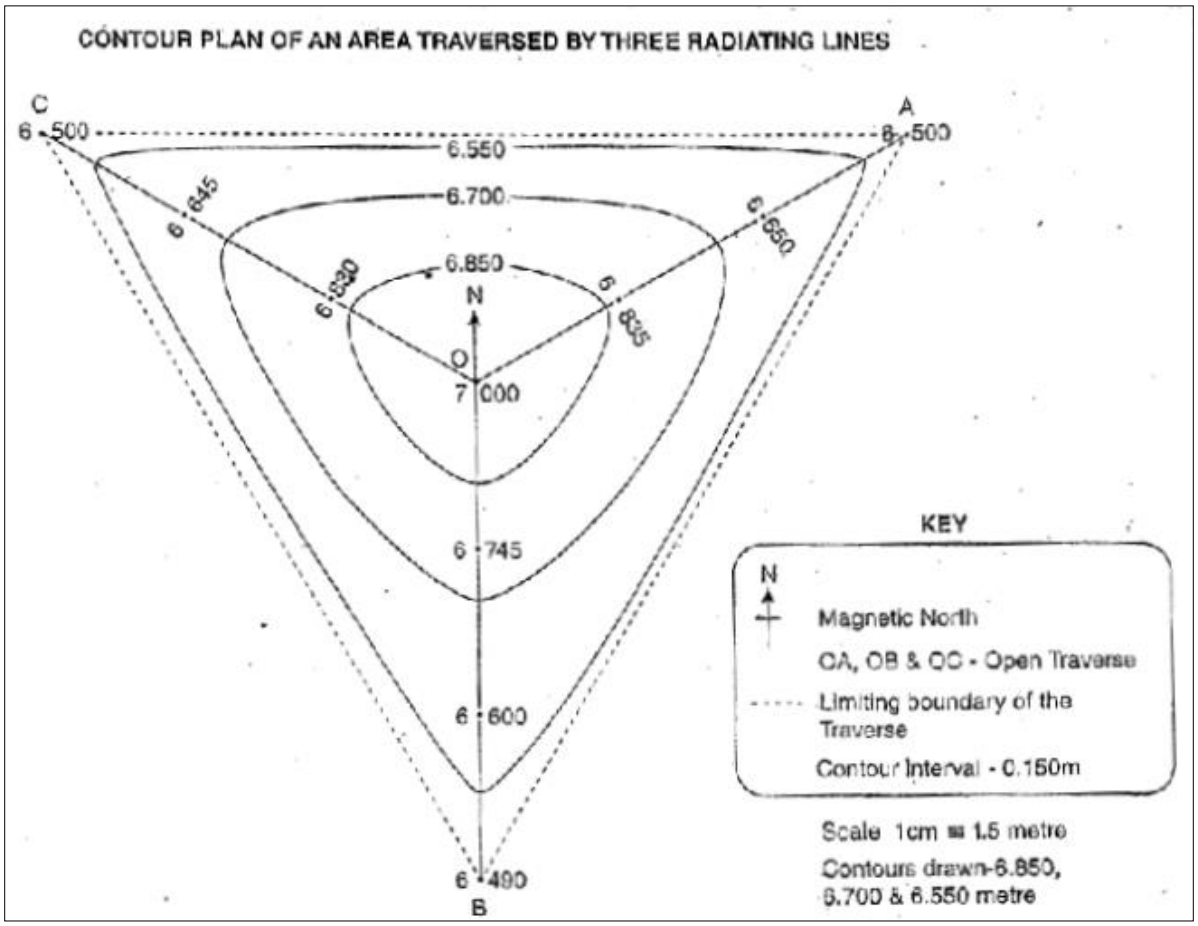
Selection of 1st Contour = Lowest RL + Interval of contour = 6.490 m. + 0.1275 m. = 6.6150 (**6.60 m. Approx**)

Selection of 2nd Contour – 1st Contour + Interval of contour = 6.60 + 0.1275 = 6. 7275 (**6.70 m. Approx**)

Selection of 3rd Contour = 2nd Contour + Interval of contour = 6.70 + 0.1275 = 6. 8275 (**6.80 m. Approx**)

Selection of contour value*2nd method = Selection of contour by arbitrary choice way

You can select the value of contour arbitrarily by showing highest & lowest value. But the intervals of contours are remaining same. Here 2nd method is followed. Contour values are 6.850 m.; 6.700 m.; & 6.550 m.


CONTOUR PLAN OF AN AREA TRAVERSED BY THREE RADIATING LINES
C
A
B
O
N
6·500
6·500
6·550
6·700
6·850
6·645
6·650
6·630
6·835
7·000
6·745
6·600
6·490
KEY
N
Magnetic North
OA, OB & OC - Open Traverse
Limiting boundary of the Traverse
Contour Interval - 0.150m
Scale 1cm = 1.5 metre
Contours drawn-6.850, 6.700 & 6.550 metre

3. Thematic Maps: Proportional Squares, Pie Diagrams with Proportional Circles, Dots and Spheres

A thematic map is a type of map that portrays the geographic pattern of a particular subject matter in a geographic area. This usually involves the use of map symbols to visualize selected properties of geographic features that are not naturally visible, such as temperature, language, or population.

There are a different number of thematic map visualisations that have various user applications. Let us have a look at the several most used thematic map types.

3.1. Proportional Squares

A Proportional Area Chart (Square) is used for comparing proportions (size, quantities, etc.) to provide a quick overview of the relative size of data without the use of scales.

Example

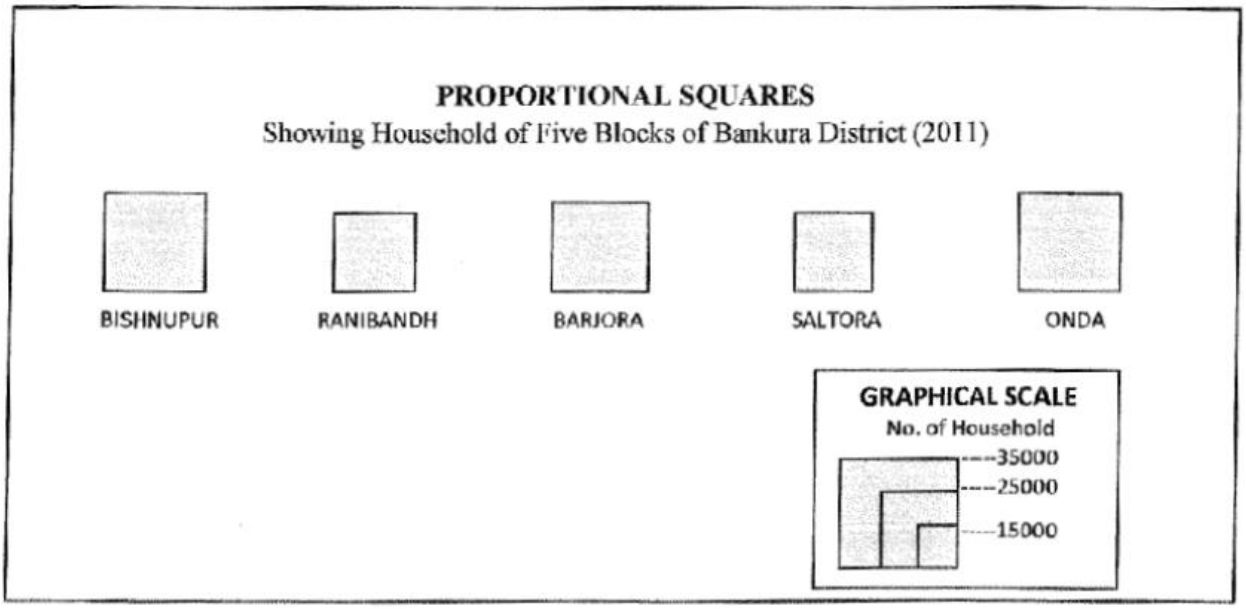
Drawing Proportional Square diagram to show the following dataset and interpret the prepared diagram.

Sl. No.	CM Block	No. of Households (2011)
l	BISHNUPUR	34022
2	RANIBANDH	1924?
3	BARJORA	30420
4	SALTO R A	20250
5	ONDA	33925

Work Sheet for Proportional Squares

Sl. No.	CD. Block	No. of Households	Length of the side (*l*) = √H	Side of the square in settle in cm (1cm = 180 unit)
1	BISHNUPUR	34022	184.4505	1.02
2	RANIBANDH	19242	138.7155	0.77
3	BARJORA	30420	174.4133	0.97

4	SALTO RA	20250	142.3024	0.79
5	ONDA	33925	184.1874	1.02
For Graphical Scale				
1		15000	122.4744	0.G8
2		25000	158.1138	0.89
3		35C00	187.0828	1.04



Interpretation

The no of household is shown by proportional square diagram. Through this diagram it is clearly found that the no. of household is nor evenly distributed through the district. Highest & lowest household founds in Onda (33925) & Ranibandh (19242). Employment opportunities, favourable physical condition etc is main causes of this uneven distribution.

3.2. Pie Diagrams with Proportional Circles

Pie diagram is another graphical method of the representation of data. It is drawn to depict the total value of the given attribute using a circle. Dividing the circle into corresponding degrees of angle then represent the sub-sets of the data. Hence, it is also called Divided Circle Diagram.

Construction

(a) Select a suitable radius for the circle to be drawn. A radius of 3, 4 or 5 cm may be chosen for the given data set.

(b) Draw a line from the centre of the circle to the arc as a radius.

(c) Measure the angles from the arc of the circle for each category of vehicles in an ascending order clock-wise, starting with smaller angle.

(d) Complete the diagram by adding the title, sub-title, and the legend. The legend mark be chosen for each variable/category and highlighted by distinct shades/colours.

Precautions

(a) The circle should neither be too big to fit in the space nor too small to be illegible.

(b) Starting with bigger angle will lead to accumulation of error leading to the plot of the smaller angle difficult.

Example

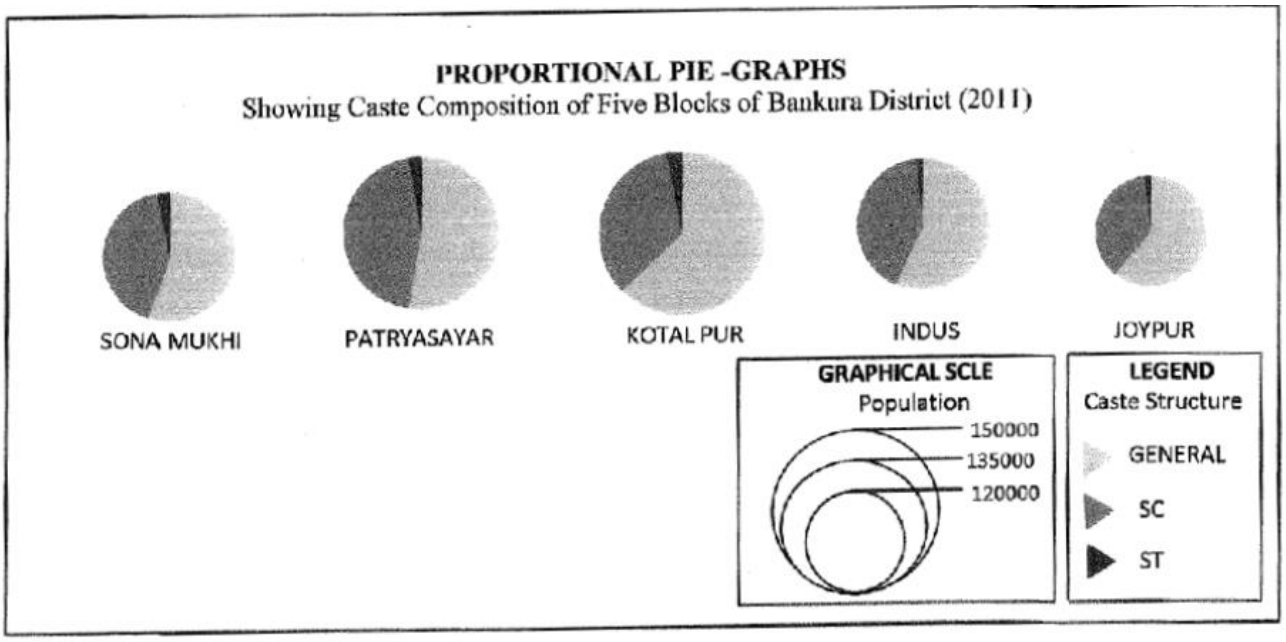
Drawing Pie diagram to show the following dataset and interpret the prepared diagram.

Sl. No.	C.D. Block	Caste Community			Total
		General Caste	SC	ST	
1	SONAMUKHI	67975	51722	3968	123665
2	PATRYASAYAR	74198	62604	3/98	140600
3	KOTALPUR	91072	49201	4255	144528
4	INDUS	75380	54679	2285	132344
5	JOYPUR	74736	45219	2127	122082

Work Sheet for Pie Diagram

Sl. No.	C.D. Block	Caste Community			Total	Radius of Circle $r = \sqrt{\frac{Q}{\pi}}$	Scale (r) 1 cm to 200 unit	Remarks
		General Caste	SC	ST				
		Angular Value(θ)						
1	SONAMUKHI	67975	51722	3968	123665	198.40	0.99	SONAMUKHI Total Population = 123665 General – 67975 Angular Value(θ) $= \frac{360°}{\text{Total}} \times \text{i}$
		197°53'	I50°34'	11°33'	360°			
2	PA1KYASAYAR	74198	62604	3798	140600	211.55	1.05	
		180°59'	160°18'	9°43'	360°			
3	KOTALPUR	91072	49201	4255	144528	214.49	1.07	
		226°51'	122°33'	10°36'	360°			
4	INDUS	75380	54679	2285	132344	205.25	1.02	
		205°3'	148°44'	6°I3'	360°			

5	JOYPUR	74736	45219	2127	122082	197.13	0.98	$= \frac{360°}{123665} \times 67975$ $= 197°53'$
		220°23'	133°21'	6°16'	360°			
For Graphical Scale								
1					150000	218.51	1.09	
2					135000	207.29	1.04	
3					120000	195.44	0.97	



Interpretation

The caste composition is shown by proportional pie graphs through this diagram. It is clearly found that distribution of caste composition is more or less same throughout the five blocks of Bankura district. Tribal population mainly prefers mountainous region, so tribal population is high in this district.

3.3. Dot Distribution Map

A dot distribution map, or dot density map, is a thematic map type that uses dots (variation of marks) to display the presence or absence of a feature. Typically, one point is assigned to represent a larger quantity.

Strengths

- A right way visualises spatial patterns.
- An effective way to represent also different categories using colours

Weaknesses

- Randomly generated points might differ from one iteration to another.
- If shown without borders, we do not know where these points represent.

Requirement

(a) An administrative map of the given area showing state/district/block boundaries.
(b) Statistical data on selected theme for the chosen administrative units, i.e., total population, cattle, etc.
(c) Selection of a scale to determine the value of a dot.
(d) Physiographic map of the region, especially relief and drainage maps.

Precaution

(a) The lines, demarcating the boundaries of various administrative units, should not be very thick and bold.
(b) All dots should be of same size.

Example

Draw a sphere diagram to show the following dataset and interpret the prepared diagram.

Sl. No.	C.D. Block	Rural Population (2011)	Sl. No.	C.D. Block	Rural Population (2011)
1	TAMLUK	207064	14	PATASPUR-II	175056
2	SAHID MATANGINI	183987	15	BHAGABANPUR-I	222677
3	PASKURA-I	283303	16	EGRA-I	167163
4	KOLAGH AT/PASKURA-II	239646	17	CGRA-II	178763
5	MOYNA	220330	18	KHEJURI 1	132992
5	NANDAKUMAK	262998	19	KHEJURI-II	139463
7	CHAND1PUR	176704	20	BGAGAWANPUR-II	192162
8	MAHISADAL	199613	21	RAMNAGAR-I	161986
9	NANDIGRAM-I	202032	22	RAMNAGAR-II	156054
10	NANDIGRAM-II	117945	23	CONTAI-I	170894
11	SUTAHATA	118629	24	CONTAI-II /DESHAPRAN	170938
12	HALDIA	97992	25	CONTAI-III	157793
13	PATASPUR-I	166977	-	-	-

Solution 1: Arbitrary Method

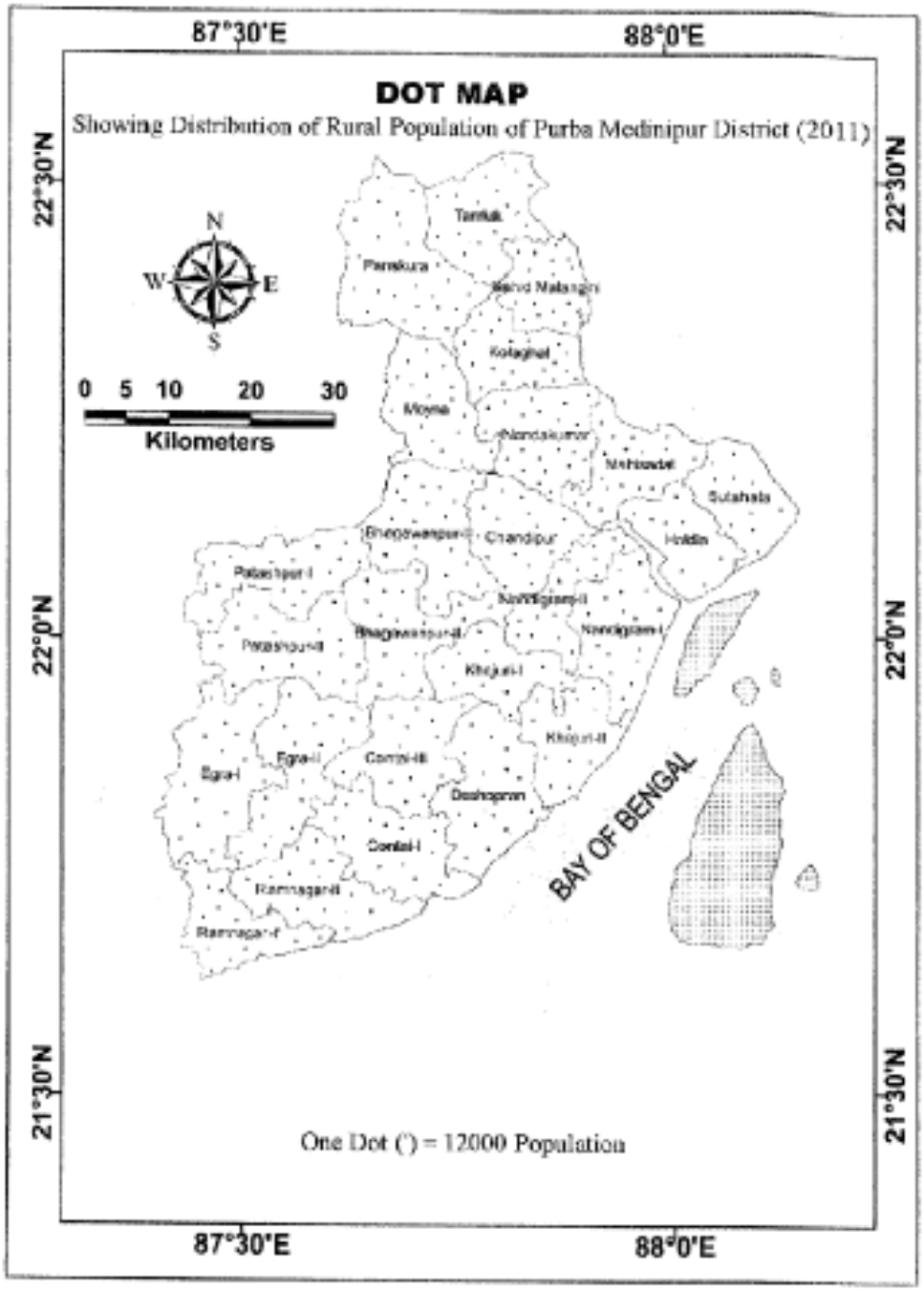
Worksheet for Dot Map

Sl. No.	C.D. Block	Rural Population (2011)	No. of Dots	Remarks
1	TAMLUK	207064	17	**Arbitrary Method is applied** 1 Dot = 12000 Population No. of Dot of Tamluk is: $= \frac{207064}{12000} = 17.25\ (17)$
2	SAHID MATANGINI	183987	15	
3	PASKURA-I	283303	24	
4	KOLAGHAT/PASKURA-II	239646	20	
5	MOYNA	220330	18	
G	NANDAKUMAK	262998	22	
7	CHAND1PUR	176704	15	
8	MAHISADAL	199613	17	
9	NANDIGRAM-I	202032	17	
10	NANDIGRAM-II	117945	10	
11	SUTAHATA	118629	10	
12	HALDIA	97992	8	
13	PATASPUR-I	166977	14	
14	PATASPUR-Il	175056	15	
15	BHAGABANPUR-I	222677	19	
16	EGRA-I	167163	14	
17	CGRA-II	178763	15	
18	KHEJURI 1	132992	11	
19	KHEJURI-Il	139463	12	
20	BGAGAWANPUR-Il	192162	16	
21	RAMNAGAR-I	161986	13	
22	RAMNAGAR-II	156054	13	
23	CONTAI-I	170894	14	
24	CONTAI-Il /DESHAPRAN	170938	14	
25	CONTAI-III	157793	13	

Solution 2: Fixed Number Method

Worksheet for Dot Map

Sl. No.	C.D. Block	Rural Population (2011)	Remarks
1	TAMLUK	207064	**Fixed-Number method Is applied.** Selection of Value for 1 Dot Highest population is found in Paskura-I: 283303 which is equivalent to 100 dots. Value of 1 Dot is $= \frac{283303}{100}$=2833.03 = 2800 (Round off) 1 Dot = 2800 Population No. of Dot of Tamluk is: $= \frac{207064}{2800}$=74.0942 (74)
2	SAHID MATANGINI	183987	
3	PASKURA-I	283303	
4	KOLAGHAT/PASKURA-II	239646	
S	MOYNA	220330	
6	NANDAKUMAK	262998	
7	CHAND1PUR	176704	
8	MAHISADAL	199613	
9	NANDIGRAM-I	202032	
10	NANDIGRAM-II	117945	
11	SUTAHATA	118629	
12	HALDIA	97992	
13	PATASPUR-I	166977	
14	PATASPUR-ll	175056	
15	BHAGABANPUR-I	222677	
16	EGRA-I	167163	
17	CGRA-II	178763	
18	KHEJURI 1	132992	
19	KHEJURI-ll	139463	
20	BGAGAWANPUR-ll	192162	
21	RAMNAGAR-I	161986	
22	RAMNAGAR-II	156054	
23	CONTAI-I	170894	
24	CONTAI-ll /DESHAPRAN	170938	
25	CONTAI-III	157793	



Interpretation

The distribution of rural population is not equal throughout the blocks of Puiba Medinipur district. Highest rural populations found in Paskura-I (283303) & lowest rural population is found in Haldia (97992). Productivity of land: transport system, availability of sales & service centre is the determining factor for the distribution of rural population in this district.

3.4. Sphere Diagram

Sphere Diagram is generally used to represent urban population respectively at one go. Sphere generally is used to represent volume specifically when the data is disproportionately large and cannot be represented properly by using and two dimensional diagrams. Sphere thus is a 3-dimensional diagram. Sphere is used to represent urban population as very large population is concentrated in a very small areal unit i.e. a town or city which is represented often by a singular marker on a map.

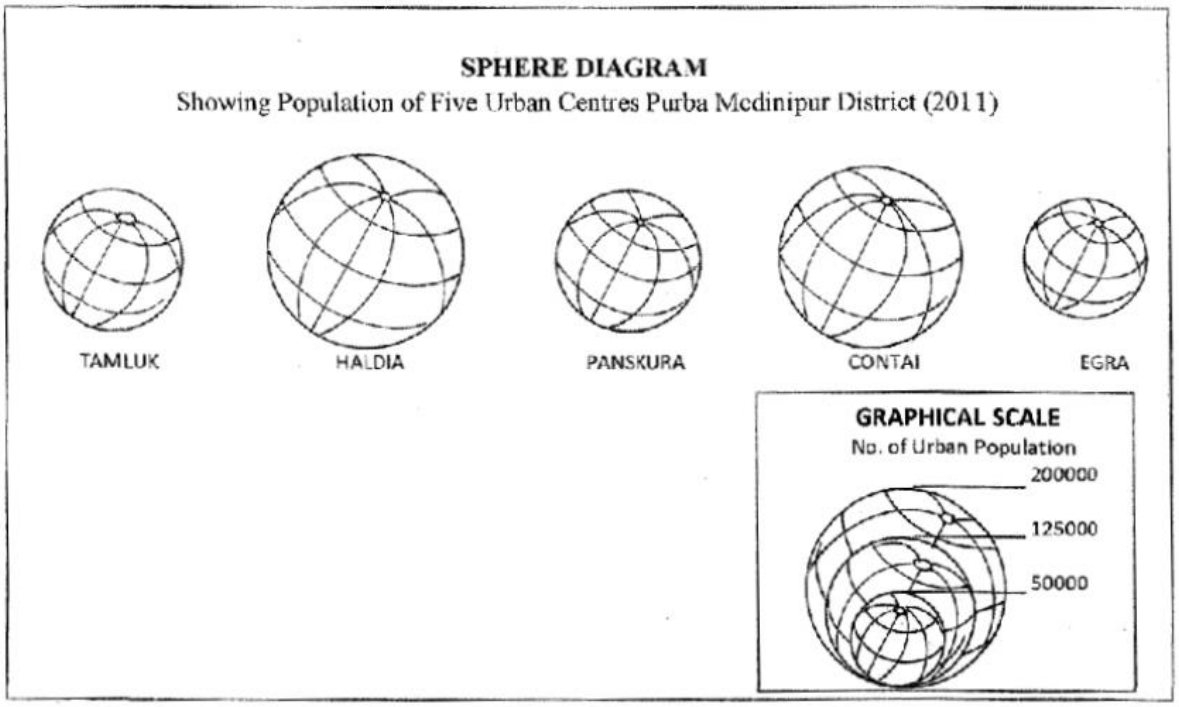
Example

Draw a sphere diagram to show the following dataset and interpret the prepared diagram.

Sl. No.	CD. Block	Urban Population (2011)
1	TAMLUK	65300
2	HALDIA	200827
3	PANSKURA	57932
4	CONTAI	92226
S	EGRA	30148

Worksheet for Sphere Diagram

SL No.	C.D. Block	Urban Population (Pu)	Radius of Circle $r = 0.62035\sqrt[3]{P_U}$	Scale (r) 1 cm. to 20 unit
1	TAMLUK	6530G	24.9816	1.24
2	HALDIA	200827	36.3282	1.82
3	PANSKUKA	57932	24.0035	1.20
4	CONTAI	92226	28.0277	1.40
5	CGRA	30148	19.3073	0.96
For Graphical Scale				
1		200000	36.2782	1.81
2		125000	31.0175	1.55
3		50000	22.8538	1.14



Interpretation

The number of urban population is shown by sphere diagram through this diagram it is clearly found that the number of urban population is not evenly distributed through the district Highest and lowest urban population founds in Haldia (200827) & Egra (30148). Employment opportunities, presence of different industries, and transport facilities etc. are main causes of this uneven distribution.

4. Thematic Maps: Choropleth Map, Isoline Map, Chorochromatic Map

4.1. Choropleth Map

The choropleth maps are also drawn to depict the data characteristics as they are related to the administrative units. These maps are used to represent the density of population, literacy/growth rates, sex ratio, etc.

Requirement for drawing Choropleth Map

(a) A map of the area depicting different administrative units.
(b) Appropriate statistical data according to administrative units.

Steps to be followed

(a) Arrange the data in ascending or descending order.
(b) Group the data into 5 categories to represent very high, high, medium, low and very low concentrations.
(c) The interval between the categories may be identified on the following formulae i.e., Range/5 and Range = maximum value – minimum value.
(d) Patterns, shades or colour to be used to depict the chosen categories should be marked in an increasing or decreasing order.

Example

Draw a Choropleth Map according to given data to show population density in Purba Medinipur district and interpret it.

Sl. No.	C.D. Block	Population (2011)	Area (Sq. km)	Sl. No.	C.D. Block	Population (2011)	Area (Sq. km)
1	TAMLUK	283082	133.86	14	PATASPUR-II	1/5056	191.74
2	SAHID MATANGINI	199210	97.82	15	BHAGABANPUR-I	234432	174.24
3	PASKURA-I	341235	240.92	16	EGRA-I	197311	218.08

4	KOLAGHAT/PASKURA-II	290124	.147.91	17	CGRA-II	178763	184.71
5	MOYNA	226927	154.51	18	KHEJURI 1	132992	130.51
6	NANDAKUMAK	262998	165.7	19	KHEJURI-ll	139453	137.46
7	CHAND1PUR	138119	137.58	20	BGAGAWANPUR-ll	196162	180.2
8	MAHISADAL	206277	146 48	21	RAMNAGAR-I	167330	139.43
9	NANDIGRAM-I	207835	181.84	22	RAMNAGAR-II	156054	163.27-
10	NANDIGRAM-II	123219	105.74	23	CONTAI-I	170894	155.27
11	SUTAHATA	123784	/9.54	24	CONTAI-ll /DESHAPRAN	268519	184.55
12	HALDIA	298864	170.34	25	CONTAI-III	157793	160.52
13	PATASPUR-I	173377	172.26	-	-	-	-

Solution

Step I: Determination of Density, $\rho = \frac{P}{A}$ $[P = \text{Ppoulation}, A = \text{Area}]$

Worksheet for Choropleth Map

(Area must be in Sq. Km. or 1 hectare = 0.01 Sq. Km., 1 Acre = 0.004047)

Sl. No.	C.D. Block	Population (2011)	Area (Sq. km)	Population Density/ Sq. km (2011)	Grade
1	TAMLUK	283082	133.86	2114.76	I
2	SAHID MATANGINI	199210	97.82	2036.50	I
3	PASKURA-I	341235	246.92	1381.97	IV
4	KOLAGHAT/PASKURA-II	290124	147.91	1961.49	I
5	MOYNA	226927	154.51	1468.69	IV
6	NANDAKUMAK	262998	165.7	1587.19	III
7	CHAND1PUR	138119	137.58	1367.34	IV
8	MAHISADAL	206277	146.48	1408.23	IV
9	NANDIGRAM-I	207835	181.84	1142.96	V
10	NANDIGRAM-II	123219	105.74	1165.30	V
11	SUTAHATA	123784	79.54	1556.25	III
12	HALDIA	298864	170.34	1754.51	I I
13	PATASPUR-I	173377	172.26	1006.48	VI
14	PATASPUR-ll	1/5056	191.74	912.99	VI
15	BHAGABANPUR-I	234432	174.24	1345.45	IV
16	EGRA-I	197311	218.08	904.76	VI
17	CGRA-II	178763	184.71	967.80	VI
18	KHEJURI 1	132992	130.51	1019.02	VI
19	KHEJURI-ll	139453	137.46	1014.57	VI
20	BGAGAWANPUR-ll	196162	180.2	1088.58	VI
21	RAMNAGAR-I	167330	139.43	1200.10	V
22	RAMNAGAR-II	156054	163.27	955.80	VI
23	CONTAI-I	170894	155.27	1100.62	V
24	CONTAI-ll /DESHAPRAN	268519	184.55	1455.54	IV
25	CONTAI-III	157793	160.52	983.01	VI

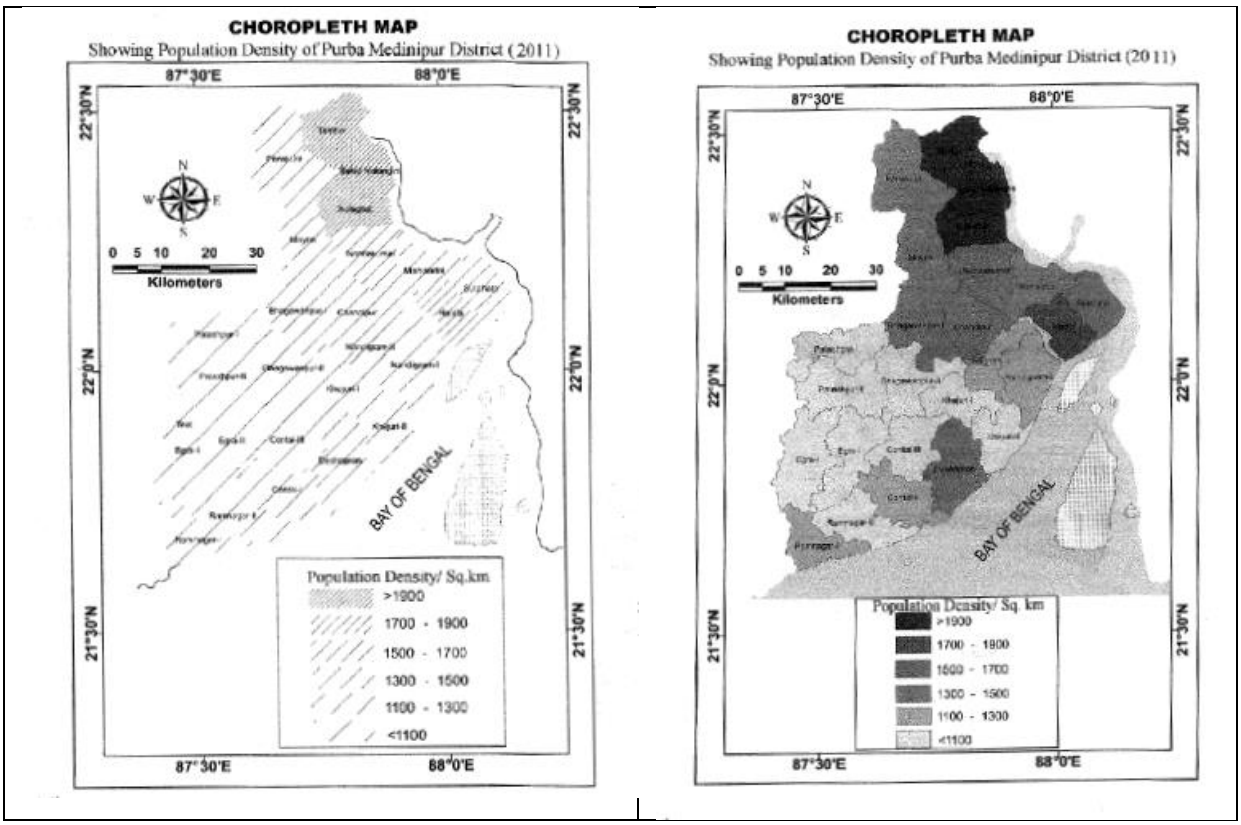
Step II: Selection of No. of Class, (C) = $1 + 3.322 \log N$ [N = No. of Observation]

$$= 1 + 3.322 \log 25 = 5.64395 \text{ (6 Classes)}$$

Step III: Determination of Class Interval, (I) = $\frac{\text{Highest Value} - \text{Lowest Value}}{\text{No.of Class}} = \frac{2114.76 - 904.76}{6} =$ 201.6666 [200]

Step IV: Construction of Choropleth Table:

Population Density/Sq. Km.	Sl. No. of CD Block	Grade	Remarks
Below 1100	13, 14, 16, 17, 18, 1920, 22, 25	VI	Exclusive method is applied to form classes, which has two open ends.
1100 – 1300	9, 10, 21, 23	V	
1300 – 1500	3, 5, 7, 8, 15, 24	IV	
1500 – 1700	6, 11	III	
1700 – 1900	12	II	
Above 1900	1, 2, 4	I	



Interpretation

The nature of population density is not equal throughout the blocks of Purba Medinipur district. Highest population density founds in Tamluk (2114.76/Sq.km) & lowest population density founds in Egra-I (904.76/ Sq. km). Remaining blocks are falls between the (1100 - 1900/ Sq.km) population density zones. Though population density is high in this region but the root causes of inter block disparities of population density is uneven distribution of resources, unsafe drinking water, unavailability of better educational facilities, unplanned infrastructural development, insufficient transport system, unavailability of proper medical care facilities etc.

4.2. Isoline Map

Geographical facts may be represented by drawing the lines of equal values on a map. All such maps are termed as Isopleth Map. The word Isopleth is derived from Iso meaning equal and pleth means lines. Thus, an imaginary line, which joins the places of equal values, is referred as Isopleth. The more frequently drawn isopleths include Isotherm (equal temperature), Isobar (equal pressure), Isohyets (equal rainfall), Isonephs (equal cloudiness), Isohels (equal sunshine), contours (equal heights), Isobaths (equal depths), Isohaline (equal salinity), etc.

Requirement

(a) Base line map depicting point location of different places.
(b) Appropriate data of temperature, pressure, rainfall, etc. over a definite period of time.
(c) Drawing instrument specially French Curve, etc. Rules to be observed
(a) An equal interval of values be selected. (b) Interval of 5, 10, or 20 is supposed to be ideal.
(b) The value of Isopleth should be written along the line on either side or in the middle by breaking the line. Interpolation Interpolation is used to insert the intermediate values between the observed values of at two stations/locations, such as temperature recorded at Chennai and Hyderabad or the spot heights of two points. Generally, drawing of isopleths joining the places of same value is also termed as interpolation.

Method of Interpolation

For interpolation, follow the following steps:

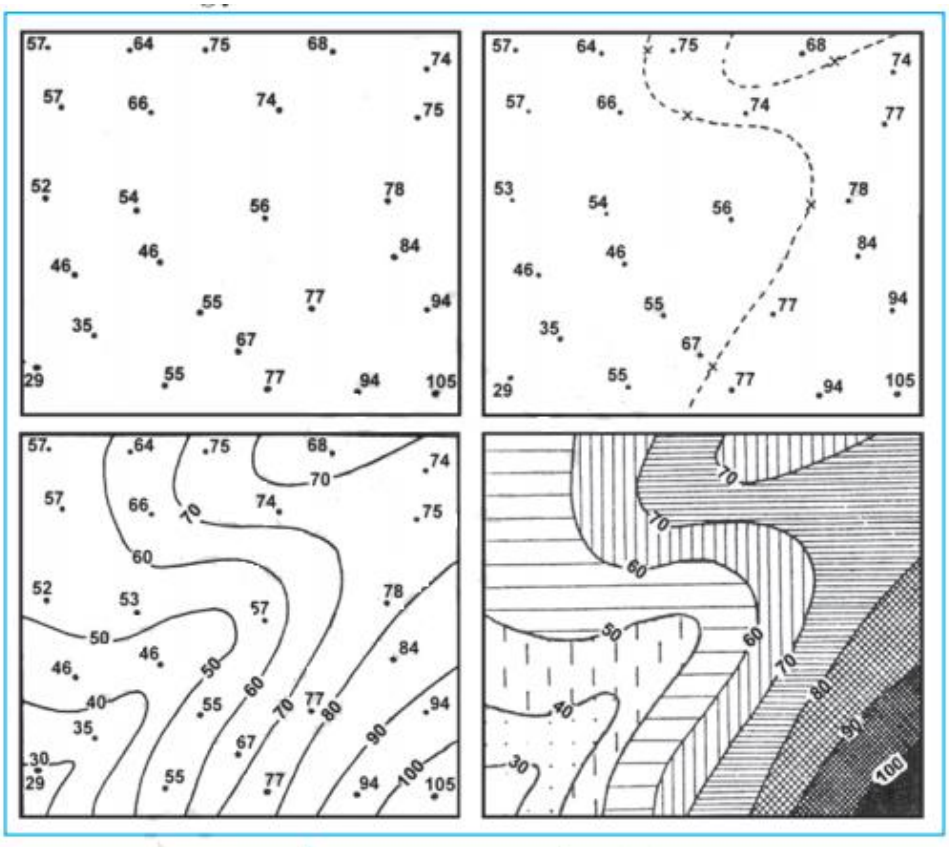
(a) Firstly, determine the minimum and maximum values given on the map.
(b) Calculate the range of value i.e. Range = maximum value – minimum value.
(c) Based on range determines the interval in a whole number like 5, 10, 15, etc.

The exact point of drawing an Isopleth is determined by using the following formulae.

$$\textbf{Point of Isopleth} = \frac{\textbf{Distance Between Two Points in CM}}{\textbf{Difference Between the Two Values of Corresponding Points}} \times \textbf{Interval}$$

The interval is the difference between the actual value on the map and interpolated value. For example, in an Isotherm map of two places show 28°C and 33°C and you want to draw 30°C isotherm, measure the distance between the two points. Suppose, the distance is 1 cm or 10 mm and the difference between 28 and 33 is 5, whereas, 30 is 2 points away from 28 and 3 points behind 33, thus, exact point of 30 will be. Thus, isotherm of 30°C will be plotted 4mm away from 28°C or 6mm ahead of 33°C.

(d) Draw the isopleths of minimum value first; other isopleths may be drawn accordingly.



Drawing of Isopleths

4.3. Chorochromatic Map

A Chorochromatic map, also known as an area-class, qualitative area, or mosaic map, is a type of thematic map that portray regions of categorical or nominal data using variations in colour symbols. Chorochromatic maps are typically used to represent discrete fields, also known as categorical coverages. Chorochromatic maps differ from choropleth maps in that chorochromatic maps are mapped according to data-driven boundaries instead of trying to make the data fit within existing, sometimes arbitrary units such as political boundaries.

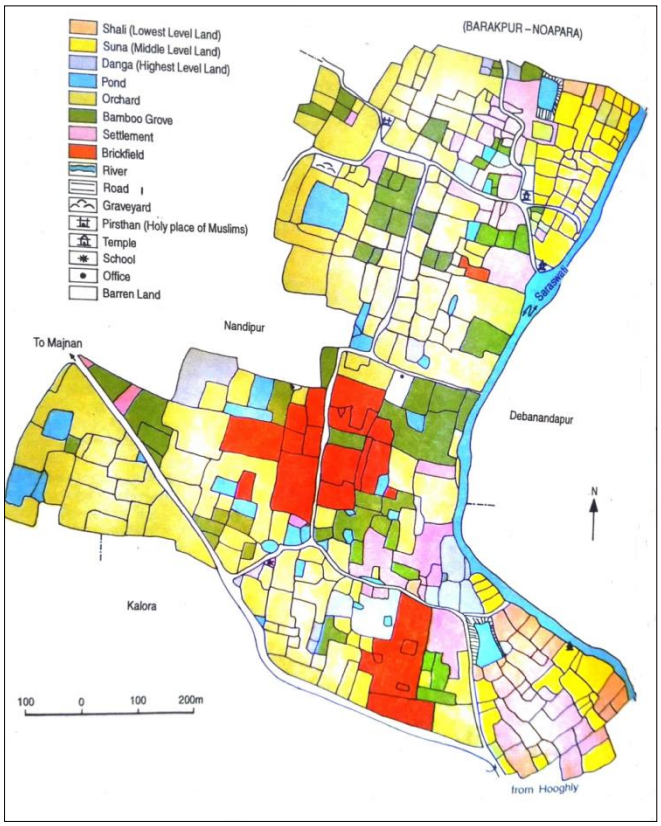
Chorochromatic maps can be categorized as either simple or compound.

(1) **Simple chorochromatic:** Simple chorochromatic maps show single regions or categories with spatially intermittent frequencies (i.e., there are gaps between the regions). An example of this would be showing the distribution of forests or mineral deposits. The chosen variable is represented by a single color symbol or pattern without subdividing it further into subgroups.

(2) **Compound chorochromatic:** Compound chorochromatic maps represent a full discrete field, consisting of a set of regions of different categories. One example would be a full vegetation map, in which the different kinds of vegetation are all shown on the same map, using different symbols or shading patterns.

Chorochromatic maps are much used for physical phenomena, like soils, geology and vegetation. We are able to distinguish at a glance the distribution of up to 8 differently coloured classes; if more classes have to be represented, codes should be added as well in order to be able to recognize the relevant phenomena. When used for socio-economic phenomena, the image they represent frequently has to be corrected. The use of coloured areas gives the map readers the impression that these areas are homogeneous with regard to the phenomenon mapped while in fact there may be enormous differences.

Chorochromatic Map Showing Landuse of Barakpur-Noapara, West Bengal, 1985



Source: Sarkar, 1997

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