



Introduction to Topographical Maps

Learning Outcomes

- Identifying the purpose of topographical maps
- Recognising features on a topographical sheet on the basis of colours
- Understanding the usage of signs and symbols on a map
- Understanding the need of scales on topographical maps
- Measuring the distance on a map using its scale



21st critical thinking

Thinking Cap

We can easily show the height of physical features like mountains and valleys in 3 dimensions. How do you think cartographers represent the height of features on 2-dimensional maps, without even using colours?

ANM

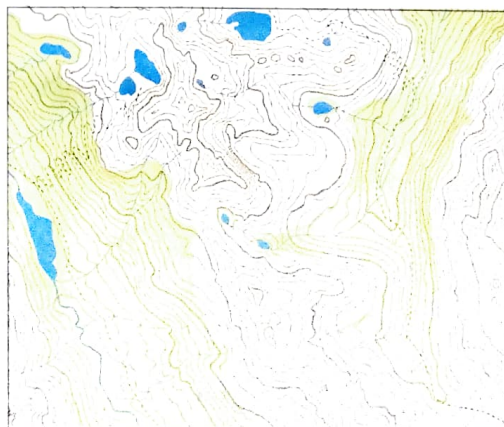
A topographical, or a survey map, is a large-scale map. It shows great details of small areas with the help of specific colours and a fixed set of symbols, called conventional symbols.



Topographical maps help you visualise the shape of the ground in a region. These contain illustrations of a surface area to depict the accurate elevation of geographical features. Toposheets are used to represent both natural and human-made features like:

- **Relief:** Mountains, valleys, slopes and depressions, as defined by contours
- **Hydrography:** Lakes, rivers, streams, swamps, rapids, falls and coastal flats

- **Vegetation:** Wooded and cleared areas, vineyards and orchards
- **Transportation:** Roads, trails, railways, bridges, airports/airfields
- **Infrastructure:** Buildings, urban developments, power transmission lines, pipelines and towers
- **Boundaries:** International, provincial/territorial, administrative, recreational and geographical
- **Toponymy:** Place names, water feature names, landform names and boundary names



A generic topographic map depicting rugged mountain peaks, lakes, rivers and trails



A topographical map contains the same elements generally used in a non-topographical map, like scale, legend and the north arrow. The map legend provides a complete listing of all the features and their corresponding symbols.

Did you know?

Toposheets are prepared in multiple series. All the maps in a series use the same reference point, scale, projection, conventional signs, symbols and colours.

The national mapping agency of every country creates and publishes topographical maps. The Survey of India (SOI) publishes topographical maps of our country.

Purpose of a Topographical Map

A topographical map is generally used as a base to draw other types of maps. Government agencies use toposheets in urban planning, resource development and surveys.

Hikers and climbers use toposheets to calculate the height of roads, hills and mountains.

Contour Method

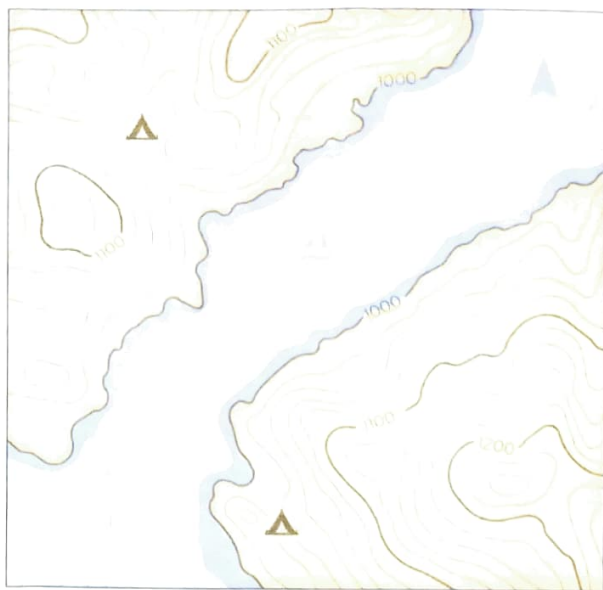
The most commonly used method to represent physical features on a topographical map is drawing contour lines. It is an effective method to show relief or elevation.

Contour Lines

A contour line connects places of equal elevation on a toposheet.

These lines show the height of the ground above or below the mean sea level. Every fifth contour line on a topographical map is labelled for easy reading. This line is called **index contour**. Index contours are bolder

than the other contour lines on a map. A toposheet consists of multiple closed shapes that contour lines form.



A topographic map showing contour lines

The spacing between contours helps determine the elevation. If the lines are close to each other, it represents a steep slope. If the lines are far apart, it denotes a gentle slope or a flat terrain.

Contour Interval

Contour interval is the altitudinal difference between two successive contour lines. It is constant throughout the map. In topographical maps, contour interval is usually 20 m or 10 m. Horizontal distance or spacing between successive contour lines, on the other hand, varies based on the steepness of slope of the land. The steeper the slopes, the closer are the lines and the smaller the spacing. On gentle slope areas, such as plains, contour lines have large gaps.

Generally, contour intervals are provided on each topographical map. However, it can also be calculated by counting the number of contours till the next labelled line.

Once you know the contour interval, you can calculate the height of the geographical feature.

Did you know?

A relief map is a topographic map without contour lines. It uses colours to show changes in elevation.

Use of Colours in Topographical Maps

In a topographical map, colours are used to depict different types of physical, economical and cultural features. It is difficult to interpret a map if colours are not used. The following seven colours are commonly used to depict terrain and other features on these maps.

Black

All writings on the map, except grid numbers, are in black. These include names, abbreviations such as DB, RS, PO, river banks, broken ground, dry streams, surveyed trees, point heights and their numbering, fire lines, railway lines, telephone and telegraph lines. Lines of latitude and longitude, all boundaries, any written amplification (such as 'open scrub', 'metalled road under construction', 'meter gauge') are also in black.

Did you know?

Surveyed trees are shown in black. These are prominent trees that have been surveyed accurately and have identification number carved on the trunk. These serve as landmarks for further survey related work and are banned for felling.

Blue

All perennial water bodies, such as seas, rivers, lakes, falls, rapids, swamps and marshes are in blue.

Green

Vegetation like wooded and forested areas are shown with green wash. Orchards, scattered trees and scrubs are shown in green colour.

Yellow

All cultivated areas on a toposheet are usually shown using shades of yellow.

White Patches

These show barren, wasteland or uncultivated land; glaciated and snow covered areas in mountains.

Brown

Shades of brown are used to show relief features and elevation. Contour lines and figures denoting the height of a contour are also shown in brown. Physical features such as sand hills, sand dunes and shifting sands are also depicted in brown.

Red

Grid lines (eastings and northings) and their numbering, all roads (metalled and unmetalled), cart tracks, footpaths, settlements, huts and buildings are red.
















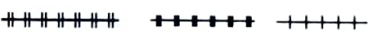











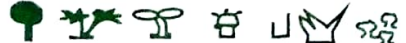
Signs and Symbols Used on a Topographical Map

Symbols are diagrams, designs, letters or abbreviations shown on maps. A symbol represents a specific feature or an object on topographical sheets.

Did you know?

Signs and symbols can maximise the amount of information you can add in a map. Symbols are also useful in case the person looking at the map doesn't know the language used on map.

The following are important symbols used in a topographical map:

International boundary	
State boundaries: Demarcated, Undemarcated	
District boundaries: Subdivision, Tehsil, Forest	
Boundary pillars: Surveyed, Unlocated, Village tri-junction	
Roads, Metalled roads, Distance stone	
Roads, Unmetalled roads, Bridge	
Cart-track, Pack-track and pass, Footpath with bridge	
Streams: With tracks in bed, Undefined, Canal	
Dams: Masonry/rock filled, Earthwork, Weir	
Dry river with water channel, River with islands and rocks, Tidal river	
Swamps, Reeds	
Wells: Lined, Unlined	
Spring, Tank: Perennial, Dry	
Embankments: Road/Rail	
Railway broad gauge: Double, Single with station, Under construction	
Double gauge railway, Single gauge railway with distance stone, Railway under construction	
Light railway or tramway, Telegraph line, Cutting with tunnel	
Contours, Cliffs	
Sand features: Flat, sand hills (permanent), dunes (shifting)	
Towns or villages: Inhabited, Deserted,	
Fort	
Huts: Permanent, Temporary	
Tower, Antiquities	
Temple, Chhatra, Church, Mosque, Idgah, Tomb, Graves	
Lighthouse, Lightship	
Buoys: Lighted, Unlighted, Anchorage	
Mine, Vine on trellis, Grass, Scrub	
Palms: Palmyra, Plantain, Conifer, Bamboo, Other trees	



Heights triangulated: Station, Point, Approximate	Δ 200 • 200 • 200
Bench-mark: Geodetic, Tertiary, Canal	BM 63.3, DM 63.3, .63
Post office	PO
Police station	PS
Bungalows: Dak or travellers, Inspection, Rest-house	DB, IB (Canal), RH (Forest)
Circuit house	CH
Camping ground	CG
Forest: Reserved, Protected	RF, PF

Scale



Scale refers to the relationship between the distance of a location from a point on the map with its actual distance on the ground. It is the ratio of distance between two places on the map to their actual distance on the ground. Scaling ensures that objects on the ground are proportionally represented on the map. It also helps calculate distance between two locations on Earth.

Types of Scales

There are three ways to represent map scales.

Representative Fraction (RF)

In this type of scaling, the numerator represents the distance on the map and the denominator represents the distance on the ground. The numerator value is always 1, and the numerator and denominator values have the same unit. The unit can be represented in centimetres, metres, feet, inches, etc.

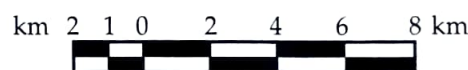
$$RF = \frac{\text{Distance on the map}}{\text{Distance on the ground}}$$

For example, 1 cm on the map represents 20,000 cm on the ground can be represented as,

$$RF = \frac{1}{20,000} \text{ or } 1 : 20,000$$

Linear or Graphical Scale

It is similar to a ruler. This consists of a straight line, which is divided into lengths that represent given distances on the Earth's surface. It is usually drawn near the lower portion of the map.



A graphic or linear scale

In the diagram above, the linear scale has five equal parts. Each part of 1 cm represents a distance of 1 km on the ground. At the extreme left, one part is further divided into two parts of 0.5 cm, which represents 500 m on the ground.

Verbal Scale

Verbal scales are also called statement scales. Here, the map scale is described in words. The statement that represents a scale includes the unit. For example, 1 cm distance on the map is equal to 25 km distance on the ground is represented as 1 cm : 25 km or 1 cm to 25 km.

ACTIVITY



art integration

What is the distance of your school from your home? Draw a rough map to indicate the route. Include a map scale using representative fraction.



Measuring Distance on a Map

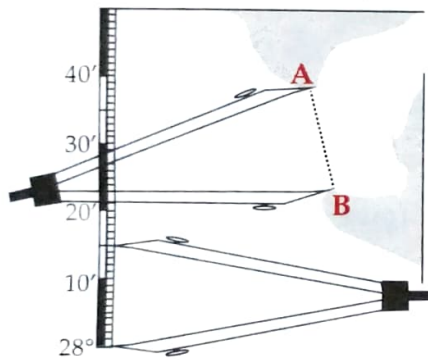
Measuring distance is an important part of map reading. It can be useful while travelling to a destination or to search for a location. You can measure distances on the map along a straight line or along curved lines.

Along a Straight Line

A ruler is used to measure the distance between any two points on a map. After calculating the distance on the map, you can use the map scale to calculate the distance on the ground.

Along Curved Lines

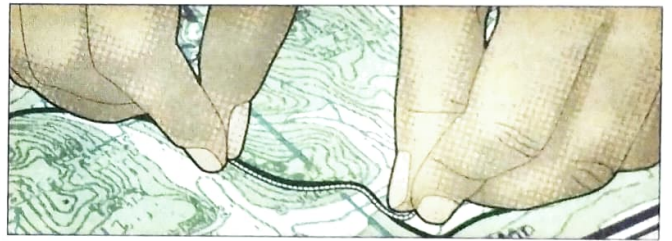
Curved lines can be railway lines, roads, rivers, etc. There are two methods to measure distances along curved lines.



The divider method

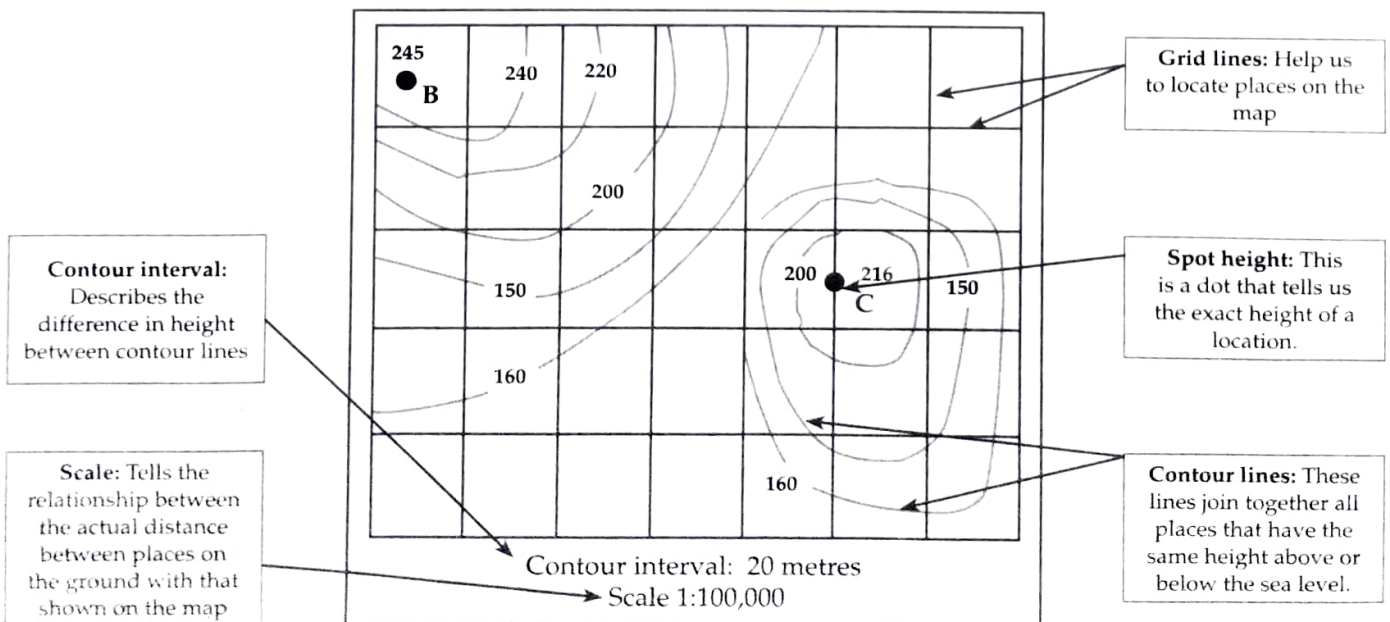
The divider method: In this method, a divider is used as a tool. To measure the distance, set the pointed ends of the divider 1 cm or 2 cm apart. Keep one pointed end of the divider at one end of the object. Turn the divider continuously until you reach the other end. Count the number of turns and by using the scale of the map, calculate the distance on the ground.

The twine method: In this method, a string is used to measure the distance on the map. Place the string along the feature that you want to measure from one end to the other. Ensure that all bends and curves are followed. Measure the length of the string and using the map scale, calculate the distance on the ground.



The twine method

AT A GLANCE



EXERCISE



INT






A. Fill in the blanks.

- Toposheets allow you to visualise the shape of the _____ in a region.
- A _____ connects places of equal elevation on a toposheet.
- Names and abbreviations in a toposheet are shown using _____ colour.
- Human-made features, such as settlements are shown with the help of _____ colour.
- A _____ represents a specific feature or object on topographical sheets.

Distance on the map	Distance on the ground	Scale
a. 2 cm	_____ km	1 cm : 25 km
b. 5 cm	15000 km	_____
c. 3 cm	_____ m	1 cm : 30 km
d. _____	500 km	1 cm : 100 km
e. _____	64 m	1 cm : 8 m

B. Match the following.

Symbol		Natural or human-made feature	
1.	-----	a.	Contours, Cliffs
2.	■ ■ ■ □ □	b.	Fort
3.	 	c.	International boundary
4.		d.	Wells
5.	● ○	e.	Huts
Term		Description	
6.	Map	f.	Used to measure distances along curved lines on the map
7.	Scale	g.	Described in words
8.	Linear scale	h.	Diagrammatic representation of the Earth's surface
9.	Verbal scale	i.	Used to calculate distance between two locations
10.	The twine method	j.	A simple line divided into equal parts by small intersecting lines

INT



C. State whether true or false.

- A toposheet can be used to represent both natural and human-made features.
- Contour lines between index lines are labelled.

INT



- Locations such as post offices and police stations are depicted using red colour on maps.
- Vegetation on maps is represented in green.
- RH denotes the presence of a type of bungalow.

D. Choose the correct answer.

- Which element provides a complete listing of all features and their corresponding symbols?

<input type="checkbox"/> title	<input type="checkbox"/> legend
<input type="checkbox"/> scale	<input type="checkbox"/> graticule
- Which type of relief is denoted when contour lines are drawn close to one another?

<input type="checkbox"/> gentle slope	<input type="checkbox"/> flat terrain
<input type="checkbox"/> steep slope	<input type="checkbox"/> undefined slope
- Which colour shows the boundaries of a country on a map?

<input type="checkbox"/> black	<input type="checkbox"/> red
<input type="checkbox"/> blue	<input type="checkbox"/> brown
- Yellow colour depicts which feature on a map?

<input type="checkbox"/> water body	<input type="checkbox"/> cultivated area
<input type="checkbox"/> town	<input type="checkbox"/> forest
- Which of the following represents a protected forest?

<input type="checkbox"/> CH	<input type="checkbox"/> PF
<input type="checkbox"/> RF	<input type="checkbox"/> PS
- This type of scale is included on the lower part of the map.

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E. Give reasons.

- Colours are used in a map.
- Contour lines help determine the elevation of a point on a map.
- Symbols are used in a topographical map.

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F. Answer in a paragraph or two.

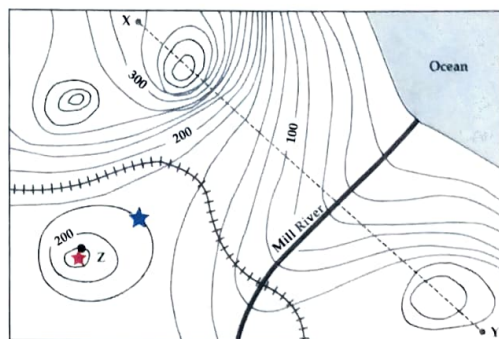
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2. What are contour lines?
3. What features are depicted using red colour on a toposheet?
4. What features are depicted using brown colour on a map?
5. Write a note on map scale.
6. Differentiate between the different types of scales used in maps.



Map work

Study the contour map carefully and answer the following questions.

1. How many hilltops are shown on this map?
2. What is the elevation at point Z?
3. In the map, Sanju is marked as the red star in the lower left portion of the map. Elevations are lower outside the rings (Sanju's location). So, Sanju is standing at _____ metres.
4. At what elevation is Suman (marked by the blue star) standing?



Contour interval = 20 m



Integrate



mathematics

Opisometer is an instrument used for measuring the length of curved lines. It is useful for investigating maps. The instrument has a toothed wheel with known circumference. To measure the length of a curved line, the opisometer is simply used to trace the line. In case, you are using an opisometer, which measurements will you require to calculate the final length?



Life Skills



critical thinking

Maps are created with the help of projections. This means that the actual distances between two locations on a globe are distorted. It happens when converting a three-dimensional object to a two-dimensional map. The distances on a map appear different from that on a globe.

List the countries that show a large difference between their size on a map and on the globe. Compare five countries and calculate the relative difference.



Project



information literacy



language and communication

Find out more information about the Survey of India, its function and importance. Write a paragraph about it in your notebook. Also, paste a picture of the organisation below its description.



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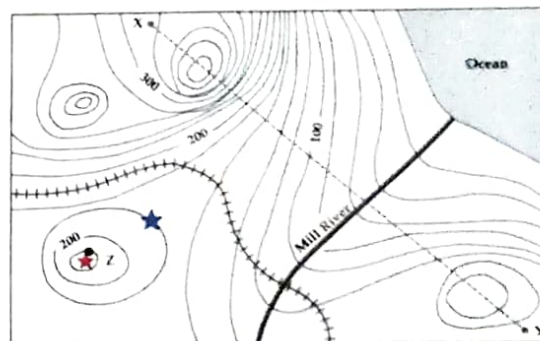
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