UNIT 9

Surveying

Unit Overview

9.1 Introduction

9.2 Clinometers

9.3 Prismatic Compass

Learning Objectives

- *Understand the importance of surveying in general.*
- *Measuring the height of an object using clinometers.*
- *Conduct and calculate the prismatic compass survey of a given spot.*

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9.1 Introduction

Surveying has been essential element in the development of man's environment for centuries. It is important in planning and execution of every form of construction. Surveying is used to map the earth above and below the sea, prepare navigational map and establish databases for natural resource management, development of engineering data for huge buildings constructions, settlements, roads, railways, bridge constructions and so forth.

Surveying is the science of measuring and recording distances, angles, heights and sizes of the earth's surface to obtain data from which accurate plans and maps are made. Generally, surveying is the systematic process of making measurements on the field from which maps are drawn. The map is the most essential piece of equipment which the geographer, engineer and architect use. The geographers must learn to read, make and use map as an essential element. In this lesson, we will see about clinometers and Prismatic Compass.

9.2 Clinometers

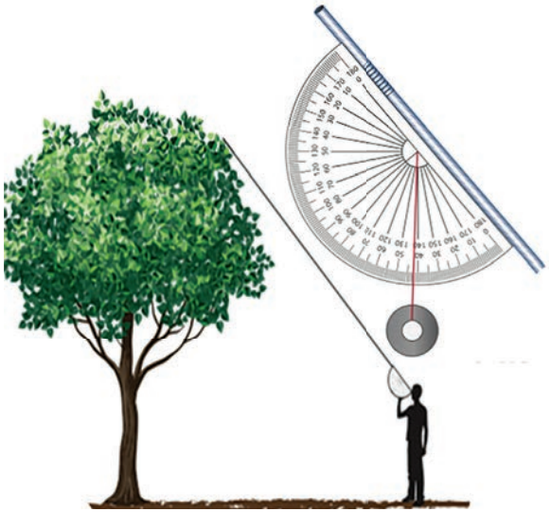
In this Instruction, we will learn how to use clinometers to measure the height of a tall object. What you will need; Clinometers, Tape, Paper, Pen or pencil, Assistant.

Step 1: Pick a Spot

Let us pick a spot to measure your object which may be a tree or electric or telephone pole. You should be far enough away from your object that you can see the top of it, and you need to be on level ground with the base of the object.

Step 2: Measure Angle

Here's where we bust out our handy clinometers. Look through the straw of your clinometers at the top of the tree or whatever object you're measuring. The weighted



string should hang down freely, crossing the protractor portion of the clinometers. Read the angle shown, and subtract from 90° to find your angle of vision from your eye to the top of the tree (it can be helpful here to have an assistant to read the measurement while we look through the straw). We record our results on a paper. From the spot, the clinometers (read by assistant) show 55°. Subtracting from 90° that indicated that we looked at an angle of 35° to the top of the tree.

Step 3: Measure Distance

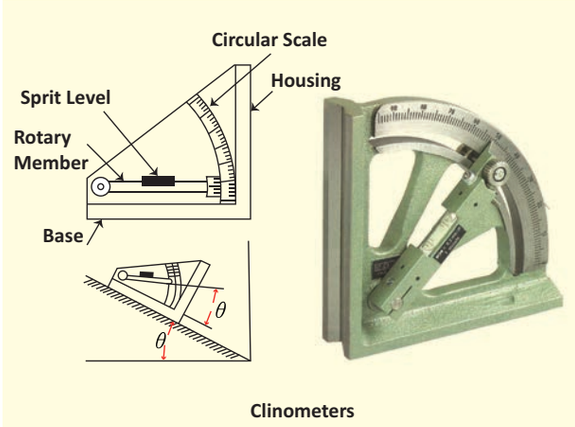
Once we have our angle of vision, we can use tape measure to find the distance from the spot we are standing to the base of the object we are measuring (an assistant comes in handy here, too). We must know how far away we are to accurately calculate the height. Our spot was 15.6 meters from the base of the tree we measured.

Step 4: Find Your Eye-height

The last piece of data you need to calculate the height of the object is the height from the ground to our eye (our eye-height). We must have the assistant help us measure this using our tape measure. Our eye height was recorded for this example as 1.64 metres.

Step 5: Draw a Picture

In calculating the height of the object you just measured, we find it helpful to begin by

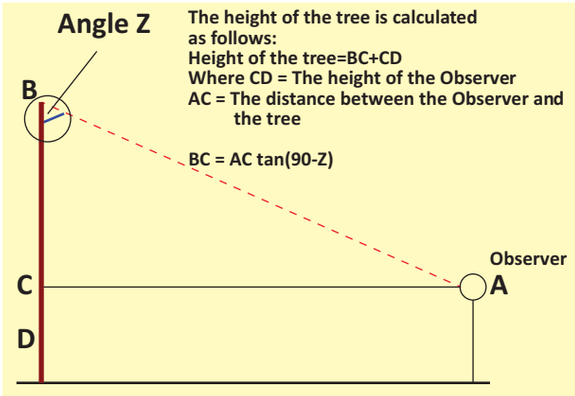


Clinometers

drawing a picture and labeling it with all of the information we have.

Step 6: Model as a Triangle

The next step is to simplify our drawing to model our system as a right triangle. Label our triangle with the angle we read on our clinometers as well as the distance you were standing from the object (we don't need the eye-height just yet).



We can find x in this triangle (which represents the portion of the height from eye-level up) by using some basic trigonometry, specifically the tangent ratio of the triangle:

tan(**angle**) = x / **distance**

Multiply by the distance on both sides and you get:

x = tan(**angle**) * **distance**

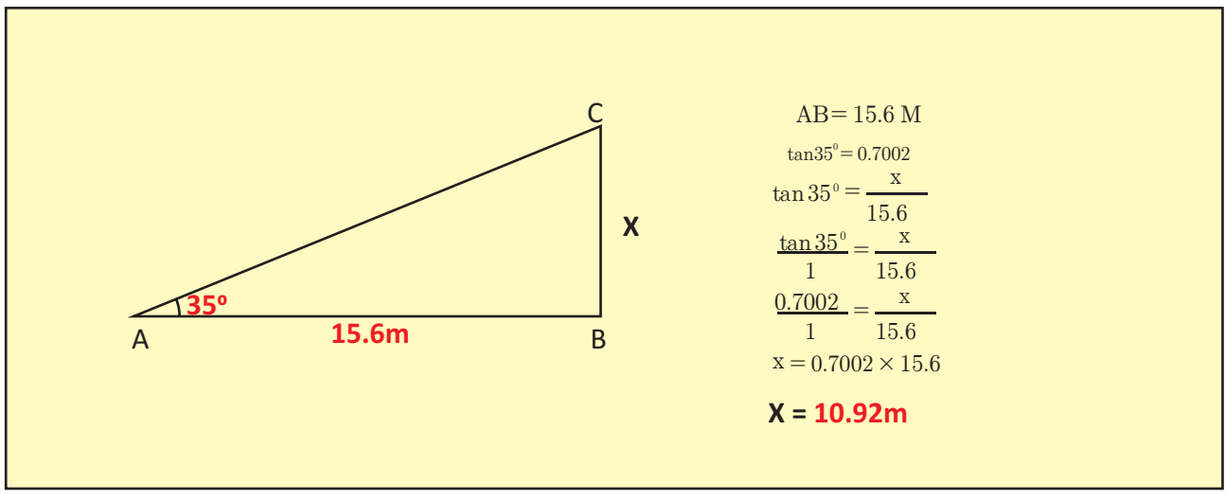
Use a calculator to multiply these together and get a decimal value.

In the example:

tan(35°) = x / 15.6

x = tan(35°) * 15.6

x = 10.92 metres



Step 7: Combine with Eye Height

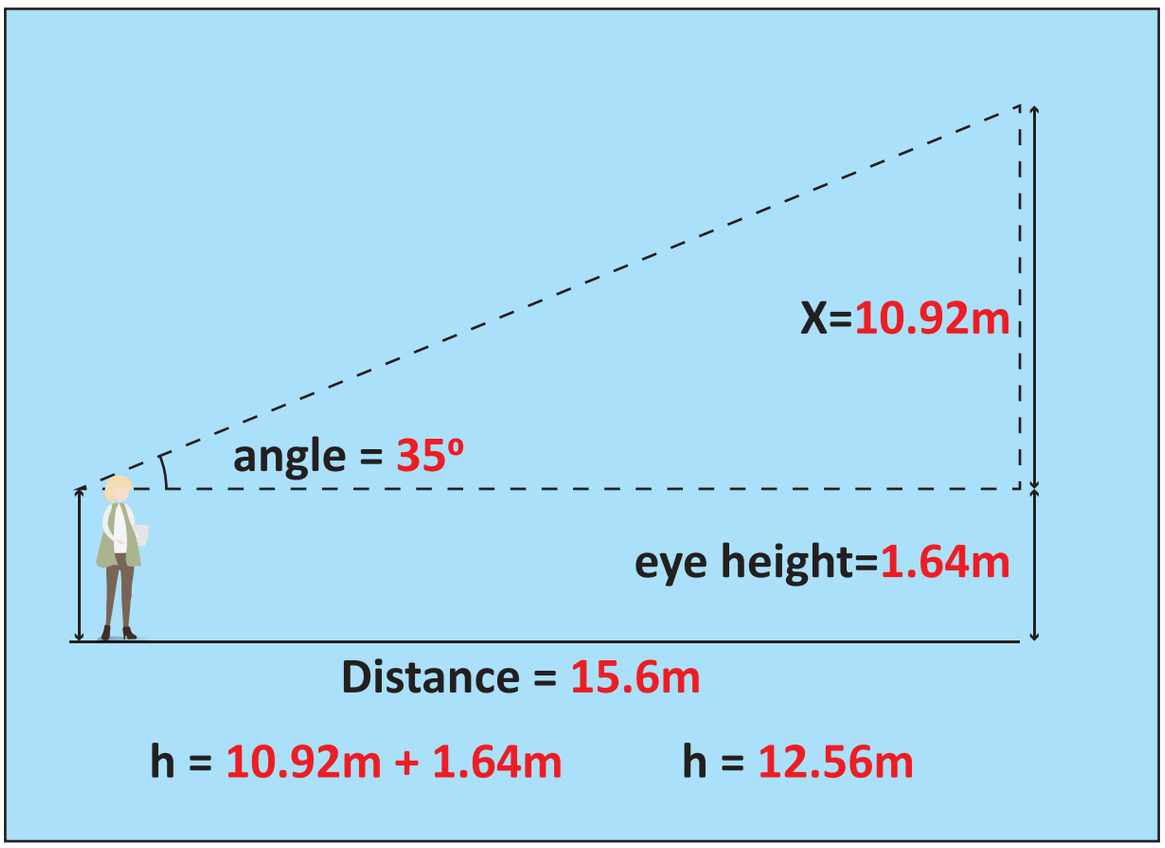
To find the height of our object, we bring this x value back to the original drawing. By labeling it, we can see that the height of the object, h, is equal to the x value we just found plus the eye-height we measured earlier:

h = x + (eye-height)

In the example:

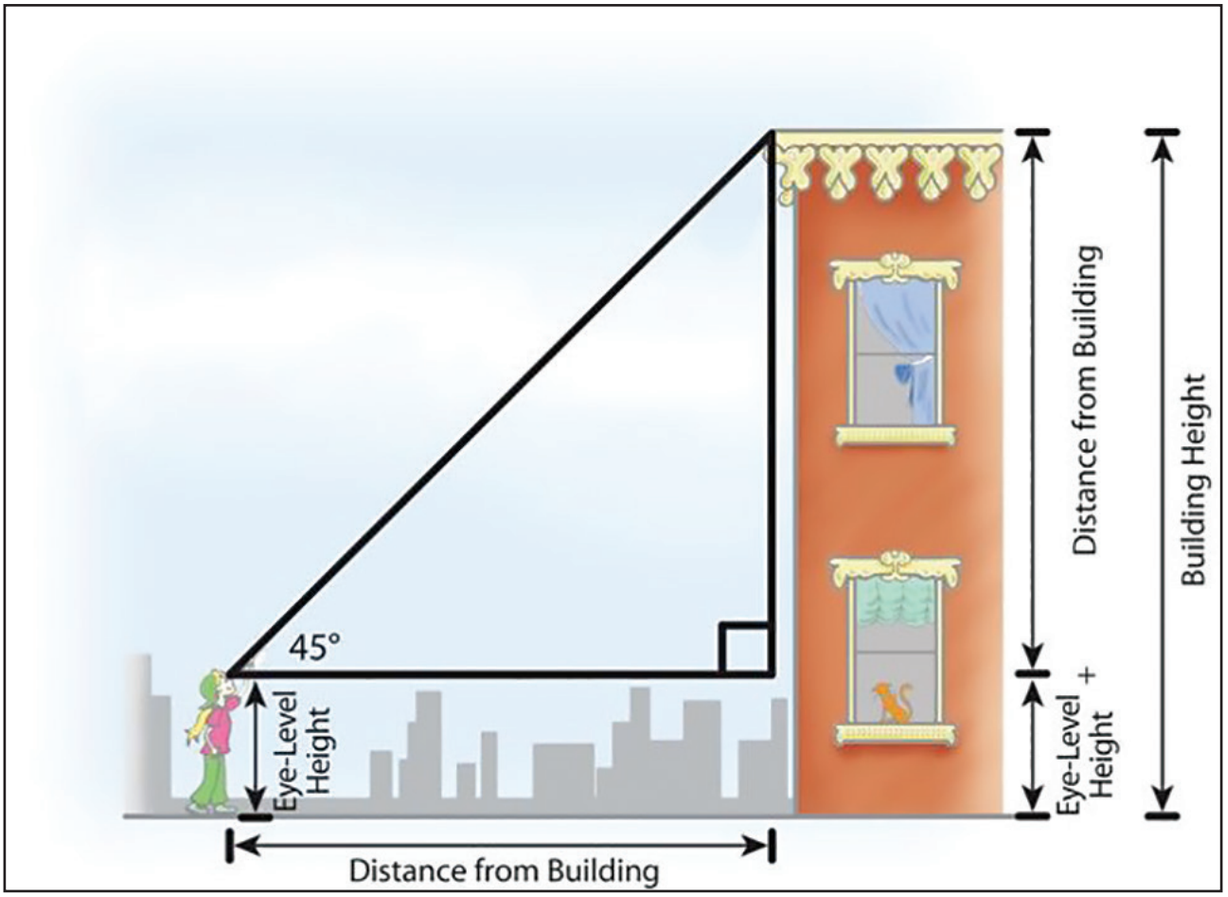
h = 10.92m + 1.64m

h = 12.56m



Exercise

Find out the height of the building shown below. Or Find out the height of a tree or building or electric pole near your premise. Given eye sight and distance from the building are 1.5m and 18m respectively



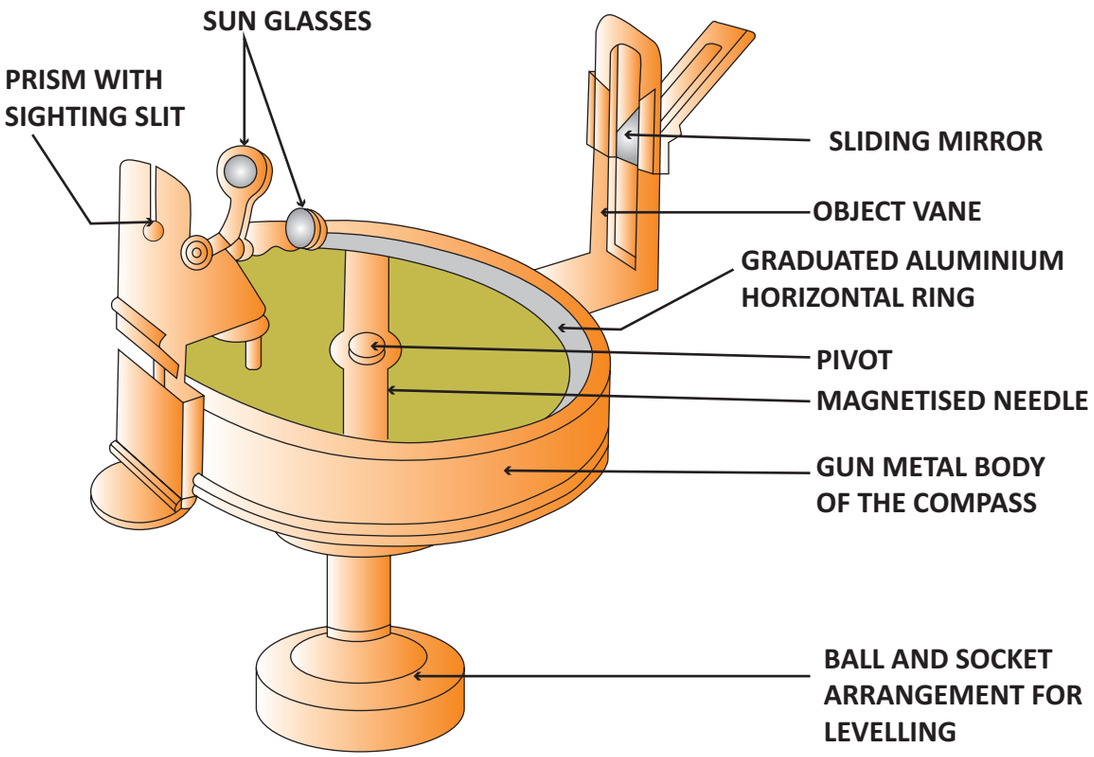
9.3 Prismatic Compass

Prismatic compass is a simple instrument comprising an aluminum ring graduated to 30 minutes held at the top of a broad magnetic needle set in balance on a hard steel pivot. This compass is fitted in a circular metal box with a transparent glass cover. The glass – top is further covered with a hinged metal lid. On one side of the circular box there is a hinged eye- vane with a prism having convex vertical and horizontal face in order to magnify the marking of degree on the aluminium ring as reflected from the hypotensual side of the prism. Two coloured sunglasses are set at a hinge to avoid direct sun rays at the eye vane.

On the other side of the circular box, there is a sighting vane consisting of a hinged metal frame with a horse hair at the centre. This horse hair in reality may be a fine silk thread or a metal wire. A hinged adjustable mirror is set on the outer side of the sighting vane in order to locate the too high or too low object through reflection.

There is a brake pin or knob which brings the oscillating circular ring to standstill.

The metal box has a threaded bottom which can be screwed in by another threaded knob at the top of a ball fitted and adjustable in a socket of the compass- stand.



Prismatic Compass

Use of Prismatic Compass

Prismatic compass measures the horizontal angle with reference to the magnetic north- line. The bearing thus obtained is a magnetic bearing which is measured as a horizontal angular distance of any line of the traverse from magnetic north in clock wise direction.

The corners of plot or building, bends of a road can be measured directly by prismatic compass. The bends of a meandering canal, if divided into segments, can be favourably determined by a prismatic compass.

Exercise

Observe the prismatic compass. Note the name and function of each and every part.