

Title: Making of a Clinometer

Objective

To make a mathematical instrument 'clinometer' to measure the height of a distant object.

Prerequisite Knowledge

1. Concept of angle of elevation and depression.
2. Properties of right-angled triangle.



Materials Required

Small pipe or drinking straw, a wooden board, wooden strip, thread, weight, screw, geometry box, etc.

Procedure

1. Prepare a semi-circular protractor with the help of geometry box. Mark degrees in sexagesimal scale with 0° at the lowest and 1° to 90° proceeding both clockwise and anti-clockwise.
2. Fix a hollow pipe along the diameter of it. fig. (i).
3. Punch a hole at the centre of a semicircle.
4. Suspend a weight (w) from a small nail fixed to the centre.
5. Ensure that the weight at the end of the string hangs below the protractor.

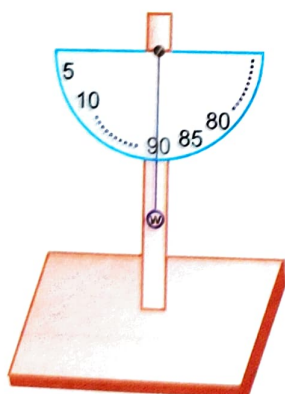
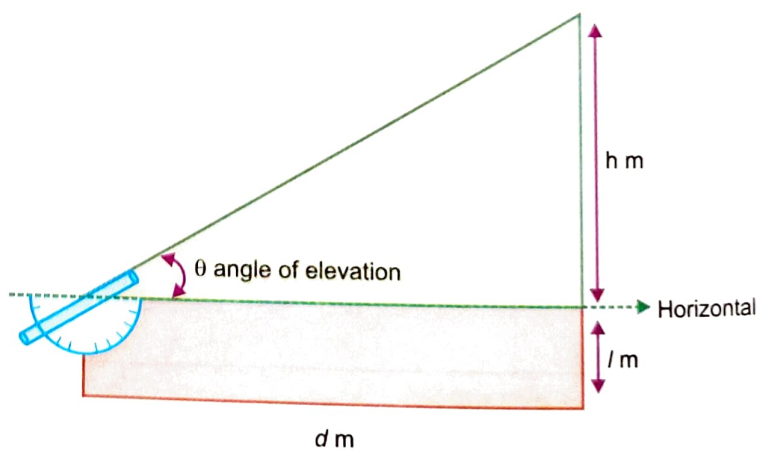


Fig. (i)



Determining the Height of an Object:

6. Measure the distance of the object from you. Let it is d .
7. Look through the hollow pipe straw at the top of the object by rotating it gradually. Make sure that you can clearly see the top of the object.
8. Hold the clinometer steady and record the angle which the string makes on the scale of the clinometer. This angle is the required angle of elevation, let be θ .

Using trigonometric ratio:

$$\tan\theta = \frac{\text{height}}{\text{distance}} = \frac{h}{d}$$
$$h = d \cdot \tan\theta$$

Observation

- angle of elevation θ .
 - distance between object and clinometer d .
 - height of clinometer l (let)
- $\therefore$ height of object $= l + h = l + d \tan\theta$

Result

Angle of elevation can be found easily.

Learning Outcome

Students learn how to determine the angle of elevation of an object by clinometer and use of it to determine the height of an object at a known distance.

