

13. APPLICATIONS OF TRIGONOMETRY

Class: 10

Subject: Mathematics

Name of the teacher:

School:

Chapter	Topic	Number of periods required (10)	Timeline for teaching		Any specific information
			From	To	
13. APPLICATIONS OF TRIGONOMETRY	1.Introduction	1			
	2.Drawing figures to solve problems	1			
	3.Solution for single triangle problems	3			
	4. Solution for two triangles problems	4			
	7.Optional exercise and Revision	1			

Prior Concept / Skills:	
1. Trigonometry ratios- $\sin\theta$, $\cos \theta$, $\tan \theta$ and their formulae. 2. Values of trigonometric ratios at the specific angles especially 30°, 45°, 60° 3. Alternate interior angles are equal when a transversal fell on two parallel lines.	
Learning outcomes	Number of Periods
Students are able to,	
1. Identify the importance of trigonometry in day today life.	1
2. Draw the figure using given situations in order to find heights and distances.	1
3. Solve the problems related to single triangle by applying suitable trigonometric ratio.	3

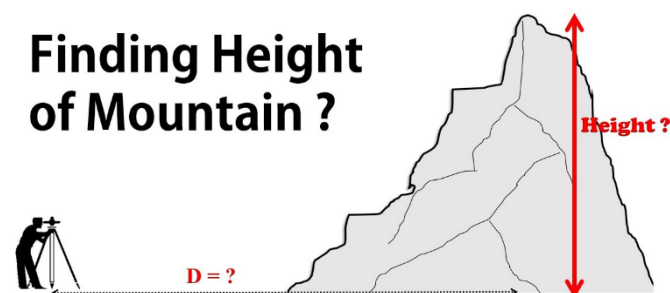
4. Solve the problems related to two triangles by applying suitable trigonometric ratios.	4
5. Solve some challenging /higher order thinking problems using the concepts covered in the chapter.	1

TEACHING LEARNING PROCESS

Induction/Introduction (Generating interest, informing students about the outcomes and expectations for the lesson)

Discuss on the highest peaks and dams in the world by showing pictures.

- How can we measure height of the student?
- Is it possible to measure the height of tall trees in the same method?
- What is the length of room?
- Is it possible to measure the width of the river in the same method?
- What is the highest peak in the world?
- What is the height of the JOGG falls in Karnataka?
- How can they measure?



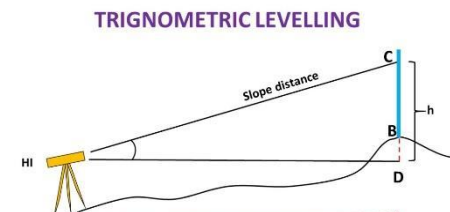
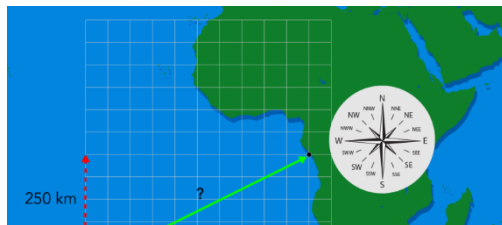
These discussions create interests towards applications of trigonometry chapter.

Experience and Reflection (Task/question that helps students explore the concept and connect with their life)

Activity: Collect the information about the applications of trigonometry in daily life in various sectors from internet/ magazines/ newspaper. Discuss with friends/ teachers and make a report on it with mentioning pictures. Some fields are given below.

Example: 1. Trigonometry to Measure Height of a Building or a Mountain. Trigonometry is used in measuring the height of a building or a mountain.

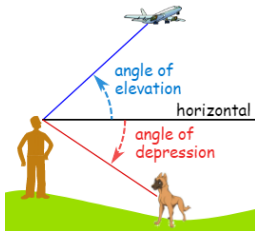
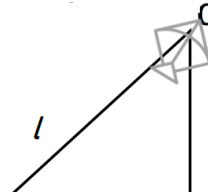
- Trigonometry in Aviation.
- Trigonometry in Criminology.
- Trigonometry in Marine science.

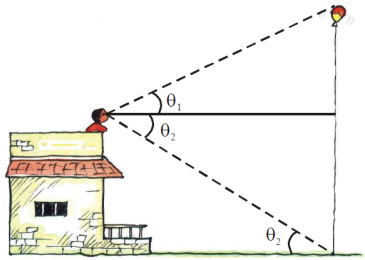
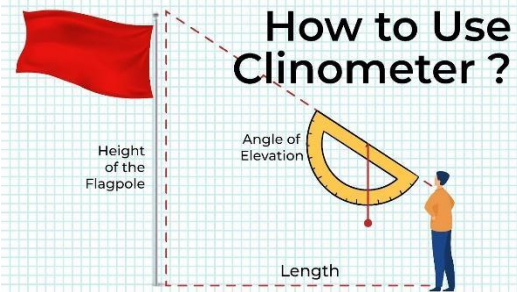
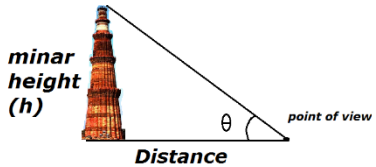


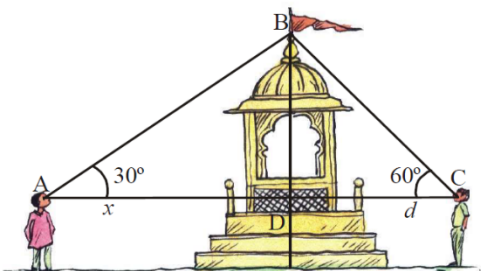
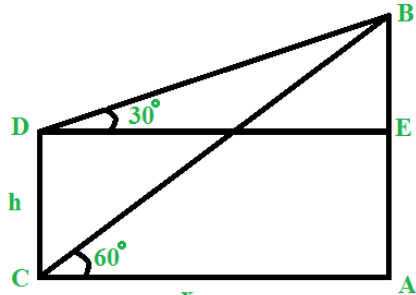
- Trigonometry in architecture,
- Trigonometry in theoretical physics,
- Trigonometry in surveying

Trigonometry in Navigation.

Trigonometry in surveying.

Explicit Teaching/Teacher Modelling (I Do)	Group Work (We Do)	Independent Work (You Do)	Notes / TLM
<u>1.Introduction (1)</u> • Discuss about the need of trigonometry in finding heights and distances. • Explain line of sight and horizontal line using examples. • Demonstrate the angle of elevation and angle of depression.	• Discussion on the application of trigonometry in the field of surveying. • Draw the diagrams of the angle of elevation and angle of depression. 	• Write the applications of trigonometry in various fields. • Write definitions the angle of elevation and angle of depression.	• Digital resource: Diksha QR code. • Chart containing angle of elevation and angle of depression diagrams.
<u>2. Drawing figures to solve problems (1):</u> • Explain the essential points to be remind while drawing diagrams. (i) All the objects considered as linear for mathematical convenience.	• Discuss and draw the figures for the situations given in examples 1 to 3 problems. • Write the answers for the questions given under think and discuss section.	• draw the figures for the situations given under 'do this' section. 	• Create some more situations and ask the students to draw the suitable figure.

(ii) The angle of elevation or depression is considered with reference to the horizontal line. (iii) The height of the observer is neglected, if it is not given in the problem.			
3. Solution for single triangle problems (3) - Discuss how to find the heights and distances using diagrams by applying trigonometric ratios. - Help the students in activities in finding the heights of the poles, trees and buildings in surroundings. - Model problem solving of examples 4 and 5.	- Activity: Find the height of the flag pole by using clinometer with the help of teacher. Verify by the actual measure.  - Solve problem number 1,3,4,5 and 9 in Exercise 12.1 with the help of teacher.	- Activity: Find the height of the you friends by using clinometer with the help of teacher. Verify by the actual measure. - Solve problem number 2,6,7,8 and 10 in Exercise 12.1.	- Clinometer - Natural tangents values chart  $\tan \theta = \frac{\text{minar height}(h)}{\text{distance}}$

4.3. Solution for single triangle problems (4): - Discuss how to find the heights and distances using two triangles by applying trigonometric ratios. - Model problem solving of examples 6 and 7 using two triangles.	Solve problem number 1,5,6,8 and 9 in Exercise 12.2 with the help of teacher. 	Solve problem number 2,3,4 and 8 in Exercise 12.2 	Provide additional problems based on two triangles.
5.Optional exercise and Revision: (1) - Model problem solving of problem 1 in optional exercise. - Revise all the concepts of this chapter.	Solve Problem number 2 and 4 in optional exercise with the help of teacher.	- Solve Problem number 3 and 5 in optional exercise. - Prepare a chart with utility of trigonometry in various sectors.	A chart with key concepts of the chapter.

Check For Understanding Questions

Factual:

- Define the angle of elevation.
- Define angle of depression.
- _____ is the line from the eye of an observer to the point in the object viewed by the observer.
- When the object is below the horizontal level, the angle formed by the line of sight with the horizontal is called _____.
- When the object is above the horizontal level, the angle formed by the line of sight with the horizontal is called _____.

- A pole casts a shadow equal to height of the pole on the ground, then the sun's elevation is _____.
- If the length of the shadow of a tower is increasing, then the angle of elevation of the sun is _____.

Open Ended / Critical Thinking:

- The persons a, b, c, d observes top of the clock tower with angles of 30° , 70° , 40° , 60° respectively, then find the nearest person to tower.
- Draw a diagram having angle of elevation and angle of depression by creating a situation.
- From the top of a tower h m high, the angles of depression of two objects, which are in line with the foot of the tower are α and β ($\beta > \alpha$). Find the distance between the two objects.
- The angle of elevation of the top of a tower from two points distant s and t from its foot are complementary. Prove that the height of the tower is $\sqrt{st}$.

Student Practice Questions & Activities (Exercises from workbook / textbooks/ blackboard)

1. Draw diagram for the following situations "A person is flying a kite at an angle of elevation α and the length of thread from his hand to kite is l."
2. Suppose you are shooting an arrow from the top of a building at a height of 6 m to a target on the ground at an angle of depression of 60° . What is the distance between you and the object?
3. A tree breaks due to storm and the broken part bends so that the top of the tree touches the ground by making 30° angle with the ground. The distance between the foot of the tree and the top of the tree on the ground is 6m. Find the height of the tree before falling down.
4. The shadow of a tower standing on a level plane is found to be 50 m longer when Sun's elevation is 30° than when it is 60° . Find the height of the tower.
5. Find the angle of depression of a boat from the bridge at a horizontal distance of 25m from the bridge, if the height of the bridge is 25m.

6. A kite is flying at a height of $150\sqrt{3}$ m above the ground level, attached to string inclined at 60° to the horizontal, calculate the length of string.

Assessment (Think of what children SAY, DO and MAKE while learning that can form the evidence of learning to be used for assessment).

- Prepare new question and solve involving applications of trigonometry.
- Project work: Prepare the clinometer with protractor. Find the height of the tree/building in your surroundings by using appropriate trigonometric ratio. Present the report to your class.
- Quiz conducted on applications of trigonometry.
- Students' homework and class work notebook.

SIGNATURE OF THE TEACHER

SIGNATURE OF THE HEAD MASTER

VISITING OFFICER WITH REMARKS