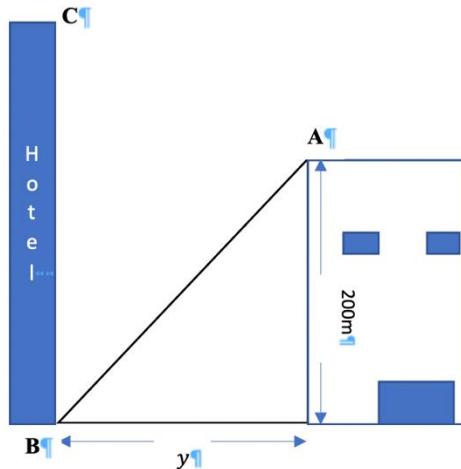




SUBJECT and GRADE	Grade 10 MATHEMATICS	
TERM 3	Week 6	
TOPIC	2-Dimensional Trigonometry	
AIMS OF LESSON	<p>To:</p> <ul style="list-style-type: none">Understand the concepts of ELEVATION and DEPRESSION.Apply knowledge of solving right-angled triangles to problems of HEIGHTS, DISTANCES and BEARING.Represent a real – life problem as a right-angled triangle or triangles.	
RESOURCES	<i>Paper based resources</i>	<i>Digital resources</i>
	Consult your Trigonometry section in the textbook.	Intro to Heights and distances Khan Academy: https://www.youtube.com/watch?v=TgQs7k5p2Ag , https://www.youtube.com/watch?v=BGXgcvGPRLI&pbjreload=101 Exact trigonometric values using hand trick – Special Angles https://www.youtube.com/watch?v=TyrM8G1MqiI Angles of Elevation and Depression: https://www.youtube.com/watch?v=7ONj6TKvi2g
INTRODUCTION	<ul style="list-style-type: none">Trigonometry was developed in ancient civilizations to solve practical problems such as building construction and navigation. These lessons will show that trigonometry can be used to solve other practical problems.NB! Bearing also involves Trigonometry. So do watch the video https://www.youtube.com/watch?v=Udpkd_7EjhI	
	In this lesson you will require to know how to label the three sides of a triangle in terms of hypotenuse, opposite and adjacent. You will also require to know the three trigonometric ratios sin, cos and tan. NB! SOH CAH TOA for remembering the ratios	
CONCEPTS AND SKILLS: Heights and Distances		
ANGLE OF ELEVATION The term angle of elevation represents the angle from the horizontal line upward to an object. An observer's line of sight would be above the horizontal line.		 A diagram showing an 'Observer' at the bottom left. A horizontal line extends to the right, labeled 'Horizontal Line'. Above the horizontal line, a diagonal line labeled 'Sight Line' extends upwards and to the right, ending at an 'Object'. The angle between the horizontal line and the sight line is labeled 'Angle of Elevation'.
ANGLE OF DEPRESSION The term angle of depression represents the angle from the horizontal line downward to an object. An observer's line of sight would be below the horizontal line.		 A diagram showing an 'Observer' at the top right. A horizontal line extends downwards to the right, labeled 'Horizontal Line'. Below the horizontal line, a diagonal line labeled 'Sight Line' extends downwards and to the right, ending at an 'Object'. The angle between the horizontal line and the sight line is labeled 'Angle of Depression'.

Example 1

The angle of depression is from point A on the top of a building 200m high to the base of a Hotel, B. Determine the distance on the ground between the building and the hotel.



$$\text{Solution: } \tan \theta = \frac{\text{opp}}{\text{adj}}$$

$$\tan 57^\circ = \frac{200}{y}$$

$$\frac{y}{1} \times \tan 57^\circ = \frac{y}{1} \times \frac{200}{y}$$

$$y \times \tan 57^\circ = 200$$

$$\frac{y \times \tan 57^\circ}{\tan 57^\circ} = \frac{200}{\tan 57^\circ}$$

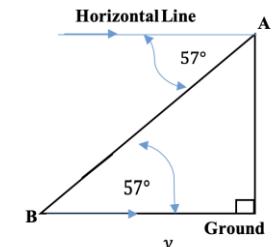
$$y = \frac{200}{\tan 57^\circ}$$

$$y = 412.63 \text{ m}$$

Steps:

Draw the sketch as below indicating the 90°angle which the building makes with the ground.

1. Mark the angle of depression, which is the angle the sight line (AB) makes with the horizontal. Note that the horizontal line is parallel to the ground. Thus because of alternate angles being equal the angle B inside the triangle can be marked as 57°.

**Example 2: Refer to the same sketch as in example 1**

Suppose that the angle of elevation from the point A on the top of the building to the top of the Hotel C is . Determine the Height of the Hotel.

Solution: Let h , be the height of the hotel above the building

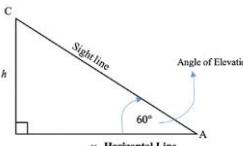
$$\tan 60^\circ = \frac{h}{200}$$

$$h = 200 \tan 60^\circ$$

$$h = 64.01 \text{ m}$$

therefore the height of the hotel is: $412.63 + 64.01 = 476.64 \text{ m}$

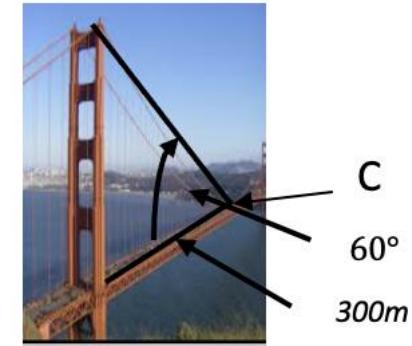
Steps: Draw the sketch as below



indicating the 90°angle which the hotel makes with the horizontal line.

Mark the angle of elevation, the angle the sight line (AC) makes with the horizontal line. Let h , be the height of the hotel above the building.

1. Determine the distance from C to the top of the tower. The angle of elevation from point C to the top of the tower is 60°. The distance from C to the Tower is 300m.

**Answer:**

1. distance to top of tower = 600

Example 3:

A ladder with height 20m is placed against a building.

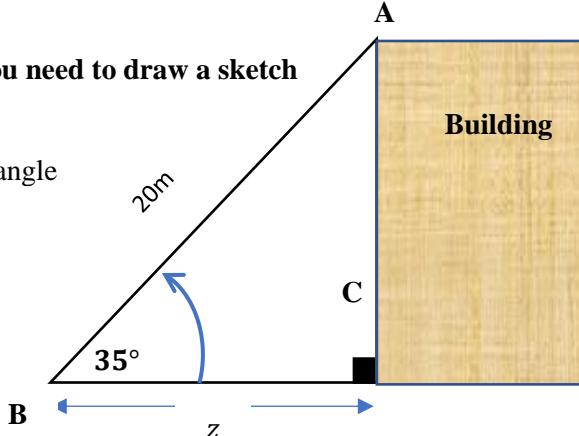
The angle of elevation to the top of the building is 35° and the distance on the ground from that point to the building is

Solution:

In order to answer this you need to draw a sketch of the given info.

Note the building makes a angle with the ground.

In ABC is the hypotenuse side. z is the adjacent side and of the given angle B . Thus the trig ratio involving the adjacent and hypotenuse is \cos .

**Can You?**

2. The control tower at an airport is looking with an angle of elevation of 35° at a plane flying 985 m higher than the tower. Determine the horizontal distance between the plane and tower.

Answer:

Horizontal distance between the tower and the plane is 1406,73m.

**ACTIVITIES/
ASSESSMENT**

Siyavula:
Page: 240
Exercise: 7 - 5

Mind Action Series:
Page: 78
Exercise: 6 a - d

CONSOLIDATION

- The aim of the lesson has been to link the ratios we use to real-life situations and illustrate how to approach these problems using the concept of ratios and the right angled triangle.
- Make sure that you draw a sketch where one is not given.
- With sketch there is information you need to fill in, where you are making some assumption.
Assumption you will have to make:
 - A wall makes a angle with the ground.
 - A tower makes a 90° angle with the ground