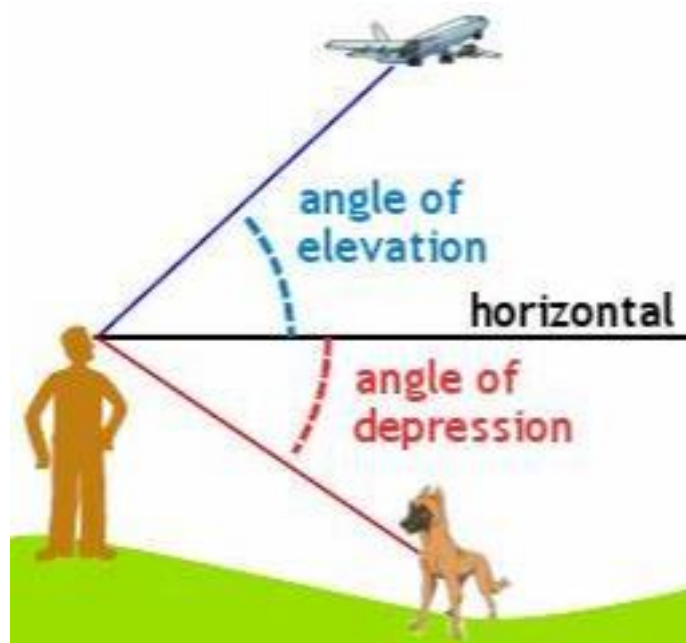


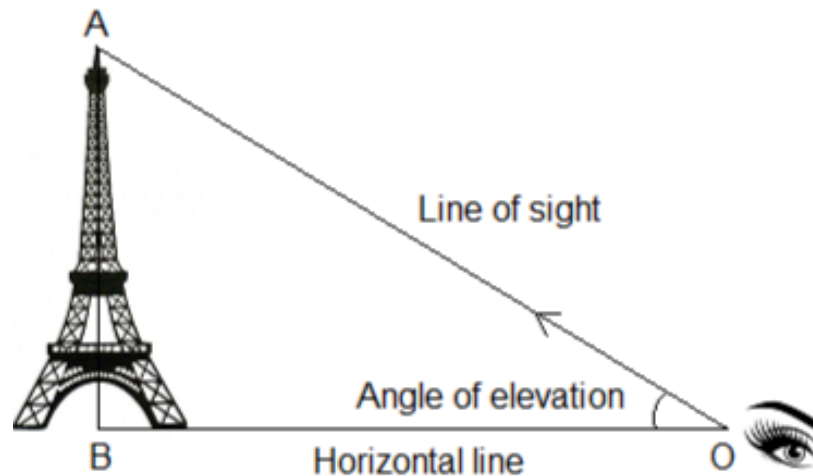
ANGLES OF ELEVATION AND DEPRESSION



Angle of Elevation

The **angle of elevation** is the angle formed between the horizontal line (the line of sight from the observer's eye level) and the line of sight when the observer looks **upward** toward an object. In other words, it is the angle that you make when you look upward from a point of observation (for example, standing on the ground) to see something above you (like the top of a building or a bird flying).

- **Key point:** The angle of elevation is always measured **from the horizontal upwards**.
- **Example:** Imagine you are standing at a distance from a building. If you look up to see the top of the building, the angle between your line of sight and the horizontal ground is the **angle of elevation**.



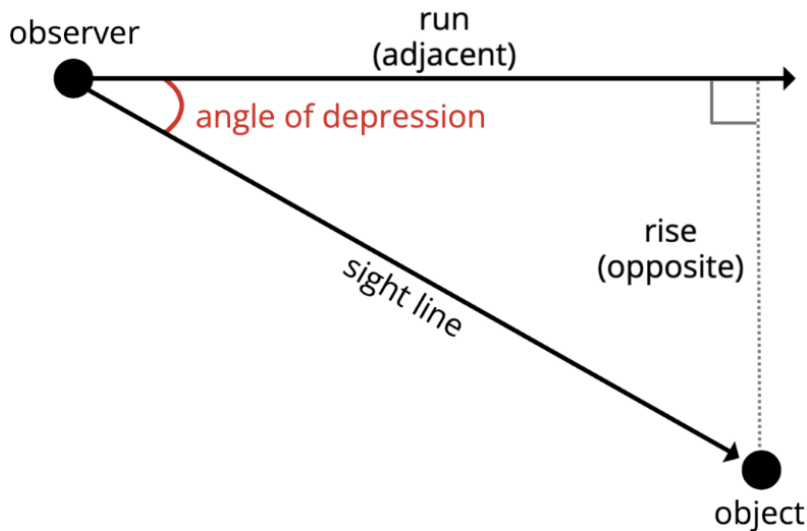
Real-World Example:

- A person standing 50 meters away from a tall building looks up and spots a bird flying at the top of the building. If the angle of elevation from the person's eyes to the bird is 30° , we use this angle to calculate the height of the bird (or building) using trigonometry (like tangent or sine).

Angle of Depression

The **angle of depression** is the angle formed between the horizontal line and the line of sight when the observer looks **downward** toward an object. This occurs when the observer's eyes are at a higher point (for example, standing on a balcony or being in a plane) and looking down toward something below them.

- **Key point:** The angle of depression is always measured **from the horizontal downwards**.
- **Example:** If you're standing on a balcony looking down at a person on the ground, the angle between the horizontal line from your eyes and your line of sight to the person on the ground is the **angle of depression**.



Real-World Example:

- If a person is looking down at the top of a tree from a window 10 meters above the ground and the angle of depression to the top of the tree is 20° , the person can calculate the distance between the tree and the building (horizontal distance) using trigonometric functions.

Key Relationships Between Angles of Elevation and Depression

- **Symmetry:** The **angle of elevation** from one point to an object is **equal** to the **angle of depression** from the object to the same point. This is because both angles are measured from the horizontal line, and the situation creates a pair of alternate interior angles in a right triangle.

For example, imagine you are on the ground and looking up at the top of a building (elevation), and someone is at the top of the building looking down at you (depression). Both angles formed are the same, as they are alternate interior angles.

Trigonometric Applications

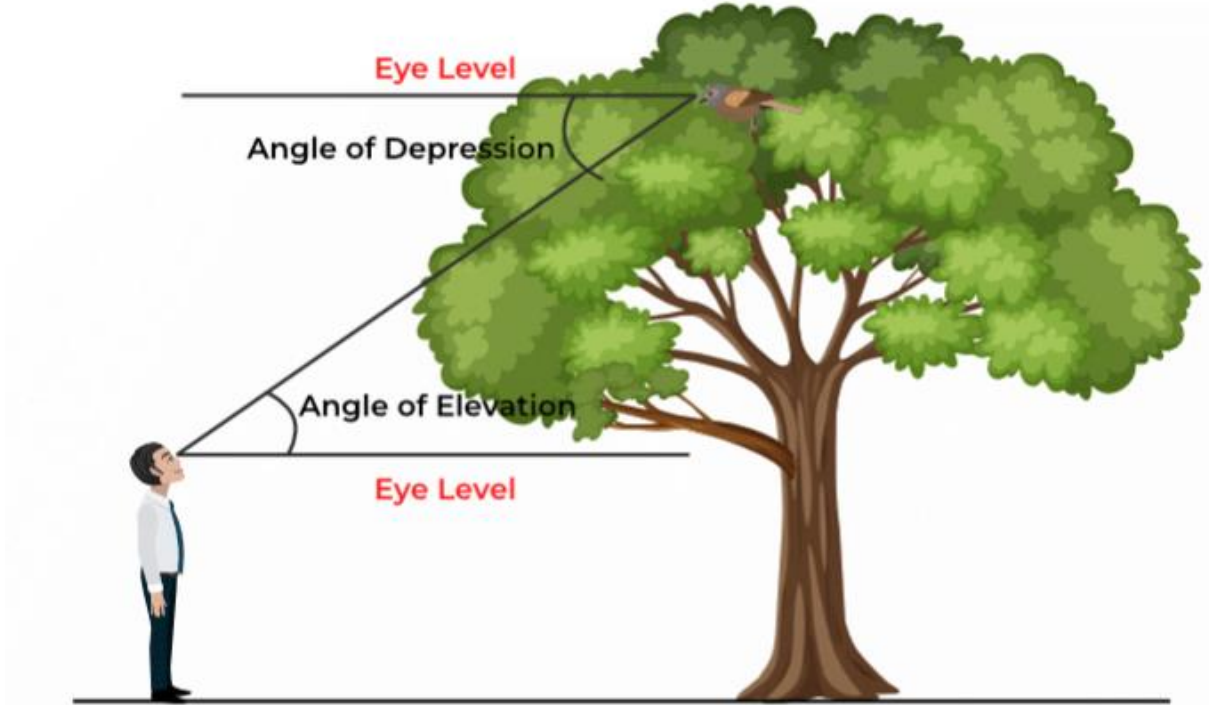
In many problems, angles of elevation and depression are used with **right-angled triangles**. Trigonometric ratios such as **sine**, **cosine**, and **tangent** can help you calculate unknown sides (like the height of an object) or angles in such problems. Here's how trigonometry comes into play:

- **Tangent formula:** If you know the angle of elevation and the horizontal distance from the object, you can use the tangent function to calculate the height of the object.

$$\tan(\theta) = \text{OPPOSITE} / \text{ADJACENT}$$

Where:

- θ (*theta*) is the angle of elevation.
- "Opposite" is the height of the object (vertical distance).
- "Adjacent" is the horizontal distance.



Visualizing the Angles:

- **Angle of Elevation:** When you look up, the angle you make with the horizontal is the angle of elevation.
- **Angle of Depression:** When you look down, the angle you make with the horizontal is the angle of depression.

The **angle of elevation** is the angle formed when you look **up** from your eye level to an object.

The **angle of depression** is the angle formed when you look **down** from your eye level to an object.

These angles are used in problems involving right-angled triangles and can be calculated using trigonometric functions like sine, cosine, and tangent.