

Civil and Environmental Engineering Department  
College of Engineering – Majmaah University

## 5- How to Find a Building Length using Theodolite?

*Surveying II – CE 371*

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Student Name:

Section No.:

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## ***Fieldwork # 5***

### **Theodolite Applications (1)**

#### **Objectives:**

1. Conduct an application using Theodolite and tape
2. Demonstrate a practical problem for the student by solving a real life problem.
3. Enhance the student abilities to think, create solutions, and work as a team

#### **Problem:**

It is required to find the length of inaccessible building using Theodolite or Total Station.

#### **Equipment and Tools:**

1. Theodolite
2. Tripod
3. Leveling rod
4. 30 m – tape
5. Taping pins (2)

#### **Procedure:**

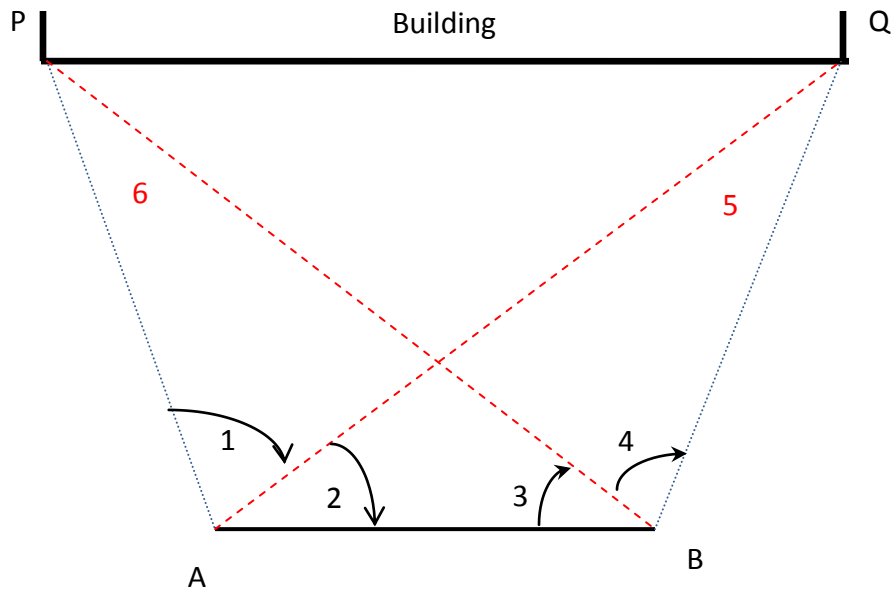
1. Select suitable points for a base line AB on front of the building.
2. Determine carefully the distance AB using tape or tacheometric method.
3. After adjusting the theodolite at point A measure the angles (1 and 2) .
4. Move to point B and measure angles (3 and 4).  
Your aim is to find the distance PQ which represents the length of the target building. So:

In Triangle PBA

$$\text{Angle } (6^\wedge) = 180^\circ - (1^\wedge + 2^\wedge + 3^\wedge)$$

In Triangle AQB

$$\text{Angle } (5^\wedge) = 180^\circ - (2^\wedge + 3^\wedge + 4^\wedge)$$



In Triangle PAB

$$\frac{AB}{\sin(6)} = \frac{AP}{\sin(3)} = \frac{PB}{\sin(1+2)}$$

AB is determined, and thus you can calculate AP and PB

In Triangle PAQ

$$\frac{AB}{\sin(5)} = \frac{BQ}{\sin(2)} = \frac{AQ}{\sin(3+4)}$$

AB is determined, and thus you can calculate BQ and AQ

In Triangle PBQ

$$PQ = \sqrt{PB^2 + BQ^2 - 2PB * BQ \cos(4)}$$

For check

In Triangle PAQ

$$PQ = \sqrt{PA^2 + AQ^2 - 2PA * AQ \cos(1)}$$

Working sheet