Mustansiriyah University
College of Engineering
Highway and Transportation Engineering Department

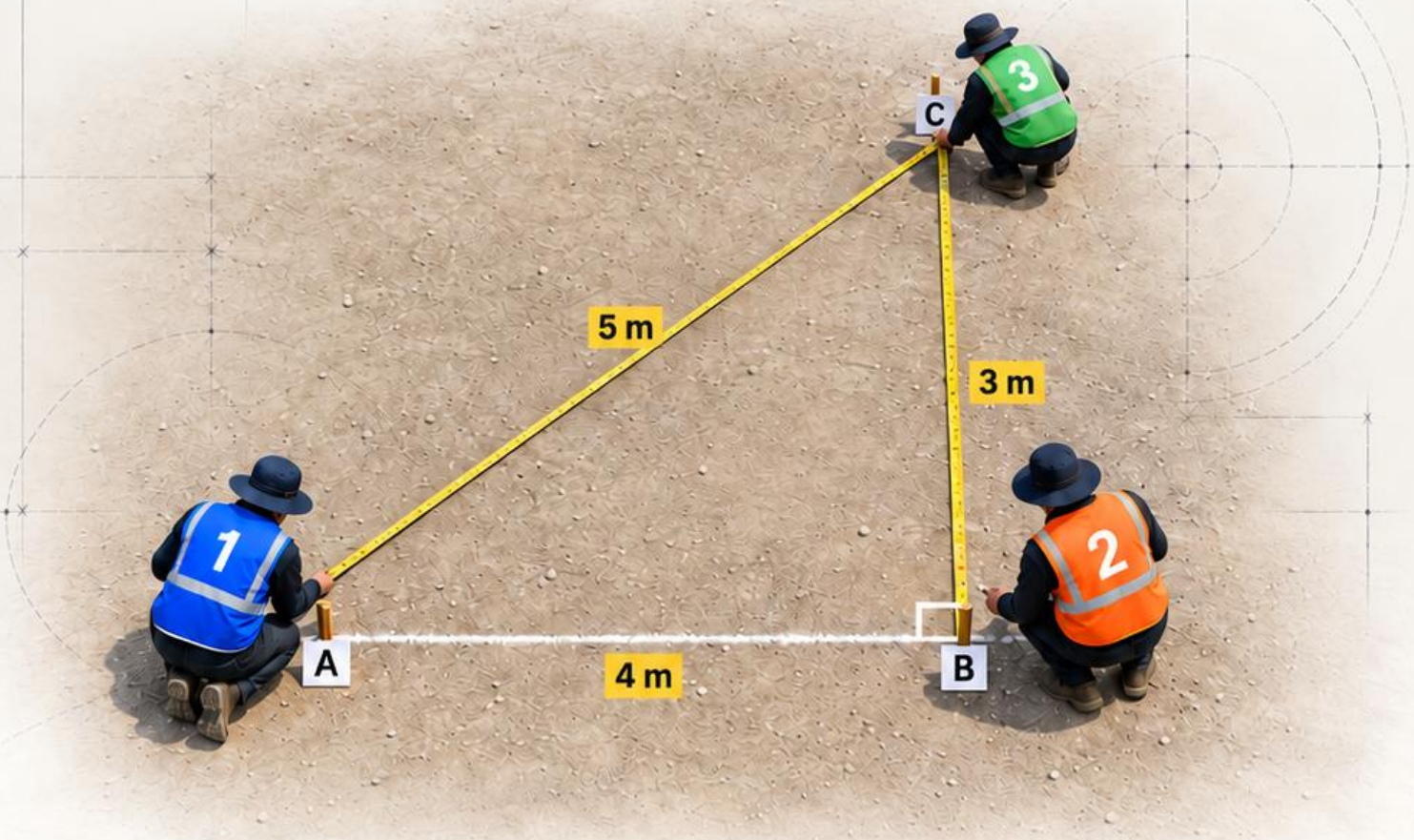
Engineering Surveying Laboratory

Second Year - First Semester

Experiment 2

Set up and drop columns with tape

(Setting out right angles)



Prepared by:

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General Objective

To develop students' ability to set out perpendicular lines using a measuring tape and basic geometric methods.

Learning Objectives

By the end of this experiment, students will be able to:

1. Identify the equipment required for setting out right angles.
2. Apply the 3:4:5 triangle method to establish a perpendicular line.
3. Construct a perpendicular using the isosceles triangle method.
4. Record field measurements and draw clear sketches.

Introduction

Setting out right angles is a basic surveying operation used to establish perpendicular lines in the field. A measuring tape can be used to construct these angles using simple geometric principles. This experiment introduces the 3:4:5 triangle and isosceles triangle methods, which are useful in surveying and construction layout.

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Experiment 2: Set up and drop columns with tape

(Setting out right angles)

Purpose: To set out perpendicular lines using a measuring tape through the 3:4:5 Triangle and Isosceles Triangle methods.

Equipment

1. Tape (شريط القياس)



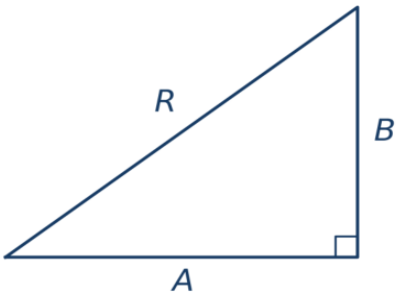
2. Ranging pole or rod (الشاخص)

3. Pegs (اوتاد)

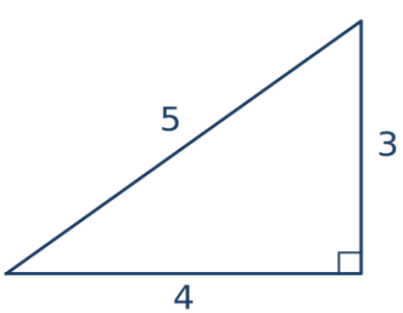


Theory: 3:4:5 Triangle Method

The 3:4:5 triangle method is based on the Pythagorean Theorem. A triangle with sides in the ratio 3:4:5 forms a right angle between the two shorter sides. This principle is used to set out perpendicular lines in surveying.



$$R = \sqrt{A^2 + B^2}$$

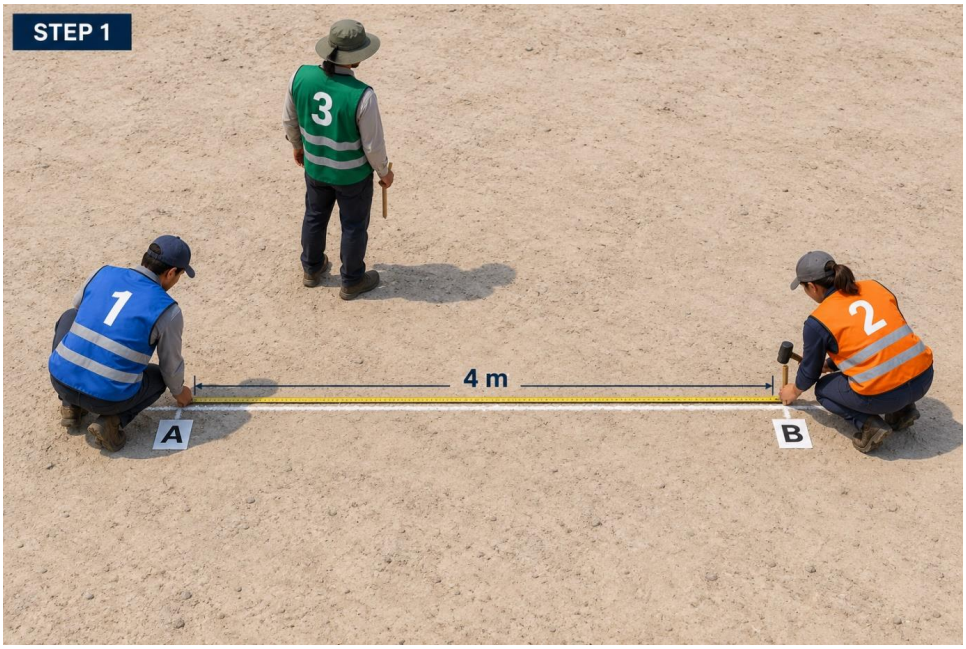


$$R = \sqrt{3^2 + 4^2} = \sqrt{25} = 5$$

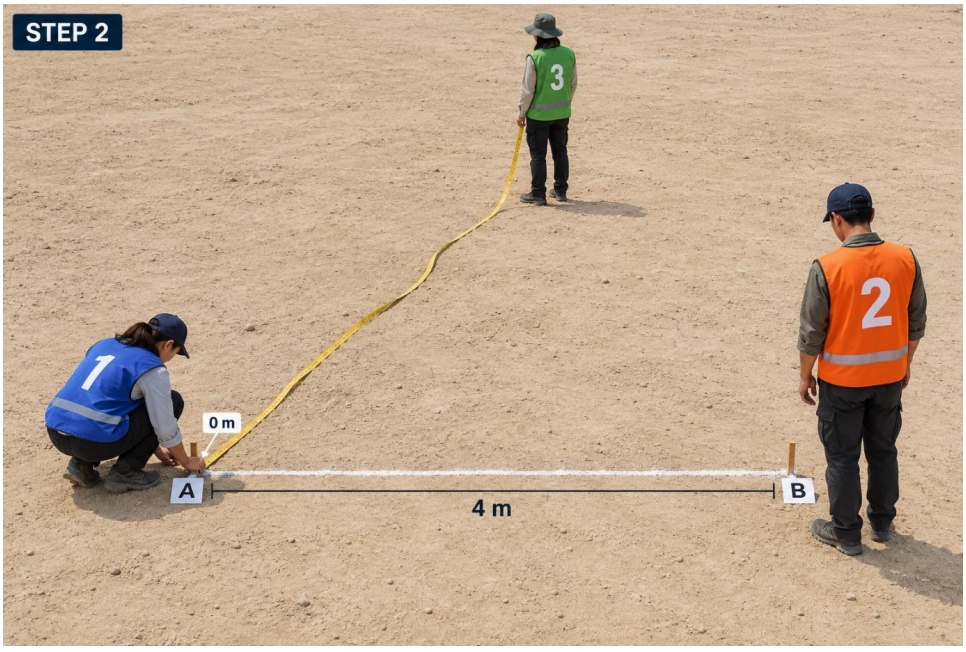
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Procedure | Method 1: 3:4:5 Triangle Method

1 Measure **4 m** along the survey line from **A to B**, and place a peg at each point.

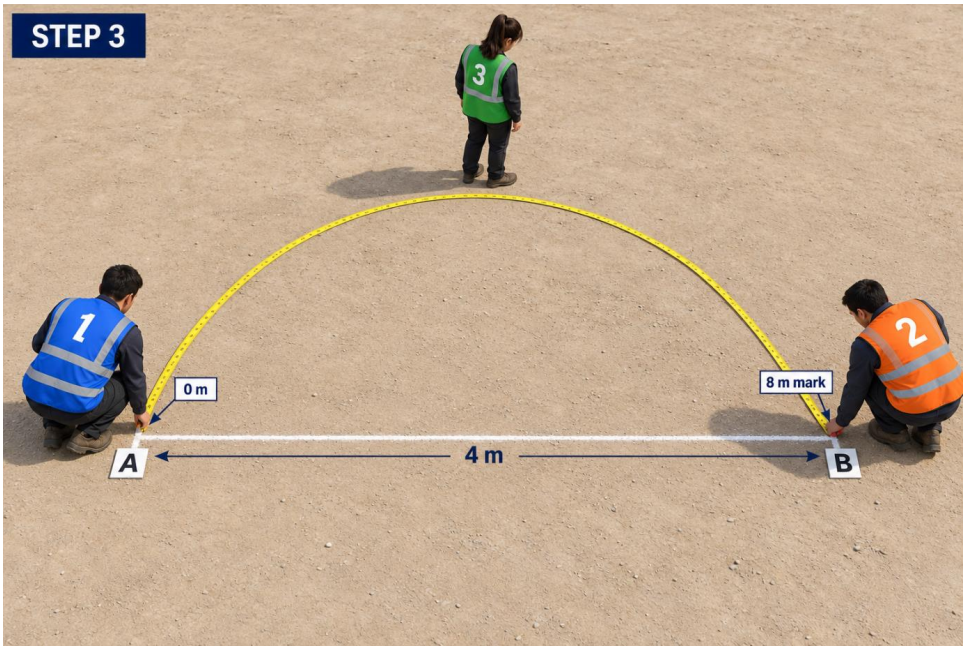


2 Person 1 holds the **zero mark** of the tape at peg **A**.

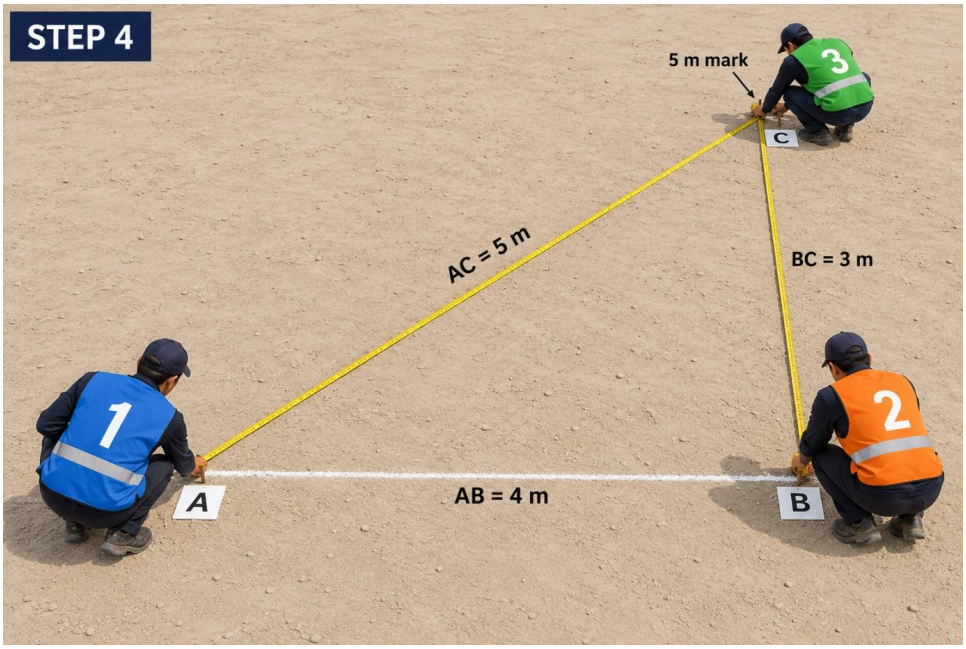


Method 1: 3:4:5 Triangle Method (continued)

3 Person 2 holds the **8 m mark** of the same tape at peg **B**.



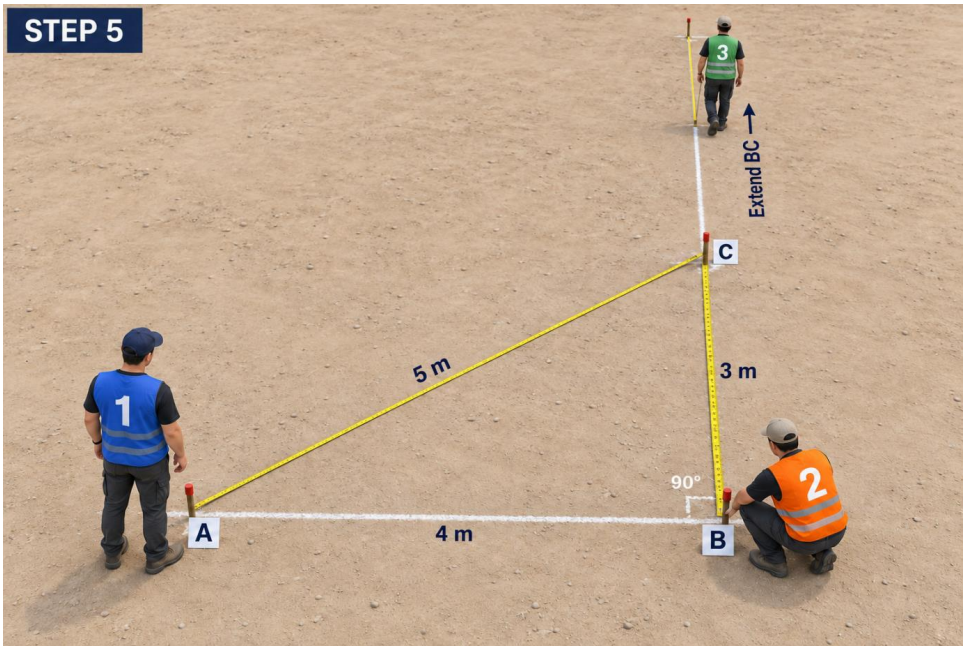
4 Person 3 holds the **5 m mark** and moves away from AB until both tape sections are taut. Mark this point **C**, giving **AC = 5 m** and **BC = 3 m**.



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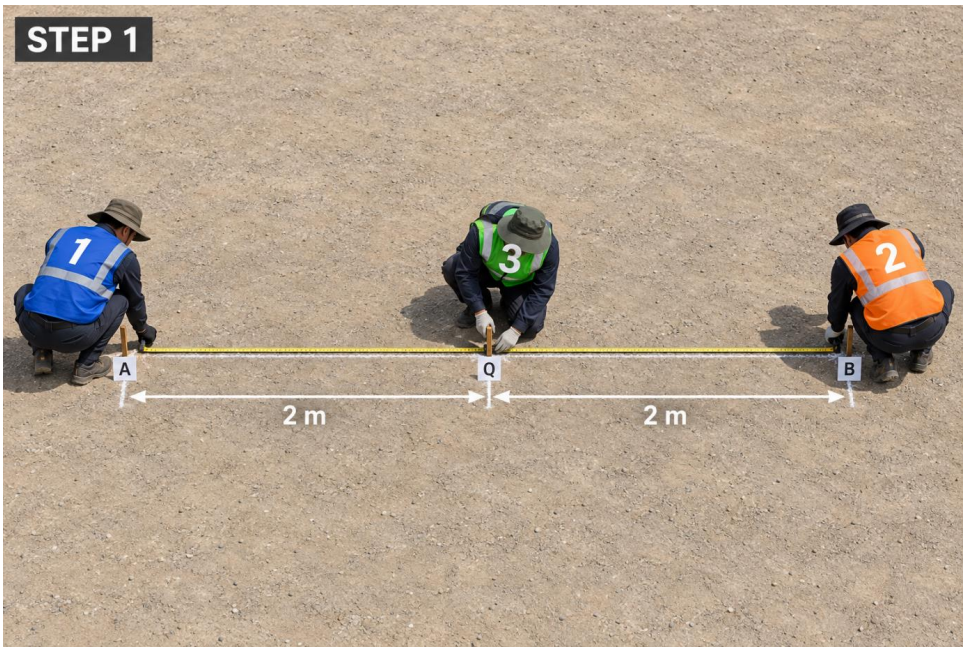
Method 1: 3:4:5 Triangle Method (continued)

5 Extend **BC** beyond C to the required length. This line is perpendicular to **AB**, forming **90° at B**.



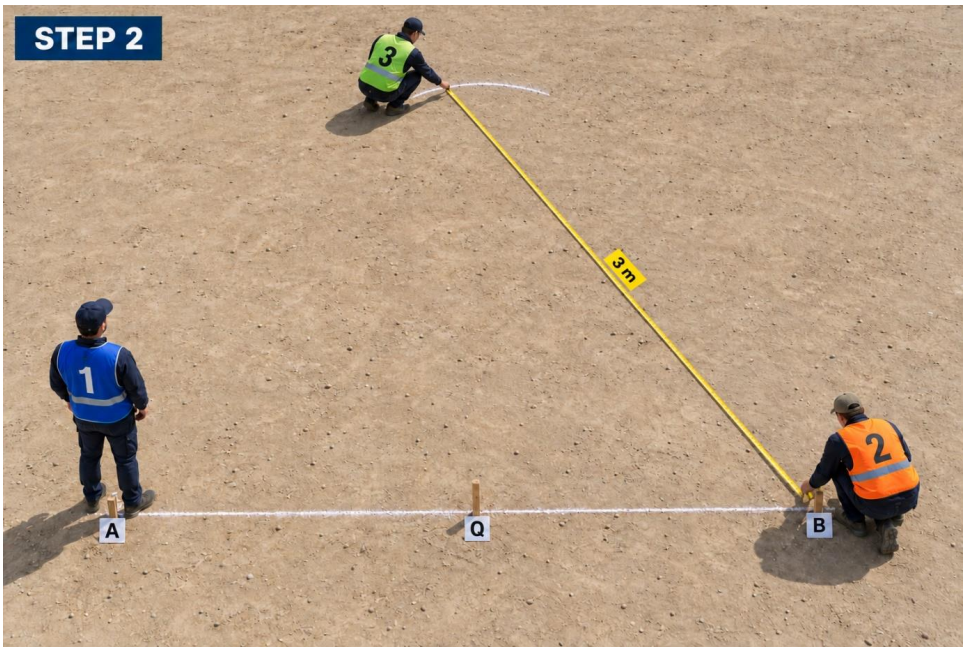
Method 2: Isosceles Triangle Method

1 Select points **A and B** on opposite sides of **Q** along the survey line, so that **AQ = BQ**. Mark the points with pegs.

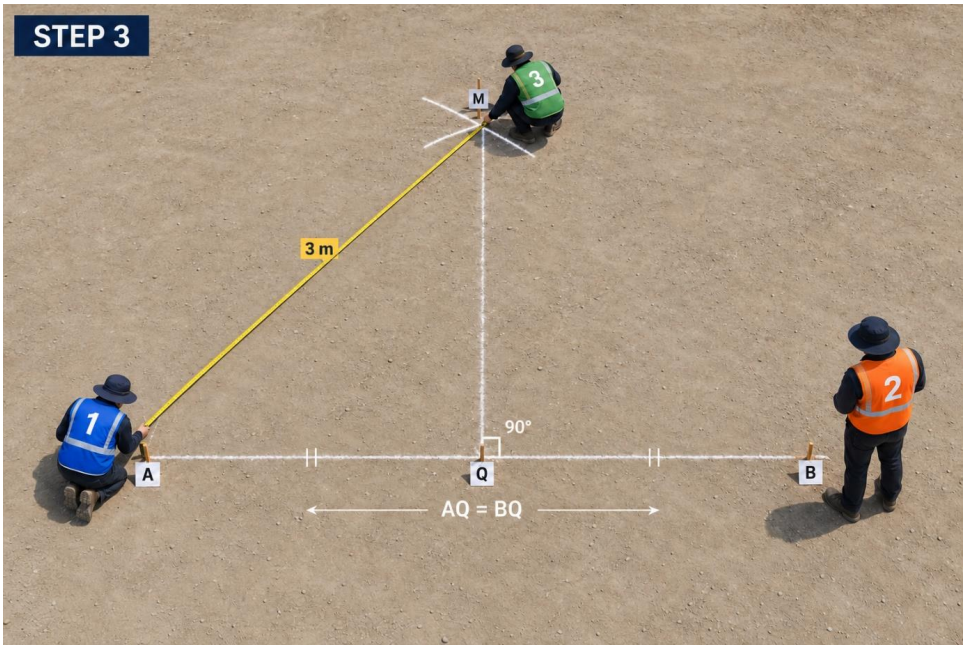


Method 2: Isosceles Triangle Method (continued)

2 Person 2 holds the zero mark of the tape at **B**, while Person 3 draws an arc using a fixed radius greater than **BQ**.



3 Person 1 holds the zero mark at **A**, while Person 3 draws another arc using the **same radius**. Mark the intersection **M** and join Q to M; **QM is perpendicular to AB**.



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Data Sheet

Experiment 2: Set up and drop columns with tape
(Setting out right angles)

Student Name: _____ Date: / /

Group Names

No.	Student Name
1	
2	
3	
4	
5	
6	
7	
8	

Supervisor signature