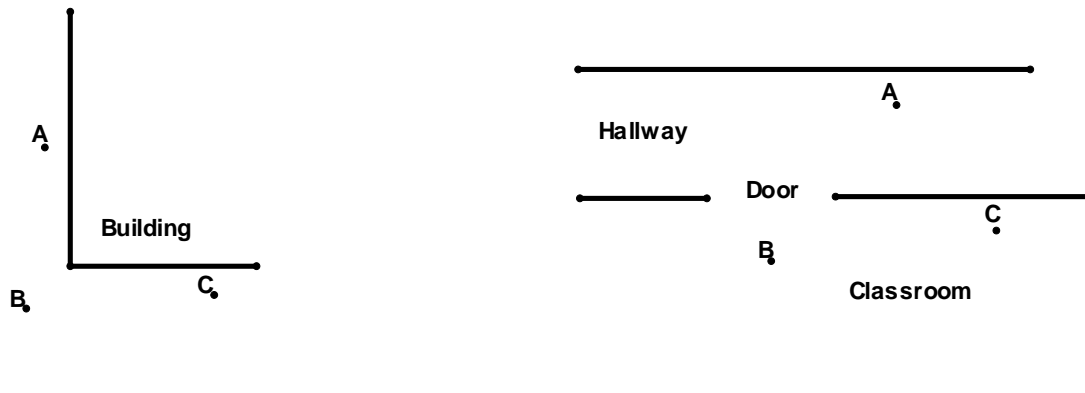


# Transit Lab Activities

## Lab #1

**Indirect Measure of distance between two points using one angle of measure.**

**Problem Statement: It is necessary to find the distance between two points A and B. There is a wall between the two points making it impossible to make a direct measurement between the two points. (See the two diagrams below for two ways to set this up.) Point C represents a location where both A and B can be seen. The transit will be placed at point C and used to find the measure of angle ACB. The measure of the line segments AC and BC can be found with a tape measure.**



Students might solve the problem in the following ways:

Level 1: Recreate the distance between the points (Scale of 1:1) someplace where obstacles are eliminated. At this level, students will measure the distance A to C and then C to B. They will use the transit to recreate the angle ACB. These measurements will be used to stake out three corresponding A', B', C' points on the ground away from any obstacles using a tape measure and the transit to set the points. Students then measure from A' to B' to find the distance from A to B.

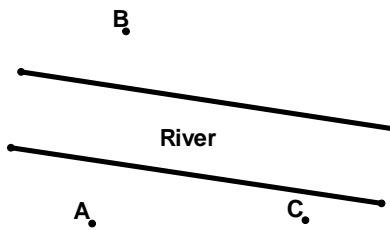
Level 2: Recreate the distance between the points (Scale set by student or teacher, for example, 1":3"). At this level, students will measure the distance A to C and then C to B. They will use the transit to measure the angle ACB. Students will then create A'B'C' on a piece of paper using the pre-set scale and found measurements. Students will measure the distance between A' and B'. Students then use the ratio  $AB/BC = A'B'/B'C'$  where BC, A'B' and B'C' are all measurable distances. Students solve for AB.

Level 3: Finding the distance using the law of cosines.  $c^2 = a^2 + b^2 - 2ab\cos C$  where AC is "a", BC is "b", and angle ACB is C. Students solve for c to find AB.

Level 4: Reinforce Side-Angle-Side congruence or similarity in a geometry class.

## Lab #2

### Indirect measurement of distance between two points A and B.



This lab is similar to lab #1 except that we use the rules for angle-side-angle in order to find the desired distance. Point C is arbitrarily picked by the students anywhere on the same side as point A. Students might solve the problem in the following ways:

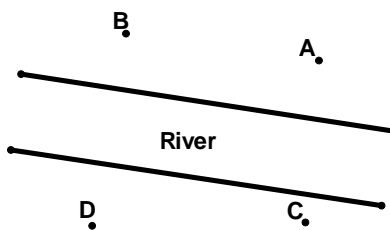
Level 1: Recreate a congruent triangle using a scale of 1:1 in an area that is not obstructed so students can measure  $A'B'$ .

Level 2: Recreate a similar triangle on paper using a scale such as 1":3".

Level 3 Use the Law of Sines to solve for the unknown distance.

Level 4: Reinforce the idea of angle-side-angle for congruent or similar triangles.

### Lab #3 Indirect measure of distance between two points (A and B) using a known distance (D to C) and the angle measures (angles CDB and DCA).



Level 1: Recreate a congruent triangle using a scale of 1:1 in an area that is not obstructed so students can measure  $A'B'$ . Students might solve the problem in the following ways:

Level 2: Recreate a similar triangle on paper using a scale such as 1":3".

Level 3: Use the Law of Sines to solve for the unknown distance.

Level 4: Reinforce the idea of congruent or similar quadrilaterals using angle-side-angle and diagonals.