

GGB Lab5: Shortest Distance from a Point to a Line

(revised for Geogebra from Exploring Geometry with The Geometer's Sketchpad Key Curriculum Press, 2012, pp 37)


Measuring the distance between two points is easy, but how do you measure the distance between a point and a line? There are many different distances, depending on what point you measure to on the line. What is the shortest distance?


OBJECTIVE: In this investigation you will discover the shortest distance from a point to a line.


SKETCH and INVESTIGATE: Open a new GGB file and save it as "Lab5a Shortest Distance from Point to Line"


Answer the questions in your composition book as you complete the lab and questions are asked.


- 1 Construct a textbox containing: "Lab 5a: Shortest Distance from a Point to a Line"

- 2 Construct line AB. Use  **Line through Two Points**
Select two points left click in graphics window to place point A, move and left click again to place point B.

- 3 Construct point C not on line AB. Use  **New Point**
Click on the Graphics View or on line, function, or curve and click off the line AB.


- 4 Construct point D on line AB. Use  **New Point**
Click on the Graphics View or on line, function, or curve and click on the line AB.

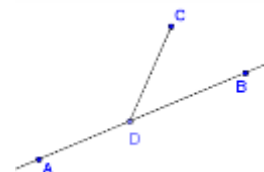
- 5 Construct segment CD, where point D is on line AB. Use  **Segment between Two Points**
Select two points and select point C then point D.

- 6 Measure segment CD. Use  **Distance or Length**
Select two points, segment, polygon, or circle and select point C then point D.

- 7 Drag point D back and forth along the line and observe where CD becomes great and where it becomes small.


- 8 Locate point D to make segment CD as small as possible.


- 9 Measure the distance from point C to line AB. Use  **Distance or Length**
Select two points, segment, polygon, or circle and select point C then select line AB.




QUESTION 1: Drag point D so that length CD is not the smallest. How does the distance from segment CD compare to the distance from C to line AB?

QUESTION 2: Drag point D so that length CD is the smallest. What appears to be the relationship between segment CD and line AB when distance CD is the smallest?

- 10 Measure angle CDB to confirm your conjecture in Question 2. Use  **Angle**
Select three points or two lines and select point C, then D then point A. If the angle measure is larger than 180° then right click on the shaded angle, choose Object Properties **Angle Between:** and select an angle between 0 and 180.

- 11 Construct a perpendicular line from point C to line AB. Use  **Perpendicular Line**
Select point and perpendicular line select point C then line AB.

- 12 Construct point E, the intersection point of line AB and the perpendicular line. Use

 **Intersect Two Objects**
Select two objects or click directly on intersection and select the intersection.

- 13 Hide the perpendicular line, then construct segment CE. Change the color of this segment and of point E to red. Change the segment to a dotted line.

- 14 Drag point D until the distance from point C to line AB is the shortest. This should confirm your conjecture.

QUESTION 3: How would you define the distance from a point to a line? Record your definition using a complete sentence.