



Problem – Measuring a River

In this activity, you are part of a team building a new road. To prepare for building a bridge, you need to measure the distance across a river. The river is treacherous and impossible to cross without the right equipment, so you must measure its width *indirectly*, using some stakes to mark points on the bank, a tape measure, and a theodolite. A theodolite is a special instrument used by surveyors to measure angles. To measure an angle, the theodolite must be placed at the vertex.

- Brainstorm some ideas how you might measure the width of the river indirectly.

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Here is one way to measure the width of the river indirectly, using the tools you have. You place a stake (S1) where you are standing, then walk down the bank until you are opposite the rock. You drive a stake here (S2) and find the distance.

- On page 1.3, measure the angle between the rock and S1, with a vertex at S2.

Let's examine and prove the Law of Sines, then return to solve the problem.

Click the slider on page 1.6 to prove the Law of Sines using the displayed steps.

- Record the Law of Sines below:

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Now you can return to the river problem on page 1.8.

- Draw the triangle formed by the three points.
- Set up your theodolite at S2 and measure the angle formed by the rock, S2, and S1.
- Walk back to S1 and set up your theodolite. Measure the angle formed by the rock, S1, and S2.
- Calculate the remaining angle of the triangle.
- Use the Laws of Sines to write and solve an equation to find the width of the river.