# Similar and Right Triangles: Unit Overview

**MPM2D, Grade 10 Principles of Mathematics (Academic), Unit 6.** 11 classes of 75 minutes, plus 1 to 2 classes for the summative and 1 for the unit test (about three weeks).

### The big question

How can similar triangles and trigonometry help us measure things we can't reach?

Students tell similar figures from congruent ones, investigate the properties of similar triangles, and use proportions to solve real problems with shadows, mirrors, maps and models. In an outdoor lab they measure heights indirectly. Similar right triangles then lead to the primary trigonometric ratios, which students use to find side lengths and angles, build a clinometer, solve angle of elevation and depression problems, combine two right triangles, and model jobs in navigation, roofing, surveying and accessible design. The summative, Measure the Unreachable, has students measure one tall object with similar triangles and with a clinometer, then compare the two results and explain the error.

## Lessons

| # | Lesson | Classes | Question | Expectations | What's inside |
|---|---|---|---|---|---|
| 1 | **Similar or Congruent?** | 1 | Same shape, same size? | T1.2 | Side ratios, angles, notation |
| 2 | **Properties of Similar Triangles** | 1 | What makes triangles similar? | T1.1 | Angle and side conditions; nested triangles |
| 3 | **Similar Triangles in the Real World** | 1 | How do proportions solve problems? | T1.3 | Shadows, maps, models and ponds |
| 4 | **Indirect Measurement Lab** | 1 | Can we measure what we can't reach? | T1.3 | Shadow and mirror methods outdoors |
| 5 | **The Primary Trigonometric Ratios** | 1 | Why are the ratios fixed? | T2.1 | Sine, cosine and tangent from similar triangles |
| 6 | **Finding Side Lengths** | 1 | Which ratio do I use? | T2.2, T2.3 | SOH CAH TOA; solving for a side |
| 7 | **Finding Angles** | 1 | How do we undo a ratio? | T2.2, T2.3 | Inverse ratios; ramps, roofs and ladders |
| 8 | **Angles of Elevation and Depression** | 1 | How high is it? | T2.3 | Building and using a clinometer |
| 9 | **Two-Triangle Problems** | 1 | What do the triangles share? | T2.3 | Towers, cliffs, signs and buildings |
| 10 | **Trigonometry at Work** | 1 | Who uses this? | T2.3 | Navigation, roofing, ramps and surveying |

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| # | Lesson | Classes | Question | Expectations | What's inside |
|---|---|---|---|---|---|
| 11 | **Right Triangle Review** | 1 | Which tool fits? | T1.1–T2.3 | Choosing a method; mixed review |

## Assessment

| Type | In this unit |
|---|---|
| Assessment for learning | Sort the Pairs, Investigate, Measure It, the Lab Sheet, Ratios Stay the Same, Find the Side, Find the Angle, the Clinometer Lab, Two Triangles, On the Job, Mixed Review, quick checks and exit tickets |
| Assessment as learning | Self-checks, Always Sometimes Never, Missing Sides and Angles, Models and Maps, the lab Analysis, Write the Ratios, Sides at Work, Angles at Work, Elevation and Depression, More Two-Triangle Problems, Your Own Problem, Problem Solving |
| Assessment of learning | Summative task (Measure the Unreachable) with a rubric, and a unit test with full solutions |

## Materials

Included:

- **Original problems and data:** every problem, data set and diagram was written for this unit (sample data is fictional)
- **Two outdoor labs:** shadow and mirror measurement, and a homemade clinometer
- **Start Here:** unit overview, summative task and rubric, unit test, and teacher solutions for both

Free or low-cost classroom tools only: protractors, straws, string, washers, small mirrors, measuring tapes and calculators. If students can't go outside, use the sample data in the lab and summative.

## What's in each lesson

- Teacher lesson plan with expectations, timed sequence, differentiation, look-fors and answer guides
- Slides with speaker notes
- Student handouts and organizers
- Editable Word and PowerPoint files, plus PDFs

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