Acute Triangles: Unit Overview

MPM2D, Grade 10 Principles of Mathematics (Academic), Unit 7. 8 classes of 75 minutes, plus 1 class for the summative and 1 for the unit test (about two weeks).

The big question

How do we solve triangles that don't have a right angle?

Students see why the primary ratios need a right angle, label acute triangles, and investigate the ratio of each side to the sine of its opposite angle. They follow the development of the sine law from two right triangles that share an altitude (connecting it to solving a system), then the development of the cosine law from the cosine ratio and the Pythagorean theorem. They use both laws to find sides and angles, choose the right tool with a decision chart, and solve problems in navigation, surveying, roof framing and sports. A review lesson connects Units 6 and 7. The summative, Trail Mapper, plans a hike-and-paddle route through a park using both laws, with a time estimate and a route card. Every triangle in this unit is acute, as the curriculum requires.

Lessons

#	Lesson	Classes	Question	Expectations	What's inside
1	**Beyond Right Triangles**	1	Why isn't SOH CAH TOA enough?	T3.1	Labelling; altitudes; investigating side ÷ sine
2	**The Sine Law**	1	Where does the sine law come from?	T3.1, T3.3	Following the development; finding a side
3	**Using the Sine Law**	1	How do we find an angle?	T3.3	Sines on top; checking reasonableness
4	**The Cosine Law**	1	What if the sine law can't start?	T3.2	Following the development; link to Pythagoras
5	**Using the Cosine Law**	1	Two sides and an angle, or three sides?	T3.3	Finding sides and angles; common errors
6	**Choosing the Right Tool**	1	Which tool fits?	T3.3, T3.4	A decision chart; solving completely
7	**Acute Triangle Problems**	1	Where is the triangle?	T3.4	Ships, rivers, trusses, goals and balloons
8	**Trigonometry Review**	1	How do the tools connect?	T1.3, T2.2, T3.3, T3.4	Mixed review of Units 6 and 7

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Assessment

Type	In this unit
Assessment for learning	Investigate the Ratios, Following the Development (both laws), Find the Side, Find the Angle, Cosine Law Practice, Which Tool?, On Land and Water, Mixed Review, quick checks and exit tickets
Assessment as learning	Self-checks, Why Primary Ratios Aren't Enough, Check It, Verify and Connect, Cosine Law at Work, Solve It Completely, Roofs, Goals and Balloons, Problem Solving
Assessment of learning	Summative task (Trail Mapper) 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 (the park and lake are fictional)
- **Two developments:** the sine law and the cosine law, each followed step by step beside a numerical example
- **Start Here:** unit overview, summative task and rubric, unit test, and teacher solutions for both

Free tools only: calculators, rulers, protractors, compasses and GeoGebra (free). Students follow the developments; they don't need to reproduce them.

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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