Plan for Geometry Unit 4: Right Triangle Trigonometry

Relevant Unit(s) to review: none

Essential prior concepts to engage with this unit	Prior to beginning this unit students will have considerable familiarity with right triangles. They learned to identify right triangles beginning in grade 4. Students studied the Pythagorean Theorem in grade 8, and used similar right triangles to build the idea of slope. This unit also builds heavily on similarity which is the previous unit in the geometry course.
Brief narrative of approach	This unit builds on extensive experiences and grounds trigonometric ratios in familiar contexts. The first few lessons of this unit examine some special cases of similar right triangles to solidify the idea that any right triangles with a single congruent acute angle are similar. Two of these three lessons are optional. While the standards do not specifically call for special right triangles, they are an opportunity to practice, build on important ideas, and are frequently included on college entrance exams. From there students generate data for the side length ratios of many sets of right triangles. This data is organized into a table which students apply to problems. Taking the time to both build and use the table helps students build a solid foundation before they learn the names of trigonometric ratios. Once students have practiced estimating both side lengths and angle measures using the table, they learn the names cosine, sine, and tangent. At this point, students then practice looking up the cosine, sine, or tangent of a given angle in a calculator with simple triangles, then they apply trigonometry to several contexts. When students solve problems in context they grapple with whether or not their answer is reasonable, as well as the appropriate degree of precision to report.

Lessons to Add	Lessons to Remove or Modify
For this unit, there are no lessons that need to be added, because the most relevant content is the previous unit in this course (Unit 3: Similarity). However, if students have forgotten the Pythagorean Theorem you may need to provide some additional guidance.	This unit does not require any lessons to be removed. However, there are two optional lessons that are not necessary to be successful in the rest of the course. So, if time is needed, you can skip those lessons or choose to do only the first one.
Lessons added: 0	Lessons removed: 0

Modified Plan for Geometry Unit 4

Day	IM lesson	Notes
	assessment	Check Your Readiness
1	G.4.1	Angles, steepness, and ratios
2	G.4.2	45-45-90 triangles
3	G.4.3	30-60-90 triangles
4	G.4.4	Ratios in right triangles
5	G.4.5	More ratios in right triangles
6	G.4.6	Those ratios have names: sine, cosine, and tangent!
7	G.4.7	Applying right triangle ratios to solve problems
8	G.4.8	

9	G.4.9	Finding angles using inverse trigonometric functions and calculators
10	G.4.10	Using right triangle trigonometry to solve problems
11	G.4.11	Estimating pi
	assessment	End of Unit Assessment

Priority and Category List for Lessons

High priority (+), Medium priority (0), Low priority (-)

E: Explore, Play, and Discuss, D: Deep Dive, A: Synthesize and Apply

Lesson	Priority (+, 0, -)	Category (E, D, A)	Notes
G.4.1	0	E	The goal of this lesson is for students to recognize that the ratio of the legs of a right triangle with a given acute angle is fixed. They are building connections to similar right triangles in the previous unit.
G.4.2	-	E	This lesson is optional. The lesson provides scaffolding for students to reason about 45-45-90 triangles.
G.4.3	-	E	This is another optional lesson. It builds on the thinking that students did in the previous optional lesson. It is recommended to only do this lesson along with the previous optional lesson. This lesson delves into the 30-60-90 triangle.
G.4.4	+	E	This lesson is students' first encounter with trigonometry although they won't encounter the word trigonometry yet. They start with the essential concept of connecting angle measurements with the ratios of side lengths in a right triangle. In this lesson, students are focused on looking for patterns, estimating, and moving back and forth between predicting angle measures from ratios and ratios from angle measures.
G.4.5	+	A	The goal of this lesson is for students to continue to build the understanding that an acute

			angle measure in a right triangle determines the ratios of its side lengths, and vice versa. Students first use their right triangle table to estimate angle measures given a right triangle with three known side lengths. Then they use the ratios they calculated to find unknown side lengths precisely. Students are not expected to master this skill in this lesson.
G.4.6	+	D	In this lesson students learn the names of the trigonometric ratios they have been using in the right triangle table and how to look them up on the calculator.
G.4.7	0	A	In this lesson students deepen their understanding of trigonometry by completing an info gap. The info gap structure requires students to make sense of problems by determining what information is necessary and then asking for information they need to solve it.
G.4.8	0	D	In previous lessons, students began to make conjectures about cosine and sine of complementary angles before they've learned the terms cosine or sine. In this lesson, students do some calculations to remind them of their previous conjectures and then prove $\sin(x) = \cos(90 - x)$.
G.4.9	+	A	For the past few lessons students have been finding side lengths in right triangles where they are given an acute angle and the length of one other side. In this lesson they find an angle given two side lengths of a right triangle. They learn to use a calculator to look up the angle corresponding to a ratio of sides and then apply that skill to a variety of problems and a context.
G.4.10	0	A	In this lesson students apply the concepts of trigonometry to two different situations. In the first, students need to interpret a diagram with limited information to find a way to calculate the dimensions of a polygon. In the second, students are given information about a plane's flight path, but they need to draw their own diagram as well as grapple with converting units.
G.4.11	0	A	In this lesson students build off their concrete calculations from the previous lesson to write a generalized formula for the perimeter of a polygon inscribed in a circle of radius 1. The relatively unstructured presentation of this activity is purposeful so students can build their perseverance and sense-making.