Geometry and Measurement: Unit Overview

MTH1W, Grade 9 Mathematics (De-streamed), Unit 5. 12 classes of 75 minutes, plus one class for the unit test (about two and a half weeks).

The big question

How do geometric and measurement relationships help us design, build and solve real problems?

Students tell the story of a measurement system from a culture or community and connect it to careers, then convert units within the metric system (including area and volume units) and between metric, imperial and other systems. They investigate circle and triangle properties and use them in designs, discover and apply the Pythagorean relationship in real-life and composite shapes, and show how changing dimensions affects perimeter, area, surface area and volume. They use the volume relationships between prisms and pyramids and between cylinders and cones, and read and alter Python code that tests every case to find the best dimensions. The summative asks students to design an accessible outdoor learning space with a ramp, a raised bed and planters.

Lessons

#	Lesson	Classes	Question	Expectations	What's inside
1	**Measurement Stories**	1	Where did our units come from?	E1.1, A2	Body units, cubits, the metre, the qajaq, careers
2	**Converting Metric Units**	1	Why is 1 m^2 10 000 cm^2?	E1.3	Metric staircase; area, volume and capacity
3	**Between Measurement Systems**	1	Multiply or divide?	E1.3	Imperial, shaku, hands; units cancel
4	**Circle Properties in Design**	1	What rules hide in every circle?	E1.2	Central and inscribed angles, semicircle, tangent
5	**Triangle Properties in Design**	1	Why are bridges full of triangles?	E1.2	Angle sum, exterior angles, isosceles, rigidity
6	**The Pythagorean Relationship**	1	How do the sides of a right triangle relate?	E1.5	Squares on the sides; the 3-4-5 check
7	**Pythagoras in Composite Shapes**	1	Where do right triangles hide?	E1.5	Ladders, ramps, screens, gables, kites
8	**Changing Dimensions: Perimeter and Area**	1	Same fence, different gardens?	E1.4	Fixed perimeter and area; scaling; pizza
9	**Changing Dimensions: Surface Area and Volume**	1	What makes a package efficient?	E1.4	64 cm^3 boxes; k^2 and k^3; open-top box

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10	**Prisms and Pyramids**	1	Why one-third?	E1.6	V = Bh and (1/3)Bh; tents, beds, litres
11	**Cylinders and Cones**	1	How much does it hold?	E1.6, E1.4	Cans, cones, silos, rain barrels
12	**Coding Measurement and Review**	1	Can code find the best dimensions?	E1.4, C2.2, C2.3	Fence and box code; unit review

Assessment

Type	In this unit
Assessment for learning	Body Measures, Convert It, Convert Between Systems, Circle Angles, Missing Angles, Discover It, Find the Triangle, Fixed Fence, The 64 cm³ Box, Prisms and Pyramids, Cylinders and Cones, Read and Alter the Code, quick checks and exit tickets
Assessment as learning	Self-checks, Measurement Story Planner, unit review
Assessment of learning	Summative task (Design a Space) with a rubric, and a unit test with full solutions

Materials

Included:

- **Original problems and diagrams:** every problem, data set, diagram and plan was written or drawn for this unit
- **Code:** two short Python programs (any free Python editor, or trace on paper)
- **Start Here:** unit overview, summative task and rubric, unit test, and teacher solutions for both

Free tools only: rulers, compasses, protractors, grid paper, string, dry rice or sand, card stock, GeoGebra or Desmos, and any board-approved Python editor. The lot and all products are fictional.

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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