Powers and Proportions: Unit Overview

MTH1W, Grade 9 Mathematics (De-streamed), Unit 2. 10 classes of 75 minutes, plus one class for the unit test (about two and a half weeks).

The big question

How do powers describe very large and very small quantities, and how do ratios, rates and percentages help us make decisions?

Students discover how powers work through patterns: repeated multiplication, zero and negative exponents, scientific notation for objects from DNA to the distance to the Sun, and the exponent laws for numeric and algebraic expressions. They use Python loops to explore growth and negative exponents. The second half of the unit turns to proportional reasoning: unit rates and best buys, percentages with discounts, Ontario's 13% HST and percent change, scale drawings, maps, recipes, similar triangles and density. Students finish by posing their own problems. The summative is a bedroom makeover on a budget.

Lessons

#	Lesson	Classes	Question	Expectations	What's inside
1	**Patterns in Powers**	1	What does an exponent do?	B2.1	Folding paper; expanded form; negative bases
2	**Zero and Negative Exponents**	1	What does 2^0 or 2^−3 mean?	B2.1	Pattern charts; a^0 = 1; a^(−n) = 1/a^n
3	**Scientific Notation**	1	How do we write huge and tiny numbers?	B2.1	Powers-of-ten scale; conversions; E notation
4	**Exponent Laws: Multiply and Divide**	1	Why do exponents add and subtract?	B2.2	Product and quotient laws; errors; sci. notation
5	**Simplifying with Powers**	1	How do we combine the laws?	B2.2, C1.4	Power of a power and of a product; shapes
6	**Coding with Powers**	1	How can a loop model growth?	B2.1, C2.2, C2.3	Python for and while loops
7	**Ratios and Rates**	1	How do we compare fairly?	B3.5	Unit prices, speed, L/100 km, bus passes
8	**Percentages in Real Life**	1	How do discounts and taxes work?	B3.5, B3.3	HST, tips, percent change, working backward
9	**Proportional Reasoning**	1	How do we measure what we can't reach?	B3.5	Floor plans, maps, recipes, shadows, density
10	**Pose Your Own Problem**	1	What makes a good problem?	B3.5, A1, B2.1, B2.2	Write, swap, solve; unit review

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Assessment

Type	In this unit
Assessment for learning	Power patterns, pattern charts, conversions, Simplify It, Code A and B, best buys, sale day, Scale It, quick checks and exit tickets
Assessment as learning	Self-checks, Problem Writer peer feedback, unit review
Assessment of learning	Summative task (Scale It: A Bedroom Makeover) with a rubric, and a unit test with full solutions

Materials

Included:

- **Original problems and diagrams:** every problem, price, floor plan, scale strip and shadow diagram 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

Prices are invented for practice. Physical measurements (the CN Tower, Earth, the Sun's distance, the speed of light, blood cells, DNA) are rounded, commonly cited values. Ontario's HST is 13%.

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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