Algebra and Code: Unit Overview

MTH1W, Grade 9 Mathematics (De-streamed), Unit 3. 11 classes of 75 minutes, plus one class for the unit test (about two and a half weeks).

The big question

How can letters, expressions, equations and code describe patterns and solve problems?

Students meet algebra's history (Egyptian heap problems, Babylonian tablets, Brahmagupta and al-Khwarizmi's al-jabr), then generalize growing patterns with expressions, compare expressions with tiles, substitution, graphs and simplifying, and simplify polynomials using properties of operations. They write, solve and verify equations (including fractions and formulas) for real situations. The coding lessons build on Units 1 and 2: Python variables, parameters, functions, guess-and-check loops and if statements that solve equations and inequalities. The summative combines a short Algebra Story with Plan Detective, a comparison of three gym memberships using expressions, equations and code.

Lessons

#	Lesson	Classes	Question	Expectations	What's inside
1	**The Story of Algebra**	1	Who invented algebra?	C1.1, A2	Heap problems, false position, al-jabr
2	**Patterns to Expressions**	1	How do we write a rule for any figure?	C1.2	Growing patterns, words to symbols, a riddle
3	**Are They Equivalent?**	1	When are two expressions the same?	C1.3	Tiles, substitution, graphs, simplifying
4	**Simplifying Expressions**	1	How do we make long expressions short?	C1.4	Like terms, distributive property, polynomials
5	**Expressions in Context**	1	How do expressions describe real things?	C1.4, C1.2	Monomial × polynomial; area, volume, profit
6	**Writing Equations**	1	How do we turn a story into an equation?	C1.5, C1.2	Let statements; six contexts
7	**Solving Equations**	1	How do we keep an equation balanced?	C1.5	Inverse operations; both sides; verifying
8	**Equations with Fractions and Formulas**	1	How do we rearrange a formula?	C1.5, B3.4	Clearing fractions; five formulas
9	**Variables and Parameters in Code**	1	How can one program model many situations?	C2.1, C2.3	Cost tables, parameters, functions
10	**Equations and Inequalities in Code**	1	How can a computer search for answers?	C2.1, C2.2, C1.5	Guess-and-check loops, if, decomposing

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#	Lesson	Classes	Question	Expectations	What's inside
11	**Algebra Problem Solving and Review**	1	How do the stories and skills connect?	C1.1–C1.5, C2.3	Lightning talks; unit review

Assessment

Type	In this unit
Assessment for learning	Heap problems, growing patterns, Test the Pairs, Simplify, Translate It, Solve and Verify, formulas, Code A to D, Decompose It, quick checks and exit tickets
Assessment as learning	Self-checks, story share notes, unit review
Assessment of learning	Summative task (Algebra Story and Plan Detective) with a rubric, and a unit test with full solutions

Materials

Included:

- **Original problems and diagrams:** every problem, pattern, tile diagram, balance and graph was written or drawn for this unit
- **Code:** four 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: algebra tiles (or paper tiles), Desmos for graphing, and any board-approved Python editor. The gym, prices and plans 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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