Quadratic Expressions: Unit Overview

MPM2D, Grade 10 Principles of Mathematics (Academic), Unit 4. 10 classes of 75 minutes, plus one class for the unit test (about two weeks).

The big question

How are multiplying and factoring two sides of the same idea, and what do factors tell us about a graph?

Students use area models and algebra tiles to expand products of binomials, then use patterns to expand squares of binomials, products of a sum and a difference, and two-variable products. They reverse the process: common factoring and grouping, factoring $x^2 + bx + c$ by sum and product, factoring $ax^2 + bx + c$ by decomposition, and recognizing differences of squares and perfect square trinomials. A flowchart helps them choose a strategy and factor fully. Investigating $y = a(x - r)(x - s)$ in Desmos, they connect factors to zeros, find the axis and vertex, sketch from factored form and write equations from zeros and a point. The summative, Frame It, uses expressions to design a frame, a garden path and a poster, and connects factored form to an arch's graph.

Lessons

#	Lesson	Classes	Question	Expectations	What's inside
1	**Multiplying Binomials**	1	How do area models multiply binomials?	QR3.1	Area models; sum and product pattern
2	**Special Products**	1	Which products have shortcuts?	QR3.1	Squares; sum times difference; two variables
3	**Common Factoring**	1	How do we undo the distributive property?	QR3.2	GCF; binomial factors; grouping
4	**Factoring $x^2 + bx + c$**	1	Which two numbers?	QR3.2	Sum and product; signs
5	**Factoring $ax^2 + bx + c$**	1	What if $a \neq 1$?	QR3.2	Decomposition and grouping
6	**Special Factoring Patterns**	1	Which patterns factor instantly?	QR3.2	Differences of squares; perfect squares
7	**Choosing a Factoring Strategy**	1	Where do I start?	QR3.2	A flowchart; factoring fully
8	**Factored Form and Zeros**	1	What do factors tell us about a graph?	QR3.3, QR1.3, QR4.1	Zeros, axis, vertex; a ball's flight
9	**From Factored Form to Graph**	1	How do we sketch from factors?	QR3.3, QR1.3	Sketching; equations from zeros; three forms
10	**Expressions Review**	1	How do the ideas connect?	QR3.1–QR3.3	Mixed review, error hunt and a factoring relay

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Assessment

Type	In this unit
Assessment for learning	Expand and Simplify, Use the Patterns, Find the Common Factor, Sum and Product, Decomposition, Spot the Pattern, Mixed Factoring, Features from Factors, Sketch from Factors, Mixed Review, quick checks and exit tickets
Assessment as learning	Self-checks, Area Expressions, Mental Math and Errors, Fully Factored?, Write the Equation, Error Hunt and Relay
Assessment of learning	Summative task (Frame It) with a rubric, and a unit test with full solutions

Materials

Included:

- **Original problems and diagrams:** every expression, design and diagram was written for this unit
- **Concrete tools:** area models, algebra tiles (paper or free virtual tiles) and a factoring flowchart
- **Start Here:** unit overview, summative task and rubric, unit test, and teacher solutions for both

Free tools only: algebra tiles (paper or free online), graph paper, Desmos and GeoGebra CAS (free).

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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