Unit #4: Factoring and Quadratics

Content Area: **Template**
Course(s):
Time Period: **February**
Length: **8 weeks**
Status: **Published**

State Mandated Topics Addressed in this Unit

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N/A	N/A

Factoring and Quadratics

Learning Objectives

- Objective 1 - Interpret parts of expressions including terms, factors, and coefficients.
- Objective 10 - Explain the properties of the quantity represented by an expression
- Objective 11 - *Factor a quadratic expression to reveal its zeros
- Objective 12 - Rewrite quadratic equations to vertex form using completing the square.
- Objective 13 - Determine if the vertex is a maximum or minimum.
- Objective 14 - Choose an equivalent form of an expression.
- Objective 15 - Produce an equivalent form of an expression.
- Objective 16 - Explain the properties of the quantity represented by an expression.
- Objective 17 - Choose an equivalent form of an expression.
- Objective 18 - Produce an equivalent form of an expression.
- Objective 19 - Explain the properties of the quantity represented by an expression.
- Objective 2 - Interpret expressions in terms of context.
- Objective 20 - *Transform exponential functions using the properties of exponents*
- Objective 21 - Understand polynomials are closed under addition, subtraction, and multiplication.
- Objective 22 - Create and solve equations.
- Objective 23 - Create and solve inequalities.
- Objective 24 - Explain the steps to solving an equation.
- Objective 25 - Construct a viable argument to justify a solution method.
- Objective 26 - Solve quadratic equations in one variable, including completing the square and quadratic formula.
- Objective 27 - Derive the quadratic formula by completing the square.
- Objective 28 - Use completing the square to transform quadratic equations into the form (x-p)^2=q.

- Objective 29 - Compare properties of two functions represented differently (algebraically, graphically, numerically, verbally)
- Objective 3 - Interpret complicated expressions by viewing its parts as a single entity.
- Objective 30 - Write a function that describes a relationship between two quantities.
- Objective 31 - *Determine an explicit expression, recursive process, or steps for calculations from a given context*
- Objective 32 - Combine functions using arithmetic operations.
- Objective 33 - Build a function by combining two functions and relate the resulting functions to a model.
- Objective 4 - Factor expressions.
- Objective 5 - Identify structure to rewrite expressions.
- Objective 6 - Rewrite using difference of squares.
- Objective 7 - Rewrite expressions using difference and sum of cubes.
- Objective 8 - Choose an equivalent form of an expression.
- Objective 9 - Produce an equivalent form of an expression.

Essential Skills

- Essential Skill 1 - Artists will be able to interpret parts of expressions including terms, factors, and coefficients.
- Essential Skill 10 - Artists will be able to produce an equivalent form of an expression.
- Essential Skill 11 - Artists will be able to explain the properties of the quantity represented by an expression.
- Essential Skill 12 - Artists will be able to factor a quadratic expression to reveal its zeros.
- Essential Skill 13 - Artists will be able to rewrite quadratic equations to vertex form using completing the square.
- Essential Skill 14 - Artists will be able to determine if the vertex is a maximum or minimum.
- Essential Skill 15 - Artists will be able to choose an equivalent form of an expression.
- Essential Skill 16 - Artists will be able to produce an equivalent form of an expression.
- Essential Skill 17 - Artists will be able to explain the properties of the quantity represented by an expression.
- Essential Skill 18 - Artists will be able to transform exponential functions using the properties of exponents.
- Essential Skill 19 - Artists will be able to explain the steps to solving an equation.
- Essential Skill 2 - Artists will be able to interpret expressions in terms of context.
- Essential Skill 20 - Artists will be able to construct a viable argument to justify a solution method.
- Essential Skill 21 - Artists will be able to solve quadratic equations in one variable, including completing the square and quadratic formula.
- Essential Skill 22 - Artists will be able to derive the quadratic formula by completing the square.
- Essential Skill 23 - Artists will be able to use completing the square to transform quadratic equations into the form (x-p)^2=q.
- Essential Skill 24 - Artists will be able to understand polynomials are closed under addition, subtraction, and multiplication.

- Essential Skill 25 - Artists will be able to create and solve equations.
- Essential Skill 26 - Artists will be able to create and solve inequalities.
- Essential Skill 27 - Artists will be able to compare properties of two functions represented differently (algebraically, graphically, numerically, verbally) Example: given a graph of a quadratic and algebraic expression, say which has the larger maximum.
- Essential Skill 28 - Artists will be able to write a function that describes a relationship between two quantities.
- Essential Skill 29 - Artists will be able to determine an explicit expression, recursive process, or steps for calculations from a given context.
- Essential Skill 3 - Artists will be able to interpret complicated expressions by viewing its parts as a single entity.
- Essential Skill 30 - Artists will be able to combine functions using arithmetic operations.
- Essential Skill 31 - Artists will be able to build a function by combining two functions and relate the resulting functions to a model.
- Essential Skill 4 - Artists will be able to factor expressions.
- Essential Skill 5 - Artists will be able to identify structure to rewrite expressions.
- Essential Skill 6 - Artists will be able to rewrite using difference of squares.
- Essential Skill 7 - Artists will be able to rewrite expressions using difference of cubes.
- Essential Skill 8 - Artists will be able to rewrite expressions using sum of cubes.
- Essential Skill 9 - Artists will be able to choose an equivalent form of an expression.

Standards

MATH.9-12.A.APR.A.1	Understand that polynomials form a system analogous to the integers, namely, they are closed under the operations of addition, subtraction, and multiplication; add, subtract, and multiply polynomials.
MATH.9-12.F.BF.A.1	Write a function that describes a relationship between two quantities.
MATH.9-12.F.BF.A.1.a	Determine an explicit expression, a recursive process, or steps for calculation from a context.
MATH.9-12.F.BF.A.1.b	Combine standard function types using arithmetic operations.
MATH.9-12.A.APR.B.3	Identify zeros of polynomials when suitable factorizations are available, and use the zeros to construct a rough graph of the function defined by the polynomial.
MATH.9-12.F.BF.A.1.c	Compose functions.
MATH.9-12.A.CED.A.1	Create equations and inequalities in one variable and use them to solve problems. Include equations arising from linear and quadratic functions, and simple rational and exponential functions.
MATH.9-12.F.IF	Interpreting Functions
MATH.9-12.A.REI.A.1	Explain each step in solving a simple equation as following from the equality of numbers asserted at the previous step, starting from the assumption that the original equation has a solution. Construct a viable argument to justify a solution method.
MATH.9-12.F.IF.B	Interpret functions that arise in applications in terms of the context
MATH.9-12.F.IF.B.4	For a function that models a relationship between two quantities, interpret key features of graphs and tables in terms of the quantities, and sketch graphs showing key features given a verbal description of the relationship.

MATH.9-12.A.REI.B.4	Solve quadratic equations in one variable.
MATH.9-12.A.REI.B.4.a	Use the method of completing the square to transform any quadratic equation in x into an equation of the form $(x - p)^2 = q$ that has the same solutions. Derive the quadratic formula from this form.
MATH.9-12.A.REI.B.4.b	Solve quadratic equations by inspection (e.g., for $x^2 = 49$), taking square roots, completing the square, the quadratic formula and factoring, as appropriate to the initial form of the equation. Recognize when the quadratic formula gives complex solutions and write them as $a \pm bi$ for real numbers a and b.
MATH.9-12.F.IF.C	Analyze functions using different representations
MATH.9-12.A.REI.D.10	Understand that the graph of an equation in two variables is the set of all its solutions plotted in the coordinate plane, often forming a curve (which could be a line).
MATH.9-12.A.REI.D.11	Explain why the x-coordinates of the points where the graphs of the equations $y = f(x)$ and $y = g(x)$ intersect are the solutions of the equation $f(x) = g(x)$; find the solutions approximately, e.g., using technology to graph the functions, make tables of values, or find successive approximations. Include cases where $f(x)$ and/or $g(x)$ are linear, polynomial, rational, absolute value, exponential, and logarithmic functions.
MATH.9-12.F.IF.C.9	Compare properties of two functions each represented in a different way (algebraically, graphically, numerically in tables, or by verbal descriptions).
MATH.9-12.A.SSE.A.1	Interpret expressions that represent a quantity in terms of its context.
MATH.9-12.A.SSE.A.1.a	Interpret parts of an expression, such as terms, factors, and coefficients.
MATH.9-12.A.SSE.A.1.b	Interpret complicated expressions by viewing one or more of their parts as a single entity.
MATH.9-12.A.SSE.A.2	Use the structure of an expression to identify ways to rewrite it.
MATH.9-12.A.SSE.B	Write expressions in equivalent forms to solve problems
MATH.9-12.A.SSE.B.3	Choose and produce an equivalent form of an expression to reveal and explain properties of the quantity represented by the expression.
MATH.9-12.A.SSE.B.3.a	Factor a quadratic expression to reveal the zeros of the function it defines.
MATH.9-12.A.SSE.B.3.b	Complete the square in a quadratic expression to reveal the maximum or minimum value of the function it defines.
MATH.9-12.A.SSE.B.3.c	Use the properties of exponents to transform expressions for exponential functions.

Instructional Tasks/Activities

- Academic games & Competitions
- Arts inspired projects
- Formative Assessments
- Ladder Activity
- Notes
- Worksheets

Assessment Procedure

- Assessment review
- Classroom Total Participation Technique

- Classwork
- DBQ
- Essay
- Exit Ticket/Entrance Ticket/Do Now
- Journal / Student Reflection
- Kahoot
- Peer Review
- Performance
- Problem Correction
- Project
- Quiz
- Rubric
- Teacher Collected Data
- Test
- Worksheet

Recommended Technology Activities

- Appropriate Content Specific Online Resource
- Chromebook
- Gimkit
- GoGuardian
- Google Classroom
- Google Docs
- Google Forms
- Google Slides
- Kahoot
- MagicSchool AI
- Powerpoint
- Quizizz
- Screencastify

Accommodations & Modifications & Differentiation

Accommodations and Modifications should be used to meet individual needs. Their IEP and 504 plans should be used in addition to the following suggestions.

Gifted and Talented

- Compare & Contrast
- Conferencing
- Debates
- Jigsaw
- Peer Partner Learning
- Problem Solving
- Structured Controversy
- Think, Pair, Share
- Tutorial Groups

Instruction/Materials

- alter format of materials (type/highlight, etc.)
- color code materials
- eliminate answers
- extended time
- large print
- modified quiz
- modified test
- Modify Assignments as Needed
- Modify/Repeat/Model directions
- necessary assignments only
- Other (specify in plans)
- other- named in lesson
- provide assistance and cues for transitions
- provide daily assignment list
- read class materials orally
- reduce work load
- shorten assignments
- study guide/outline
- utilize multi-sensory modes to reinforce instruction

Environment

- alter physical room environment
- assign peer tutors/work buddies/note takers
- assign preferential seating
- individualized instruction/small group

- modify student schedule (Describe)
- other- please specify in plans
- provide desktop list/formula

Honors Modifications

Resources

- Resource 1 - www.KhanAcademy.com