FRANKLIN-SIMPSON HIGH SCHOOL
ALGEBRA II (POST SECONDARY)
UNIT 7 PLAN
SOLVING QUADRATIC EQUATIONS

Purpose of the Unit: The overall learning objective is to learn and use methods of solving quadratic equations. These methods include factoring, tables, graphs, square roots, and the quadratic formula. During this endeavor, students will also review multiplying polynomials and simplifying square roots.

Prerequisites: Students should be able to graph parabolas using a graphing calculator, understand the components of a parabola, and know how to solve basic linear equations.

Daily Lesson Plan:

Day 1
Lesson Content: Multiplying Polynomials
Quality Core Standards:
B.1.d. Use the language of mathematics to communicate increasingly complex ideas orally and in writing, using symbols and notations correctly

1. **B.1.d.** Use the language of mathematics to communicate increasingly complex ideas orally and in writing, using symbols and notations correctly
2. **B.1.e.** Make appropriate use of estimation and mental mathematics in computations and to determine the reasonableness of solutions to increasingly complex problems

Common Core Standards:

1. **A.SSE.1a.** Interpret parts of an expression, such as terms, factors, and coefficients
2. **A.SSE.2.** Use the structure of an expression to identify ways to rewrite it.

Focus Questions:

1. How do I multiply a monomial to a polynomial?
2. How do I multiply polynomials?

Mathematical Practices:
Engagement:
Assessment:

1. Formative – Polynomial Pre-Assessment
2. Formative – Multiplying Polynomials Worksheet (1-24)
3. Formative – Multiplying Special Case Polynomials Worksheet (1-26)

Day 2
Lesson Content: Factoring Quadratic Functions of the Form x^2+bx+c
Quality Core Standards:

1. **B.1.e.** Make appropriate use of estimation and mental mathematics in computations and to determine the reasonableness of solutions to increasingly complex problems

Common Core Standards:

1. **A.SSE.1a.** Interpret parts of an expression, such as terms, factors, and coefficients
2. **A.SSE.2.** Use the structure of an expression to identify ways to rewrite it.

Focus Questions:

1. What is a quadratic function?
2. How do you factor a quadratic of the form x^2+bx+c?

Mathematical Practices:

Engagement:

Assessment:

1. Formative – ACT Practice Problems Opener
2. Formative – p221-222 (14-30 even, 72)

Day 3

Lesson Content: Factoring Quadratic Functions of the Form ax^2+bx+c

Quality Core Standards:

1. **B.1.e.** Make appropriate use of estimation and mental mathematics in computations and to determine the reasonableness of solutions to increasingly complex problems

Common Core Standards:

1. **A.SSE.1a.** Interpret parts of an expression, such as terms, factors, and coefficients
2. **A.SSE.2.** Use the structure of an expression to identify ways to rewrite it.

Focus Questions:

1. How do you find and factor out the GCF of an expression?
2. How do you factor a quadratic of the form ax^2+bx+c?

Mathematical Practices:

Engagement:

Assessment:

1. Formative – EOC Practice Problems Opener
2. Formative – p221-222 (32-46 even)

Day 4

Lesson Content: Factoring Special Quadratic Equations

Quality Core Standards:

1. **B.1.e.** Make appropriate use of estimation and mental mathematics in computations and to determine the reasonableness of solutions to increasingly complex problems

Common Core Standards:

1. **A.SSE.1a.** Interpret parts of an expression, such as terms, factors, and coefficients
2. **A.SSE.2.** Use the structure of an expression to identify ways to rewrite it.

Focus Questions:

1. How do you identify a difference of two squares and a trinomial square?
2. How do you factor a difference of two squares and a trinomial square?

Mathematical Practices:

Engagement:

Assessment:

1. **Formative – Factoring Review**
2. **Formative – p221-222 (48-54 even, 58-68 even)**

Day 5

Lesson Content: Factoring Quadratics

Quality Core Standards:

1. **B.1.e.** Make appropriate use of estimation and mental mathematics in computations and to determine the reasonableness of solutions to increasingly complex problems

Common Core Standards:

1. **A.SSE.1a.** Interpret parts of an expression, such as terms, factors, and coefficients
2. **A.SSE.2.** Use the structure of an expression to identify ways to rewrite it.

Focus Questions:

1. How do factor a quadratic?
2. How do you determine the best method for factoring a quadratic?
3. How do you determine a quadratic is prime?

Mathematical Practices:

Engagement:

Assessment:

1. Formative - ACT Practice Opener
2. Formative – Factoring Graphic Organizer
3. Formative – Factoring Review Assessment

Day 6

Lesson Content: Solving Quadratic Equations using Factoring

Quality Core Standards:

1. **B.1.a.** Apply problem-solving skills (e.g. identifying irrelevant or missing information, making conjectures, extracting mathematical meaning, recognizing and performing multiple steps when needed, verifying results in the context of the problem) to the solution of real-world problems
2. **B.1.b.** Use a variety of strategies to set up and solve increasingly complex problems
3. **B.1.c.** Represent data, real-world situations, and solutions increasingly complex context (e.g., expressions, formulas, tables, charts, graphs, relations, functions) and understand the relationships
4. **B.1.d.** Use the language of mathematics to communicate increasingly complex ideas orally and in writing, using symbols and notations correctly
5. **B.1.e.** Make appropriate use of estimation and mental mathematics in computations and to determine the reasonableness of solutions to increasingly complex problems
6. **B.1.f.** Make mathematical connections among concepts, across disciplines, and in everyday experiences
7. **B.1.g.** Demonstrate the appropriate role of technology (e.g. calculators, software programs) in mathematics (e.g., organize data, develop concepts, explore relationships, decrease time spent on computations after a skill has been established)
8. **B.1.h.** Apply previously learned algebraic concepts in geometry contexts
9. **E.1.a.** Solve quadratic equations and inequalities various techniques, including completing the square and using the quadratic formula

Common Core Standards:

1. **A.SSE.1a.** Interpret parts of an expression, such as terms, factors, and coefficients
2. **A.REI.4.b.** Solve quadratic equations by inspection, 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 in complex form

Focus Questions:

How do you use factoring to solve quadratic equations?

Mathematical Practices:

Engagement:

Assessment:

1. Formative – Projectile Situation
2. Formative – p229-230 (10-16 even, 37)

Day 7

Lesson Content: Solving Quadratic Equations using Tables and Graphs

Quality Core Standards:

1. **B.1.a.** Apply problem-solving skills (e.g. identifying irrelevant or missing information, making conjectures, extracting mathematical meaning, recognizing and performing multiple steps when needed, verifying results in the context of the problem) to the solution of real-world problems
2. **B.1.b.** Use a variety of strategies to set up and solve increasingly complex problems
3. **B.1.c.** Represent data, real-world situations, and solutions increasingly complex context (e.g., expressions, formulas, tables, charts, graphs, relations, functions) and understand the relationships
4. **B.1.d.** Use the language of mathematics to communicate increasingly complex ideas orally and in writing, using symbols and notations correctly
5. **B.1.e.** Make appropriate use of estimation and mental mathematics in computations and to determine the reasonableness of solutions to increasingly complex problems
6. **B.1.f.** Make mathematical connections among concepts, across disciplines, and in everyday experiences
7. **B.1.g.** Demonstrate the appropriate role of technology (e.g. calculators, software programs) in mathematics (e.g., organize data, develop concepts, explore relationships, decrease time spent on computations after a skill has been established)
8. **B.1.h.** Apply previously learned algebraic concepts in geometry contexts
9. **E.1.a.** Solve quadratic equations and inequalities various techniques, including completing the square and using the quadratic formula

Common Core Standards:

1. **A.APR.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
2. **A.REI.4.b.** Solve quadratic equations by inspection, 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 in complex form

Focus Questions:

1. How does quadratic equations relate to a quadratic functions?
2. How do you use a quadratic function's table of solution and/or graph to find the solution to a quadratic equation?

Mathematical Practices:

Engagement:

Assessment:

1. Formative – Calculator Review
2. Formative - Maximum Profit Situation
3. Formative – p229 (18-36 even)

Days 9 and 10

Lesson Content: Solving Quadratic Equations by using Factoring and its related Function

Quality Core Standards:

1. **B.1.a.** Apply problem-solving skills (e.g. identifying irrelevant or missing information, making conjectures, extracting mathematical meaning, recognizing and performing multiple steps when needed, verifying results in the context of the problem) to the solution of real-world problems
2. **B.1.b.** Use a variety of strategies to set up and solve increasingly complex problems
3. **B.1.c.** Represent data, real-world situations, and solutions increasingly complex context (e.g., expressions, formulas, tables, charts, graphs, relations, functions) and understand the relationships
4. **B.1.d.** Use the language of mathematics to communicate increasingly complex ideas orally and in writing, using symbols and notations correctly
5. **B.1.e.** Make appropriate use of estimation and mental mathematics in computations and to determine the reasonableness of solutions to increasingly complex problems
6. **B.1.f.** Make mathematical connections among concepts, across disciplines, and in everyday experiences
7. **B.1.g.** Demonstrate the appropriate role of technology (e.g. calculators, software programs) in mathematics (e.g., organize data, develop concepts, explore relationships, decrease time spent on computations after a skill has been established)
8. **E.1.a.** Solve quadratic equations and inequalities various techniques, including completing the square and using the quadratic formula

Common Core Standards:

1. **A.SSE.1a.** Interpret parts of an expression, such as terms, factors, and coefficients
2. **A.SSE.2.** Use the structure of an expression to identify ways to rewrite it.
3. **A.APR.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
4. **A.REI.4.b.** Solve quadratic equations by inspection, 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 in complex form

Focus Questions:

1. How do you factor quadratics?
2. How do you solve quadratic equations by factoring?
3. How do you solve quadratic equations by using quadratic functions?

Mathematical Practices:

Engagement:

Assessment:

1. Formative – Analyzing Quadratic Functions (LTF)
2. Formative – Mid-Assessment Review
3. Summative – Mid-Assessment Unit Quiz

Day 11

Lesson Content: Simplifying Square Roots

Quality Core Standards:

1. **B.1.d.** Use the language of mathematics to communicate increasingly complex ideas orally and in writing, using symbols and notations correctly
2. **B.1.e.** Make appropriate use of estimation and mental mathematics in computations and to determine the reasonableness of solutions to increasingly complex problems
3. **B.1.g.** Demonstrate the appropriate role of technology (e.g. calculators, software programs) in mathematics (e.g., organize data, develop concepts, explore relationships, decrease time spent on computations after a skill has been established)

Focus Questions:

1. What is the difference between approximating square roots and simplifying square roots?
2. How do I simplify a square root?

Mathematical Practices:

Engagement:

Assessment:

1. ACT Practice Problems – Opener
2. Formative – Simplifying Square Roots Worksheet

Day 12

Lesson Content: Solving Quadratics by using Square Roots

Quality Core Standards:

1. **B.1.d.** Use the language of mathematics to communicate increasingly complex ideas orally and in writing, using symbols and notations correctly
2. **B.1.e.** Make appropriate use of estimation and mental mathematics in computations and to determine the reasonableness of solutions to increasingly complex problems
3. **B.1.g.** Demonstrate the appropriate role of technology (e.g. calculators, software programs) in mathematics (e.g., organize data, develop concepts, explore relationships, decrease time spent on computations after a skill has been established)
4. **E.1.a.** Solve quadratic equations and inequalities various techniques, including completing the square and using the quadratic formula

Common Core Standards:

1. **A.REI.4.b.** Solve quadratic equations by inspection, 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 in complex form

Focus Questions:

1. How do I identify a quadratic that can be solved using square roots?
2. How do I solve quadratic equations using square roots?

Mathematical Practices:

Engagement:

Assessment:

1. Formative - EOC Practice Problems Opener
2. Formative - p237 (12-17)

Day 13

Lesson Content: Discriminant and the Nature of the Roots

Quality Core Standards:

1. **B.1.d.** Use the language of mathematics to communicate increasingly complex ideas orally and in writing, using symbols and notations correctly
2. **B.1.e.** Make appropriate use of estimation and mental mathematics in computations and to determine the reasonableness of solutions to increasingly complex problems
3. **B.1.g.** Demonstrate the appropriate role of technology (e.g. calculators, software programs) in mathematics (e.g., organize data, develop concepts, explore relationships, decrease time spent on computations after a skill has been established)
4. **E.1.b.** Use the discriminant to determine the number and type of roots for a given quadratic equation

Common Core Standards:

1. **A.REI.4.b.** Solve quadratic equations by inspection, 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 in complex form

Focus Questions:

1. How do I find the discriminant of a quadratic equation?
2. How do I use the discriminant to determine the number and type of solutions of a quadratic equation?

Mathematical Practices:

Engagement:

Assessment:

1. Formative Parabola Graphing Practice Opener
2. Formative – p245 (26-36 even)

Day 14

Lesson Content: Quadratic Formula with Real Solutions

Quality Core Standards:

1. **B.1.d.** Use the language of mathematics to communicate increasingly complex ideas orally and in writing, using symbols and notations correctly
2. **B.1.e.** Make appropriate use of estimation and mental mathematics in computations and to determine the reasonableness of solutions to increasingly complex problems
3. **B.1.f.** Make mathematical connections among concepts, across disciplines, and in everyday experiences
4. **B.1.g.** Demonstrate the appropriate role of technology (e.g. calculators, software programs) in mathematics (e.g., organize data, develop concepts, explore relationships, decrease time spent on computations after a skill has been established)
5. **E.1.a.** Solve quadratic equations and inequalities various techniques, including completing the square and using the quadratic formula

Common Core Standards:

1. **A.REI.4.b.** Solve quadratic equations by inspection, 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 in complex form

Focus Questions:

1. What is the quadratic formula?
2. How do you use the quadratic formula to find real solutions of quadratic equations?

Mathematical Practices:

Engagement:

Assessment:

1. Formative – Prime Quadratic Expressions Opener
2. Formative – p245 (12-24 even)

Day 15

Lesson Content: Quadratic Formula with Complex Solutions

Quality Core Standards:

1. **B.1.d.** Use the language of mathematics to communicate increasingly complex ideas orally and in writing, using symbols and notations correctly

2. **B.1.e.** Make appropriate use of estimation and mental mathematics in computations and to determine the reasonableness of solutions to increasingly complex problems
3. **B.1.g.** Demonstrate the appropriate role of technology (e.g. calculators, software programs) in mathematics (e.g., organize data, develop concepts, explore relationships, decrease time spent on computations after a skill has been established)
4. **E.1.a.** Solve quadratic equations and inequalities various techniques, including completing the square and using the quadratic formula
5. **E.1.c.** Solve quadratic equations with complex number solutions

Common Core Standards:

1. **N.CN.7.** Solve quadratic equations with real coefficients that have complex solutions
2. **A.REI.4.b.** Solve quadratic equations by inspection, 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 in complex form

Focus Questions:

1. How do I identify complex solutions of a quadratic equation?
2. How do I use the quadratic formula to find complex solutions of quadratic equations?

Mathematical Practices:

Engagement:

Assessment:

1. Formative - EOC Practice Problems Opener
2. Formative – p253 (39-44)

Day 16

Lesson Content: Quadratic Formula

Quality Core Standards:

1. **B.1.d.** Use the language of mathematics to communicate increasingly complex ideas orally and in writing, using symbols and notations correctly
2. **B.1.e.** Make appropriate use of estimation and mental mathematics in computations and to determine the reasonableness of solutions to increasingly complex problems
3. **B.1.g.** Demonstrate the appropriate role of technology (e.g. calculators, software programs) in mathematics (e.g., organize data, develop concepts, explore relationships, decrease time spent on computations after a skill has been established)
4. **E.1.a.** Solve quadratic equations and inequalities various techniques, including completing the square and using the quadratic formula

Common Core Standards:

1. **A.REI.4.b.** Solve quadratic equations by inspection, 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 in complex form

Focus Questions:

1. How do I use the quadratic formula to solve quadratic equations?
2. How do I identify errors when solving problems involving quadratic formula?

Mathematical Practices:

Engagement:

Assessment:

Formative-Quadratic Formula Constructed Response

Days 17 and 18

Lesson Content: Solving Quadratic Equations

Quality Core Standards:

1. **B.1.a.** Apply problem-solving skills (e.g. identifying irrelevant or missing information, making conjectures, extracting mathematical meaning, recognizing and performing multiple steps when needed, verifying results in the context of the problem) to the solution of real-world problems
2. **B.1.b.** Use a variety of strategies to set up and solve increasingly complex problems
3. **B.1.c.** Represent data, real-world situations, and solutions increasingly complex context (e.g., expressions, formulas, tables, charts, graphs, relations, functions) and understand the relationships
4. **B.1.d.** Use the language of mathematics to communicate increasingly complex ideas orally and in writing, using symbols and notations correctly
5. **B.1.e.** Make appropriate use of estimation and mental mathematics in computations and to determine the reasonableness of solutions to increasingly complex problems
6. **B.1.f.** Make mathematical connections among concepts, across disciplines, and in everyday experiences
7. **B.1.g.** Demonstrate the appropriate role of technology (e.g. calculators, software programs) in mathematics (e.g., organize data, develop concepts, explore relationships, decrease time spent on computations after a skill has been established)
8. **E.1.a.** Solve quadratic equations and inequalities various techniques, including completing the square and using the quadratic formula
9. **E.1.b.** Use the discriminant to determine the number and type of roots for a given quadratic equation
10. **E.1.c.** Solve quadratic equations with complex number solutions

Common Core Standards:

1. **N.CN.7.** Solve quadratic equations with real coefficients that have complex solutions
2. **A.SSE.1a.** Interpret parts of an expression, such as terms, factors, and coefficients
3. **A.SSE.2.** Use the structure of an expression to identify ways to rewrite it.
4. **A.APR.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
5. **A.REI.4.b.** Solve quadratic equations by inspection, 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 in complex form

Focus Questions:

1. How do I factor quadratic expressions?
2. How do I use the discriminant to determine number and nature of roots in a quadratic equations?
3. How do I solve quadratic equations?

Mathematical Practices:

Engagement:

Assessment:

1. Formative – Unit Seven Review Work
2. Summative - Unit Seven Unit Assessment