

Greater Brunswick Charter School Algebra 1 Curriculum

CONTENT AREA: Mathematics

Course: Algebra I

UNIT #: 3

UNIT NAME: Expressions and Equations

STUDENT LEARNING OBJECTIVES		CORRESPONDING CCSS	
1	Interpret parts of expressions in terms of context including those that represent square and cube roots; use the structure of an expression to identify ways to rewrite it. ★	<p style="background-color: #90ee90; display: inline-block; padding: 2px;">A.SSE.1,</p> <p style="background-color: #90ee90; display: inline-block; padding: 2px;">A.SSE.2</p>	<p>Interpret expressions that represent a quantity in terms of its context. ★</p> <p>a. Interpret parts of an expression, such as terms, factors, and coefficients.</p> <p>b. Interpret complicated expressions by viewing one or more of their parts as a single entity. For example, interpret $P(1+r)^n$ as the product of P and a factor not depending on P.</p> <p>Use the structure of an expression to identify ways to rewrite it. <i>For example, see $x^4 - y^4$ as $(x^2)^2 - (y^2)^2$, thus recognizing it as a difference of squares that can be factored as $(x^2 - y^2)(x^2 + y^2)$.</i></p>
2	Rewrite expressions using factoring, completing the square and properties of exponents to produce equivalent forms that highlight particular properties such as the zeros or the maximum or minimum value of the function. ★	<p style="background-color: #90ee90; display: inline-block; padding: 2px;">A.SSE.3</p>	<p>Choose and produce an equivalent form of an expression to reveal and explain properties of the quantity represented by the expression. ★</p> <p>a. Factor a quadratic expression to reveal the zeros of the function it defines.</p> <p>b. Complete the square in a quadratic expression to reveal the maximum or minimum value of the function it defines.</p> <p>c. Use the properties of exponents to transform expressions for exponential functions. <i>For example the expression $1.15t$ can be rewritten as $(1.151/12)^{12t} \approx 1.012^{12t}$ to reveal the approximate equivalent monthly interest rate if the annual rate is 15%.</i></p>
3	Perform addition, subtraction and multiplication with polynomials and relate it to arithmetic operations with integers.	<p style="background-color: #90ee90; display: inline-block; padding: 2px;">A.APR.1</p>	<p>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.</p>
4	Create equations and inequalities in one variable and use them to solve problems. <i>Include equations arising from linear and quadratic functions, simple rational and exponential functions and highlighting a quantity of interest in a formula.</i>	<p style="background-color: #90ee90; display: inline-block; padding: 2px;">A.CED.1,</p> <p style="background-color: #90ee90; display: inline-block; padding: 2px;">A.CED.4</p>	<p>Create equations and inequalities in one variable and use them to solve problems. <i>Include equations arising from linear and quadratic functions, and simple rational and exponential functions.</i></p> <p>Rearrange formulas to highlight a quantity of interest, using the same reasoning as in solving equations. <i>For example, rearrange Ohm's law $V = IR$ to highlight resistance R.</i></p>
5	Create linear and quadratic equations that represent a relationship between two or more variables. Graph equations on the coordinate axes with labels and scale.	<p style="background-color: #90ee90; display: inline-block; padding: 2px;">A.CED.2,</p>	<p>Create equations in two or more variables to represent relationships between quantities; graph equations on coordinate axes with labels and scales.</p>
6	Derive the quadratic formula by completing the square and recognize when there are no real solutions.	<p style="background-color: #90ee90; display: inline-block; padding: 2px;">A.REI.4</p>	<p>Rearrange formulas to highlight a quantity of interest, using the same reasoning as in solving equations. <i>For example, rearrange Ohm's law $V = IR$ to highlight resistance R.</i></p>
7	Solve quadratic equations in one variable using a variety of methods [including inspection (e.g. $x^2 = 81$), factoring, completing the square, and the quadratic formula].		

Major **Supporting** **Additional** (identified by PARCC Model Content Frameworks) **Bold Type indicates grade level fluency requirements.** (Identified by PARCC Model Content Frameworks).

Selected Opportunities for Connections to Mathematical Practices

1. **Make sense of problems and persevere in solving them.** *
2. **Reason abstractly and quantitatively.**
SLO 1 Analyze expressions by examining their parts in context.
3. **Construct viable arguments and critique the reasoning of others.**
SLO 6 Examine the steps in the derivation of the quadratic formula to determine if they are logical and ask questions to improve the clarify.
4. **Model with mathematics.** *
5. Use appropriate tools strategically.
6. Attend to precision.
7. **Look for and make use of structure.**
SLO 2 Look for structural similarities when writing equivalent expressions.
8. **Look for and express regularity in repeated reasoning.**

*MP.1 and MP.4 are overarching practices relevant to Algebra 1. (PARCC Model Content Frameworks)
All of the content presented in this course has connections to the standards for mathematical practices.

Bold type identifies possible starting points for connections to the SLOs in this unit.

Day	Topic	SLO	Learning Objectives	Essential Questions	Suggested Student Activities		Possible Resources
					Whole Group	Small Group / Stations	
1	Readiness for quadratic expressions		To determine strength of foundation for moving forward	<i>What do I know that will help me learn in this next unit?</i>		<ul style="list-style-type: none"> • Independent Practice • Intervention/Enrichment • I-Ready 	GlencoeAlg1 p.461-462
2	Adding and subtracting polynomials	3	To recognize terms and perform additive operations on them	<i>What does adding a polynomial look like in tangible models?</i>	<i>The text walks you through using algebra blocks as models for adding and subtracting. The key skill here is to be able to easily and fluently recognize like terms in polynomial expressions.</i>	<ul style="list-style-type: none"> • Lesson/Guided Practice • Independent Practice • Intervention/Enrichment • I-Ready 	GlencoeAlg1 p.463-464
3	Adding and subtracting polynomials	3	To combine like terms in multiple polynomials	<i>How do I know which terms to combine?</i>	<i>No need to differentiate between adding and subtracting. Subtracting is just combining like terms with a negative coefficient.</i>	<ul style="list-style-type: none"> • Lesson/Guided Practice • Independent Practice • Intervention/Enrichment • I-Ready 	GlencoeAlg1 8-1 p.465-471
4	Adding and subtracting polynomials	3	To combine like terms in multiple polynomials	<i>How is this skill used in the real world?</i>	<i>A good day to have students who got it continue with Ex. #44-60 and help those who don't yet.</i>	<ul style="list-style-type: none"> • Independent Practice • Intervention/Enrichment • I-Ready 	GlencoeAlg1 8-1 p.469-471
5	Multiplying polynomials	3	To multiply a multi-term expression with a single term expression	<i>What exponent rules must I remember to multiply effectively?</i>	<i>Lesson should focus on Part 1 of this section. Assignment should not go past Ex. #29.</i>	<ul style="list-style-type: none"> • Lesson/Guided Practice • Independent Practice • Intervention/Enrichment • I-Ready 	GlencoeAlg1 8-2 p.472-477
6	Solving polynomial equations	3	To solve equations requiring the manipulation of expressions	<i>How can I use multiplication and combining terms to solve a polynomial equation for a number?</i>	<i>Lesson should focus on Part 2 of this section. Assignment should be beyond Ex. #29</i>	<ul style="list-style-type: none"> • Lesson/Guided Practice • Independent Practice • Intervention/Enrichment • I-Ready 	GlencoeAlg1 8-2 p. 475-477
7	Solving polynomial equations	3	To solve equations requiring the manipulation of expressions	<i>How is this skill used in the real world?</i>	<i>There's plenty of time to make your way through this unit. Don't miss assigning some Spiral Review problems on p. 477.</i>	<ul style="list-style-type: none"> • Independent Practice • Intervention/Enrichment • I-Ready 	Additional practice: Math-Aids

Day	Topic	SLO	Learning Objectives	Essential Questions	Suggested Student Activities		Possible Resources
					Whole Group	Small Group / Stations	
8	Multiplying polynomials	3	To multiply binomial expressions	<i>How can I most easily keep track of which terms I've multiplied and which I still need to do?</i>	<i>While you're welcomed to go through the algebra tiles and the various Distributive Property methods to perform multiplication, a suggestion would be to skip to p.480 and focus on the FOIL method, showing how it uses the Distributive Property.</i>	<ul style="list-style-type: none"> • Lesson/Guided Practice • Independent Practice • Intervention/Enrichment • I-Ready 	GlencoeAlg1 8-3 p.480-485
9	Multiplying polynomials	3	To multiply binomials and trinomials.	<i>How can I extend the FOIL method to reliably multiply trinomials?</i>	<i>p.482, Ex.4 has an excellent example of how best to do this.</i>	<ul style="list-style-type: none"> • Lesson/Guided Practice • Independent Practice • Intervention/Enrichment • I-Ready 	GlencoeAlg1 8-3 p.483-485
10	Special products	3	To fluently multiply special products by using a specialized algorithm	<i>How can I use the pattern I see to more quickly multiply special binomials?</i>	<i>Instead of giving them the formulas, see if they can do a bunch of simple squares and find the pattern. Don't sweat it if all can't see it. This is just a shortcut for the multiplications they've been doing. Show them that using the square algorithm is the same as rewriting the binomial twice and FOIL multiplying, just faster.</i>	<ul style="list-style-type: none"> • Lesson/Guided Practice • Independent Practice • Intervention/Enrichment • I-Ready 	GlencoeAlg1 8-4 p.486-491
11	Manipulating polynomial expressions	3	To solve polynomial equations using addition, multiplying, and special algorithms to simplify the expressions.	<i>Do I have all my stuff together yet?</i>	<i>If the Spiral Reviews have been used and reviewed, this should be a simple review of the unit, thus far.</i>	<ul style="list-style-type: none"> • Independent Practice • Intervention/Enrichment • I-Ready 	GlencoeAlg1 p. 492
12	Assessment	3				<ul style="list-style-type: none"> • Review • Assessment 	

Day	Topic	SLO	Learning Objectives	Essential Questions	Suggested Student Activities		Possible Resources
					Whole Group	Small Group / Stations	
13	Greatest Common Factor Distributive Property in reverse	1	To identify the GCF of two or more terms.	<i>How can I use my old multiplication skills and my understanding of the Distributive Property to pull out a common factor?</i>	<i>The key skill here is reliably finding commonalities between terms. Factoring is a means to that end. There is no harm in guiding students to seeing the common step for finding the groups: two terms that each share a variable, then two terms of which only one has a variable. In the real world, factoring will not be needed in this (grouping) way.</i>	<ul style="list-style-type: none"> • Lesson/Guided Practice • Independent Practice • Intervention/Enrichment • I-Ready 	GlencoeAlg1 8-5 p.493-500 <i>Assign only problems with the Distributive Property listed in the instructions.</i>
14	Grouping terms for factoring	1	To identify pairs of terms that will facilitate factoring	<i>What common steps can I use to know which terms to group for factoring?</i>	<i>A day to have stronger students explore this concept with algebra tiles and your strugglers to get more practice with the factoring strategies of the last section.</i>	<ul style="list-style-type: none"> • Lesson/Guided Practice • Independent Practice • Intervention/Enrichment • I-Ready 	GlencoeAlg1 8-5 p.495-500 <i>Assign the other problems.</i>
15	Factoring trinomials	2, 6, 7	To understand the concept between factorable and non-factorable trinomials.	<i>What does factoring a trinomial mean in a tangible context?</i>	<i>The more you can give students a reliable path to a solution each time, without a lot of guessing, the more they will understand how to do this without thinking they have to be lucky to find the correct coefficients.</i>	<ul style="list-style-type: none"> • Lesson/Guided Practice • Independent Practice • Intervention/Enrichment • I-Ready 	GlencoeAlg1 8-6 p.501-502
16	FOIL factoring	2, 6, 7	To factor trinomials by reversing the FOIL method of multiplication.	<i>How can I keep track of the key factors and use their combinations to find factor binomials?</i>	<i>Suggestion: get them to really answer that essential question. Use this as a day to continue FOIL factoring practice and point out that the lead coefficient isn't always going to be 1.</i>	<ul style="list-style-type: none"> • Lesson/Guided Practice • Independent Practice • Intervention/Enrichment • I-Ready 	GlencoeAlg1 8-6 p.503-509
17	<i>Factoring without a leading coefficient of 1.</i>	2, 6, 7	To factor a trinomial when the lead coefficient is different than 1.	<i>Why is this so much harder?</i> <i>Remember, they'll get the quadratic formula later to do these, so don't waste much energy on it. In fact, we have time, let's give it to them next.</i>	<ul style="list-style-type: none"> • Lesson/Guided Practice • Independent Practice • Intervention/Enrichment • I-Ready 	GlencoeAlg1 8-7 p.510-515 <i>Assign only the simplest problems with small numbers, and not too many of them.</i>	

Day	Topic	SLO	Learning Objectives	Essential Questions	Suggested Student Activities		Possible Resources
					Whole Group	Small Group / Stations	
18	The quadratic formula	6, 7	To use the quadratic formula to solve equations that would require factoring of a polynomial with a leading coefficient other than 1.	<i>Why do they want me to factor polynomials if I can use this instead?</i>	<i>Suggest using the same problems assigned for homework to demonstrate the use of this strategy.</i>	<ul style="list-style-type: none"> • Lesson/Guided Practice • Independent Practice • Intervention/Enrichment • I-Ready 	The content is listed in 9-5 @ p.583. <i>You'll use it later to assign problems. This is just a demo for them.</i>
19	Factoring a difference of two squares	2, 6, 7	To use the algorithm for factoring the difference of two squares.	<i>Before I use the algorithm, how do I recognize a common factor?</i>	<i>Assign up to Ex. 43</i>	<ul style="list-style-type: none"> • Lesson/Guided Practice • Independent Practice • Intervention/Enrichment • I-Ready 	GlencoeAlg1 8-8 p.516-521
20	Solving an equation by factoring	2, 6, 7	To use factoring to solve an equation	<i>How is having an equation cause me to use the same skills I've learned?</i>	<i>Assign beyond Ex. 43</i> <i>Use this on a day for more practice with factoring strategies, since the addition of an equal sign is not large.</i>	<ul style="list-style-type: none"> • Lesson/Guided Practice • Independent Practice • Intervention/Enrichment • I-Ready 	GlencoeAlg1 8-8 p.519-521 <i>Don't forget the Spiral Review practice</i>
21	Factoring perfect squares	2	To recognize and factor a perfect square.	<i>How should I recognize a perfect square when they're trying to fool me?</i>	<i>Watch out for those big leading coefficients that, in this section, are usually a square or a square multiplied by a common factor.</i>	<ul style="list-style-type: none"> • Lesson/Guided Practice • Independent Practice • Intervention/Enrichment • I-Ready 	GlencoeAlg1 8-9 p.522-529

Day	Topic	SLO	Learning Objectives	Essential Questions	Suggested Student Activities		Possible Resources
					Whole Group	Small Group / Stations	
22	Creating and solving inequalities with polynomials	4, 5	To create inequality relationships that illustrate a real world problem. To solve inequalities containing polynomials.	<i>How is solving an inequality a lot like solving an equation?</i>	<i>The book doesn't seem to address this SLO. One strategy for instruction is to use equations and real world problems in previous sections and change them to inequalities for solving.</i> <i>I believe if you focus on real world problems in the text for which students needed to create an expression or an equation and simply alter them to be less than or greater than something, you will hit the mark for the unit assessment.</i>	<ul style="list-style-type: none"> • Lesson/Guided Practice • Independent Practice • Intervention/Enrichment • I-Ready 	Internet lesson resource 1 Internet lesson resource 2 Internet lesson resource 3 <i>These lessons focus on solving an inequality. The Unit Assessment has examples of creating the inequality from a real world situation.</i>
23	Operations with polynomials	1, 2, 3, 6, 7	To review all skills learned in unit	<i>What do I know now that I did know four weeks ago?</i>		<ul style="list-style-type: none"> • Independent Practice • Intervention/Enrichment • I-Ready 	GlencoeAlg1 p.530-534
24							
25	Assessment					<ul style="list-style-type: none"> • Review • Assessment 	
26						<ul style="list-style-type: none"> • 	

Word Wall Candidates

Monomial	Polynomial	Binomial	Trinomial	Term
Degree of a term	Degree of a polynomial	Standard polynomial form	Leading coefficient	Quadratic
FOIL method	Factoring		Zero Product Property	
Prime polynomial	Difference of two squares	Perfect square	Square Root Property	

Authentic Application

Your Goal: To create a formula to determine the number of tiles needed to border a pool of any size.

Your Role: Installation manager for a pool company.

Your Audience: Your customer.

The Situation: You are the new Installation Manager at the local pool store, Majestic Pools. As manager, your job is to determine the amount of materials and cost for each pool installation. The previous manager always underestimated or overestimated the amount needed, and your boss, Mr. Majestic, wants you to come up with an easier way. He has given you your first project and only two days to solve the problem and create an estimate for the client.

Your first client is a very important one. Mrs. Hamilton, who lives in the largest house in town, is always buying or building something new. She is a very good friend of Mr. Majestic and expects only the best. For her newest project, she wants to build a square pool with a square tile border, two tiles wide, in the very large backyard of her new home.

First, you will need some basic information:

- The pools will have a border made of two rows of square tiles. The border tiles are 1ft. by 1ft.
- Use the area formula for a square. Find the area of tile border around the pool.
- (hint: find the area of the pool and border, then subtract the area of just the pool - then find just the area of the border; this will give you two equations with the same results)
- Let n = number of tiles needed; s = side of pool, in feet.

Now, write a polynomial equation that represents the area of the pool.

The Product: The polynomial formula to use to find the number of tiles required for any size pool.

Success Criteria: This is how your work will be evaluated.

	4	3	2	1
Math Concepts	Equation and estimate demonstrate complete understanding of concepts used to solve problem	Equation and estimate demonstrate substantial understanding of concepts used to solve problem	Equation and estimate demonstrate some understanding of concepts used to solve problem	Equation and estimate demonstrate very limited understanding of concepts used to solve problem
Math Reasoning	Data collected and steps used appropriately demonstrate complex math reasoning skills in solving the problem	Data collected and steps used correctly demonstrate effective math reasoning skills	Data collected and steps used are correct; evidence of limited math reasoning skills	Inappropriate data and steps used; evidence of little math reasoning skills
Accuracy	90-100% of steps and solution have no mathematical errors	80-89% of steps and solution have no mathematical errors	70-79% of steps and solution have no mathematical errors	Less than 70% of steps and solution have no errors
Explanation	Final product (equation and estimate) is detailed and clear	Final product is clear	Final product is difficult to understand, but includes important information	Final product is difficult to understand and is missing or has no important information