Curriculum Sample Template

Max. 8 Pages

Grade Level	11th Grade	**Content Area**	Mathematics
Course Title (grades 9-12 Only)	Algebra 2		
Expected Prior Knowledge *List the knowledge/skills mastered earlier in the year foundational to the mastery of the Required Standard(s).*	Students are expected to have prior knowledge of and/or skills mastered to: **N-CN.C.8:** Extend polynomial identities to the complex numbers. *For example, rewrite $x^2 + 4$ as $(x + 2i)(x – 2i)$.* **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. **A-APR.B.2:** Know and apply the Remainder Theorem: For a polynomial $p(x)$ and a number a, the remainder on division by $x – a$ is $p(a)$, so $p(a) = 0$ if and only if $(x – a)$ is a factor of $p(x)$.		
Alignment to Program of Instruction *Describe how the methods of instruction found in this sequence of lessons that align to the Program of Instruction described in the application package.*	Mathematics lessons focus on problem solving, critical thinking, and practical applications. Direct Instruction includes lecture (structured overview), small-group (peer partners), and teacher-directed (guided overview) learning activities. Formative assessments include didactic questioning, visual presentation of direct instruction, Cornell Notes and graphic organizers, summaries and reflections, and collaborative activities. Summative assessments designed for student mastery of content.		
Standard Number* and Description *The standard number and description of the Required Standard(s) being instructed and assessed to mastery in the curriculum sample.*	A-APR.4 Prove polynomial identities and use them to describe numerical relationships. *For example, the polynomial identity $(x^2+y^2)^2 = (x^2– y^2)^2 + (2xy)^2$ can be used to generate Pythagorean triples.*		
Materials/Resources Needed *List all items the teacher and students will need for the entire sequence of instruction (excluding common consumables).*	Math Dictionary, Scientific Calculator		

* ***Standard Number****: For English Language Arts (Reading and Writing), use Grade, Strand, Standard (e.g., 3.RI.2). For K-8 Math, use Grade, Domain, Standard (e.g., 6.EE.7). For HS Math, use Conceptual Category-Domain, Standard (e.g., A-REI.6). For Science, use Grade, Strand, Concept, PO (e.g., 4.1.3.1).*

Lesson (add as needed)	**Instructional Strategies**	**Student Activities**
1	**Factoring Patterns of Binomials and Trinomials** (1) Teacher will review warm-up problems to assess prior knowledge and provide re-teaching assignments as needed. (2) Teacher will introduce key vocabulary: difference of squares formula, difference of cubes formula, and sum of cubes formula. (3) Teacher will present structured overview of (a) the formula for the difference of squares and identifying the factoring pattern of the formula; (b) the formula for the difference of cubes and identifying the factoring pattern of the formula; and (c) the formula for the sum of cubes and identifying the factoring patterns of the formula. (4) Teacher will present guided instruction to: (a) factor the difference of squares using the formula; (b) factor the difference of cubes using the formula; and (c) factor the sum of cubes using the formula.	(1) Students will access prior knowledge by completing warm-up problems for (a) factoring a monomial from a polynomial and (b) factoring a binomial from a polynomial. (2) Students will document key vocabulary and meanings in their Math Dictionary. (3) Students will take Cornell Notes for (a) the formula for the difference of squares and identifying the factoring pattern of the formula; (b) the formula for the difference of cubes and identifying the factoring pattern of the formula; and (c) the formula for the sum of cubes and identifying the factoring patterns of the formula. (4) Students will work with peer partner to solve problems for each concept, after it is presented in guided instruction. (see Instructional Strategies 4a-c) (5) Students will complete four-six practice problems for each concept presented in the lesson. (see Instructional Strategies 4a-c)
2	**Factoring Patterns of Binomials and Trinomials** (1) Teacher will review guided instruction for factoring patterns of squares and cubes.	(1) **Summative Assessment:** Students will complete Factoring Patterns of Binomials and Trinomials Quiz. (2) **Summative Assessment:** Students will complete Factoring Patterns of Binomials and Trinomials Mathematical Applications.
3	**Polynomial Identity of Pythagorean Triples** (1) Teacher will review warm-up problems to assess prior knowledge and provide re-teaching assignments as needed. (2) Teacher will introduce key vocabulary: polynomial identities, Pythagorean Theorem, and Pythagorean triples. (3) Teacher will present structured overview of (a) the polynomial identity used to generate the Pythagorean Theorem and (b) the proof used to verify the polynomial identity used to generate the Pythagorean Theorem. (4) Teacher will present guided instruction to: (a) evaluate values of *x* and *y* to generate Pythagorean triples and (b) prove the values fit the condition of the Pythagorean Theorem.	(1) Students will access prior knowledge by completing warm-up problems to prove the Pythagorean Theorem. (2) Students will document key vocabulary and meanings in their Math Dictionary. (3) Students will take Cornell Notes for (a) the polynomial identity used to generate the Pythagorean Theorem and (b) the proof used to verify the polynomial identity used to generate the Pythagorean Theorem. (4) Students will work with peer partner to solve problems for each concept, after it is presented in guided instruction. (see Instructional Strategies 4a-b)

		(5) Students will complete four-six practice problems for each concept presented in the lesson. (see Instructional Strategies 4a-b)
4	**Polynomial Identity of Pythagorean Triples** (1) Teacher will review guided instruction for the Polynomial Identity of Pythagorean Triples.	(1) **Summative Assessment:** Students will complete the Polynomial Identity of Pythagorean Triples Quiz. (2) **Summative Assessment:** Students will complete the Polynomial Identity of Pythagorean Triples Mathematical Applications.

Summative Assessment Items and Scoring: *Below, provide at least three Summative Assessment items that together accurately measure student mastery of the application of the content and/or skills as defined by the grade-level rigor in the Required Standard(s). For each assessment item, provide an answer key or scoring rubric which clearly describes how assessment items are to be scored and how points will be awarded, such that mastery of the application of the content and/or skills as defined by the grade-level rigor in the Required Standard is clearly demonstrated by an acceptable score.*

(1) **Factoring Patterns of Polynomials Quiz:** Assessment is scored on a 30 point scale, each question is worth 5 points and partial credit may be given. Students will score 24 out of 30 points (80%) to demonstrate mastery.
(2) **Factoring Patterns of Polynomials Mathematical Applications:** Assessment is scored on a 20 point scale, each question is worth 5 points and partial credit may be given. Students will score 16 out of 20 points (80%) to demonstrate mastery.*
(3) **Polynomial Identity of Pythagorean Triples Quiz:** Assessment is scored on a 20 point scale, each question is worth 5 points and partial credit may be given. Students will score 16 out of 20 points (80%) to demonstrate mastery.
(4) **Polynomial Identity of Pythagorean Triples Mathematical Applications:** Assessment is scored on a 20 point scale, each question is worth 5 points and partial credit may be given. Students will score 16 out of 20 points (80%) to demonstrate mastery.*

*assessment independent from instruction

For each summative assessment item, partial credit will be awarded as follows:

5 points for correct answer and writing of ALL mathematical calculations required to solve item.
4 points for correct answer and writing of SOME but not ALL mathematical calculations required to solve item.
3 points for correct answer and no writing of mathematical calculations required to solve item.
2 points for incorrect answer and writing of ALL mathematical calculations required to solve item.
1 point for incorrect answer and writing of SOME but not ALL mathematical calculations required to solve item.
0 points for incorrect answer and no writing of mathematical calculations required to solve item.

Factoring Patterns of Binomials and Trinomials Quiz

Score: _____

Answer the questions below using the appropriate formulas. Be sure to show all of your work.

1. Factor each difference of squares.
   a. $x^2 - 49$
   b. $x^2 - 111$

2. Factor each difference or sum of cubes.
   a. $x^3 - 8$
   b. $x^3 + 27$
   c. $8x^3 - 64$
   d. $27 + 125x^3$

Answer Key

1. a. $(x + 7)(x - 7)$ b. $(x + 11)(x - 11)$
2. a. $(x - 2)(x^2 + 2x + 4)$ b. $(x + 3)(x^2 - 3x + 9)$
   c. $(2x - 4)(4x^2 + 8x + 16)$ d. $(3 + 5x)(9 - 15x + 25x^2)$

Factoring Patterns of Binomials and Trinomials Mathematical Applications

Score: _____

Some higher-degree polynomials can be factored by using the same formulas when factoring binomials or trinomials. Answer the questions using the appropriate patterns. Be sure to show all of your work.

1. Factor $8x^3 - 64$. Use the difference of squares pattern.
2. Factor $x^4 + x^2 - 20$. Use the difference of squares pattern.
3. Factor $x^6 - 100$. Use the difference of squares pattern.
4. Factor $x^6 - 24$. Use the difference of cubes pattern.

Answer Key

1. $(4x^2 + 5)(4x^2 - 5)$
2. $(x^2 + 5)(x + 2)(x - 2)$
3. $(x^2 - 3)(x^4 + 3x^2 + 9)$
4. $(x^3 + 10)(x^3 - 10)$

Polynomial Identity of Pythagorean Triples Quiz

Score: _____

Answer the questions below. Be sure to show all of your work.

1. Use the polynomial identity to generate a Pythagorean triple given x = 2 and y = 1. Use the Pythagorean Theorem to verify the identity fits the condition.

2. Use the polynomial identity to generate a Pythagorean triple given x = 5 and y = 2. Use the Pythagorean Theorem to verify the identity fits the condition.

Answer Key

1. Pythagorean triples: 3, 4, 5

   $(2^2 - 1^2)^2 + (2 \cdot 2 \cdot 1)^2 = (2^2 + 1^2)^2$
   $3^2 + 4^2 = 5^2$
   $9 + 16 = 25$

2. Pythagorean triples: 20, 21, 29

   $(5^2 - 2^2)^2 + (2 \cdot 5 \cdot 2)^2 = (5^2 + 2^2)^2$
   $21^2 + 20^2 = 29^2$
   $441 + 400 = 841$

Completing the Square to Find Center and Radius of a Circle Mathematical Applications

Score: _____

Read each problem carefully. Answer the question and provide mathematical evidence to support your answer.
Be sure to show all of your work.

1. Use the polynomial identity to see what happens when the values of *x* and *y* are the same. Does the identity generate a Pythagorean triple in this case? Use an example to support your answer.

2. What other specific values for *x* and *y* that would not generate Pythagorean triples? Use the polynomial identity to support your answer.

Answer Key

1. No

   Sample Answer:

$$(2^2 - 2^2)^2 + (2 \bullet 2 \bullet 2)^2 = (2^2 + 2^2)^2$$
$$0^2 + 6^2 = 8^2$$
$$0 + 36 \neq 64$$

2. 0, because only 0, not three numbers, are not generated by the identity.

$$(0^2 - 0^2)^2 + (0 \bullet 0 \bullet 0)^2 = (0^2 + 0^2)^2$$
$$0^2 + 0^2 = 0^2$$