Curriculum Sample Template

Max. 8 Pages

Grade Level	11th Grade	**Content Area**	Mathematics
Course Title (grades 9-12 Only)	Algebra 2		
Expected Prior Knowledge *The knowledge/skills mastered earlier in the year foundational to the mastery of the required Standard in the current sample.*	Students are expected to have prior knowledge of and/or skills mastered to: N-CN.1 Define and use imaginary and complex numbers.		
Alignment to Program of Instruction *Briefly outline methods of instruction found in this sequence of lessons that align to the Program of Instruction described in A.3.*	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 *List the Number* and the full description for the Required Standard or Science Performance Objective listed in section A.6.*	N-CN.4 Represent complex numbers on the complex plane in rectangular and polar form (including real and imaginary numbers), and explain why the rectangular and polar forms of a given complex number represent the same number.		
Materials/Resources Needed	Pencils, Paper, Spiral Notebook (Math Dictionary), Graph Paper		

* ***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	**Complex Numbers-Rectangular Form** 1. Teacher will review warm-up problems to assess prior knowledge and provide re-teaching assignments as needed. 2. Teacher will introduce key vocabulary: complex plane, rectangular coordinates 3. Teacher will present structured overview of: (a) the concept of a complex plane and (b) the graph of a complex plane-rectangular form. 4. Teacher will present guided instruction to: (a) graph rectangular coordinates on a complex plane; (b) add and subtract complex numbers; and (c) add complex numbers on the complex plane.	1. Students will access prior knowledge by completing warm-up problems for: (a) writing a number in terms of *I* and (b) solving binomials. 2. Students will document key vocabulary and meanings in their Math Dictionary. 3. Students will take Cornell Notes for: (a) the concept of a complex plan and (b) the graph of a complex plane-rectangular form. 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	**Complex Numbers-Rectangular Form** 1. Teacher will review guided instruction for graphing a complex numbers.	1. **Summative Assessment:** Students will complete Complex Numbers-Rectangular Form Quiz. 2. **Summative Assessment:** Students will complete Complex Numbers Mathematical Applications.
3	**Complex Numbers-Polar Form** 1. Teacher will introduce key vocabulary: complex plane, polar coordinates 2. Teacher will present structured overview of: (a) the properties of polar coordinates and (b) the graph of a complex plane-polar form. **3.** Teacher will present guided instruction to: (a) graph polar coordinates on a complex plane; (b) convert rectangular coordinates to polar coordinates; and (c) polar coordinates to rectangular coordinates.	1. Students will document key vocabulary and meanings in their Math Dictionary. 2. Students will take Cornell Notes for: (a) the properties of polar coordinates and (b) the graph of a complex plane-polar form. 3. Students will work with peer partner to solve problems for each concept, after it is presented in guided instruction. (see Instructional Strategies 3a-c) 4. Students will complete four-six practice problems for each concept presented in the lesson. (see Instructional Strategies 3a-c)
4	**Complex Numbers-Polar Form** 1. Teacher will review guided instruction for graphing a complex numbers.	2. **Summative Assessment:** Students will complete Complex Numbers-Polar Form Quiz.

Summative Assessment Items: *Attach here.* For each summative assessment item, include an answer key or scoring rubric describing how points are to be awarded.

1. **Complex Numbers-Rectangular Form Quiz:** Assessment is scored on a 50 point scale, each question is worth 5 points and partial credit may be given. Students will score 40 out of 50 points (80%) to demonstrate mastery.
2. **Complex Numbers Mathematical Applications:** Assessment is scored on a 15 point scale, each question is worth 5 points and partial credit may be given. Students will score 12 out of 15 points (80%) to demonstrate mastery.*
3. **Complex Numbers-Polar Form Quiz:** Assessment is scored on a 45 point scale, each question is worth 5 points and partial credit may be given. Students will score 36 out of 45 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.

Complex Numbers-Rectangular Form Quiz

Score: _____

Graph each complex number.

1. -6 2. $4i$ 3. $6 + 7i$ 4. $-8 - 5i$ 5. $-3i$

Add or subtract. Write the result in the form $a + bi$.

6. $(-1 + 2i) + (6 - 9i)$ 7. $(3 - 3i) - (4 + 7i)$ 8. $(-5 + 2i) + (-2 + 8i)$

_____ _____ _____

Find each sum by graphing on the complex plane.

4. $(-6 - i) + (1 + 3i)$ 5. $(-2 - 2i) + (8 - 6i)$

Complex Numbers Mathematical Applications

Score: _____

1. The sum of any complex number a + bi and its conjugate is a real number. Is this sometimes true, always true, or never true? _____ (Explain your answer.)

2. The difference between any complex number a + bi (b ≠ 0) and its conjugate is a real number. Is this sometimes true, always true, or never true? _____ (Explain your answer.)

3. In electronics, the total resistance to the flow of electricity in a circuit is called the impedance, Z. Impedance is represented by a complex number. The total impedance in a series circuit is the sum of individual impedances. The impedance in one part of a circuit is $Z_1 = 3 + 4i$. In another part of a circuit, the impedance is $Z_1 = 5 + 2i$. What is the total impedance of the circuit?
_____

Complex Numbers-Polar Form Quiz

Score: _____

Graph each of the polar coordinates on the complex plane.

1. (3, 60°) 2. (-1, -135°) 3. (3, π/4) 4. (-2, 3π/4)

Find the polar coordinates for the given rectangular coordinates.

5. (-4, 4) 6. (-2, 0) 7. (-2√3, 2)

_____ _____ _____

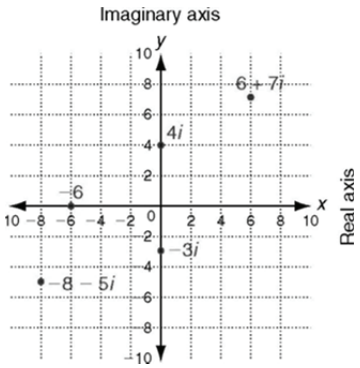
Find the rectangular coordinates for the given polar coordinates.

8. (-1, π/2) 9. (3, 7π/6)

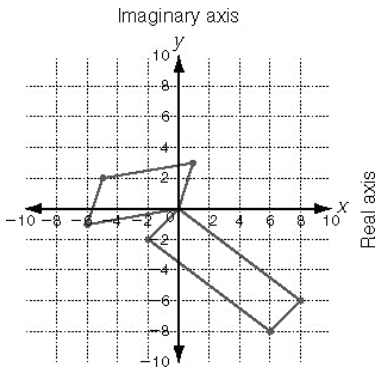
_____ _____

Complex Numbers-Rectangular Form Quiz Answer Key

1-5.



6. 5
7. 10*i*
8. -4*i*
9. –5 + 2*i*
10. – 8*i*

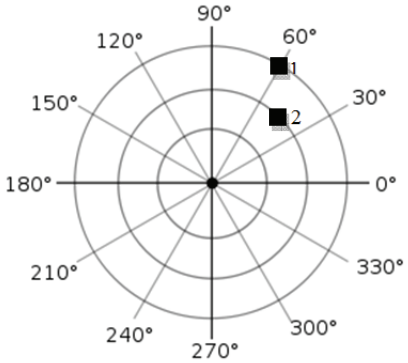


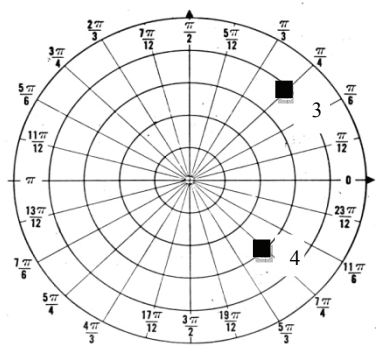
Complex Numbers Mathematical Applications Answer Key

1. Always true; (a +b*i*) + (a – b*i*) = a
2. Never true; (a +b*i*) - (a – b*i*) = 2b*i*
3. 8 + 2*i*

Complex Numbers-Polar Form Quiz Answer Key

1-4.





5. $(4\sqrt{2}, 3\pi/4)$
6. $(2, \pi)$
7. $(4, 5\pi/6)$
8. $(0, -1)$
9. $(-3\sqrt{3}/2, -3/2)$