CCSS Advanced Algebra 4 Introduction to Complex Numbers Name \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

In the mid 1500s, an Italian mathematician named Gerolamo Cardano posed a simple sounding algebraic problem:

Find two numbers that add to 10 and multiply to 40.

This simple premise lead to the invention of a new set of numbers that have turned out to be interesting and useful in the development of deeper mathematical thought.

1. Let and be the numbers in Cardano’s problem. Write two equations to represent the problem that he posed.
2. Solve this SYSTEM OF EQUATIONS to find values of and . Is there a problem with the solutions you found? Explain why or why not.
3. Definitions:

* **Imaginary Unit**:
* **Complex Number**: any number that can be expressed using the Imaginary Unit. For example, , , .
* **Real Part** of a Complex Number: the value of a complex number that does not include .
* **Imaginary Part** of a Complex Number: the value of a complex number that doe include .

a. Use the Quadratic Formula to solve the equation . Determine the Real and Imaginary parts of each solution.

b. Use the Quadratic Formula to solve the equation . Determine the Real and Imaginary parts of each solution.

c. A quadratic function has complex roots and . Write the function in Standard Form.

d. The polynomial function has a zero at . Find the two complex roots of .

4. Notes to Self:

* How can you use the Quadratic Formula to determine whether or not a quadratic function has complex roots?
* How can you use the Complex Roots of a parabola to write the function in Standard Form?
* If an degree polynomial has 2 real roots, how many complex roots must it have? If it has 3 real roots, how many complex roots must it have?

5. Extra Practice:

1. Find all the roots (real and complex) of each polynomial:
   1. ii. iii.
2. Solve each equation below (find real and complex solutions):
   1. ii. iii.

6. Review (Rational Expressions): Simplify each expression below:

a. b. c.

d. e.