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| **Lesson Title : Encryption with Algebra 2**  | **Unit #: 1** | **Lesson #: 2** | **Activity #: 2**  |
| **Activity Title: Make and Break the Encryptions** |

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| **Estimated Lesson Duration:** | **6 days**  |
| **Estimated Activity Duration:** | **2 days (50 minute periods)** |

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| **Setting:** | **Middlesboro High School (my classroom)** |

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| **Activity Objectives:**  |

I can …

1. Use inverse functions and function composition to double encrypt and decrypt messages
2. Break double encryptions using knowledge of inverse functions

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| **Activity Guiding Questions:** |

1. How are encryptions broken?
2. What is a man in the middle – how does he operate?

| **Next Generation Science Standards (NGSS)**  |
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| **Science and Engineering Practices (Check all that apply)**  | **Crosscutting Concepts (Check all that apply)** |
| [ ]  Asking questions (for science) and defining problems (for engineering) | [ ]  Patterns |
| [ ]  Developing and using models | [ ]  Cause and effect |
| [ ]  Planning and carrying out investigations | [ ]  Scale, proportion, and quantity |
| [ ]  Analyzing and interpreting data | [ ]  Systems and system models |
| [ ]  Using mathematics and computational thinking | [ ]  Energy and matter: Flows, cycles, and conservation |
| [ ]  Constructing explanations (for science) and designing solutions (for engineering) | [ ]  Structure and function.  |
| [ ]  Engaging in argument from evidence | [ ]  Stability and change.  |
| [ ]  Obtaining, evaluating, and communicating information  |  |

| **Ohio’s Learning Standards for Science (OLS)** |
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| **Expectations for Learning - Cognitive Demands (Check all that apply)** |
| [ ]  Designing Technological/Engineering Solutions Using Science concepts **(T)** |
| [ ]  Demonstrating Science Knowledge **(D)** |
| [ ]  Interpreting and Communicating Science Concepts **(C)** |
| [ ]  Recalling Accurate Science **(R)** |

| **Ohio’s Learning Standards for Math (OLS) and/or** **Common Core State Standards -- Mathematics (CCSS)** |
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| **Standards for Mathematical Practice (Check all that apply)** |
| [ ]  Make sense of problems and persevere in solving them | [ ]  Useappropriate tools strategically |
| [ ]  Reason abstractly and quantitatively | [x]  Attendto precision |
| [ ]  Construct viable arguments and critique the reasoning of others | [x]  Look for and make use of structure |
| [x]  Model with mathematics | [x]  Look for and express regularity in repeated reasoning |

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| **Unit Academic Standards (NGSS, OLS and/or CCSS):** |

**F-LEA4** Construct and compare linear, quadratic, and exponential models and solve problems: For exponential models, express as a logarithm the solution to *abct*= *d* where *a*, *c*, and *d* are numbers and the base *b* is 2, 10, or *e*; evaluate the logarithm using technology.

**F-IFB5** Interpret functions that arise in applications in terms of the context: Relate the domain of a function to its graph and, where applicable, to the quantitative relationship it describes

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| **Materials**: (Link Handouts, Power Points, Resources, Websites, Supplies) |

Worksheet to track all messages sent and received

Worksheet to track any broken encryptions

Flash drives with Java code to allow game to be player

Code to download the game: <http://gauss.ececs.uc.edu/Project5>

The manual explaining the game in detail (available on the wiki)

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| **Teacher Advance Preparation:** |

Make sure the java runs on all computers

Edit individual codes to reflect progress of each group/team

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| **Activity Procedures:** |

1. Explain the rules
2. Give teams 5 minutes to plan a strategy of playing
3. Let students play game, teacher can monitor by watching the server code

**Formative Assessments:** Link the items in the Activities that will be used as formative assessments.

Results of the game count as a test grade – graded on curve: 1st team gets 100, 2nd 95, and on and on (feel free to change grading schedule as you want)

**Summative Assessments:** These are optional; there may be summative assessments at the end of a set of Activities or only at the end of the entire Unit.

N/A

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| **Differentiation:** Describe how you modified parts of the Lesson to support the needs of different learners.Refer to Activity Template for details. |

Accommodations:

1. Changed point amounts / time to play depending on individual student accommodations

Extensions

1. Try to gain all your points by breaking other peoples’ codes

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| **Reflection:** Reflect upon the successes and shortcomings of the lesson. |

This was the coolest part of the unit by far. It allowed students to incorporate their paper encryption system and see it come to life in the computer. If I had more time throughout the year, we would have played the game more as a reward at the end of units where students were successful. It was a great experience and the code ran smoothly.