**COSMOS RET Experiments**

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| Lab Name | Are Your Messages Secure? |
| Subject Area (e.g. Math, Science, etc.) | Math |
| Grade | 8th |
| Topic | Functions |
| Experiment Title | Are Your Messages Secure? |
| Hardware (e.g. number of receivers, etc.) | COSMOS Primary Node |
| Software (e.g. GnuRadio) | Open ssl |
| Number of Sessions to teach the topic | 1 to 2 |
| Educational standards to be addressed | **CCSS.MATH.CONTENT.8.F.A.1**Understand that a function is a rule that assigns to each input exactly one output. The graph of a function is the set of ordered pairs consisting of an input and the corresponding output.1**CCSS.MATH.CONTENT.8.F.A.2**Compare properties of two functions each represented in a different way (algebraically, graphically, numerically in tables, or by verbal descriptions). For example, given a linear function represented by a table of values and a linear function represented by an algebraic expression, determine which function has the greater rate of change.**CCSS.MATH.CONTENT.8.F.A.3**Interpret the equation y = mx + b as defining a linear function, whose graph is a straight line; give examples of functions that are not linear. For example, the function A = s2 giving the area of a square as a function of its side length is not linear because its graph contains the points (1,1), (2,4) and (3,9), which are not on a straight line.**CCSS.MATH.CONTENT.8.F.B.4**Construct a function to model a linear relationship between two quantities. Determine the rate of change and initial value of the function from a description of a relationship or from two (x, y) values, including reading these from a table or from a graph. Interpret the rate of change and initial value of a linear function in terms of the situation it models, and in terms of its graph or a table of values.**CCSS.MATH.CONTENT.8.F.B.5**Describe qualitatively the functional relationship between two quantities by analyzing a graph (e.g., where the function is increasing or decreasing, linear or nonlinear). Sketch a graph that exhibits the qualitative features of a function that has been described verbally.**MS-ETS1-4**. Develop a model to generate data for iterative testing and modification of a proposed object, tool, or process such that an optimal design can be achieved.**MS-PS4-1**.Develop a model and use mathematical representations to describe waves that includes frequency, wavelength, and how the amplitude of a wave is related to the energy in a wave.**MS-PS4-2**. Develop and use a model to describe that waves are reflected, absorbed, or transmitted through various materials.**MS-PS4-3**. Integrate qualitative scientific and technical information to support the claim that digitized signals are a more reliable way to encode and transmit information than analog signals.**1A-CS-01**. Select and operate appropriate software to perform a variety of tasks, and recognize that users have different needs and preferences for the technology they use.**1A-AP-09.**Model the way programs store and manipulate data by using numbers or other symbols to represent information.**2-NI-04.** Model the role of protocols in transmitting data across networks and the Internet.**2-CS-05.** Explain how physical and digital security measures protect electronic information. |
| COSMOS concepts to be used for the lab | Network Security |
| How the educational goals are achieved through teaching using the experiment, how the topic is connected to the COSMOS concepts used)  | The educational goals are achieved by showing students how to data mapping by encryption and decryption is completed behind the scenes. Students will be able to decrypt messages from other students and their teacher in order to interpret and solve linear and nonlinear functions in the real world. 1. Teacher will model to students how to open the COSMOS node.
2. Teacher will model how to encrypt a message.
3. Teacher will model how to decrypt a message using the password.
4. Students will work in pairs to practice encrypting and decrypting messages.
5. Once everyone has taken a turn, all students will work to decrypt messages from their teacher that will help them solve and interpret linear and nonlinear functions in the real-world.
6. Students will complete the attached worksheet.
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| Short Description and Walkthrough of the experiment | Students will be able to see how messages are encrypted in order to understand how to decrypt messages.  |
| Testbed mapping of the experiment | Possible extensions include allowing students to use asymmetric encryption to encrypt and decrypt messages using the primary node. |
| Virtual Reality mapping of the experiment | N/A |
| Teacher(s) Name(s) and school(s) contributed to this lesson plan | Brooke Williams- Arthur Tappan PS/MS46Martina Choi - Beacon High School |