1.0 ngMaki It Dciuflfti to daeR

Suppose you had the letters B, E, E, H, I, K, L, S, S, T, U, and Y – could you figure out the original phrase that these letters came from? People who play Scrabble or Words with Friends could use their vocabulary knowledge to make different words from available letters, but what we want is to recreate the original phrase that these letters made.

What if instead of giving just the list of letters in alphabetical order you were given the same set of letters but written in this form: HET KYS SI LUEB – does that help in figuring out the original phrase? Time to take a closer look!

1.0.0 Explore: ngMaki It Dciuflfti to daeR

Focus Question: How can we use patterns to rearrange the elements of a message?

1) On the front board of the classroom for anyone to see, Sandy wrote the following message to her best friend Terry who will have class in the same room next period right before lunch:

LSTE OREDR A PAZZI FRO LHCNU

Sandy and Terry came up with their private writing system a few weeks ago and feel confident that people who don't know the method will not be able to figure out what their messages say.

- a) Are you able to figure out what their message says? Explain how you went about trying to figure out what their message says.
- b) The next morning Terry wrote a message to Sandy about this weekend's party for Jill.

NDEE YUO TO SNGI TEH BYAD CDRA

What does the message say?

- c) Describe (not verbally but on paper) how the method used by Sandy and Terry works.
- 2) Terry and Sandy realized that they had to change their message system the day they walked into a class together and saw the following written on the front board:

WE FDERUGI OTU YRUO MDOHTE

Terry and Sandy will need to develop a new encryption method. Why do they think that?



- 3) Now that someone has figured out their writing pattern, Sandy spent some time over the weekend brainstorming new patterns for writing a message. Below are examples of the same message written using five different methods:
 - i. HT8P MMEE TATT HELI BRAR YTON IG
 - ii. MLNE II EBG TRHAATT R8TYPHT MEO
 - iii. THGI MMP8 ATEE EHTT RBIL TYRA NO
 - iv. TEEM TA EHT YRARBIL THGINOT MP8
 - v. HIM RTN HTB MYA IE8 RET TGL PAE OT
 - a) What does the message say?
 - b) Which method was the easiest to "figure out"? Write a brief explanation that references specific features of this method.
 - c) Which method was the hardest to "figure out"? Write a brief explanation that references specific features of this method.
 - d) Which methods are similar and what makes them similar?
 - e) Is there a method that seems to be unlike the others? If so, what makes this method seem different?



1.0.1 Reflect

A cipher is secret or disguised method of communicating.

- 1) What do you think makes a good cipher?
- 2) What makes one cipher more secure than another?



ngMaki It Dciuflfti to daeR - Problem Set

Check for Understanding

- 1) What does "cryptography" mean to you at this point? What is the purpose of cryptography?
- 2) What are some features of a secure system?

Repeated Reasoning

3) Using the following message, give step-by-step directions on how to encrypt the plaintext. Then, give clear directions on how to decrypt the ciphertext.

Plaintext: YOU ARE A GOOD STUDENT Ciphertext: UOY ERA OGA SDO DUT TNE

 Develop a variation of the cipher that you and your partner developed for Sandy. Describe your new cipher system – be specific! Use your new cipher system to encrypt the message: YOUR FUTURE IS BRIGHT. Ask someone outside of class to read your ciphertext. How secure is your new cipher system? Explain.

Diving Deeper

- 5) Work with a friend and develop your own unique cipher system. Your cipher system should allow you and your friend to easily share messages, but if anyone else sees the ciphertext they will be unable to determine its meaning. Encrypt a message of your choice then answer the following questions:
 - a. What is needed to encrypt a message? That is, how does your encryption process work? Is your method generalizable to messages of any length? Why or why not?
 - b. If someone saw the ciphertext you created, but didn't know the encryption method, do you think they would be able to decrypt the message? Why or why not?
 - c. How does decryption work? That is, once your partner receives the message, how do they read the contents? Be specific.
- 6) Cryptography plays an important role in communication and has an abundance of modern and historical examples. Are there any examples of communicating secret information that you are familiar with? What was the importance of keeping information secret? How was secrecy achieved?

