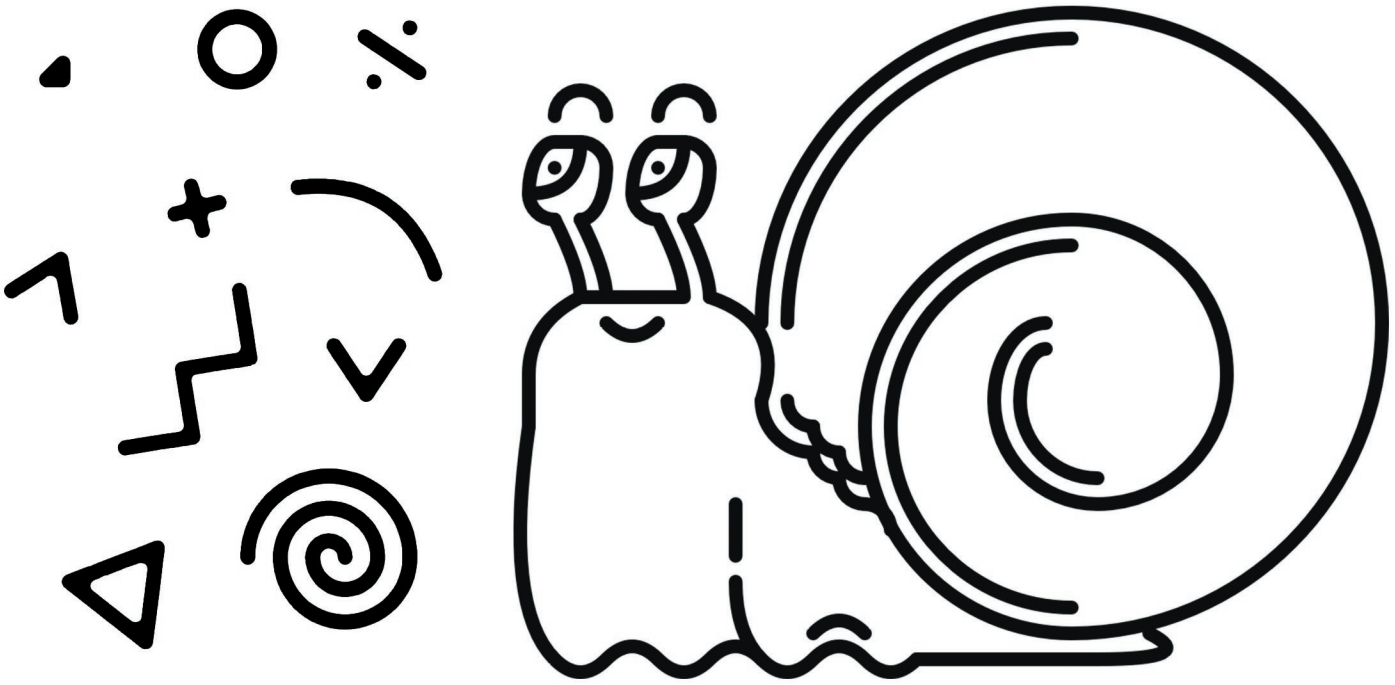
eureka snail mail

Welcome to the first issue of our activity booklet! In these letters we will be exploring a topic called cryptography.
Crypto+Graphy means “hidden writing”. We use cryptography to decipher spy codes, secure information online, and understand how insects communicate with each other!
We have a bunch of cryptography themed activities in store for you!
Enjoy!

-The Eureka Team

april 2020 issue 1



cryptography

introduction

The internet allows us to share news, ideas, videos, art, and so much more with the whole world! Usually we want to share with everybody, but some information, like medical information or important conversations, need to be kept private. How do we keep that information secret? With **encryption**!

Computers turn your information into a secret code called an encryption! Once information is encrypted, it can only be read with a password called a **cipher**. Encryption isn't just something computers do; a person who makes or cracks codes is called a **cryptographer**. The next activity will show you how to make and use a cipher to start encoding and *deciphering* your own messages!

diy cipher

part 1. how to use

One of the earliest known forms of encryption is called a substitution cipher. We will be using a simple form of a substitution cipher where you replace each letter of the alphabet with another letter by shifting the whole alphabet to the left or right. This is also called a Caesar cipher, named after the Roman leader Julius Caesar who used this kind of cipher to send secret messages.
This example shifts the alphabet 3 to the right. Here, the letter A becomes the letter D, the letter B becomes the letter E and so on. To use this form of cipher to encrypt a message we would use our new alphabet to create our message.

| A | B | C | D | E | F | ...
| A | B | C **| D | E | F | G | H | I | ...**
1 2 3

A B C D E F G H I J K L M N O P Q R S T U V W X Y Z
D E F G H I J K L M N O P Q R S T U V W X Y Z A B C

Plaintext: Hello World
Ciphertext: Khoor Zruog

The number of shifted letters and the direction shifted is our encryption key, so for someone to decrypt the message they would need to know our encryption key and then they would run through the same process **in reverse**. Following our example, to decrypt we would shift each letter of the ciphertext 3 letters to the left to get the plaintext message.

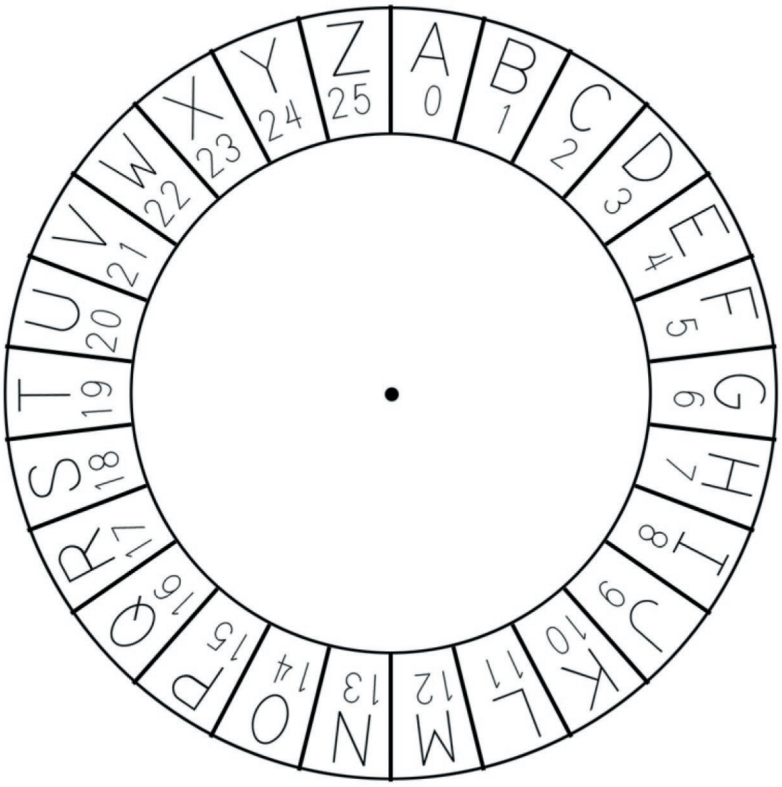
Ciphertext: Khoor Zruog
Plaintext: Hello World

Using the included supplies, you are going to make a Caesar Cipher Wheel! This will let you easily encrypt and decrypt messages using a substitution cipher.

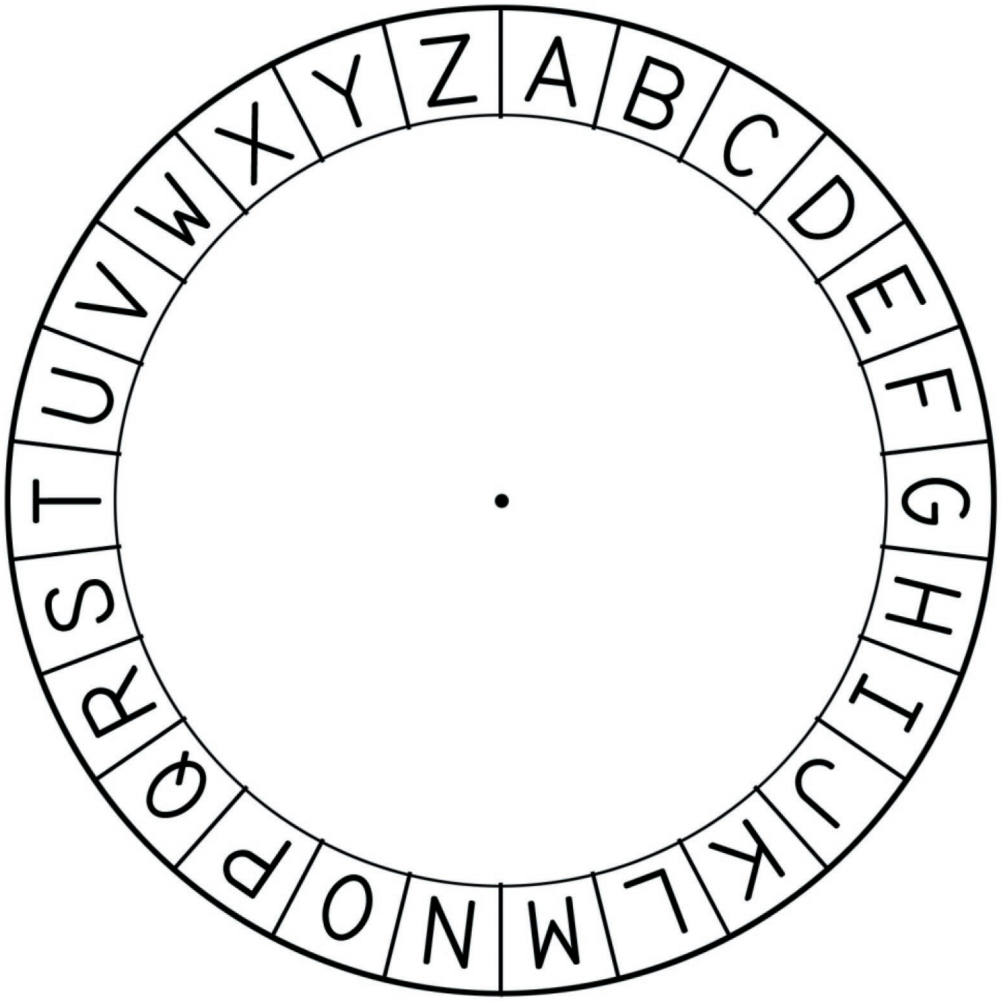
diy cipher

Instructions:

1. Carefully cut out each disk
2. Make a small hole on the black dot at the center of both disks.
3. Place the smaller disk on top of the larger one.
4. Connect the disks with the supplied pipe cleaner.

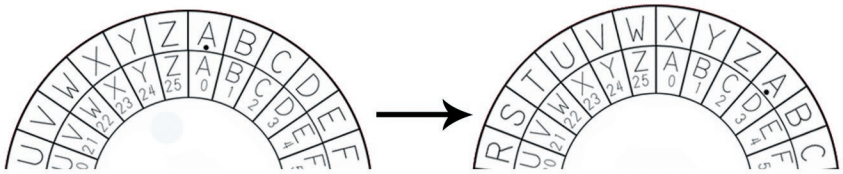


part 2. cut-out



diy cipher

Now that you have your own Caesar Cipher Wheel, we can practice using it to encrypt and decrypt messages! To use your cipher wheel, rotate the **inner disk** based on the encryption key. For our example take the inner disk and **rotate it 3 letters to the left** like below.



Try using your new cipher wheel to decrypt the following messages encoded with the same encryption key! Match the letter on the smaller disk to the larger one to decode the message.

Ciphertext: FRGLQJ
Plaintext: __ __ __ __ __ __

Ciphertext: VWHDP
Plaintext: __ __ __ __ __

Ciphertext: FRPSXWHU VFLHQFH
Plaintext: __ __ __ __ __ __ __ __ __ __ __ __ __ __ __

We can also use our wheel to encrypt messages! Try encrypting the messages below using the same key. Match the letter on the larger disk to the smaller one to encode the message

Plaintext: Cipher
Ciphertext: __ __ __ __ __ __

Plaintext: Robot
Ciphertext: __ __ __ __ __

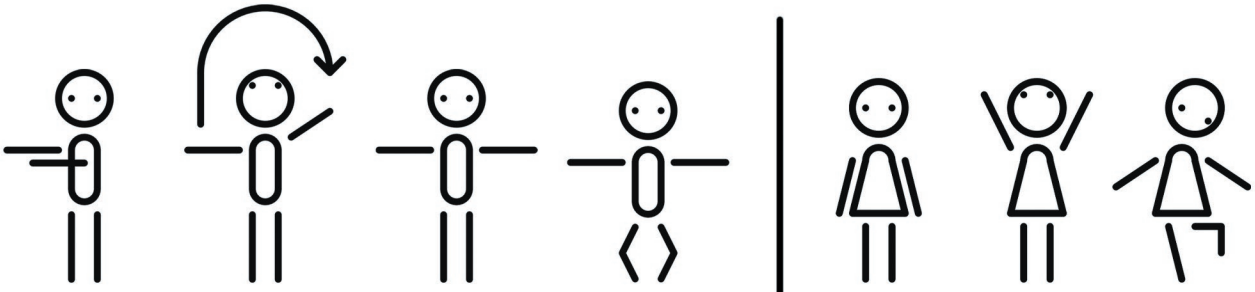
Using your new cipher wheel come up with your own encryption keys and create secret messages! Remember that if you want someone to be able to decrypt a message, they need to know your encryption key. You can use specific encryption keys for different people or topics to keep messages private.

part 3. activities

bee dance

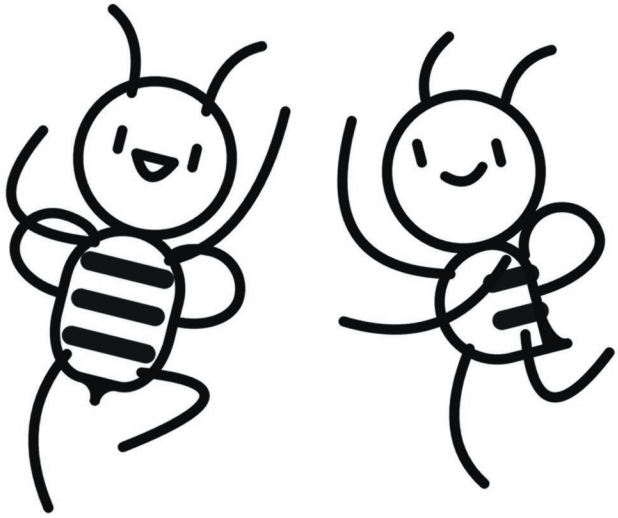
physical activity

Did you know that bees dance to share directions to flowers? By moving in specific patterns and changing tempo, they can share how far away and in what direction the hive needs to travel. This is called the "**Waggle Dance**". You can make your own waggle dance and secretly talk to friends or parents, but you have to agree on what your dance means!



"I could eat a whole sandwich!" | **"You're doing great!"**

Come up with your own waggle dance to:
-Spell your name
-Ask for help reaching the top shelf
-Order a sandwich
Use the extra space to draw some dance moves!



coloring page

Before apple watches existed, some people used to wear secret decoder rings as their gadget of choice. A decoder ring is a teeny tiny version of the substitution cipher! Go ahead and decorate your retro fashion ring!

resources

trivia!
There is an episode of Dexter's Lab called "Decode of Honor" that is all about decoder rings and cracking codes!

interactive online cipher
cryptii.com

computer science classes and learning
adafruit - adafruit.com
hour of code - hourofcode.org
micro:bit - microbit.org

art & design
gb studio - gbstudio.dev
makecode - makecode.com
piskelapp - piskelapp.com
scratch - scratch.mit.edu
earsketch - earsketch.gatech.edu

educational games
lightbot - lightbot.com/flash.html

thank you!

Thank you so much for taking part in our very first Snail Mail! We hope you enjoyed the activities and coloring pages, and we would love to see what you create!

Sincerely yours,
The snail mail team

CJ, Maggie, Natasha, Pepper, Thomas, Wuga, Zach

CodeVA EUREKA WORKSHOP

Cipher Answers: FRGLOJ = CODING , VWHDP = STEAM , FRPSXWHU VFLHQFH = COMPUTER SCIENCE
CIPHER = ZFMEBO , ROBOT = OLYLW