Exploring Grade Two Computer Science

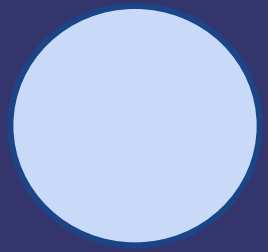
IF you teach THEN they will learn

Alberta Regional Consortia

Electrical and Computer Engineering

The most promising and profitable jobs of now and the future.

Over the next 10 years...



There will be

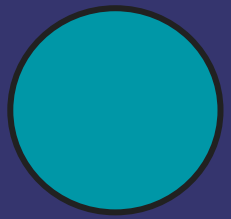
1.4 million

Programming jobs to fill

With only

400 000

Graduates in computer science



Leaving

1 million

empty jobs!

There are technology jobs in every field:

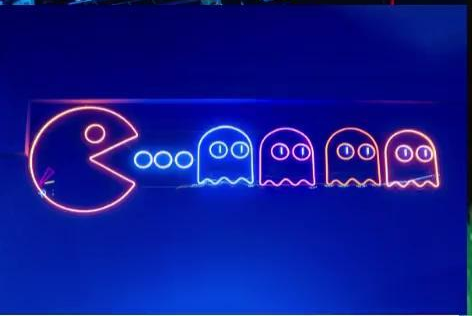
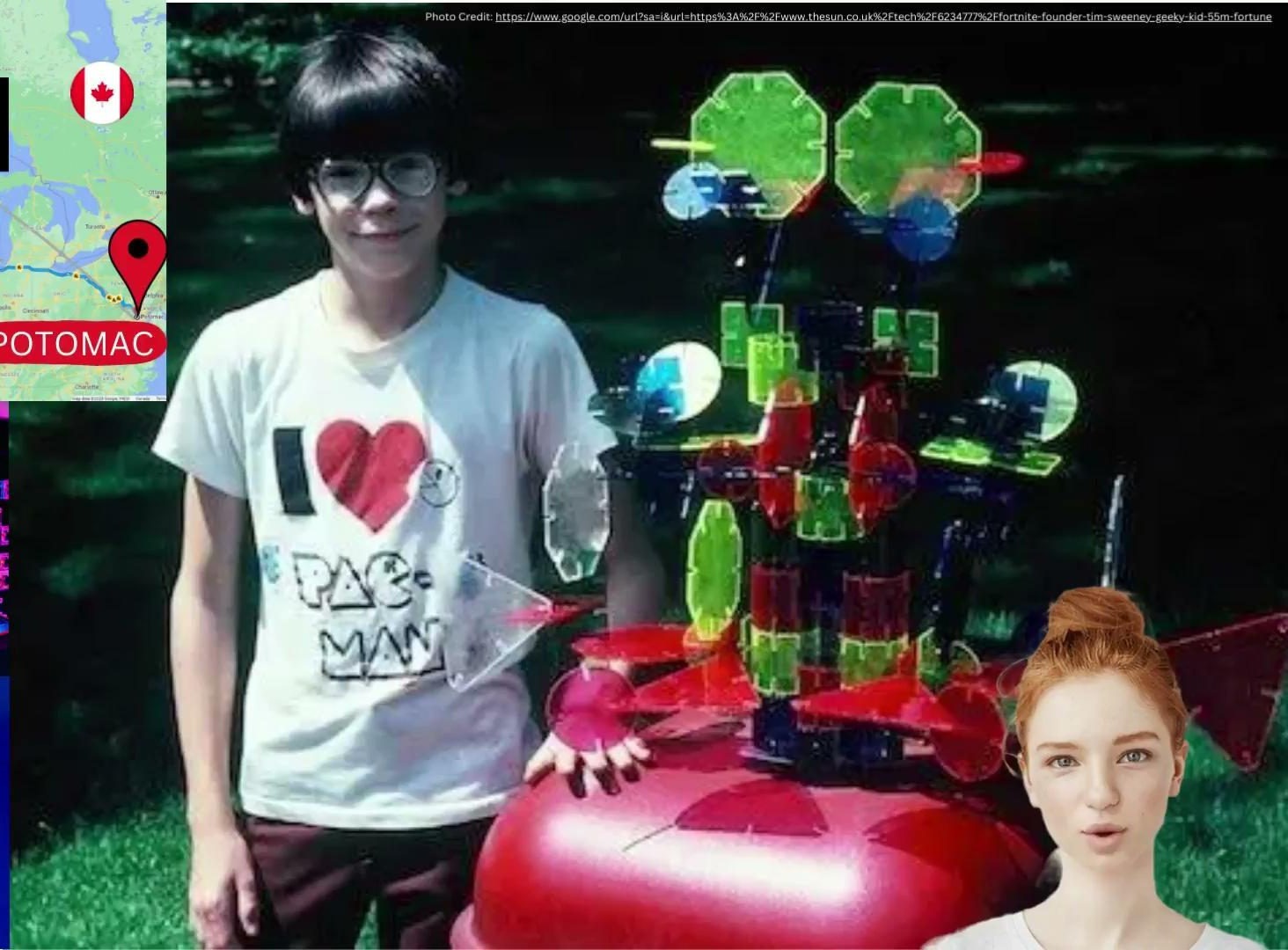


Photo Credit: https://www.google.com/url?sa=i&url=https%3A%2F%2Fwww.thesun.co.uk%2Ftech%2F6234777%2Ffortnite-founder-tim-sweeney-geeky-kid-55m-fortune



ORGANIZING IDEA

Matter: Understandings of the physical world are deepened through investigating matter and energy.

ORGANIZING IDEA

Energy: Understandings of the physical world are deepened through investigating matter and energy.

ORGANIZING IDEA

Earth Systems: Understandings of the living world, Earth, and space are deepened through investigating natural systems and their

ORGANIZING IDEA

Living Systems: Understandings of the living world, Earth, and space are deepened through investigating natural systems and th

ORGANIZING IDEA

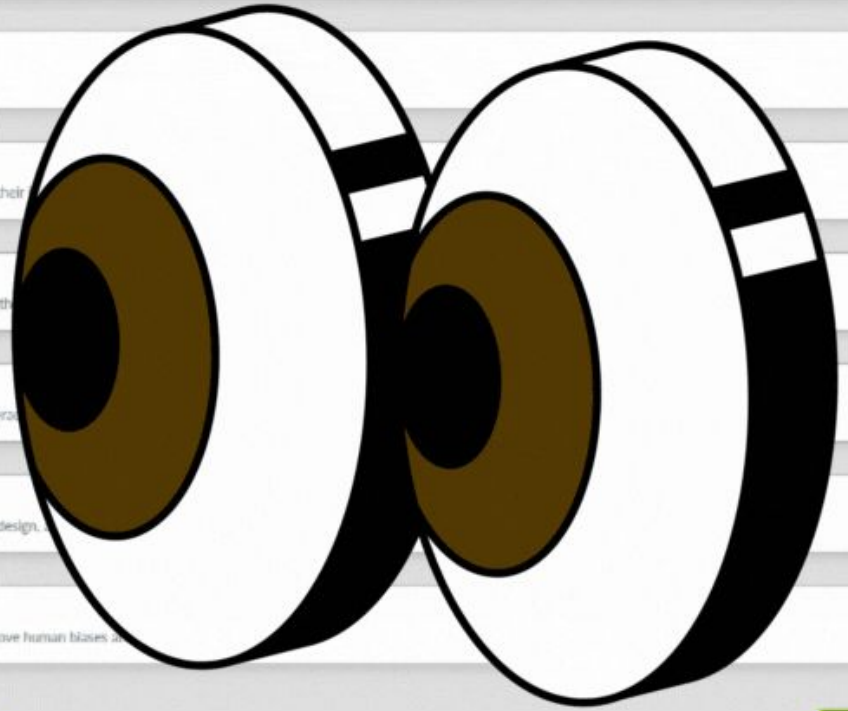
Space: Understandings of the living world, Earth, and space are deepened through investigating natural systems and their inter

ORGANIZING IDEA

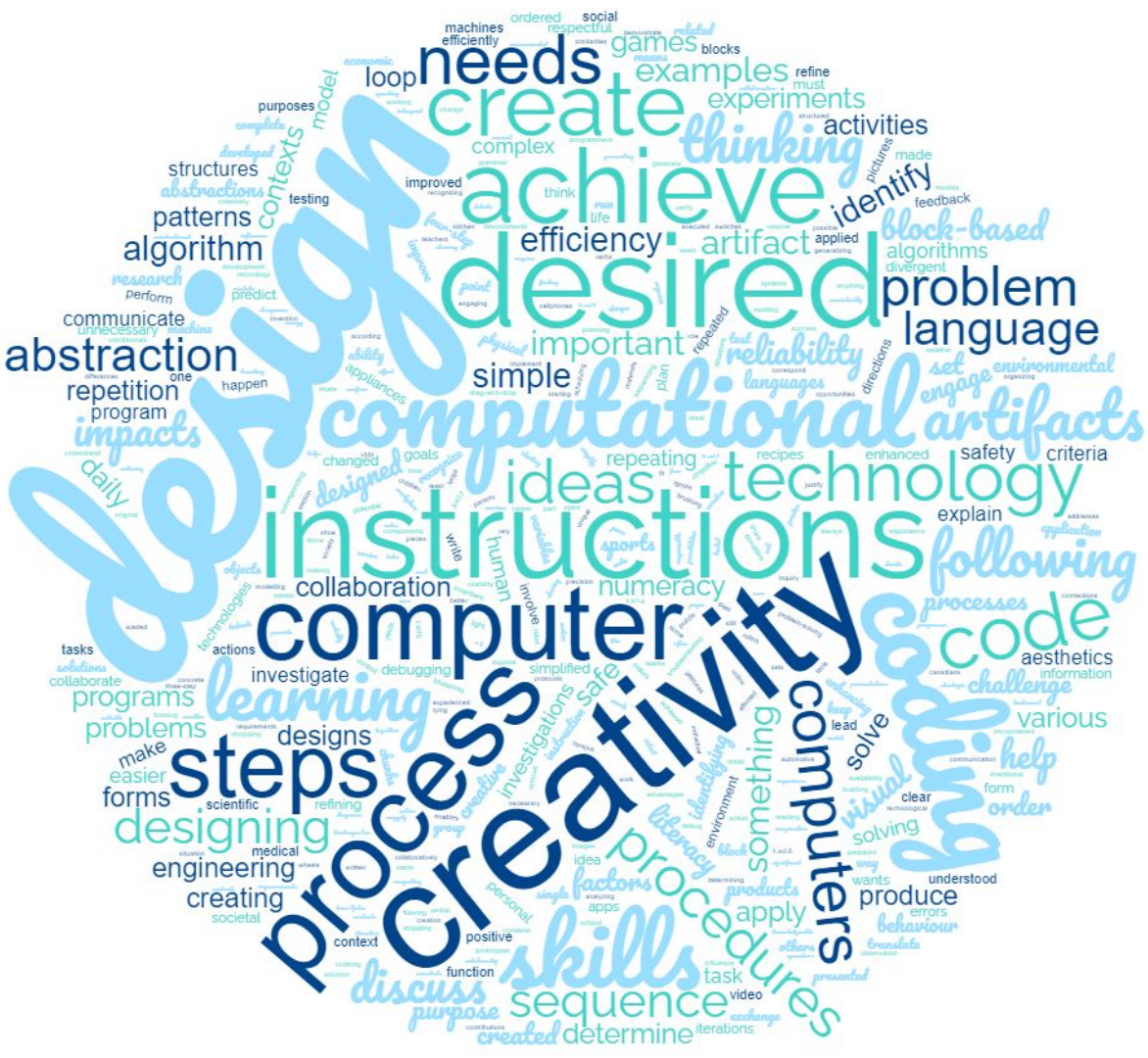
Computer Science: Problem solving and scientific inquiry are developed through the knowledgeable application of creativity, design

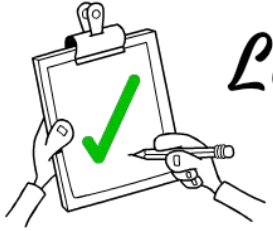
ORGANIZING IDEA

Scientific Methods: Investigation of the physical world is enhanced through the use of scientific methods that attempt to remove human biases



Problem solving and **scientific inquiry** are developed through the knowledgeable application of **creativity**, **design**, and **computational thinking**.





Learning Outcomes

K Children interpret instructions in the learning environment.

1 Students investigate instructions and their influence on actions and outcomes.

2 Students apply creativity when designing instructions to achieve a desired outcome.

3 Students investigate creativity and its relationship to computational thinking.

4 Students investigate and apply design in the context of computer science and technology.

5 Students create and justify a design that could be used by a human or machine to address a challenge.

6 Students create and refine computational artifacts through the use of design and abstraction.

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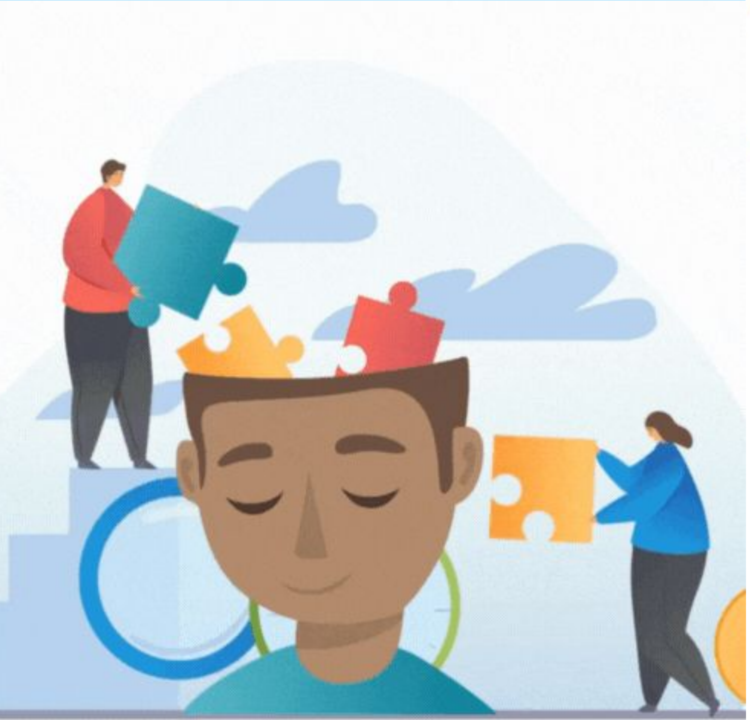

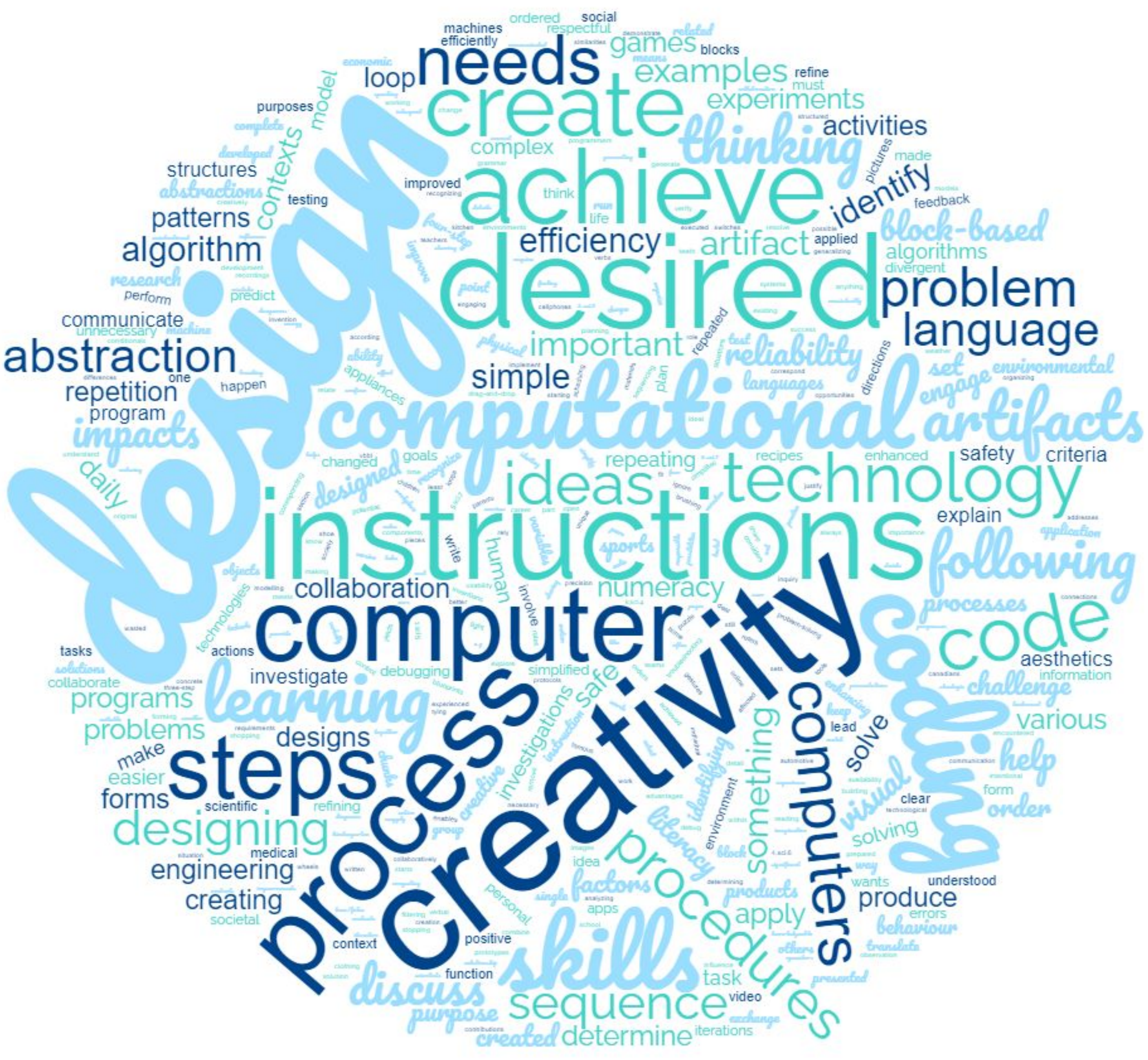
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enhancing
way

Design Thinking Process

Learn About
Your Audience

Empathize

Define

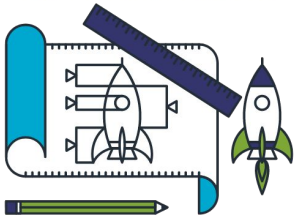
Construct Point
of View Based
on User Needs

Brainstorm and
Come up with
Creative Solutions

Ideate

Prototype

Build
Representation
of Your Ideas



Test Your Ideas

Test

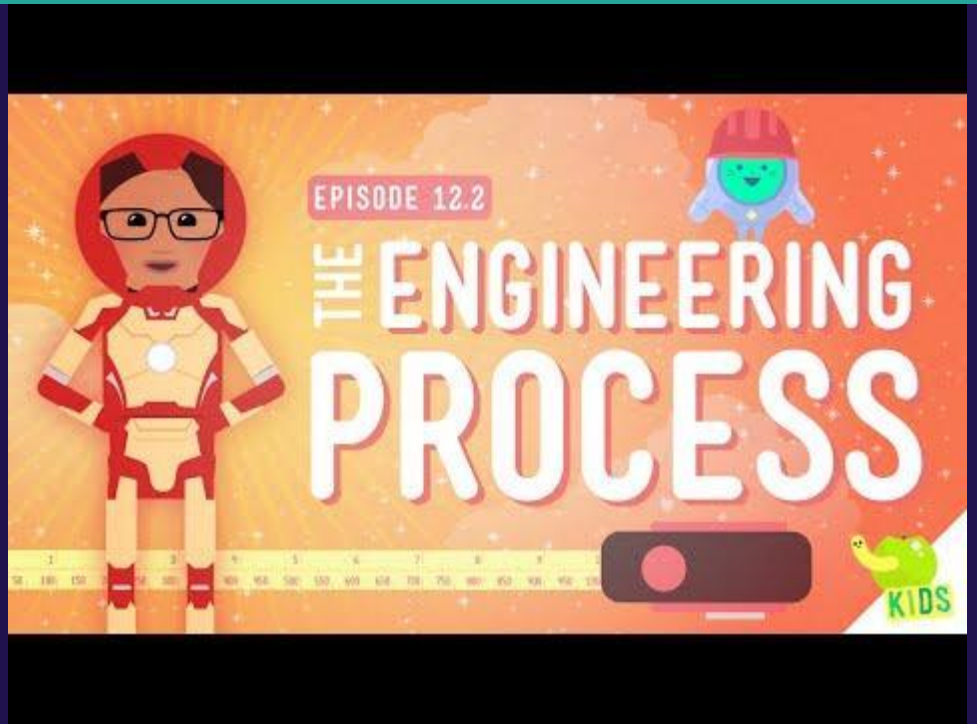
Empathize → Define → Ideate → Prototype → Test

Learn about the audience for whom you will be designing.

Walk a mile in their shoes.

Empathize → **Define** → Ideate → Prototype → Test

Use what you know about your audience to determine exactly what the problem you are going to solve is.



Empathize → Define → **Ideate** → Prototype → Test

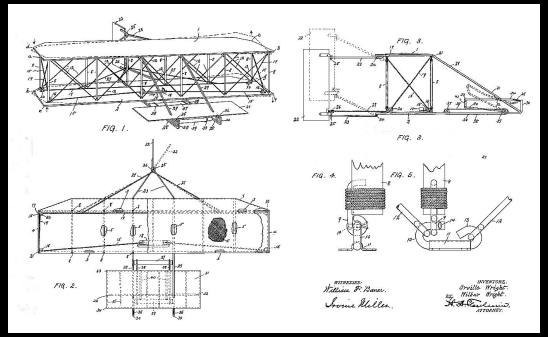
There are NO bad ideas!

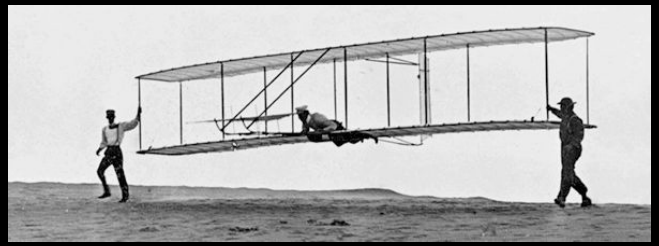
Think about your audience's needs!

Quantity over Quality!

Ideas! Ideas! Ideas!

Empathize → Define → Ideate → **Prototype** → Test





Empathize → Define → Ideate → Prototype → **Test**

If at first you don't succeed,
TRY
TRY
Again...and again...
and again.

Did you know? The Wright Brothers had 2 failures before they were successful with flight.

Empathize

As you watch the video, start to think about what this person needs. Also be prepared to talk about how the video made you feel.

Think about…

- How you would feel in Mandy's position?
- What kind of person does Mandy seem like?
- What qualities does the video show you about Mandy?

Define

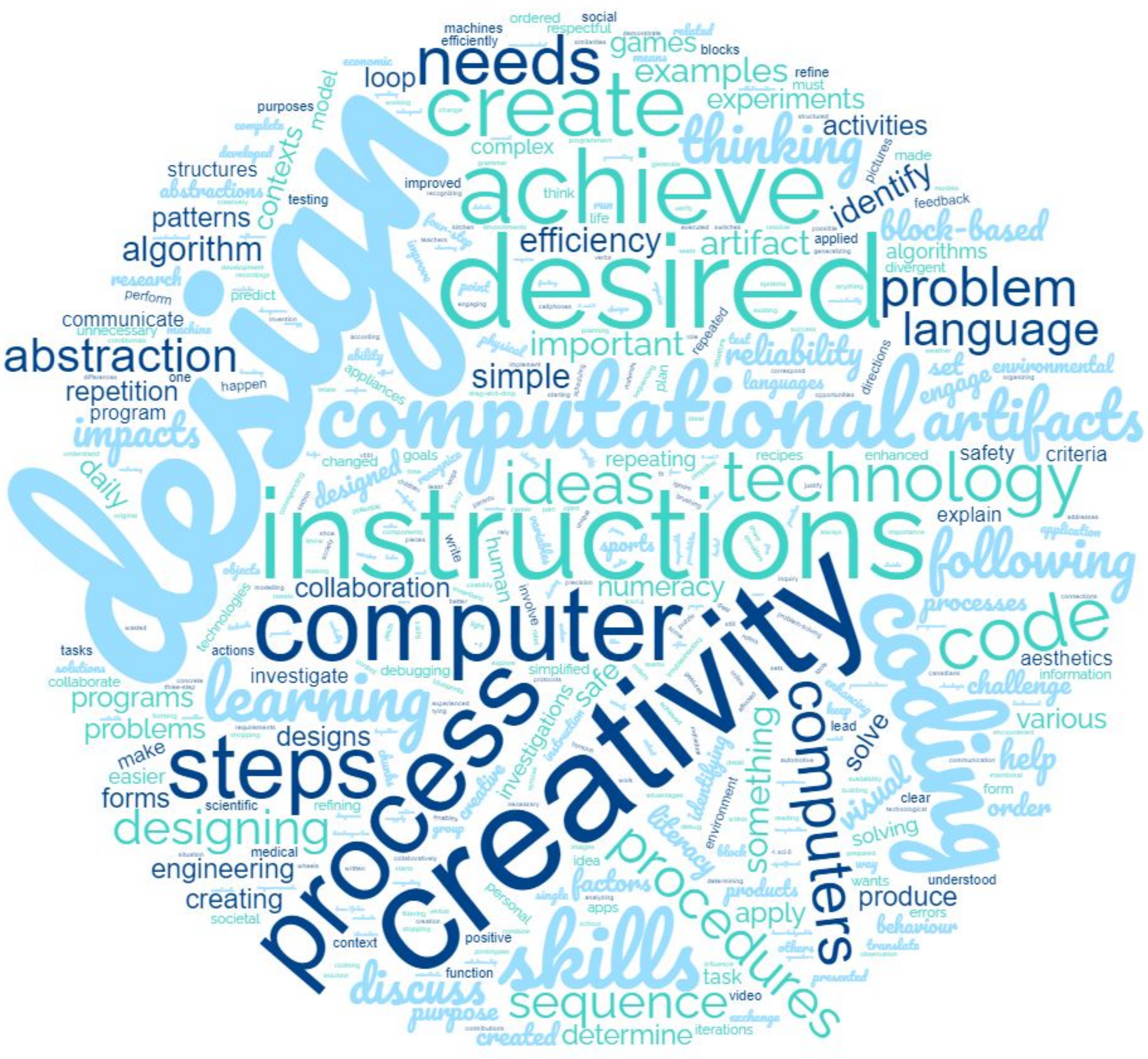
What is Mandy's problem?

Tip: It's not that she is deaf.

This is an impairment that cannot be fixed and Mandy has figure out how to sing even though she cannot hear.

How does Mandy currently deal with her problem?

She sings in her stocking feet so she can feel the vibrations.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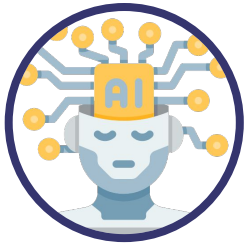
Computational Thinking

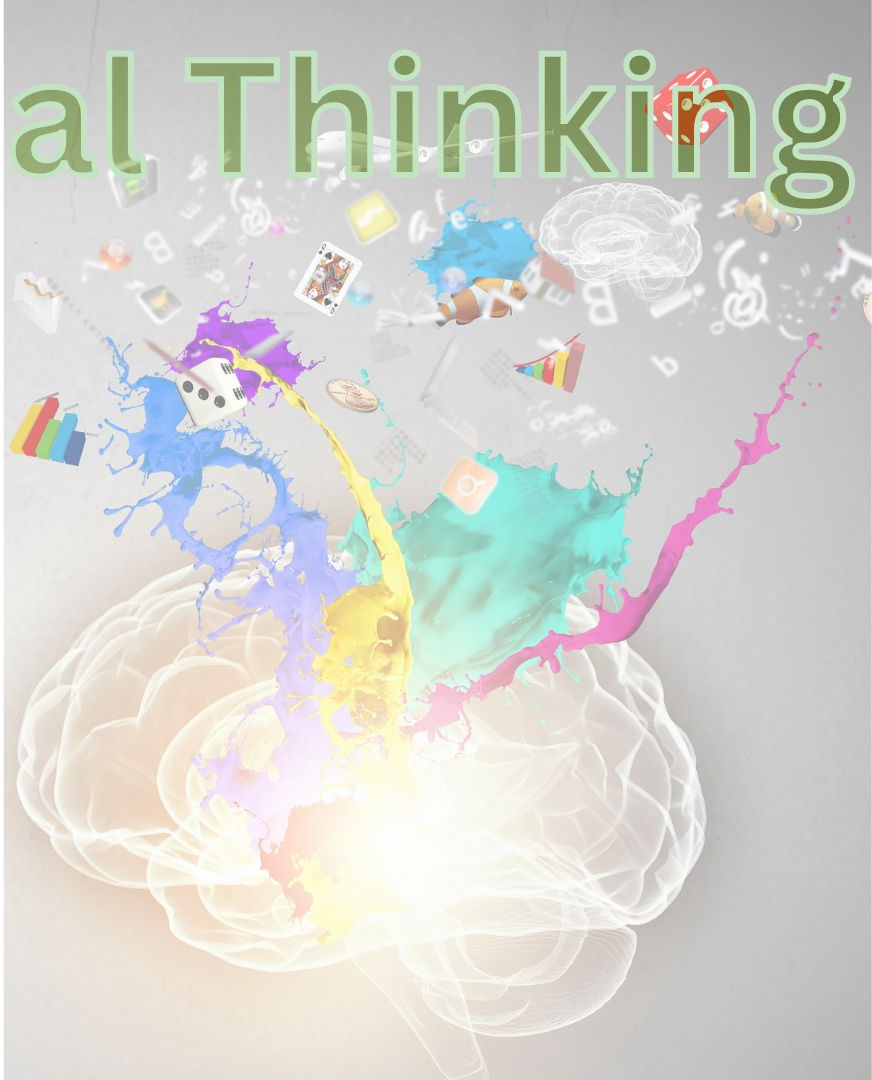


Decomposition

Pattern Recognition

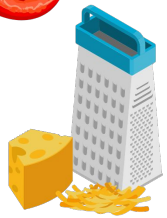
Pattern Abstraction

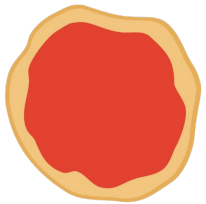
Algorithm Design

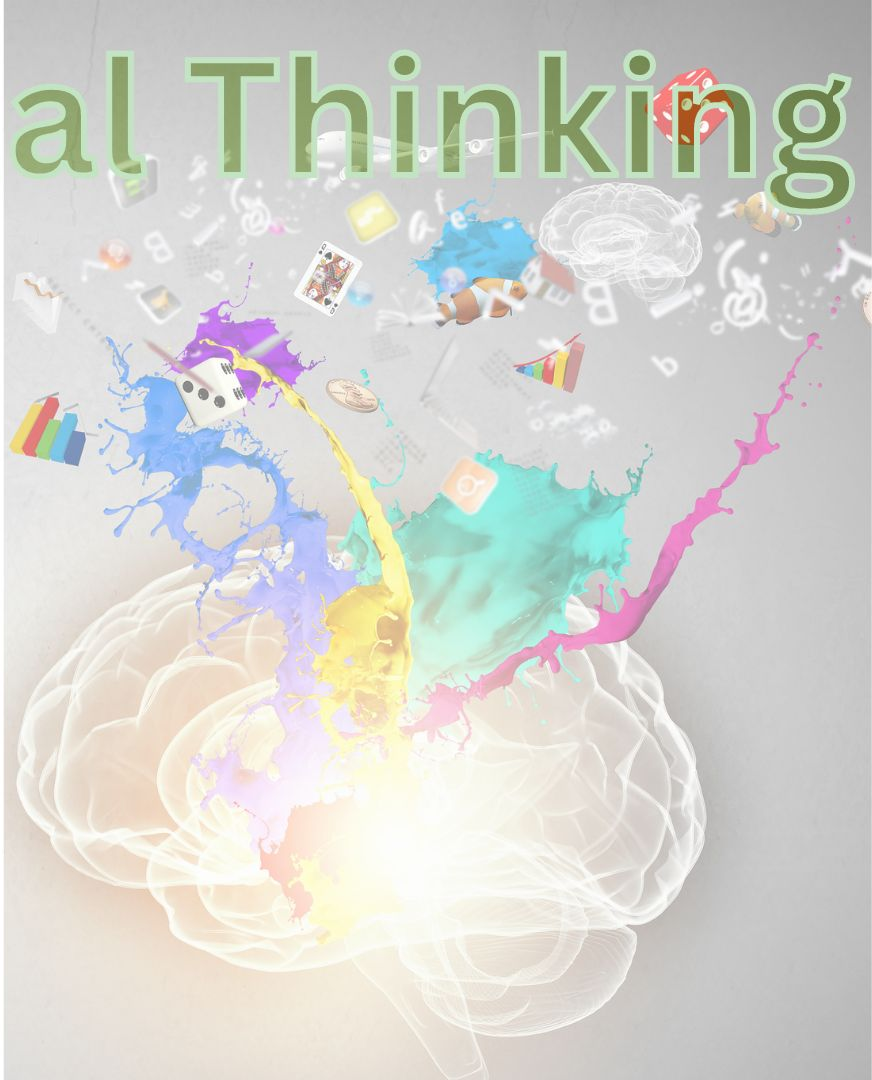


Computational Thinking

Decomposition

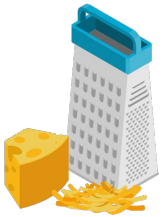
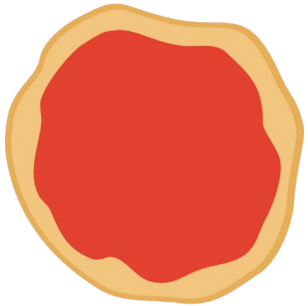


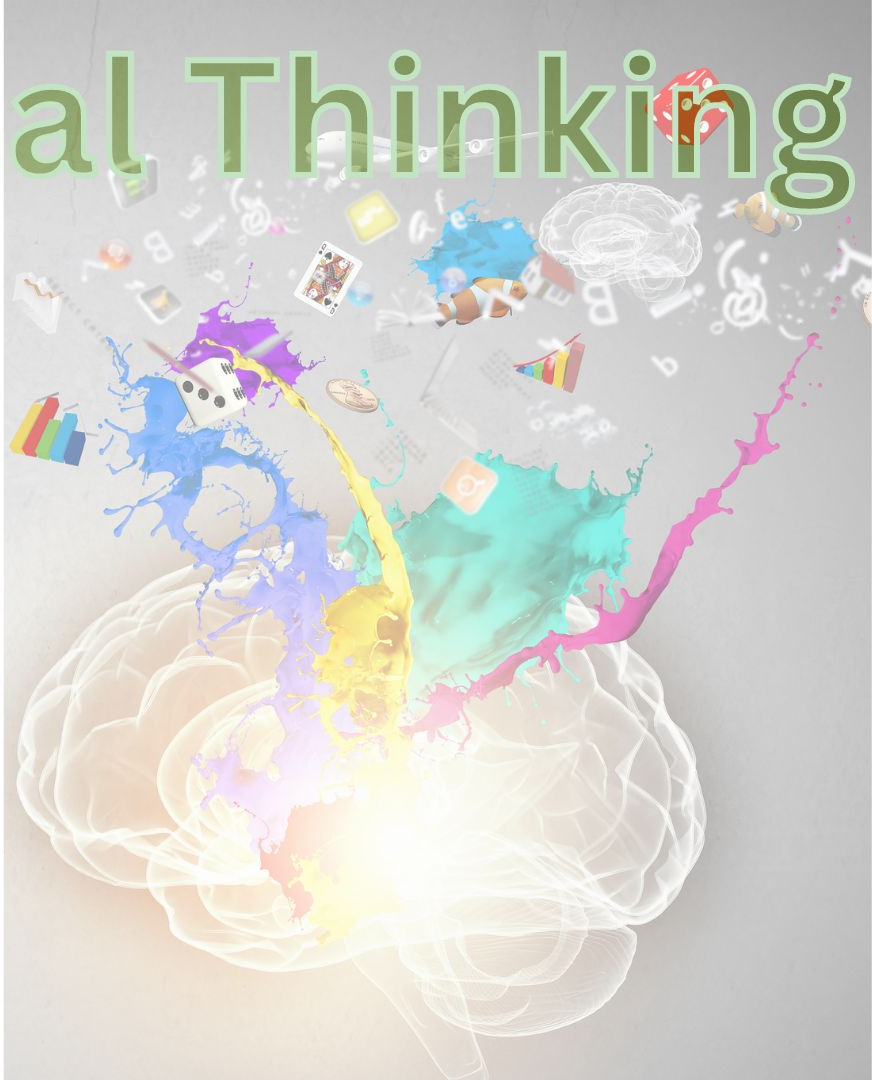




Computational Thinking

Pattern Recognition

Slice	Don't Slice
   	  



Computational Thinking

Pattern Abstraction

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   	  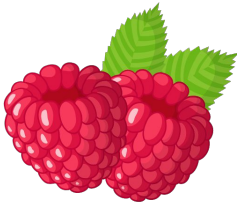 

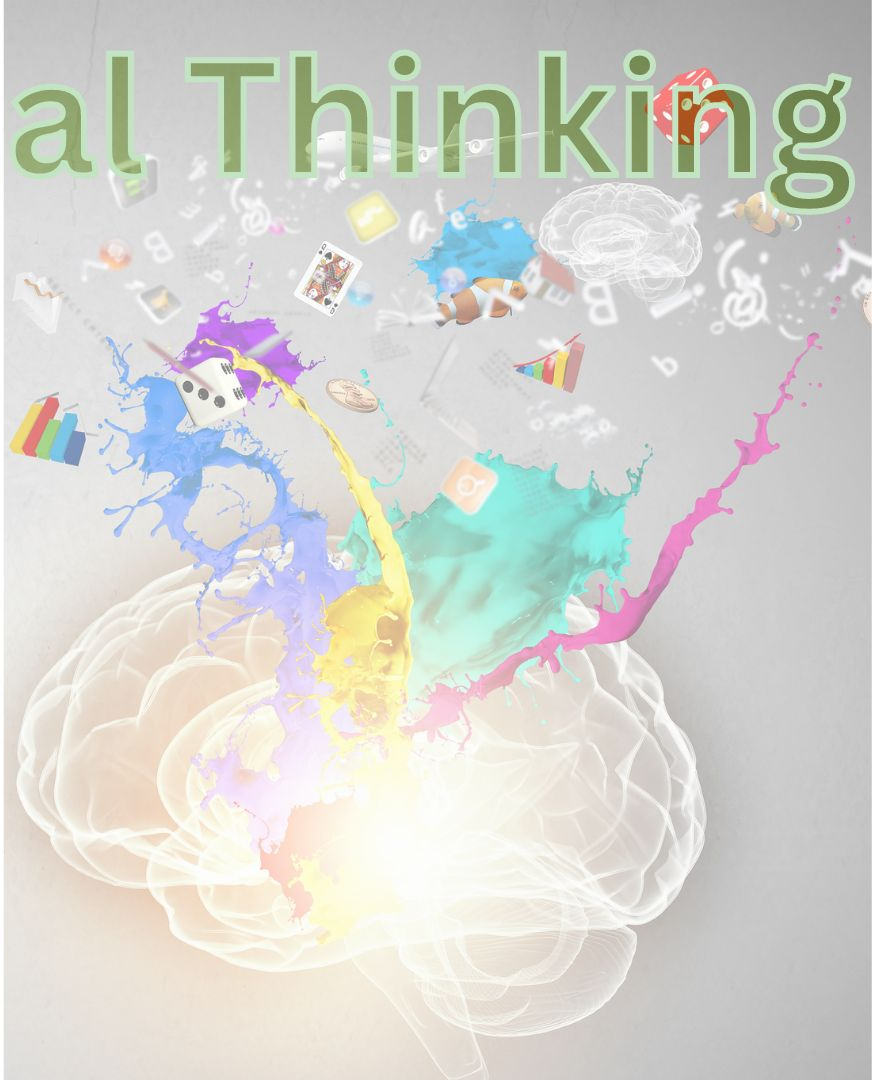

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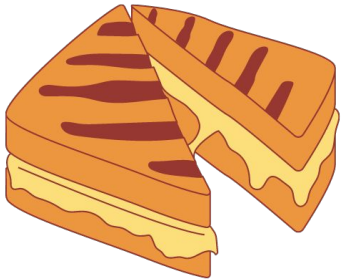
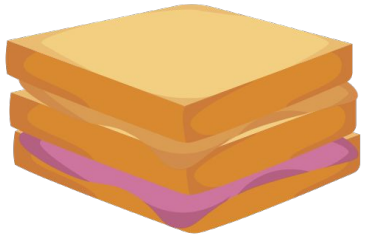
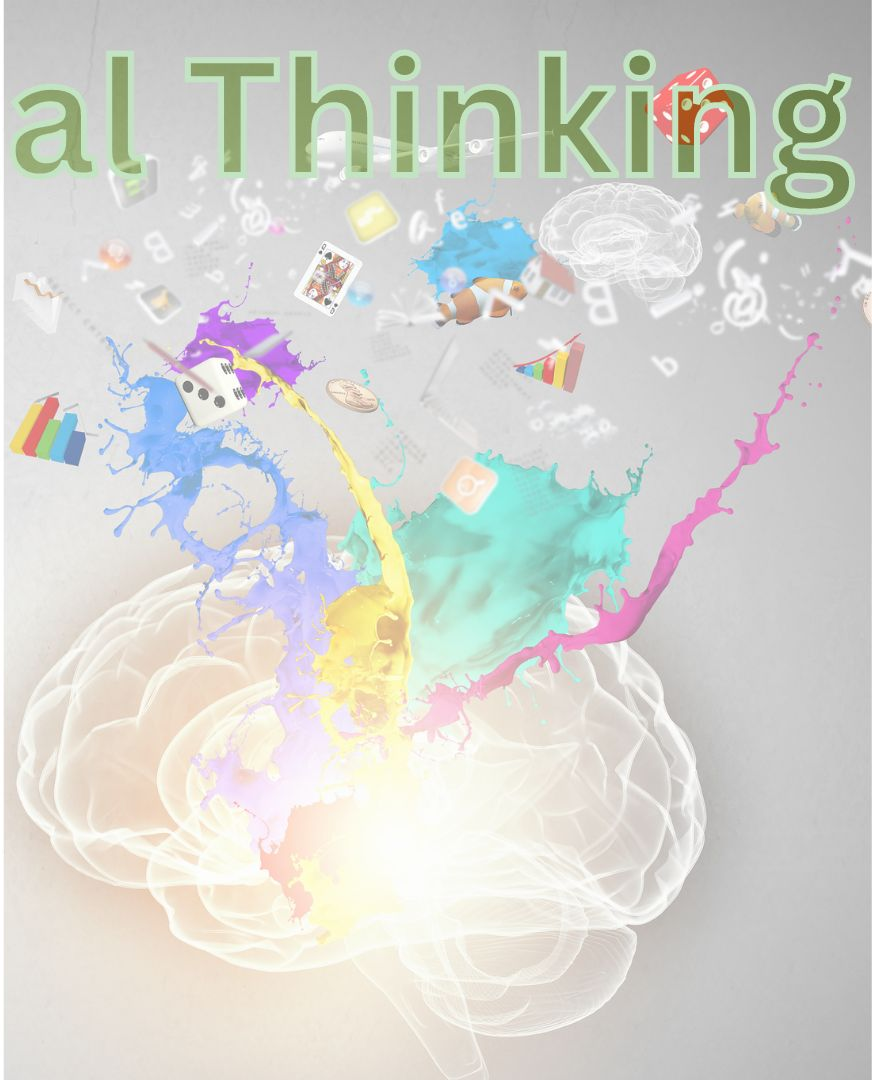


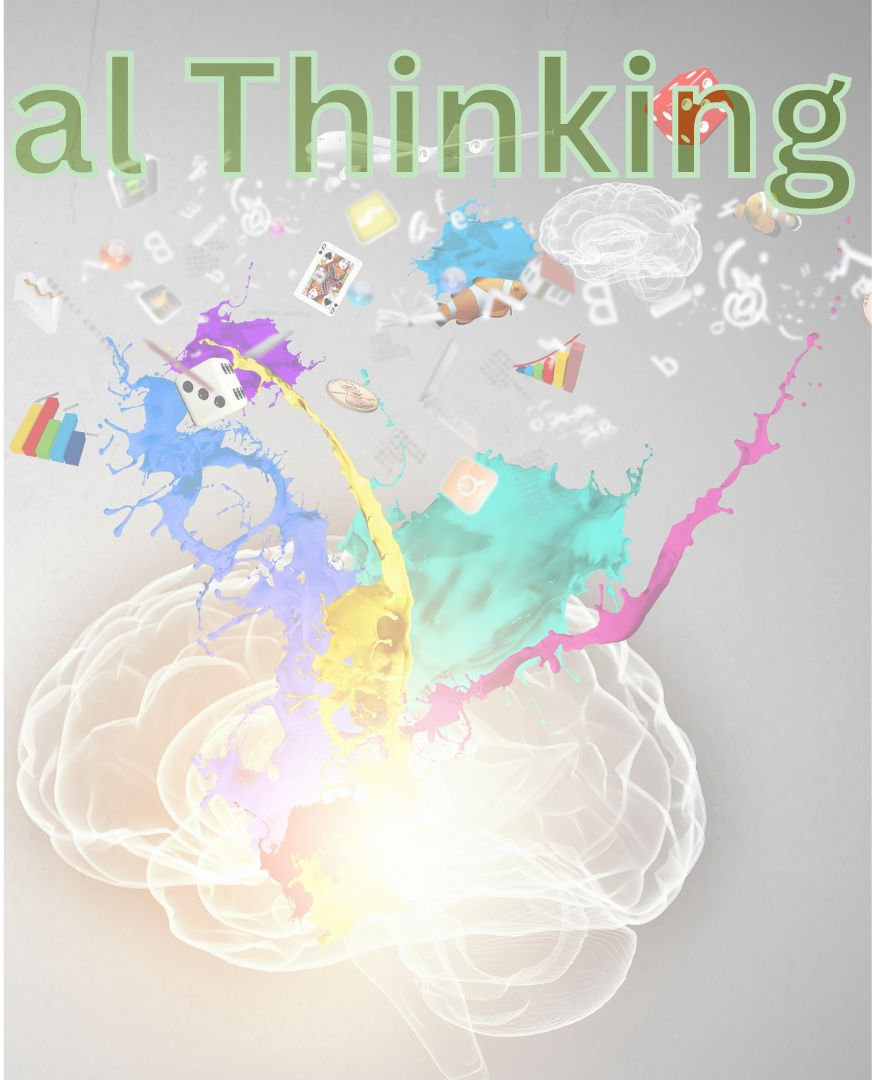


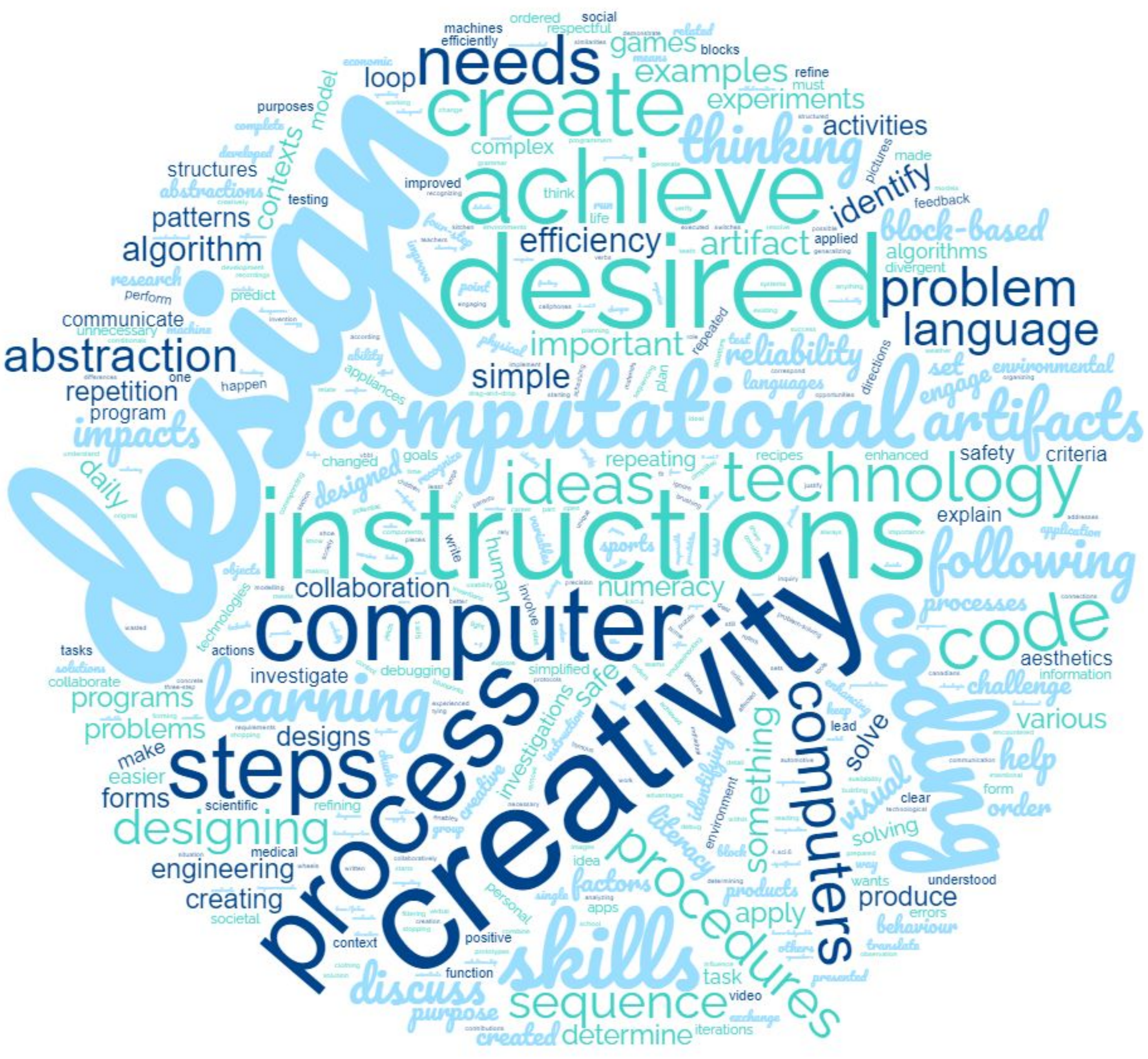


Computational Thinking

Algorithm Design

1. First prepare ingredients
    a. If it is a fruit or vegetable then wash it
    b. If it is in a package then open it
    c. If it is big then slice it
2. Layer the ingredients
    a. Start with the crust
    b. Spread sauce on crust
    c. Add shredded cheese
    d. Add each remaining ingredient

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Creativity

Finding different ways to reach the same outcome.

Problem solving to overcome obstacles to achieve a desired outcome.

Ears

To listen to the ideas of others

Eyes

To make observations

Mouth

To collaborate & share your conclusions with others

Hands

To do experiments & record observations

Curious Mind

To make predictions & hypothesis. To think deeply about the world.

Strong Heart

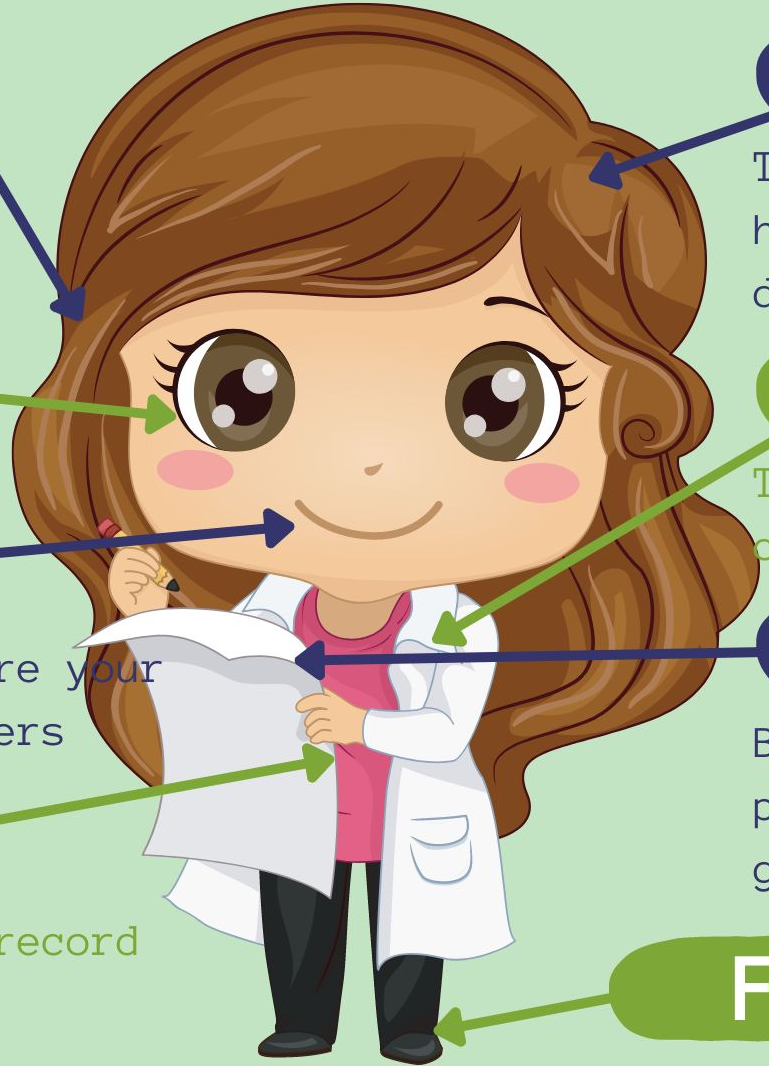
To be brave and take chances!

Tools

Beakers, Chromebooks, pencils, magnifying glasses & more

Feet

To move safely



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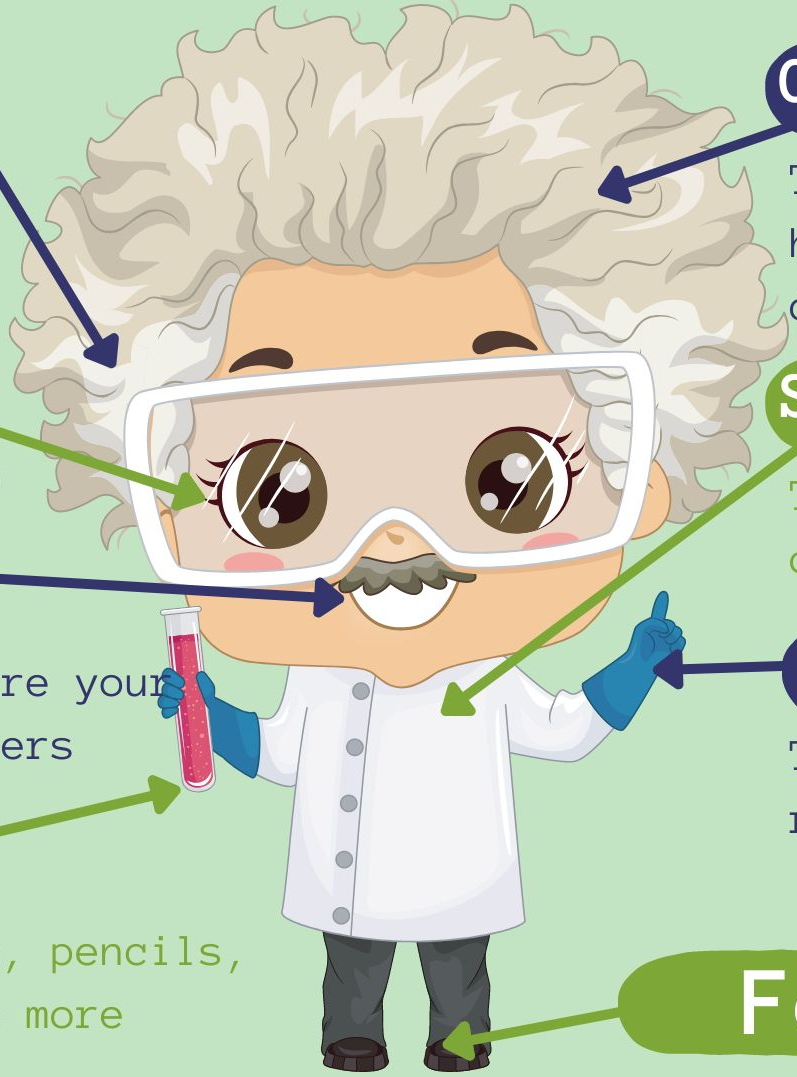

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Attack of the Kidbots

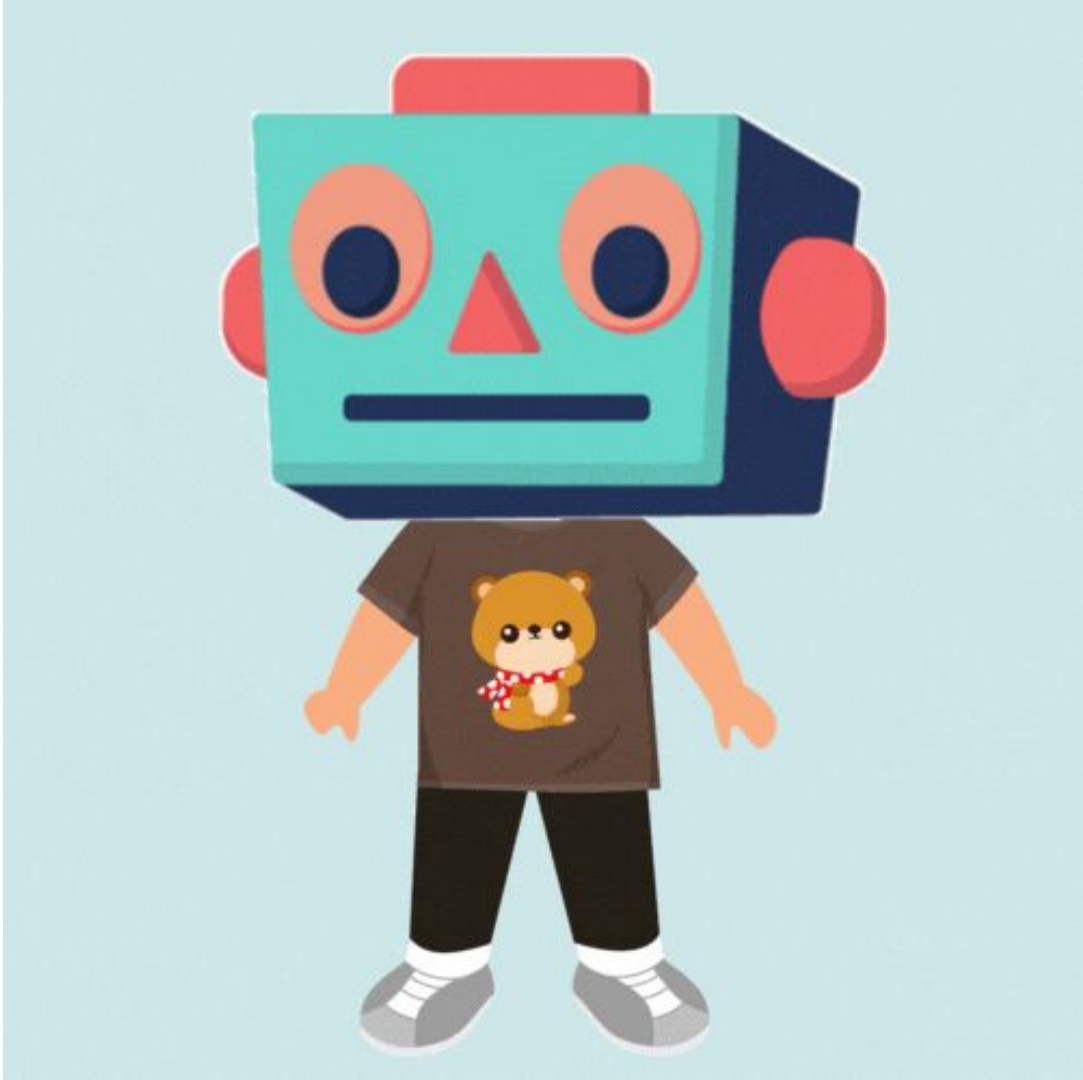
Classroom routines

Learning instructions

Other subject areas

Outside of school

- Community
- Family
- The world
- In nature



Organizing Idea	**Computer Science: Problem solving and scientific inquiry are developed through the knowledgeable application of creativity, design, and computational thinking.**
Guiding Question	**How can instructions affect outcomes?**
Learning Outcome	**Students follow instructions and relate them to outcomes.**

Knowledge	Understanding	Skills & Procedures
Creativity is the ability to generate something original, such as • ideas • technology • tools • products Creativity can be used to design instructions for • games • sports • investigations • recipes • computer programs Collaboration can result in improved ideas, which may enhance creativity and problem solving.	Instructions are designed using creativity and problem solving, which can be enhanced through collaboration.	Identify ways creativity is used to design instructions.

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Learning Outcome	**Students follow instructions and relate them to outcomes.**

Knowledge	Understanding	Skills & Procedures
Precise instructions have a variety of components, including • verbs • simple language • clear steps • a starting and stopping point Reliability of instructions means they consistently lead to the same desired outcome. Efficiency of instructions refers to designing in a way that yields desired outcomes with the least amount of energy, time, or steps. The reliability and efficiency of instructions can be affected by how they are communicated, including • form; e.g., verbal, visual, written • order • clarity	Instructions can be created to be precise, reliable, and efficient to achieve the desired outcome.	Work individually or in groups to create instructions using precise words, pictures, or diagrams. Create three-step to four-step instructions that achieve a desired outcome. Predict the outcome of instructions that have three to four steps. Refine instructions to more efficiently achieve a desired outcome. Test instructions with three to four steps to verify that a desired outcome is achieved. Debug any errors in a set of instructions to achieve a desired outcome.

Organizing Idea	**Computer Science: Problem solving and scientific inquiry are developed through the knowledgeable application of creativity, design, and computational thinking.**
Guiding Question	**How can instructions affect outcomes?**
Learning Outcome	**Students follow instructions and relate them to outcomes.**

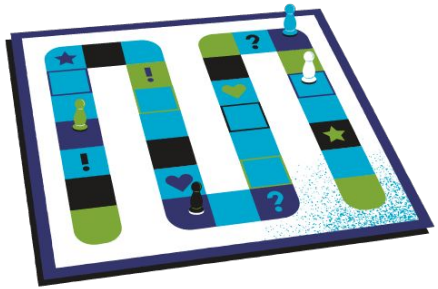
Knowledge	Understanding	Skills & Procedures
Many people, individually or in groups, can create instructions, such as • teachers • parents • students • computer programmers Many activities at school and in the workplace require creativity and collaboration to improve ideas. Debugging is the process of identifying and removing errors in a set of instructions to achieve a desired outcome. Debugging can increase the reliability of instructions.	Instructions can be created to be precise, reliable, and efficient to achieve the desired outcome.	Work individually or in groups to create instructions using precise words, pictures, or diagrams. Create three-step to four-step instructions that achieve a desired outcome. Predict the outcome of instructions that have three to four steps. Refine instructions to more efficiently achieve a desired outcome. Test instructions with three to four steps to verify that a desired outcome is achieved. Debug any errors in a set of instructions to achieve a desired outcome.

Organizing Idea	**Computer Science: Problem solving and scientific inquiry are developed through the knowledgeable application of creativity, design, and computational thinking.**
Guiding Question	**How can instructions affect outcomes?**
Learning Outcome	**Students follow instructions and relate them to outcomes.**

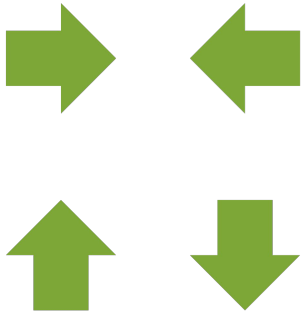
Knowledge	Understanding	Skills & Procedures
Many daily activities include repeated steps, such as • brushing teeth • tying one shoe and then using the same process on the other shoe	Instructions may be simplified by repeating steps.	Describe a situation in which repetition simplifies instructions. Exchange ideas to design clear three- to four-step instructions, including repetition, to achieve a desired outcome.

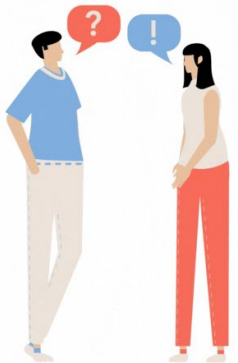
Skills & Procedures: Identify ways creativity is used to design instructions.

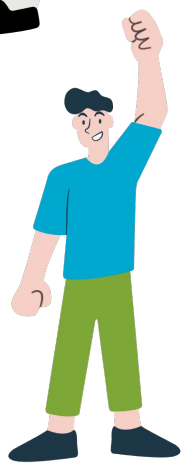
Where do we need/use instructions?



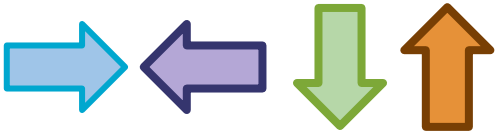
How can instructions be given?

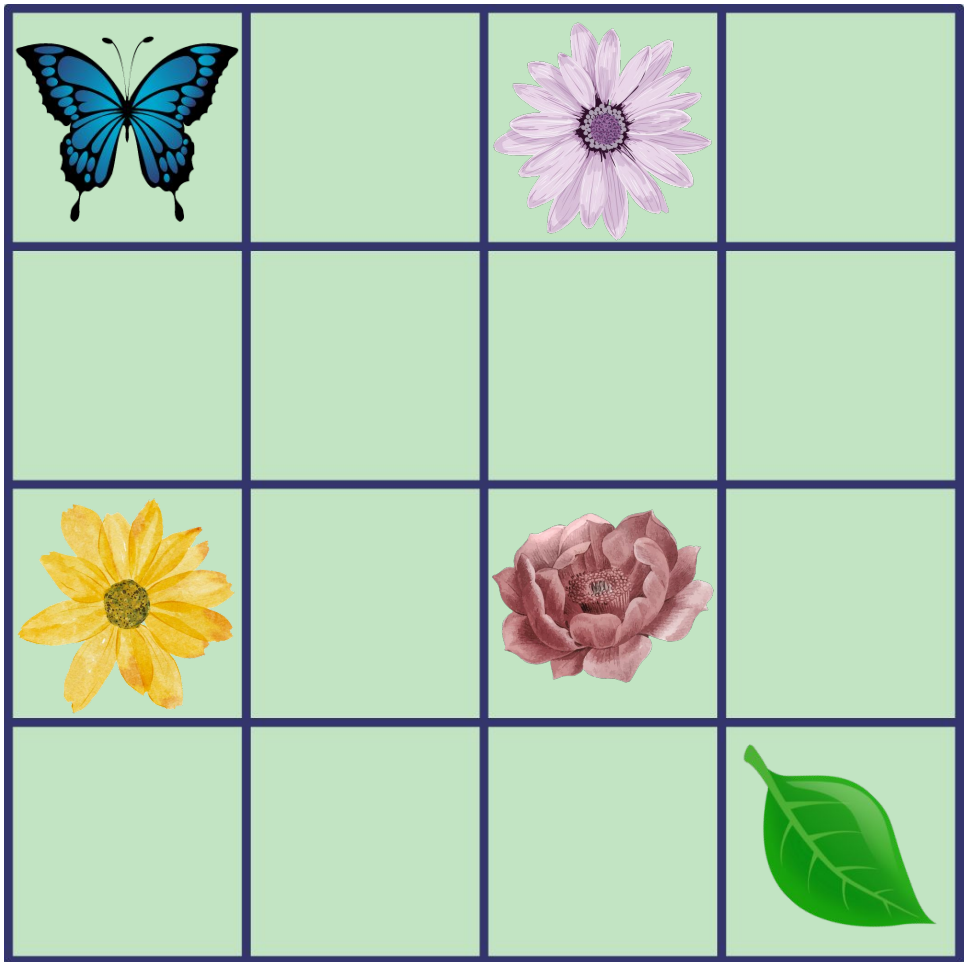






Skills & Procedures: Identify ways creativity is used to design instructions.





Skills & Procedures

Work individually or in groups to create instructions using precise words, pictures, or diagrams.

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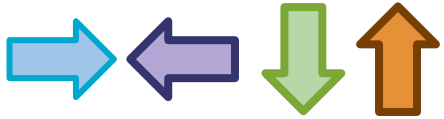
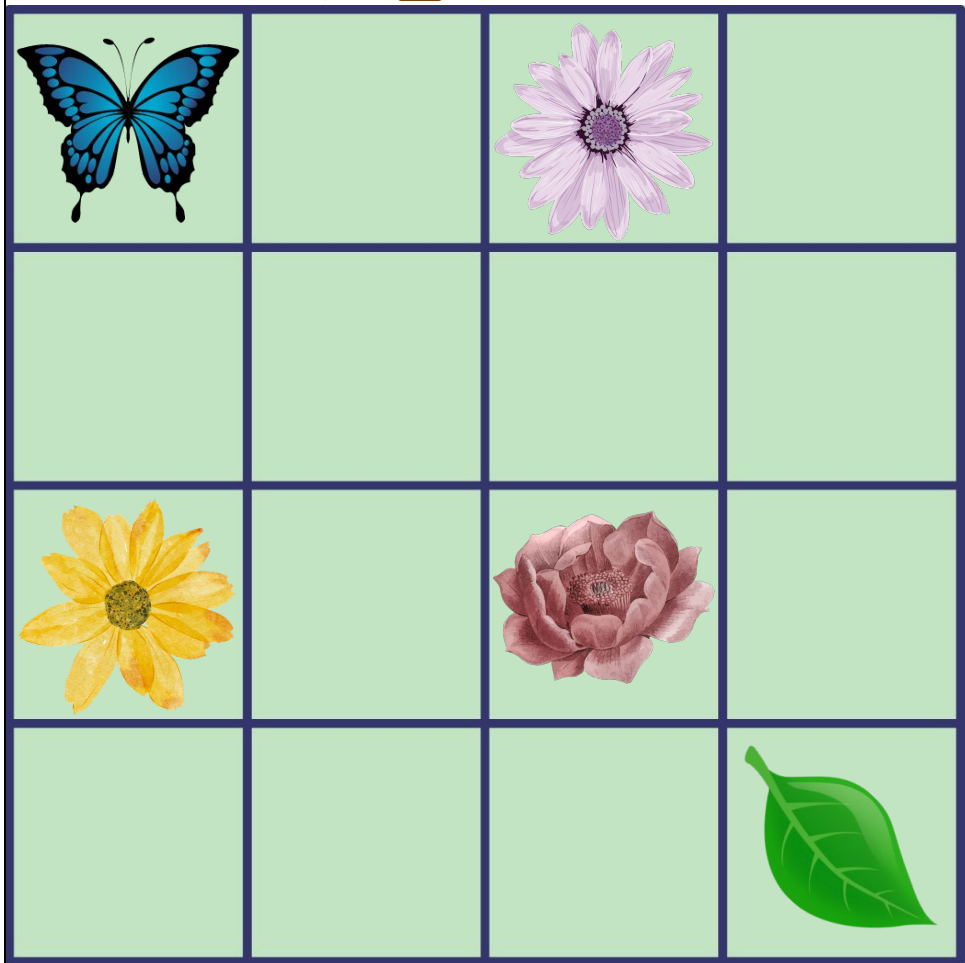


How many ways can your find for the butterfly to visit all 3 flowers and go home to its leaf?



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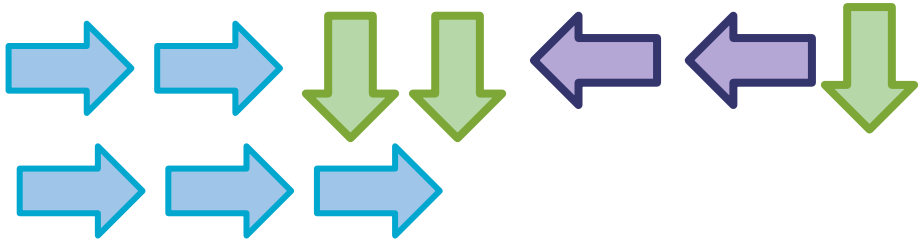
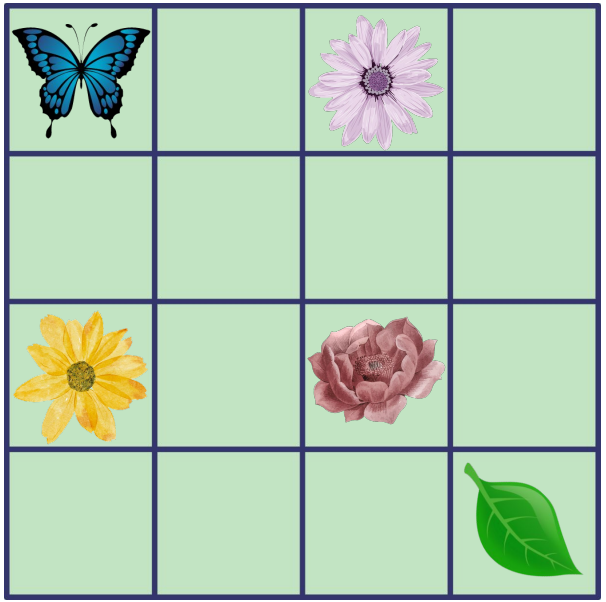


What order will the butterfly visit the flowers in if it follows this set of instructions?



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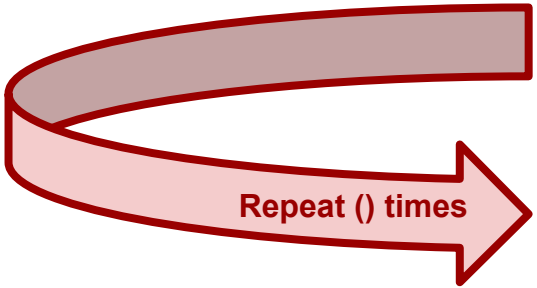
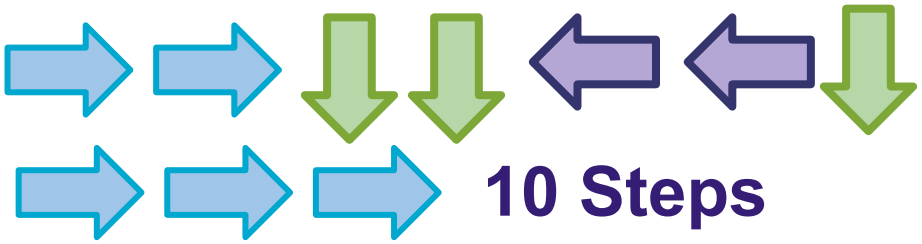


Can you use a repeat (loop) to make these instructions more simple?



5 Steps

Skills & Procedures

Work individually or in groups to create instructions using precise words, pictures, or diagrams.

Create three-step to four-step instructions that achieve a desired outcome.

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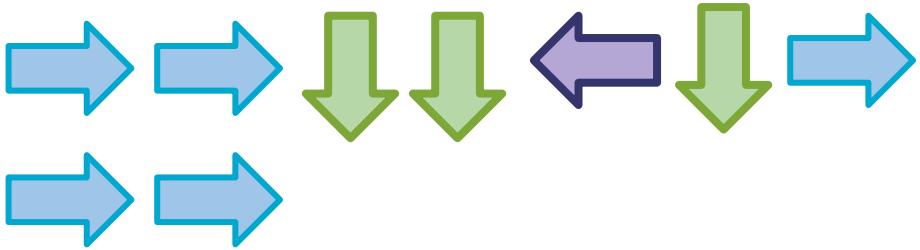
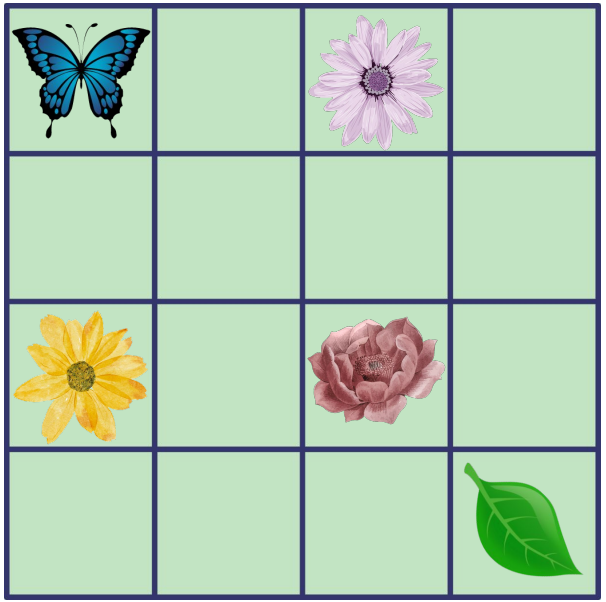


Will this set of instructions get the butterfly to all 3 flowers and end at the leaf?



Skills & Procedures

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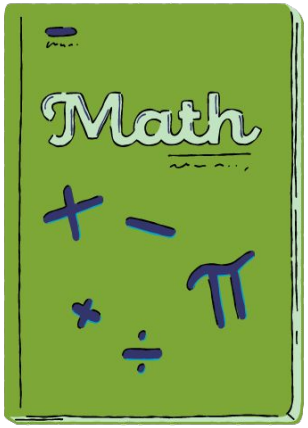
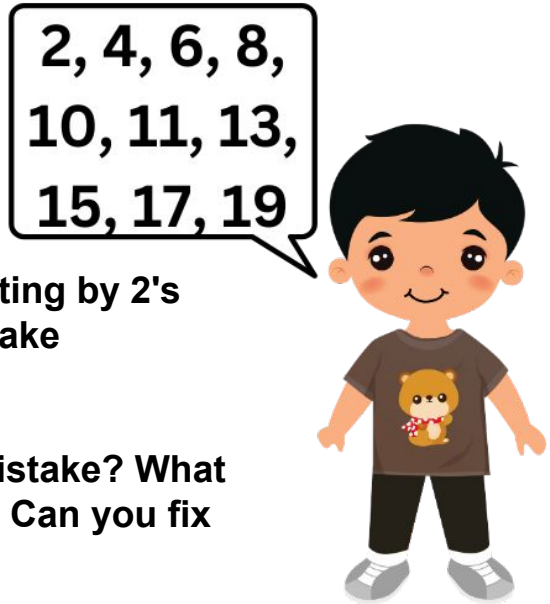


Create a set of instructions for counting by 2's.

Can you use a "repeat" to make it more refined?

Trade with a friend and check each other's instructions



Max was skip counting by 2's but he made a mistake somewhere.

Can you find the mistake? What did Max do wrong? Can you fix his mistake?

Skills & Procedures

Work individually or in groups to create instructions using precise words, pictures, or diagrams.

Create three-step to four-step instructions that achieve a desired outcome.

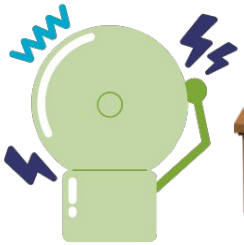
Predict the outcome of instructions that have three to four steps.

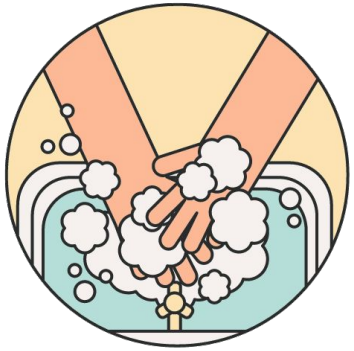
Refine instructions to more efficiently achieve a desired outcome.

Test instructions with three to four steps to verify that a desired outcome is achieved.

Debug any errors in a set of instructions to achieve a desired outcome.

IF I have a question THEN I put my hand up.





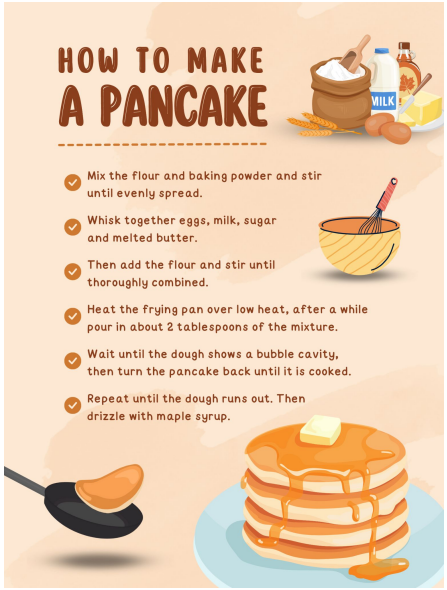
When the recess bell rings:

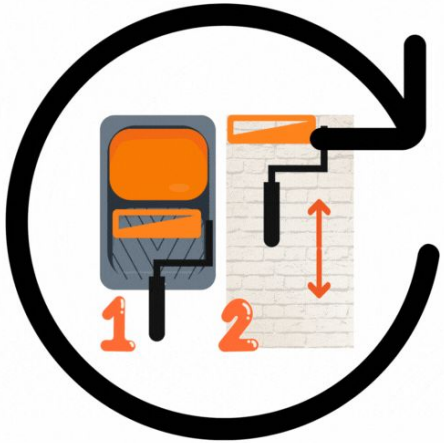
1. Clean up desk.
2. Trade inside shoes for outside shoes.
3. Go outside and play.

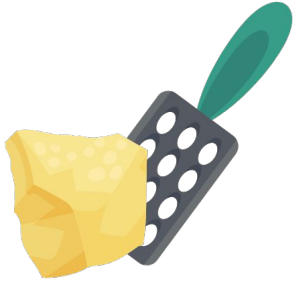
1. Wet hands.
2. Add soap.
3. Repeat for 2 minutes
    a. Scrub thoroughly over hands, fingers and wrists

Skills & Procedures

Describe a situation in which repetition simplifies instructions.

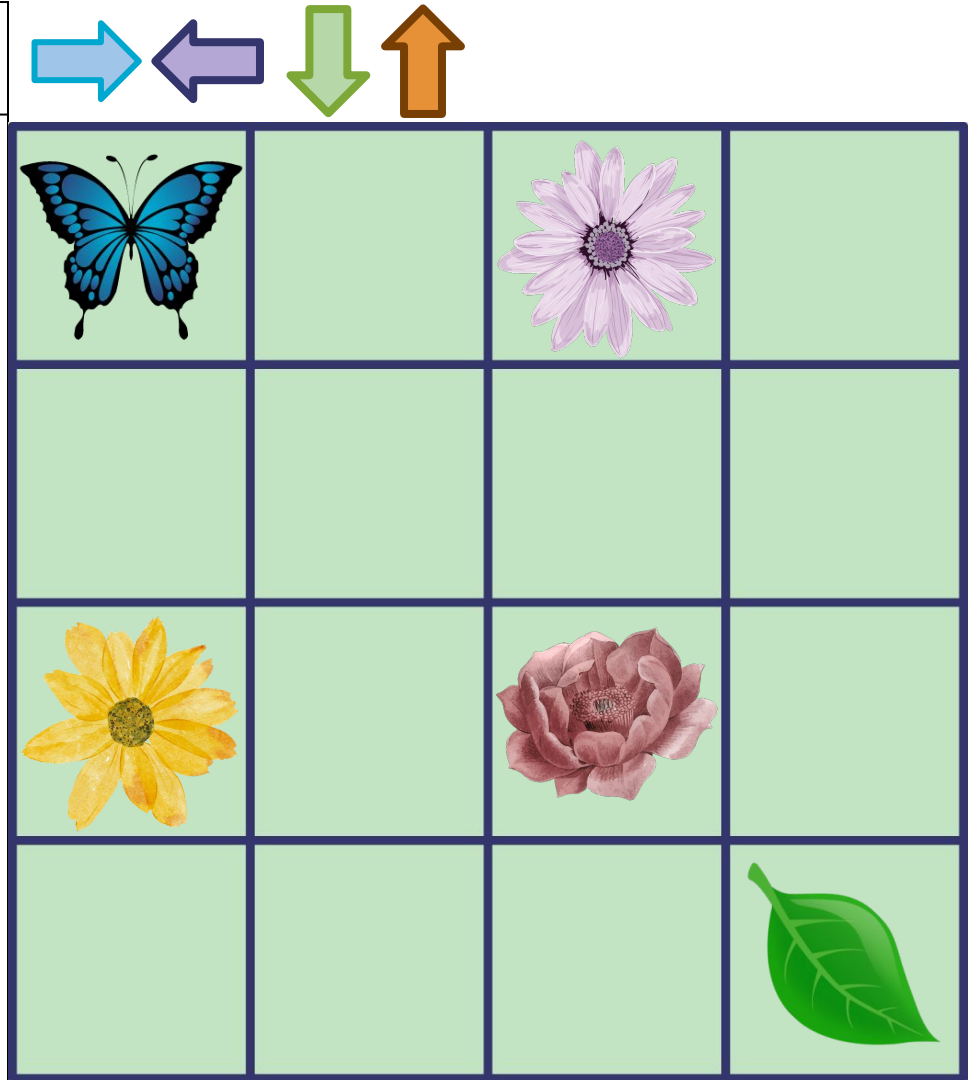




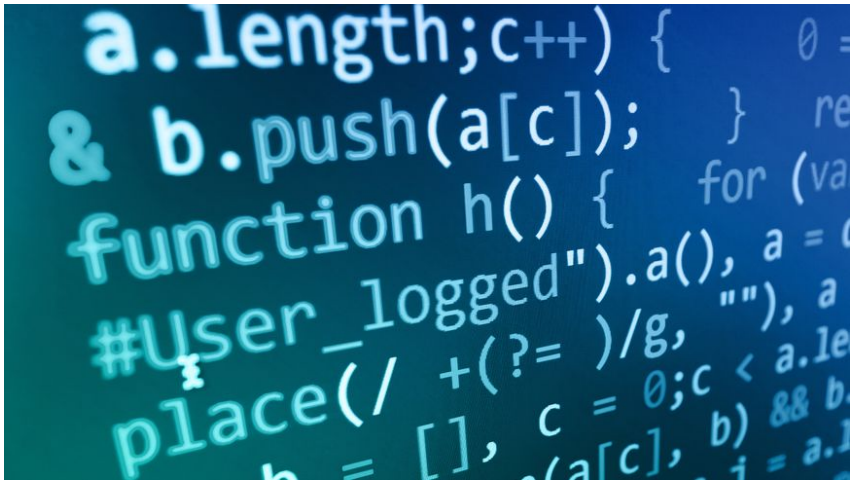


Skills & Procedures

Exchange ideas to design clear three- to four-step instructions, including repetition, to achieve a desired outcome.



Coding consists of many languages that computers understand.

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1:21
18°C


COOLING
75
78


Yale
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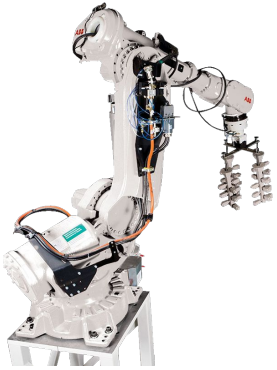
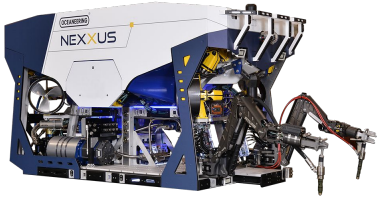
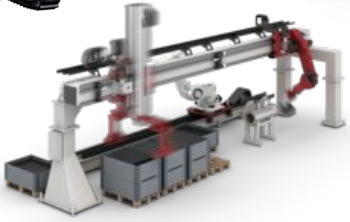
ROBOTS!!!

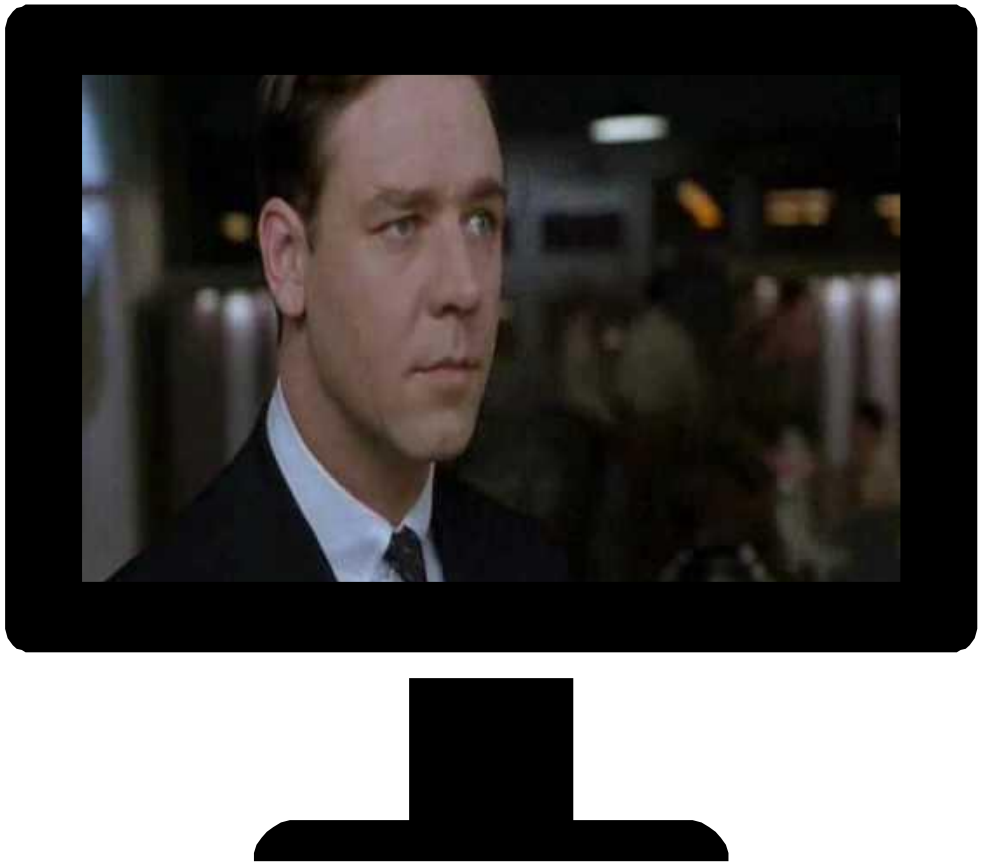




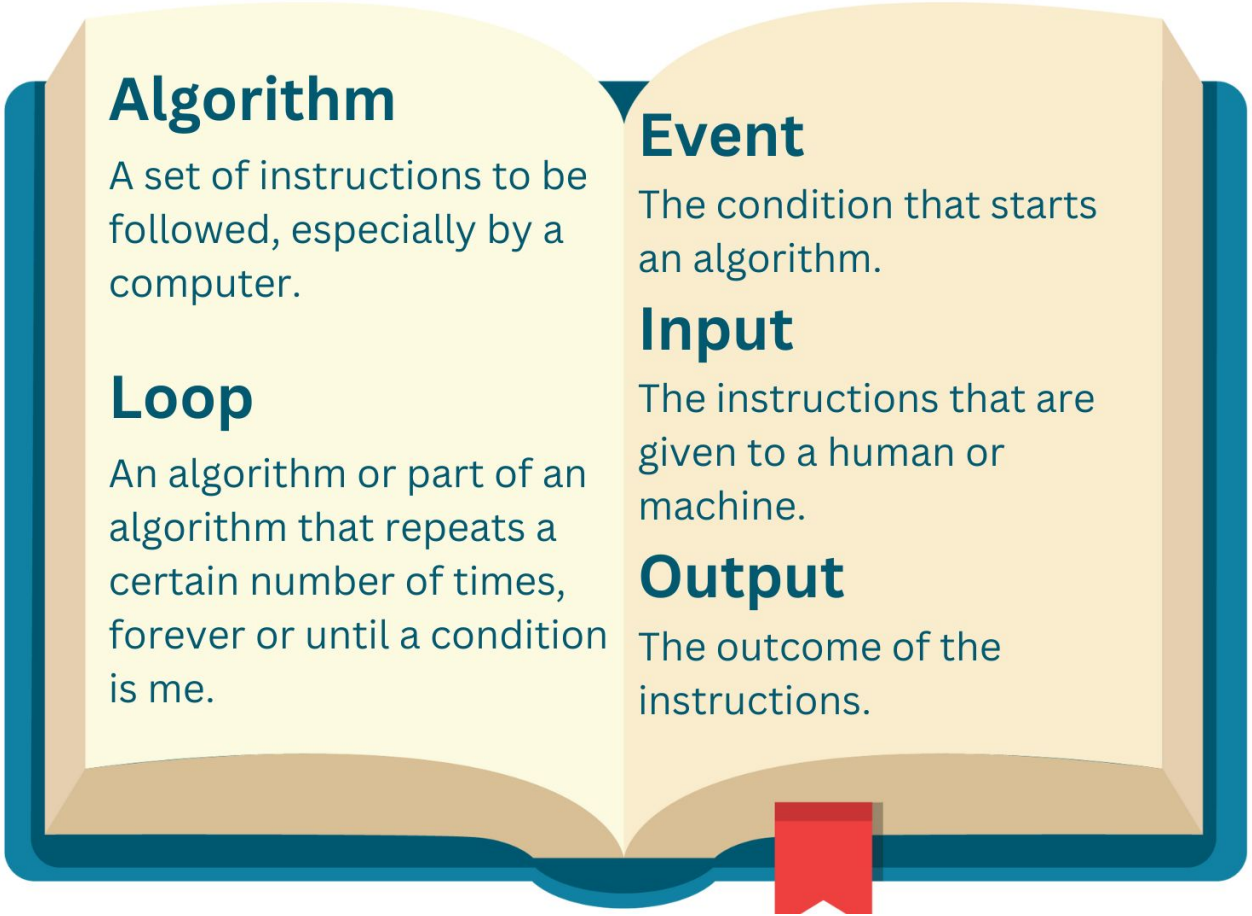


Coding

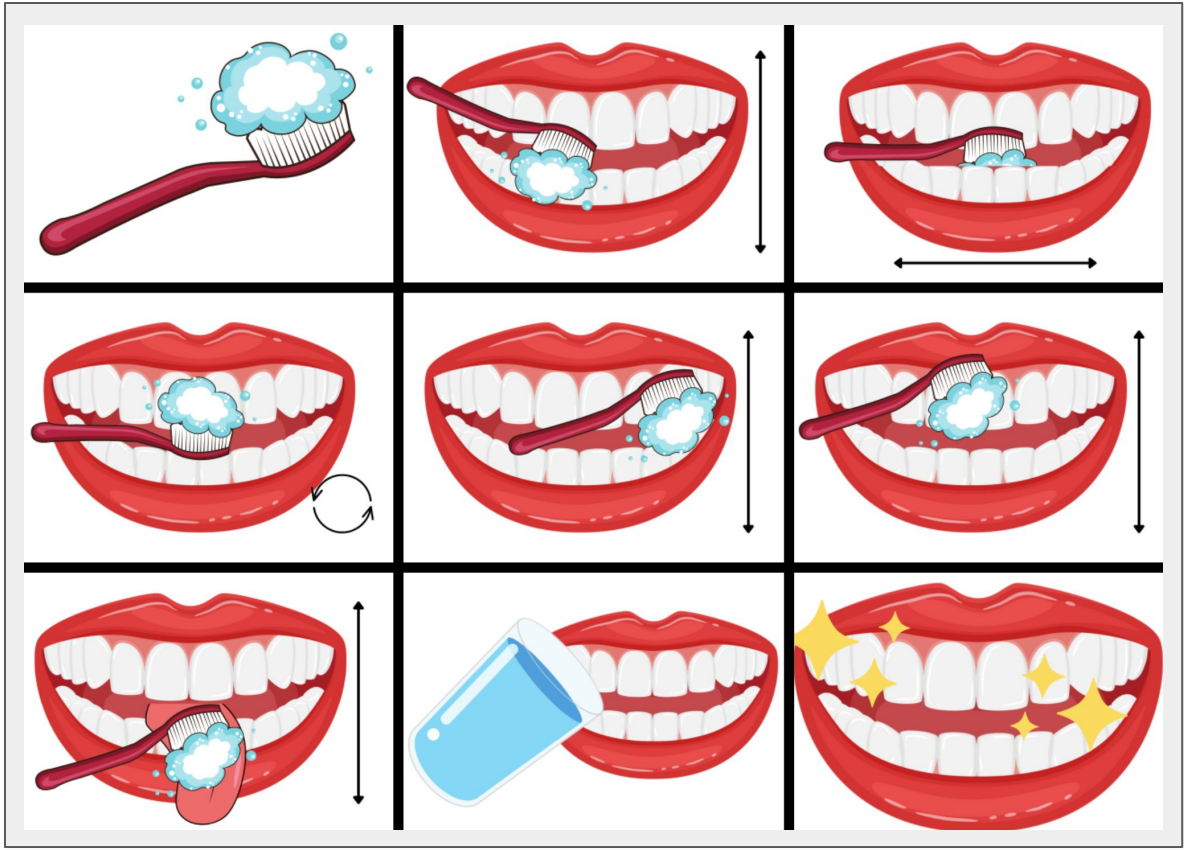
What we think it is…



Computer Science Vocabulary



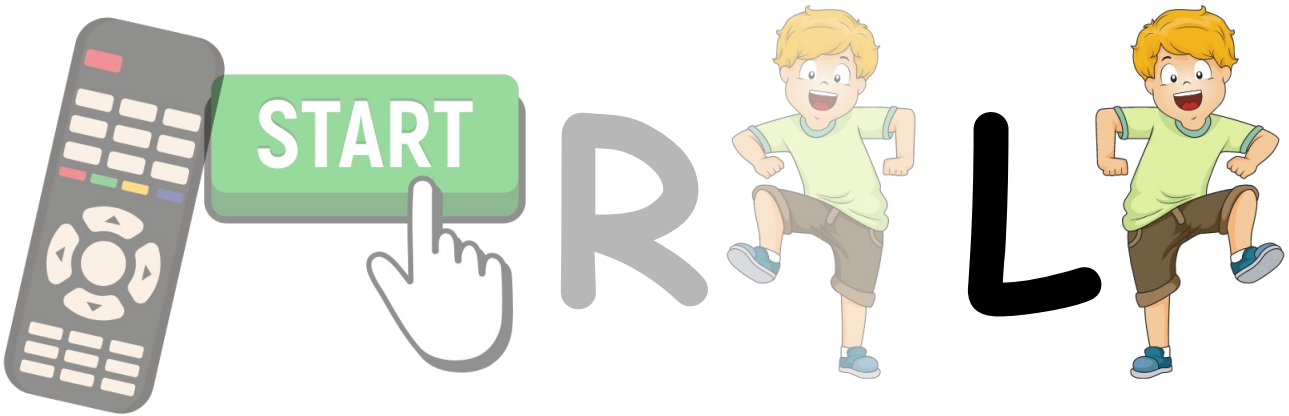
What Coding Really is



Algorithm

Algorithm

Algorithm



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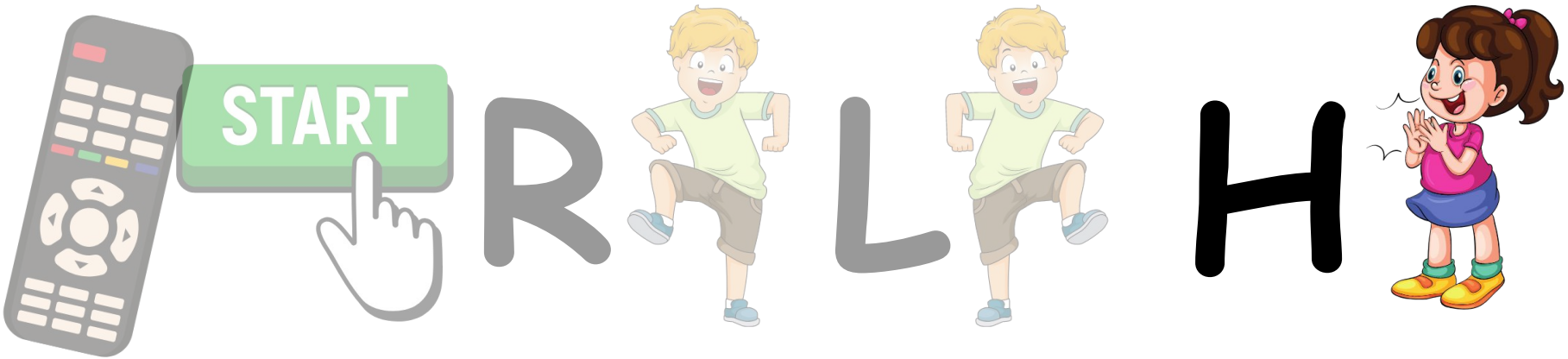

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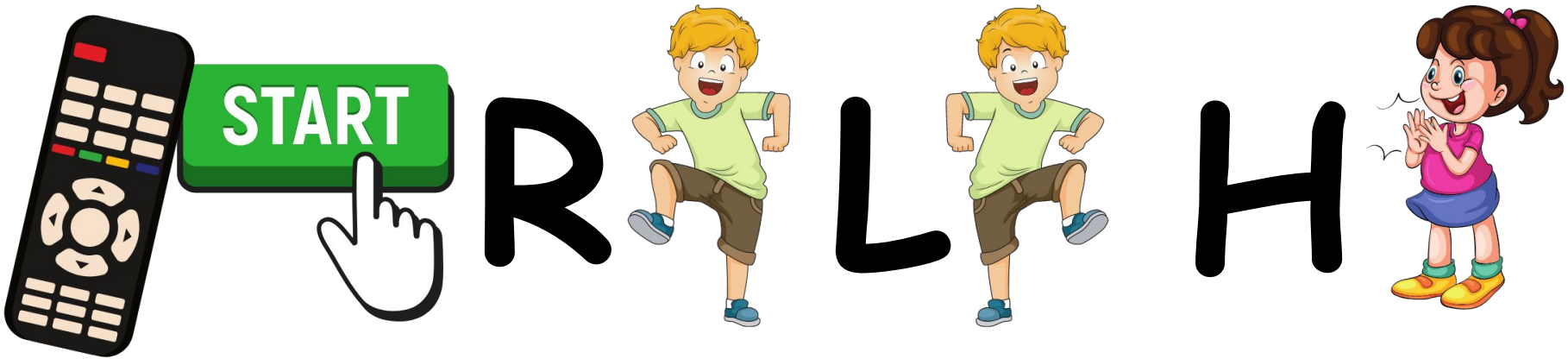
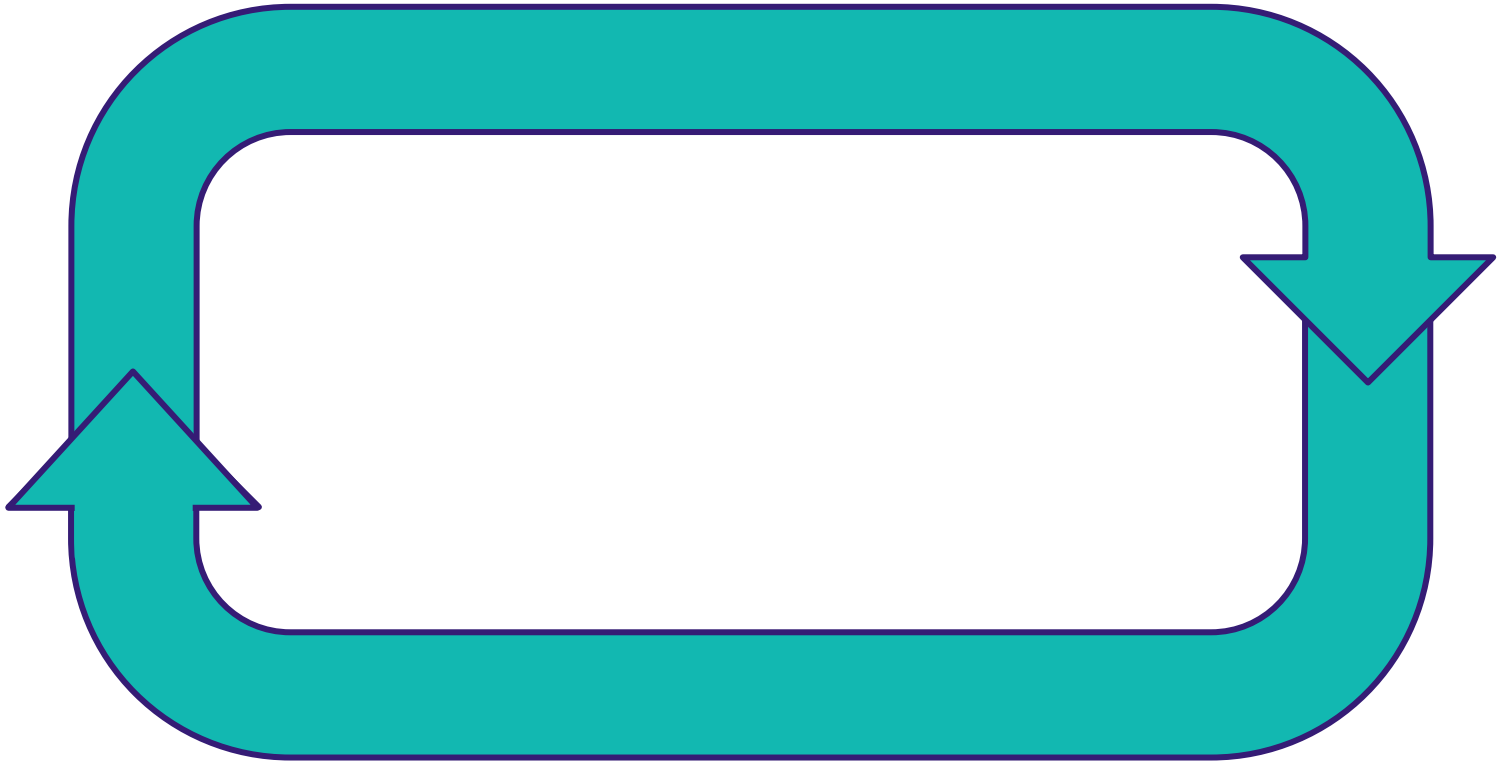
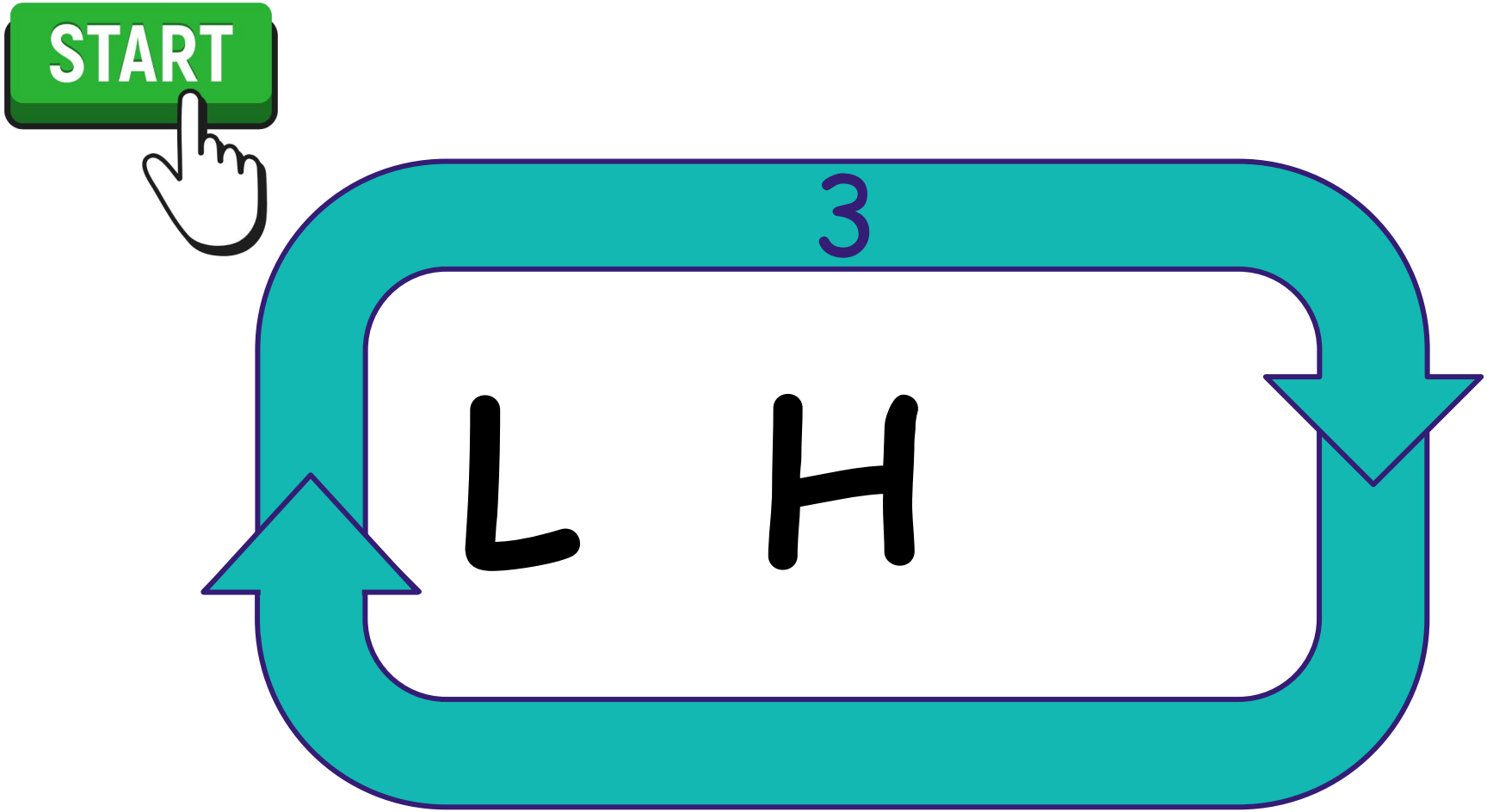


R H

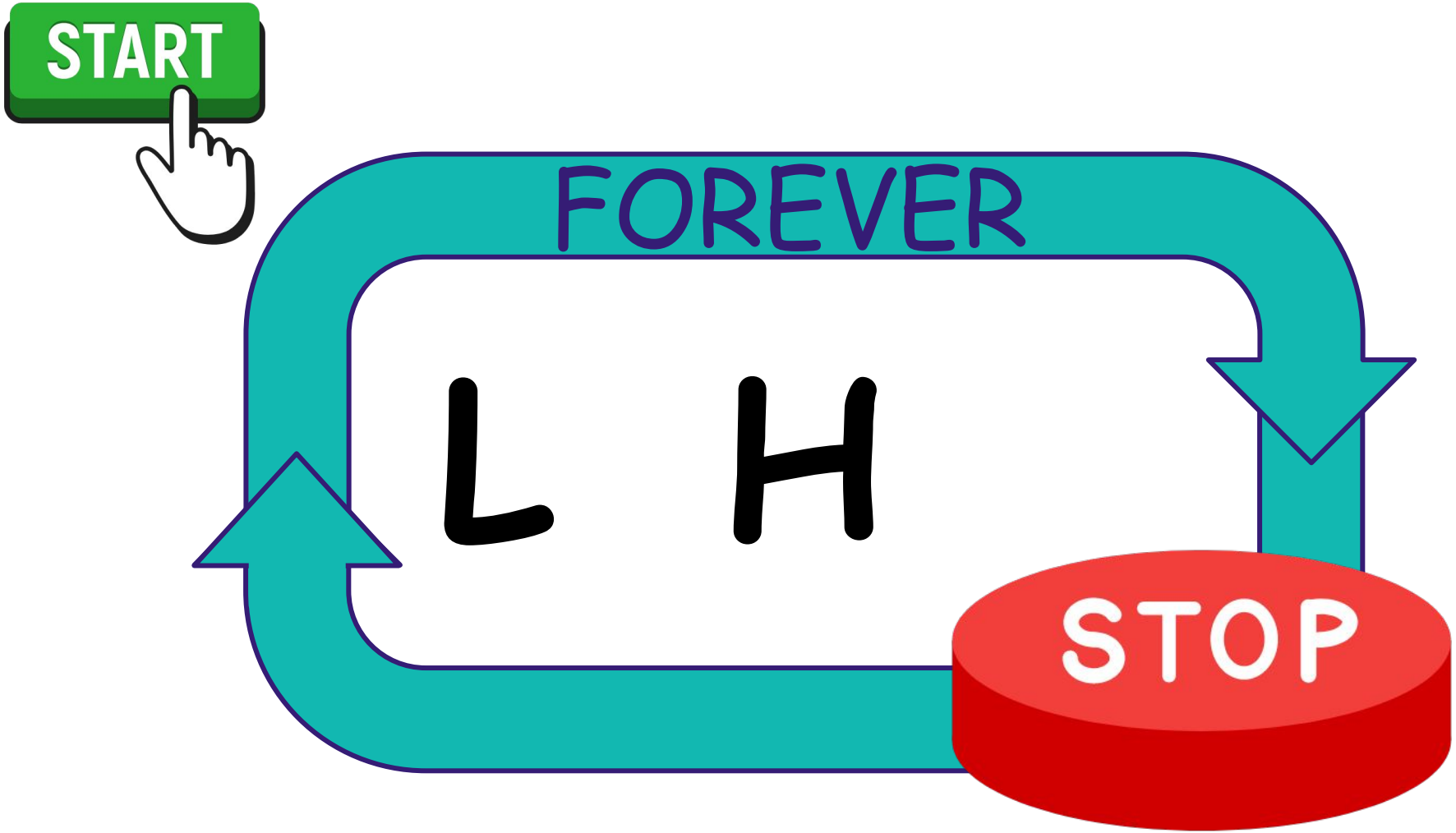
L H

L H R




START
3
L H

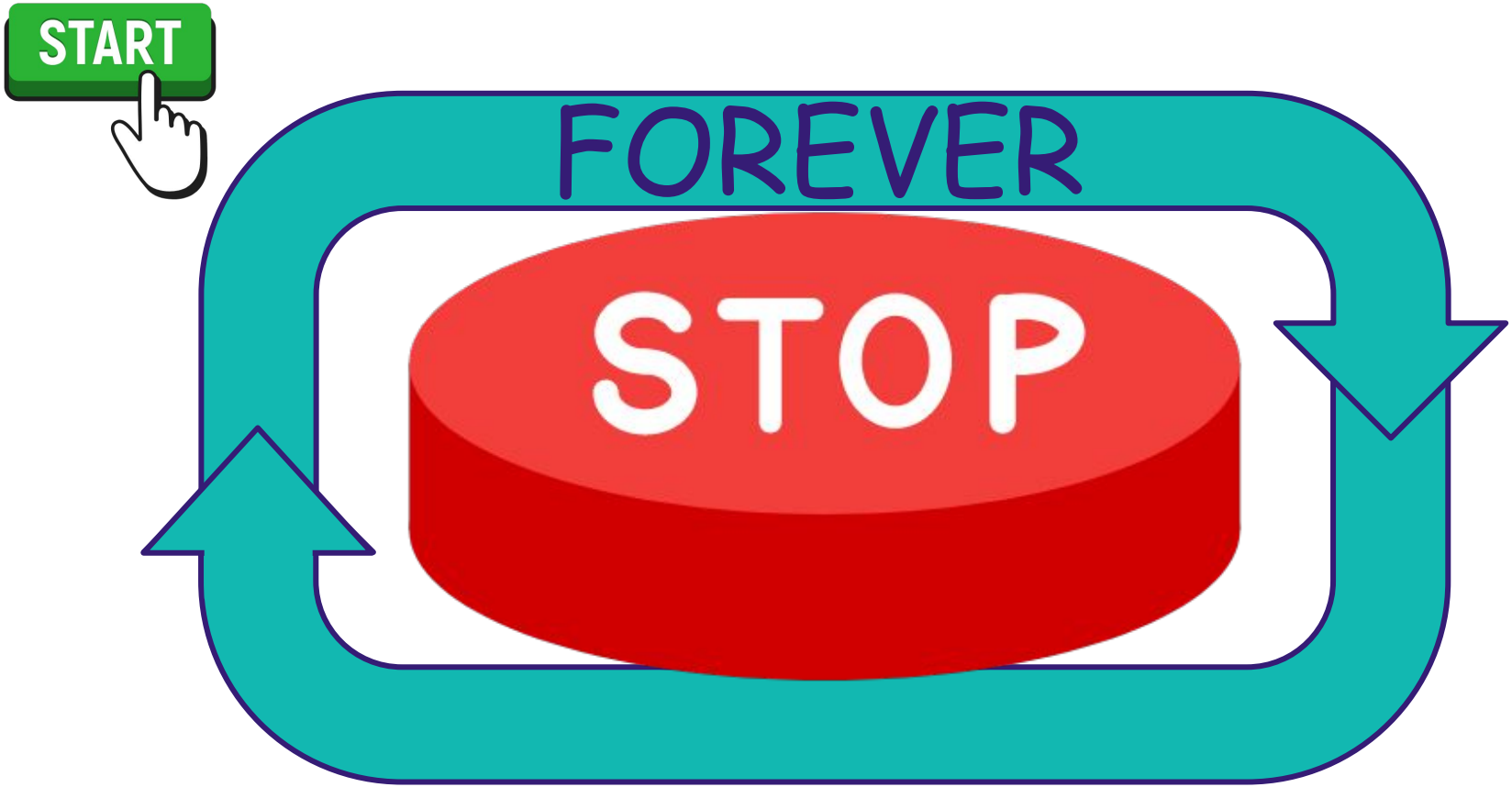

START
FOREVER
L H


START
FOREVER
L H
STOP

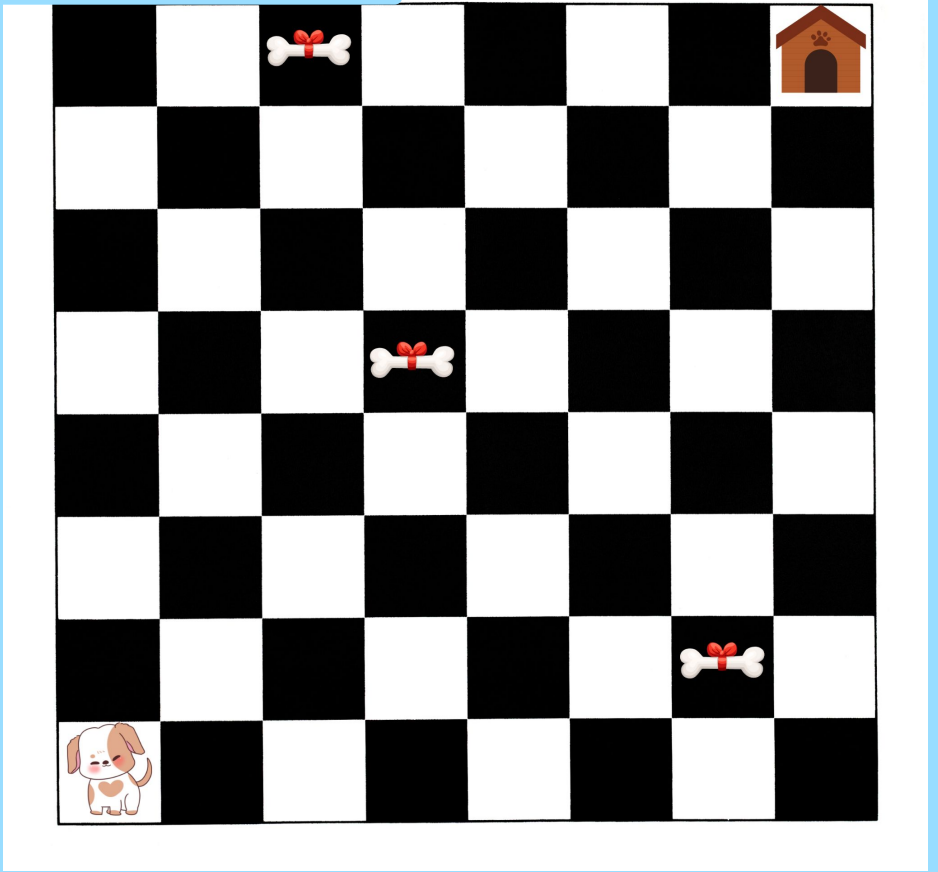

START
FOREVER
R L H

START

FOREVER


START
FOREVER
STOP

No tech? No problem.



No tech? No problem.

- Sudoku
- Code a Drawing
- Code math counting or equations
- Eye spy and other guessing games
- Code a friend/family member/teacher
- Hand signals & actions

Chromebook Coding & Computational Thinking

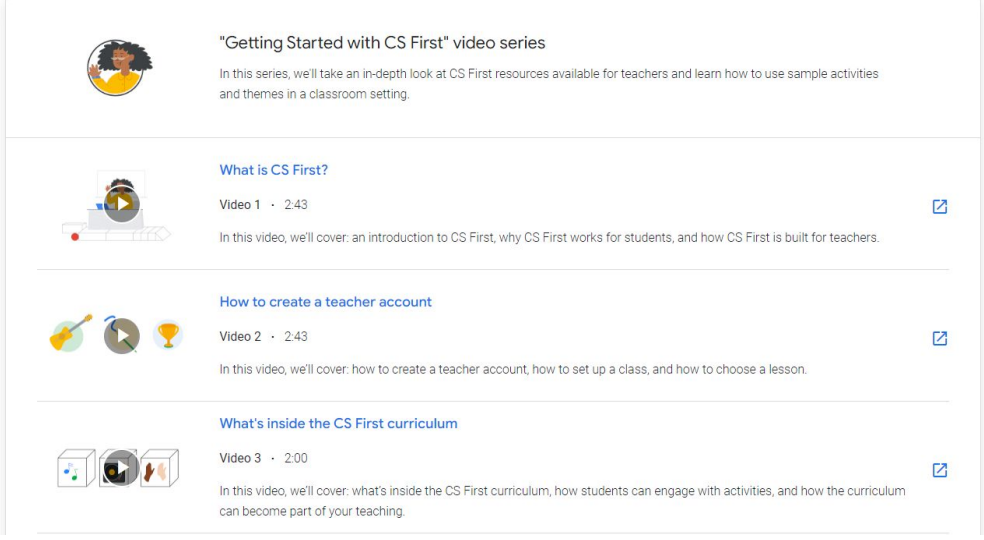
Blockly Games beta

Google CS First

Tynker

CODE.ORG

SCRATCH



Toys!!!

Your ATA Library

The Alberta Teachers' Association

Kits in Your ATA Library

- Makerkits A-D
- Makerkits E-G
- Makerkits H-L
- Makerkits M-O
- Makerkits P-S
- Makerkits T-Z



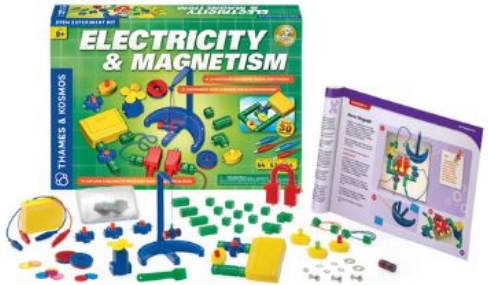










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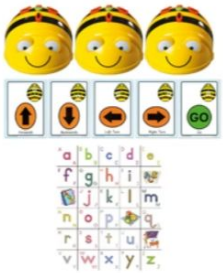
Bee- Bot & Blue Bot Robotics



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