

# Exploring Grade Three Computer Science

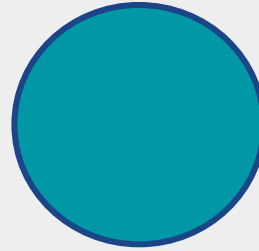


IF you teach THEN they will learn

**2013** Over the next 10 years...

# Electrical and Computer Engineering

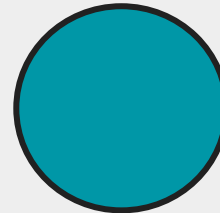
The most promising and  
profitable jobs of now and the  
future.



There will be  
**1.4 million**  
Programming jobs to



With only  
**400 000**  
Graduates in  
computer science



Leaving  
**1 million**  
empty jobs!

# Computing jobs are the #1 source of new wages in the US

**500,000**  
current openings

These jobs are in every industry and every state, and they're projected to grow at twice the rate of all other jobs.



# There are technology jobs in every field:

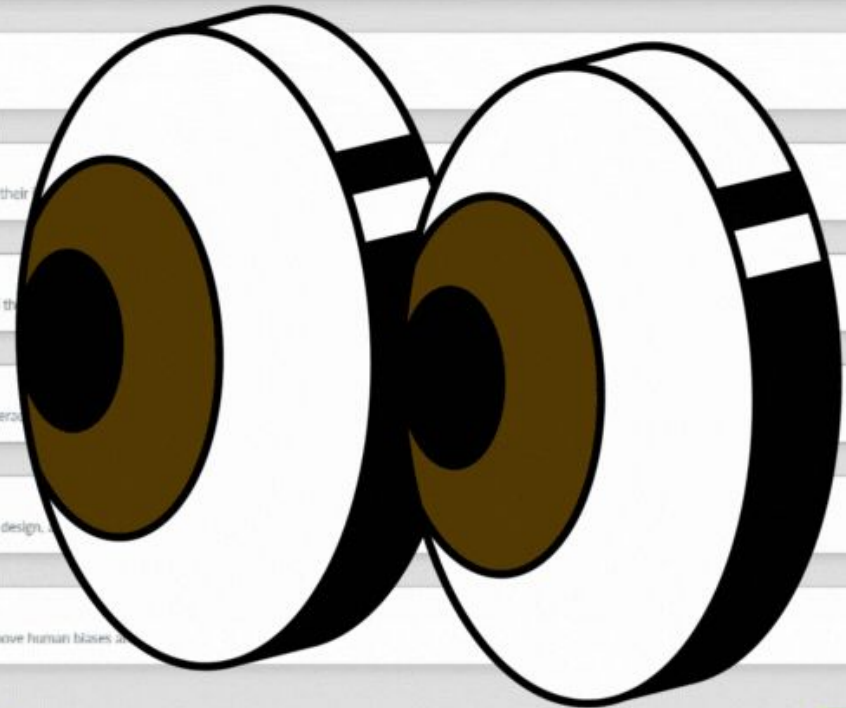


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Science Change Subject

Prev Grade 4 Grade 5 Grade 6 Next

- 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 interactions.
- ORGANIZING IDEA  
Living Systems: Understandings of the living world, Earth, and space are deepened through investigating natural systems and their interactions.
- ORGANIZING IDEA  
Space: Understandings of the living world, Earth, and space are deepened through investigating natural systems and their interactions.
- ORGANIZING IDEA  
Computer Science: Problem solving and scientific inquiry are developed through the knowledgeable application of creativity, design, and communication.
- ORGANIZING IDEA  
Scientific Methods: Investigation of the physical world is enhanced through the use of scientific methods that attempt to remove human biases and errors.



<b>Organizing Idea</b>	<b>Computer Science: Problem solving and scientific inquiry are developed through the knowledgeable application of creativity, design, and computational thinking.</b>	
<b>Guiding Question</b>	<b>How does creativity contribute to computational thinking?</b>	
<b>Learning Outcome</b>	<b>Students investigate creativity and its relationship to computational thinking.</b>	
<b>Knowledge</b>	<b>Understanding</b>	<b>Skills &amp; Procedures</b>
<p>Computational thinking includes</p> <ul style="list-style-type: none"> <li>● breaking a task into smaller chunks</li> <li>● finding patterns and similarities in tasks</li> <li>● identifying the important details when reading or solving a problem</li> <li>● designing instructions</li> <li>● working backward if a mistake is made</li> </ul> <p>Computational thinking can be used by humans to communicate with computers more efficiently; e.g., apps, virtual reality, and robotics.</p>	<p>Computational thinking is a problem-solving process that uses creativity.</p>	<p>Create a set of instructions that could be followed by a human or a machine to complete a task.</p> <p>Identify computational thinking used to solve problems or achieve desired outcomes.</p>

<b>Organizing Idea</b>	<b>Computer Science: Problem solving and scientific inquiry are developed through the knowledgeable application of creativity, design, and computational thinking.</b>	
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<b>Learning Outcome</b>	<b>Students investigate creativity and its relationship to computational thinking.</b>	
<b>Knowledge</b>	<b>Understanding</b>	<b>Skills &amp; Procedures</b>
<p>The same outcome, such as arriving at school, can be achieved in different ways.</p> <p>Divergent thinking is the process of generating multiple unique ideas or solutions.</p> <p>Creativity is an important part of computer science, technology, and engineering; e.g., computer programming, robotics.</p> <p>Creativity involves combining, changing, or reapplying existing ideas to produce something new.</p> <p>Canadians are responsible for many creative inventions, such as the Canadarm.</p>	<p>Creativity involves divergent thinking and can be used to develop different ways to achieve the same outcome.</p> <p>Creativity involves imagination, observation, and making connections.</p>	<p>Collaborate to write two different sets of instructions that achieve the same outcome.</p> <p>Relate creativity to engineering, computing, and the development of new technologies.</p> <p>Create something new by combining, changing, or reapplying existing ideas.</p> <p>Examine a Canadian invention.</p> <p>Identify examples of creativity in computer science, technology, or engineering.</p>





# Creativity

## ORIGINALITY

Creative thinking often results in ideas or solutions that are unique and haven't been thought of before. It involves breaking away from established patterns and norms.

## RISK TAKING

Creative thinkers are often willing to take risks by exploring unconventional ideas or challenging the status quo.

## IMAGINATION

Imagination is at the core of creative thinking. It involves the ability to visualize and conceptualize ideas and scenarios that don't currently exist.

## FLEXIBILITY

Creative thinkers are open to exploring various possibilities and are willing to adapt their thinking when confronted with new information or challenges. They can switch between different modes of thinking.



# *Design Thinking Process*



*Learn About  
Your Audience*



*Brainstorm and  
Come up with  
Creative Solutions*

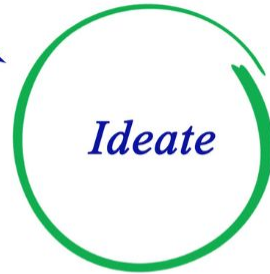


*Test Your Ideas*

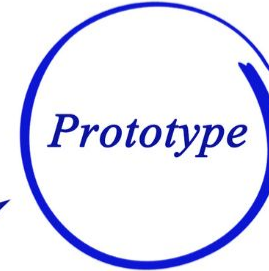


*Empathize*

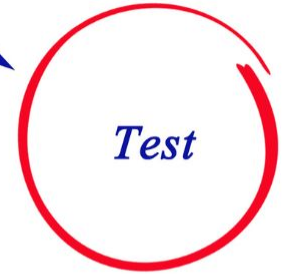
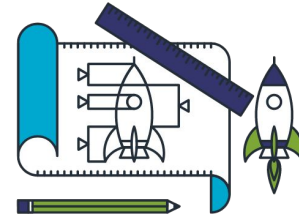
*Construct Point  
of View Based  
on User Needs*



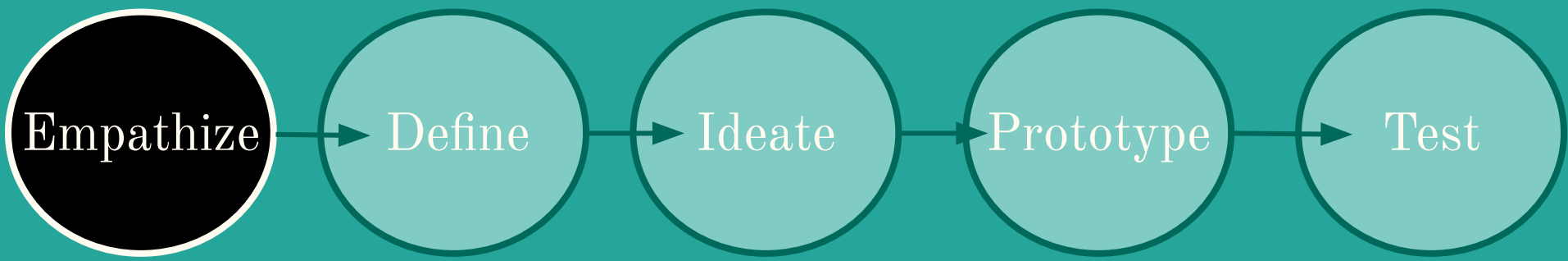
*Ideate*



*Build  
Representation  
of Your Ideas*



*Test*



Learn about the audience for whom you will be designing.

**Walk a mile in their shoes.**

# 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.



Earrings with wireless to sense vibrations



Shoes with no soles or holes to feel



Something to wear under clothes connected to speakers



A chair that picks up the vibrations

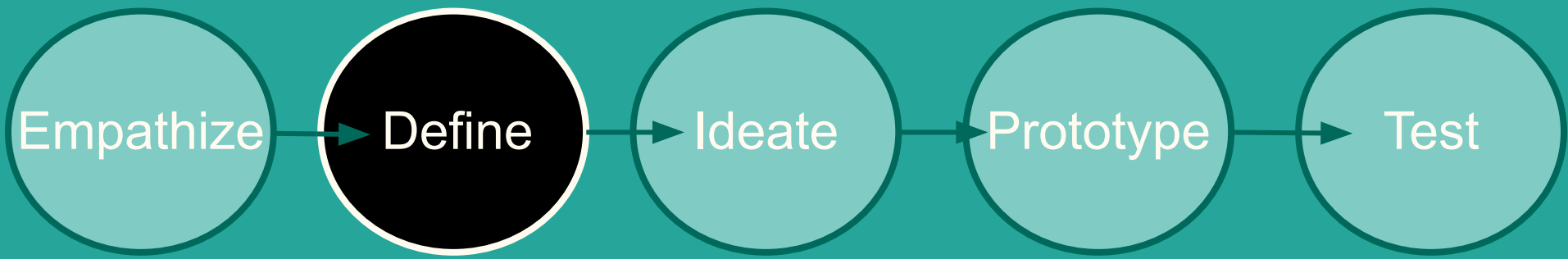


Bracelet

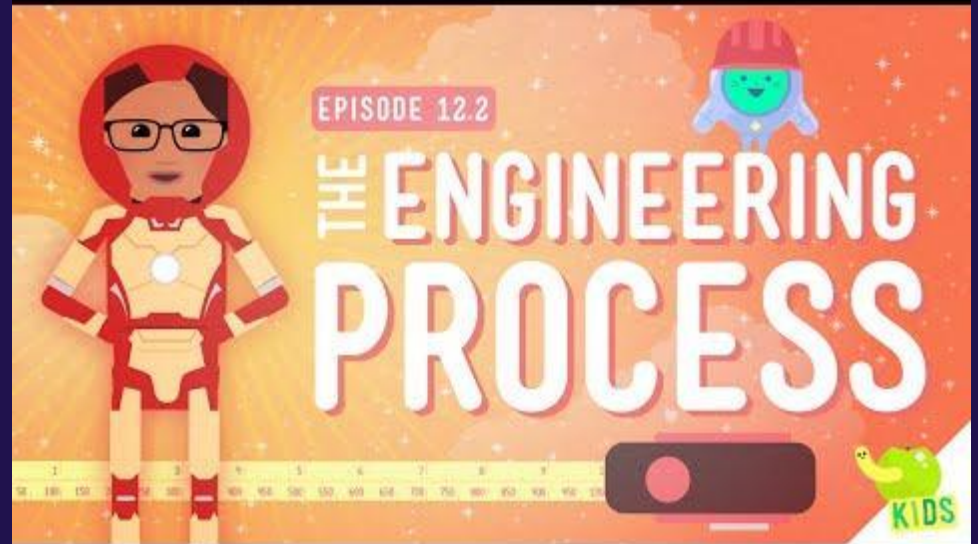


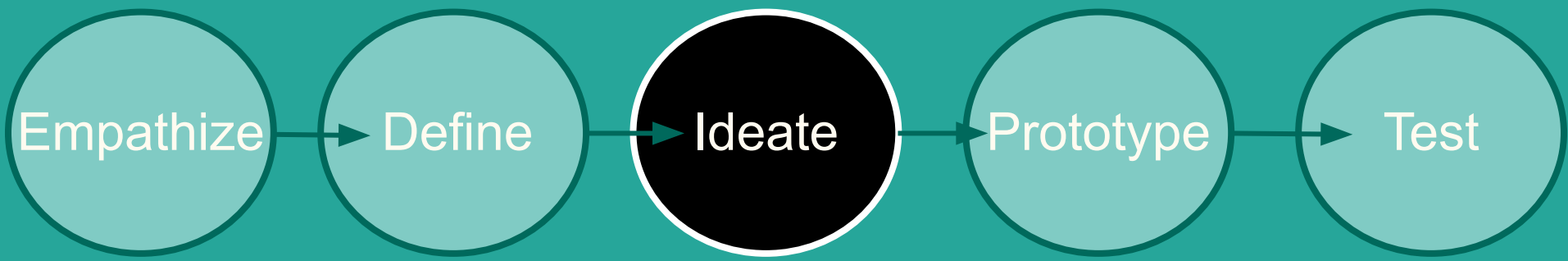
Hair accessories





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





*There are  
NO bad  
ideas!*

—  
*Think about  
your  
audience's  
needs!*



*Quantity  
over  
Quality!*

*Ideas!  
Ideas!  
Ideas!*

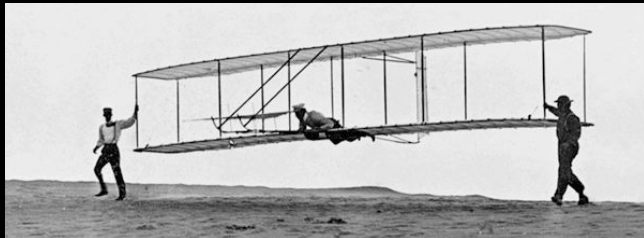
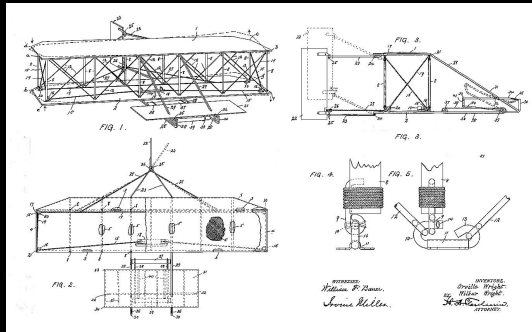
Empathize

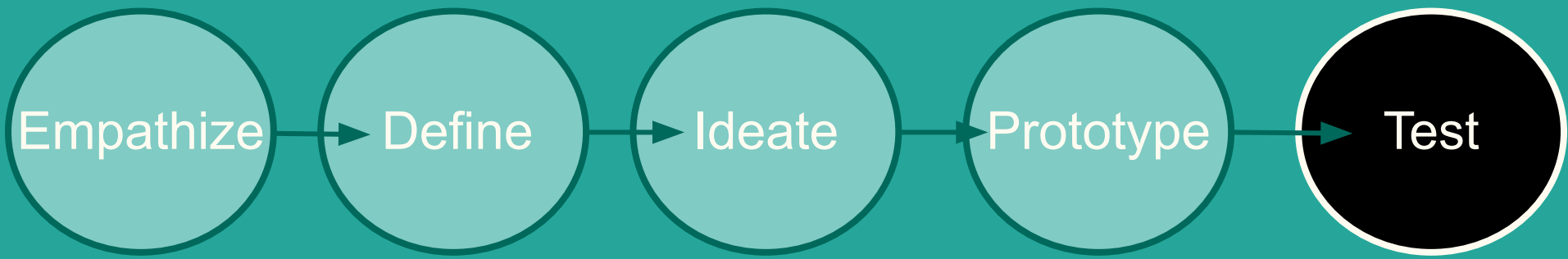
Define

Ideate

Prototype

Test





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

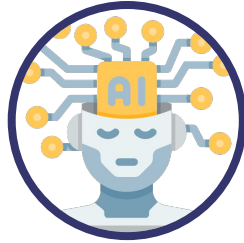
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**Did you know? The  
Wright Brothers had 2  
failures before they were  
successful with flight.**



# Computational Thinking

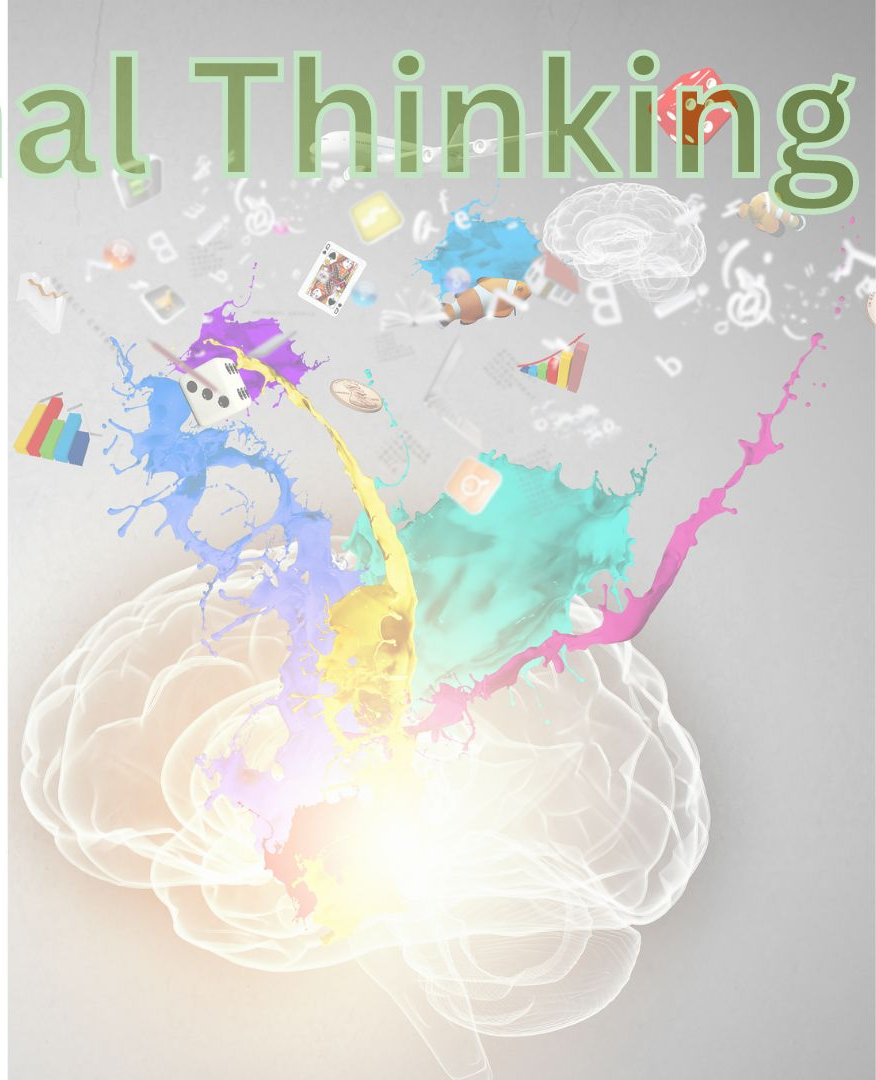
Decomposition



Pattern Recognition

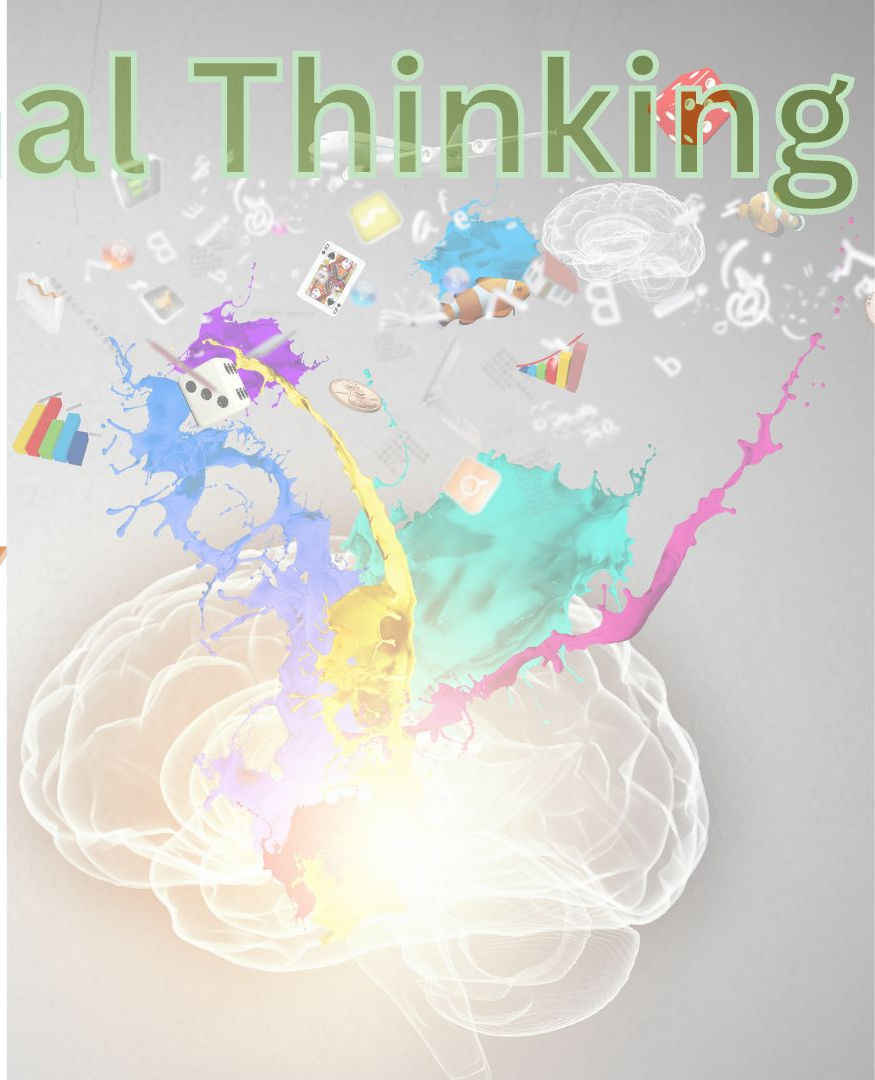
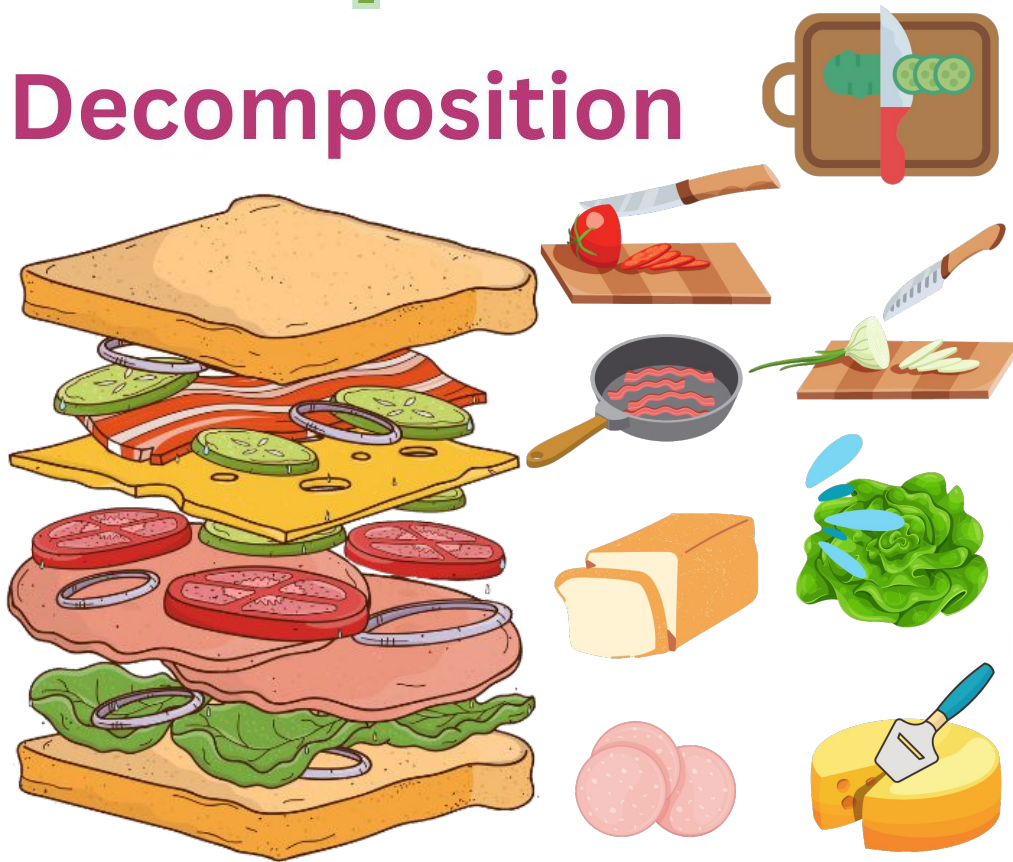
Pattern Abstraction

Algorithm Design



# Computational Thinking

## Decomposition

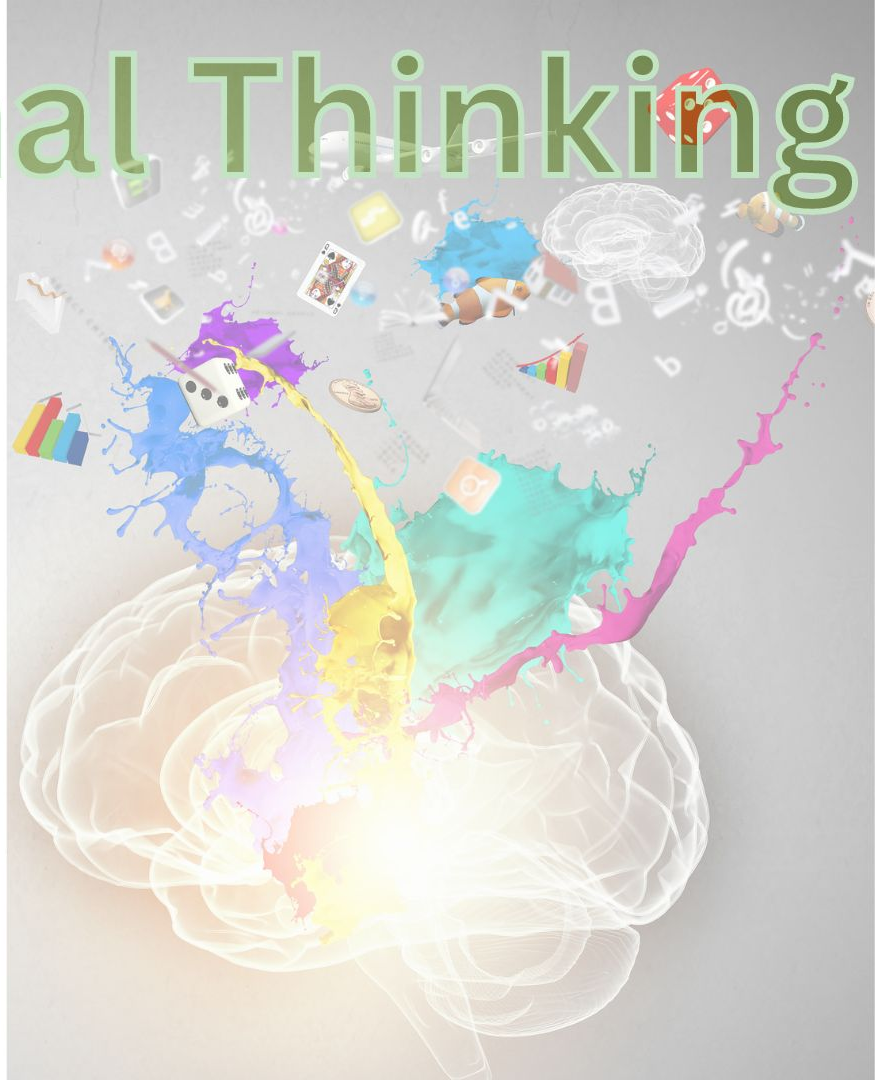
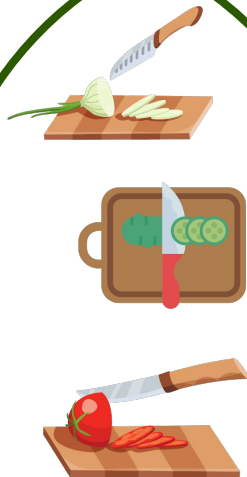
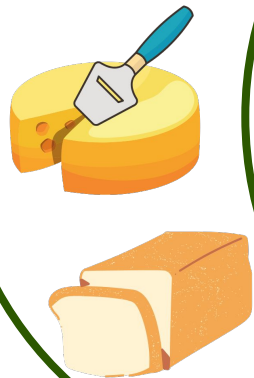


# Computational Thinking

## Pattern Recognition

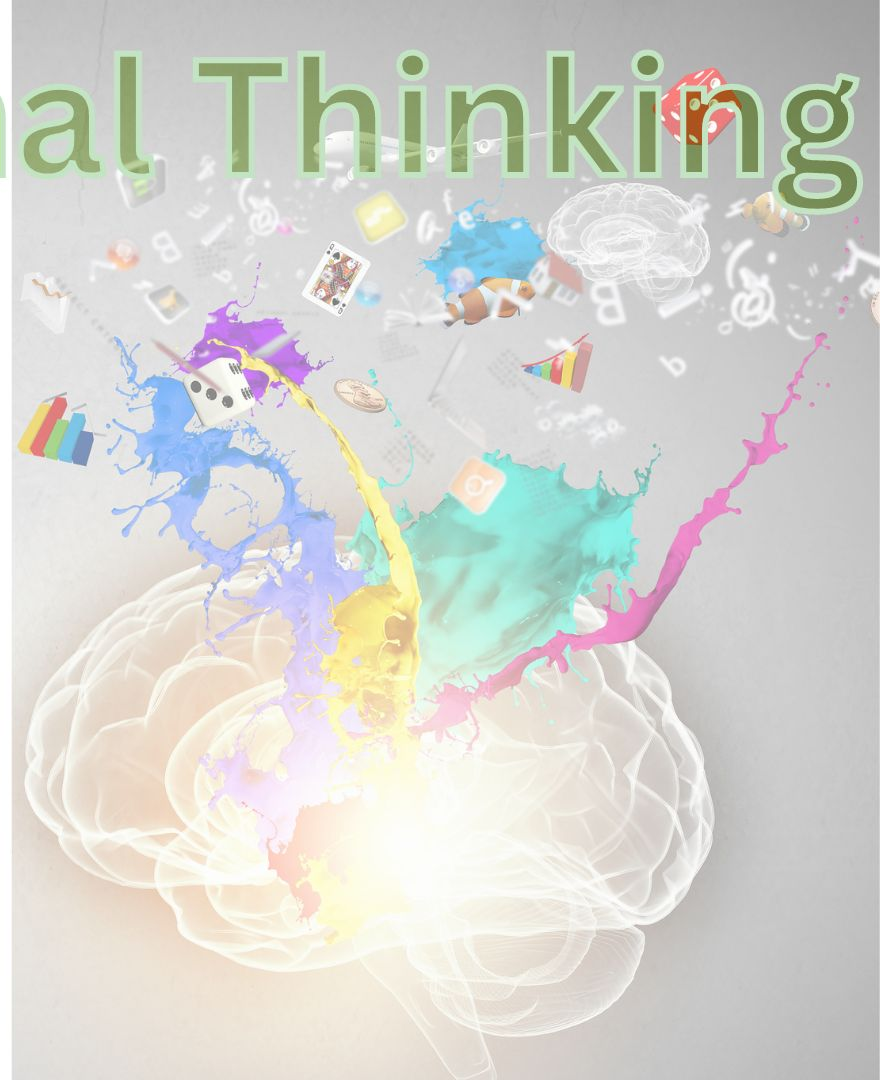
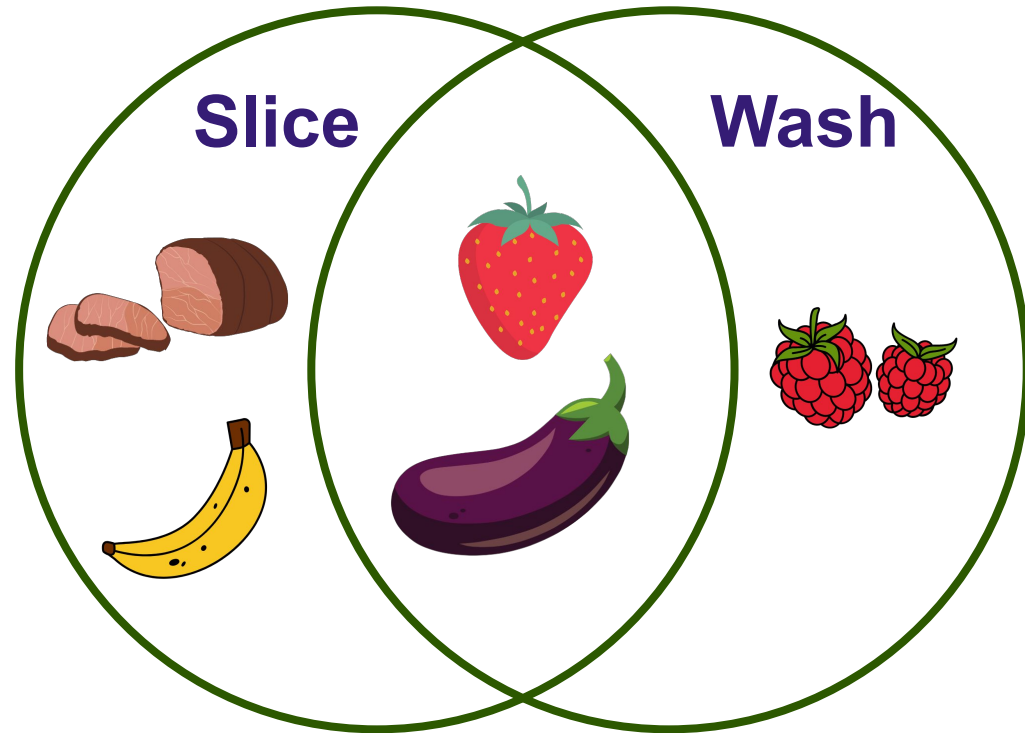
**Slice**

**Wash**



# Computational Thinking

## Pattern Abstraction





# Computational Thinking

## Algorithm Design

1. First prepare ingredients
  - a. If it is a fruit or vegetable then wash it
  - b. If it is raw meat then cook it
  - c. If it is in a package then open it
  - d. If it is big then slice it
2. Layer the ingredients
  - a. Start with a piece of bread
  - b. Repeat adding next ingredient until done
  - c. End with a piece of bread



# 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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To listen to the ideas of others

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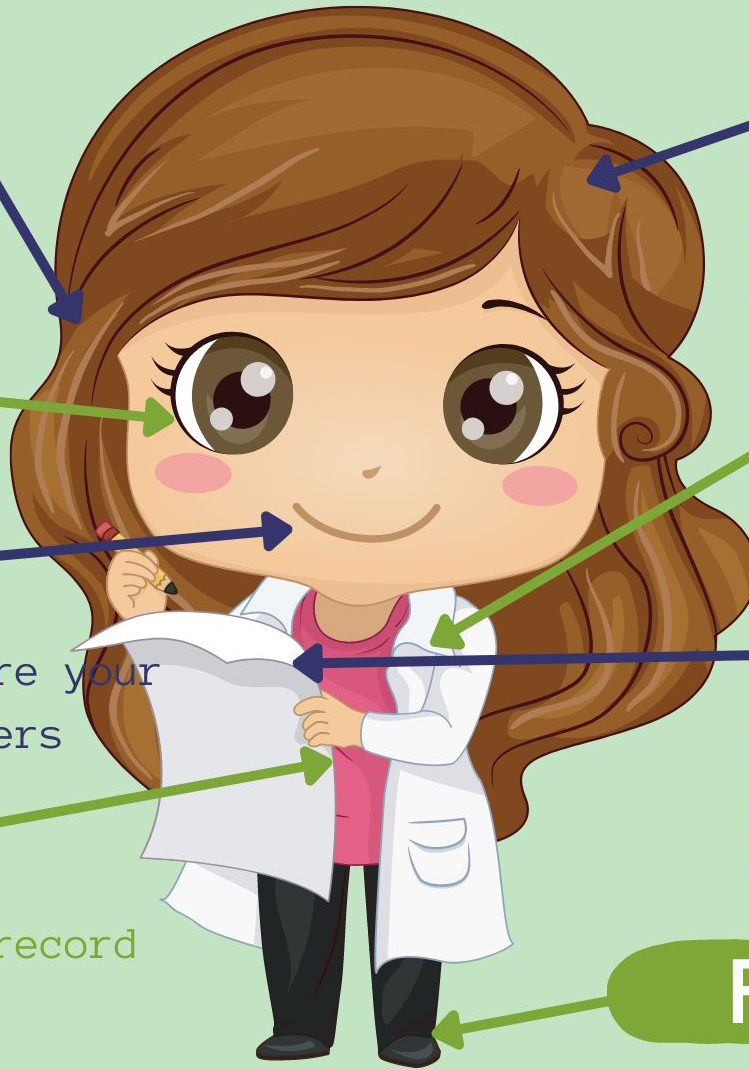
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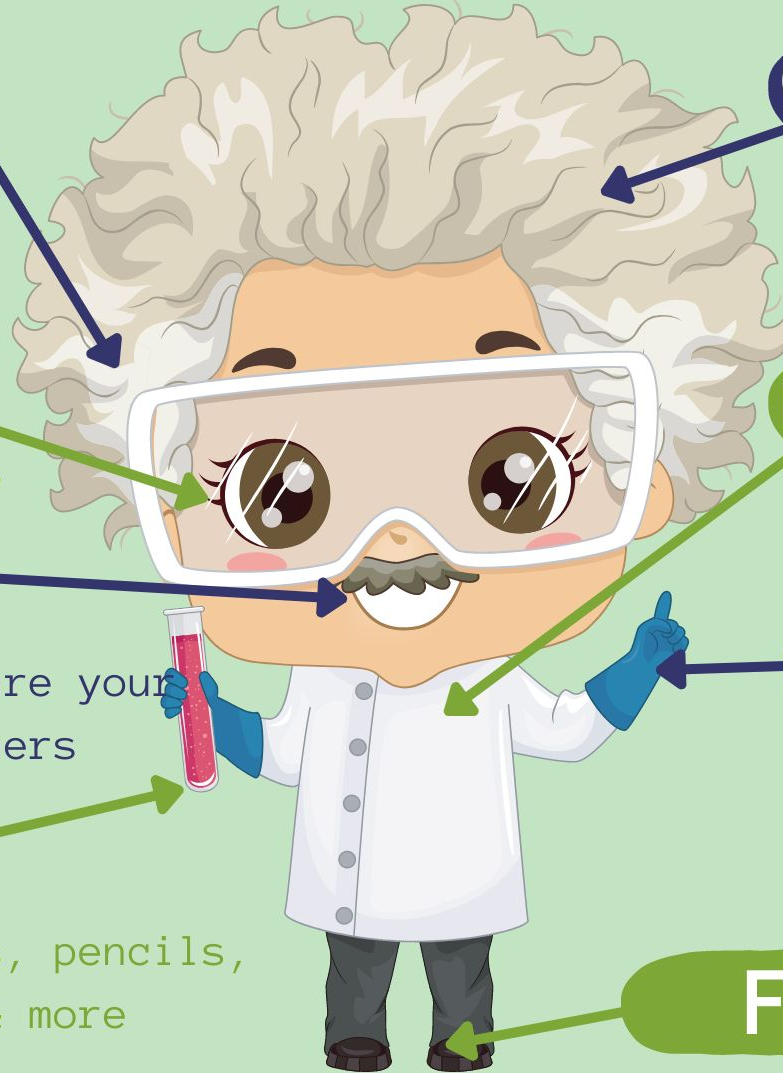
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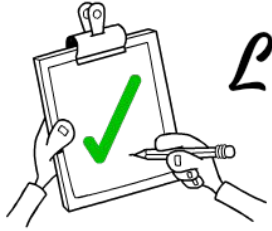
# Hands

To do experiments & record observations

# Feet

To move safely





# 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.*

**K** *Children interpret instructions in the learning environment.*

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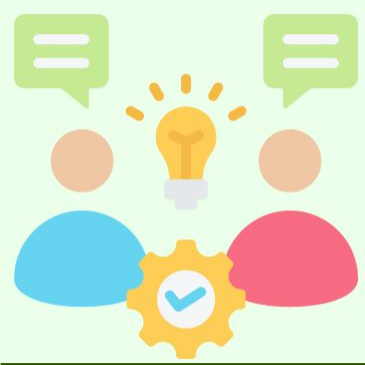
# KNOWLEDGE

Computational thinking includes

- breaking a task into smaller chunks
- finding patterns and similarities in tasks
- identifying the important details when reading or solving a problem
- designing instructions
- working backward if a mistake is made

Computational thinking can be used by humans to communicate with computers more efficiently; e.g., apps, virtual reality, and robotics.





# UNDERSTANDING

Computational thinking is a problem-solving process that uses creativity.



# SKILLS & PROCEDURES

Create a set of instructions that could be followed by a human or a machine to complete a task.



SKILLS  
&  
PROCEDURES



Identify computational thinking used to solve problems or achieve desired outcomes.



SKILLS  
&  
PROCEDURES





# KNOWLEDGE

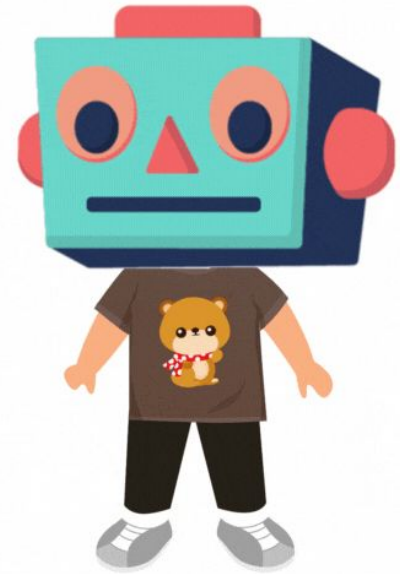
The same **outcome**, such as arriving at school, can be achieved in different ways.

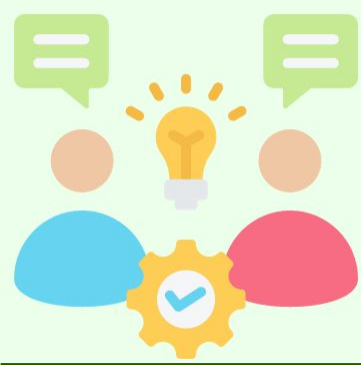
**Divergent thinking** is the process of generating multiple unique ideas or solutions.

**Creativity** is an important part of computer science, technology, and engineering; e.g., computer programming, robotics.

**Creativity** involves combining, changing, or reapplying existing ideas to produce something new.

Canadians are responsible for many creative inventions, such as the Canadarm.





# UNDERSTANDING

Creativity involves divergent thinking and can be used to develop different ways to achieve the same outcome.

Creativity involves imagination, observation, and making connections.



# SKILLS & PROCEDURES

Collaborate to write two different sets of instructions that achieve the same outcome.



Relate creativity to engineering, computing, and the development of new technologies.



Create something new by combining, changing, or reapplying existing ideas.



Examine a Canadian invention.



Identify examples of creativity in computer science, technology, or engineering.



# Attack of the Kidbots

Classroom routines

Learning instructions

Other subject areas

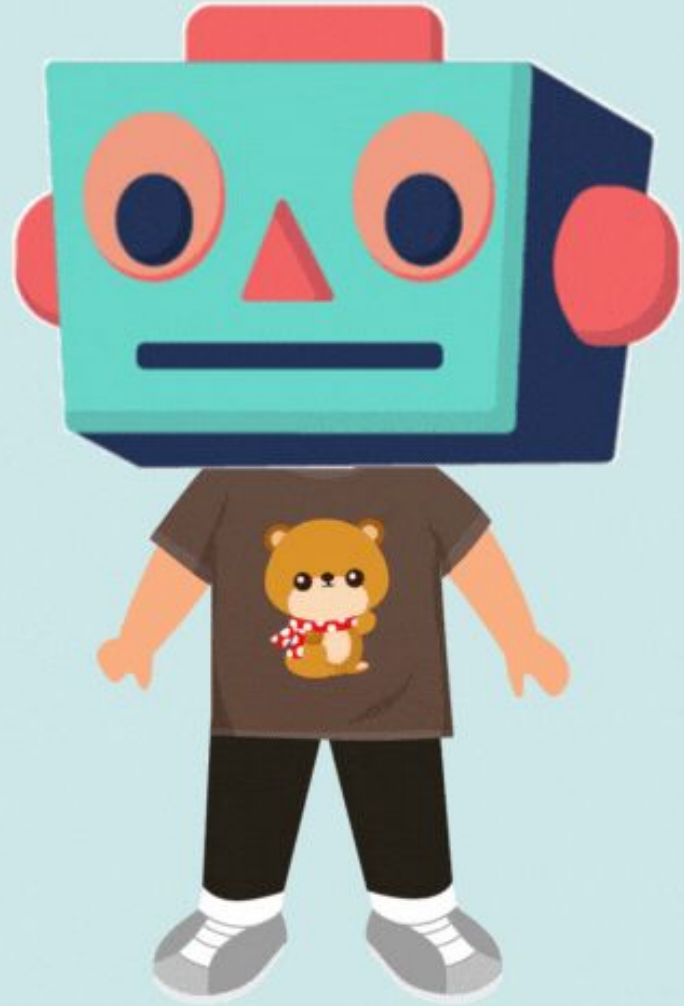
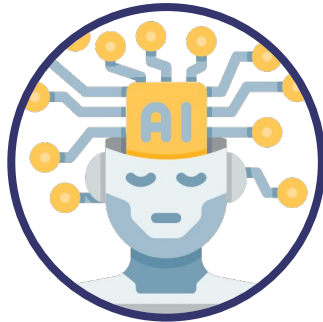
Outside of school

Community


Family

The world

In nature



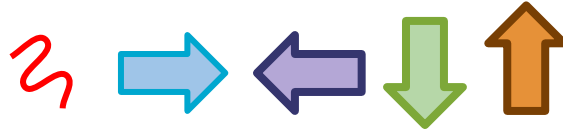
**UNDERSTANDING**  
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Create a set of instructions that could be followed by a human or a machine to complete a task.

SKILLS & PROCEDURES

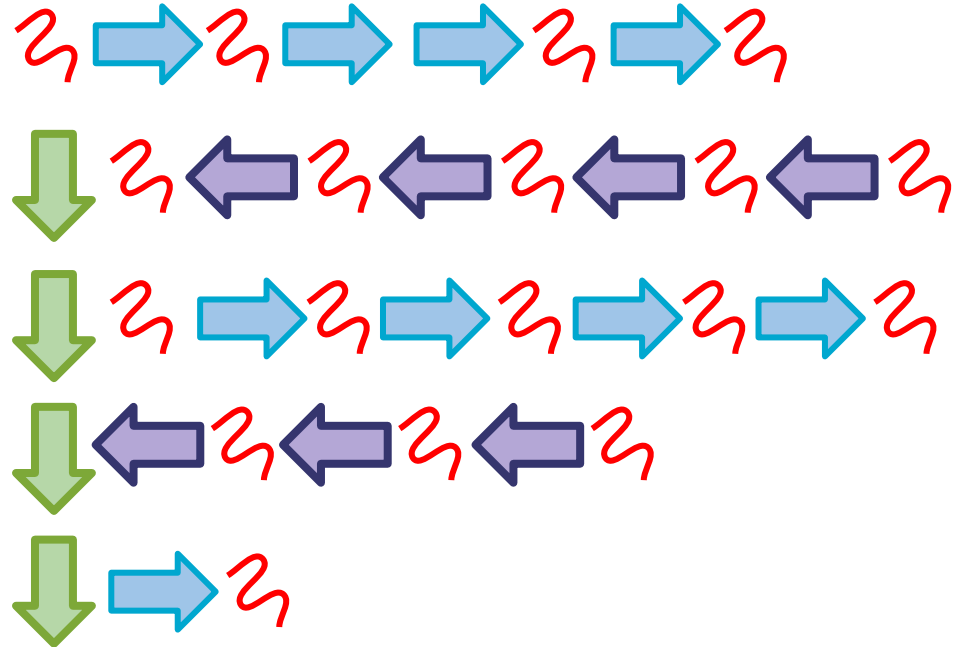




# Pixel Art Coding

An Unplugged Coding Activity

Red	Red	White	Red	Red
Red	Red	Red	Red	Red
Red	Red	Red	Red	Red
White	Red	Red	Red	White
White	White	Red	White	White



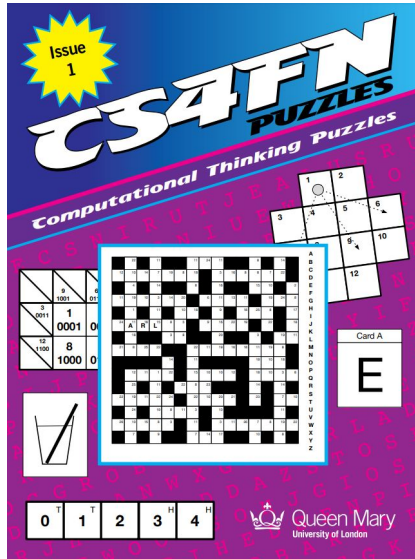
**UNDERSTANDING**  
 Computational thinking is a problem-solving process that uses creativity.

Identify computational thinking used to solve problems or achieve desired outcomes.

SKILLS & PROCEDURES



# Minesweeper Game



# Computational Thinking Puzzles

## UNDERSTANDING

Creativity involves divergent thinking and can be used to develop different ways to achieve the same outcome.

## UNDERSTANDING

Creativity involves imagination, observation, and making connections.

Create a game with drawing sprites



# Drawing Game



Create something new by combining, changing, or reapplying existing ideas.



Collaborate to write two different sets of instructions that achieve the same outcome.



[bit.ly/MrsDDrawEx](https://bit.ly/MrsDDrawEx)

[bit.ly/MrsDDrawCards](https://bit.ly/MrsDDrawCards)

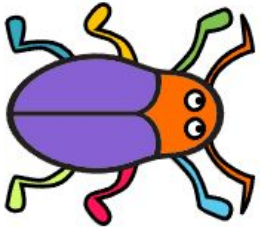
Example



Scratch Cards



Code your new sprite to draw a square in a random spot each time it is clicked



Beetle

when this sprite clicked

repeat 4

move 100 steps

turn 90 degrees

pen up

go to random position

pen down



Collaborate to write two different sets of instructions that achieve the same outcome.



SKILLS  
&  
PROCEDURES



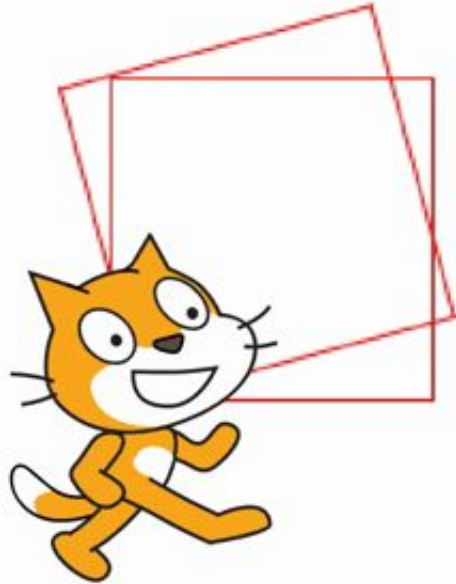
Create something new by combining, changing, or reapplying existing ideas.



SKILLS  
&  
PROCEDURES



Create something new by combining, changing, or reapplying existing ideas.



# Extension Ideas:

- 💡 Program your sprite to draw something simple like a house
- 💡 Code your sprites to automatically create random unique pieces of art
- 💡 Come up with a game that incorporates the pen tool

## UNDERSTANDING

Creativity involves divergent thinking and can be used to develop different ways to achieve the same outcome.

## UNDERSTANDING

Creativity involves imagination, observation, and making connections.

Identify examples of creativity in computer science, technology, or engineering.



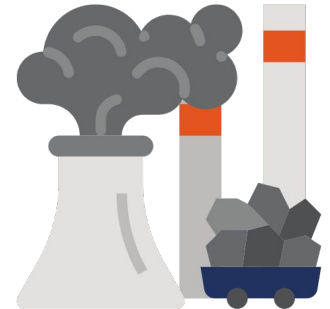
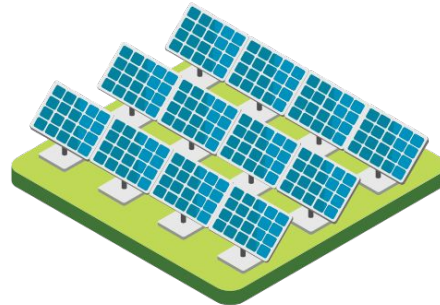
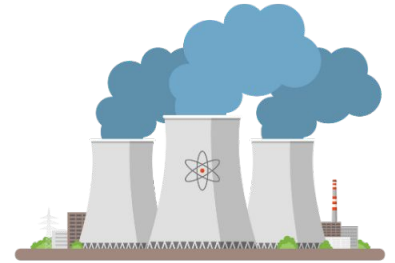
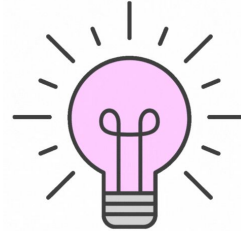
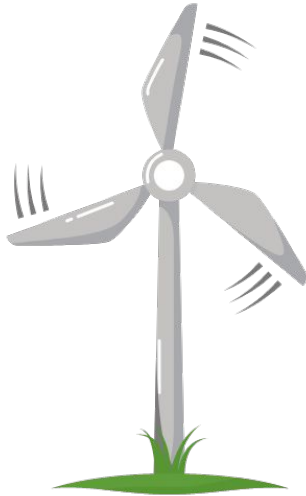
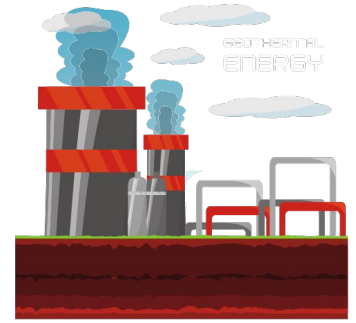
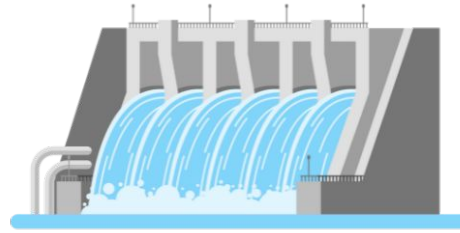
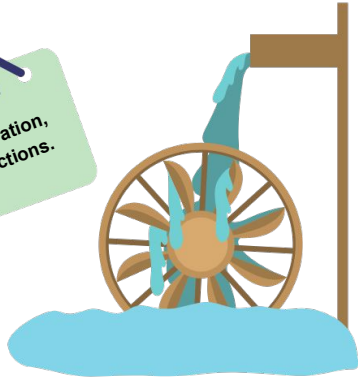
SKILLS & PROCEDURES



Relate creativity to engineering, computing, and the development of new technologies.



SKILLS & PROCEDURES



## UNDERSTANDING

Creativity involves divergent thinking and can be used to develop different ways to achieve the same outcome.

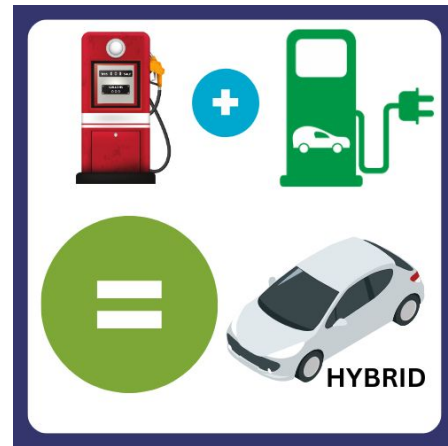
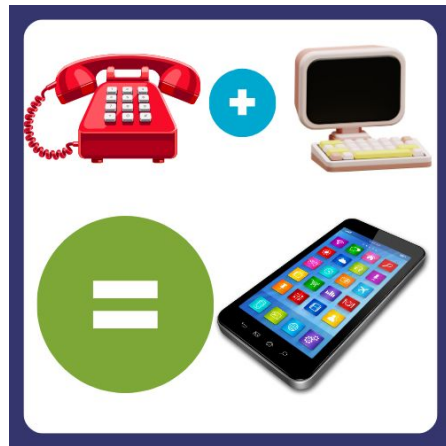
## UNDERSTANDING

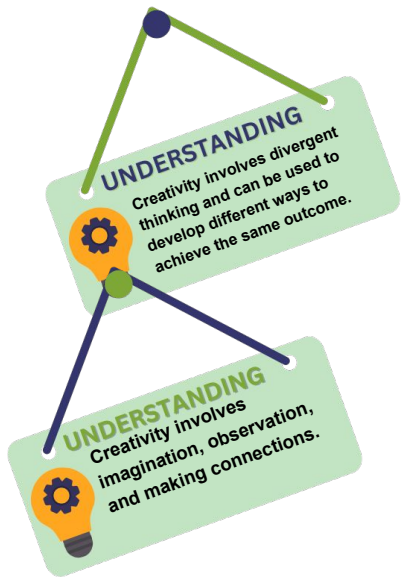
Creativity involves imagination, observation, and making connections.

Create something new by combining, changing, or reapplying existing ideas.



SKILLS & PROCEDURES





## Marble Racers Lesson Plan

**Overview** In this lesson, students create racetracks for marbles and experiment by making changes to their designs to improve the way the marbles travel down the course.

**Grades:** Preschool and K-3

**Length of Lesson:** Approximately 45 minutes

**Related Video:** "Careering Off Course" episode

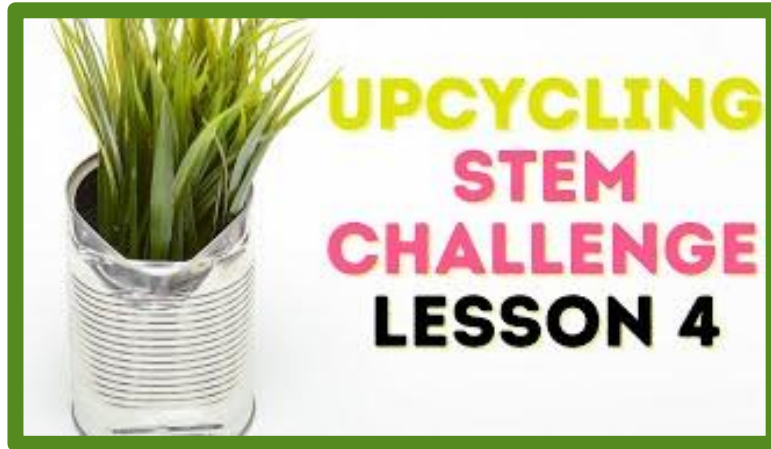
### Learning Goals:

After completing this lesson, students will be able to:

- Make a prediction or hypothesis.
- Understand how to make changes to an experiment in order to achieve desired results.
- Observe, discuss, compare and contrast results.
- Understand that changes in angles can cause objects to fall at different speeds.
- Describe the impact that different changes have on results.
- Describe and present findings.

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**Create something new by combining, changing, or reapplying existing ideas.**



**Can you think of something NEW you can make out of something that is unused, used up or broken?**

## UNDERSTANDING

Creativity involves divergent thinking and can be used to develop different way achieve the same out

## UNDERSTANDING

Creativity involves imagination, observation, and making connections.



Identify examples of creativity in computer science, technology, or engineering.



Examine a Canadian invention.



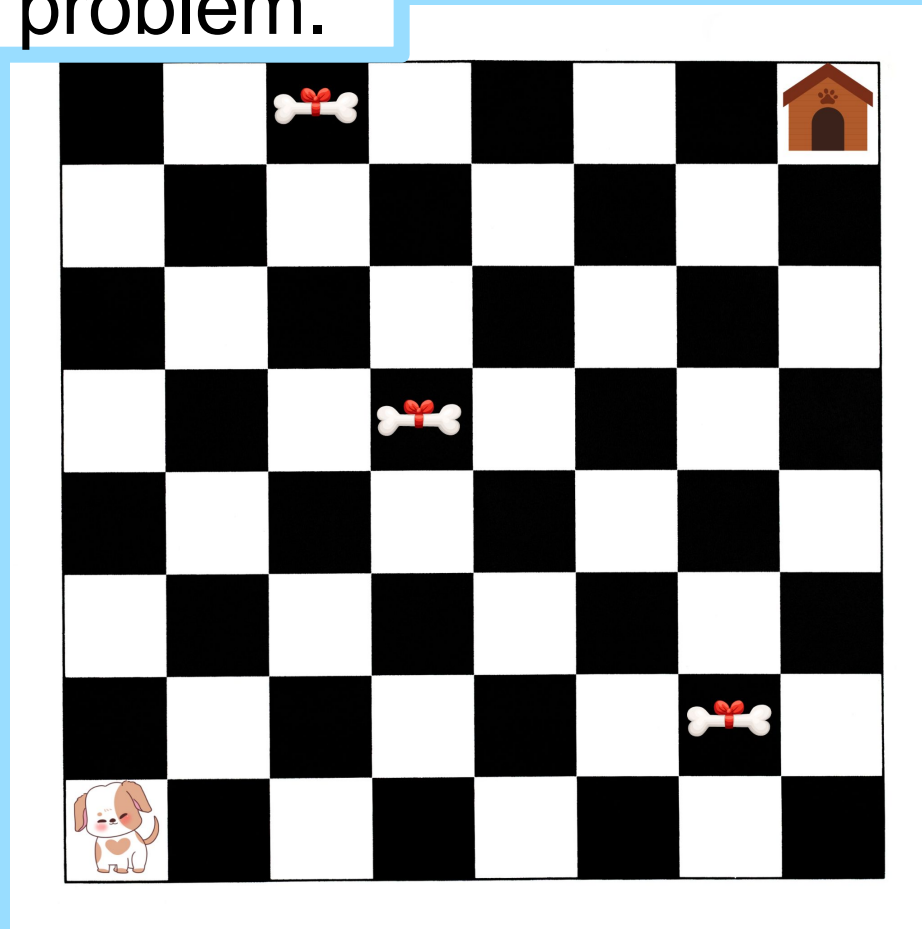
Pacemaker



Insulin



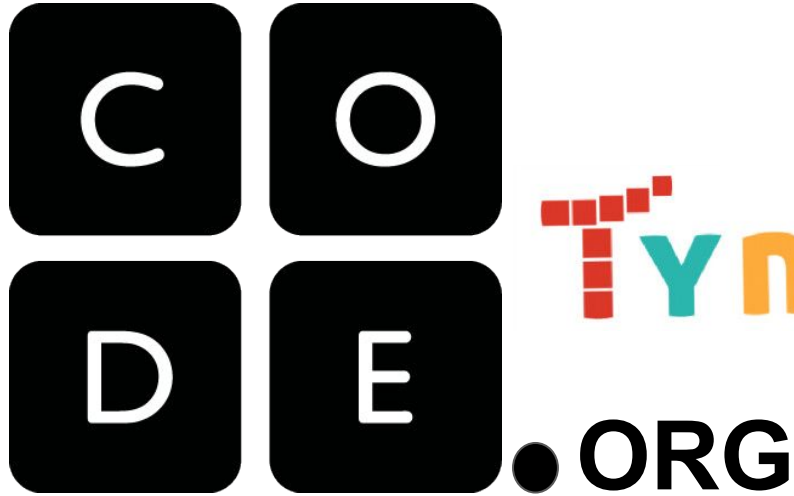
No tech? No problem.



# 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



CS First



"Getting Started with CS First" video series

In this series, we'll take an in-depth look at CS First resources available for teachers and learn how to use sample activities and themes in a classroom setting.

**What is CS First?**

Video 1 · 2:43

In this video, we'll cover: an introduction to CS First, why CS First works for students, and how CS First is built for teachers.

**How to create a teacher account**

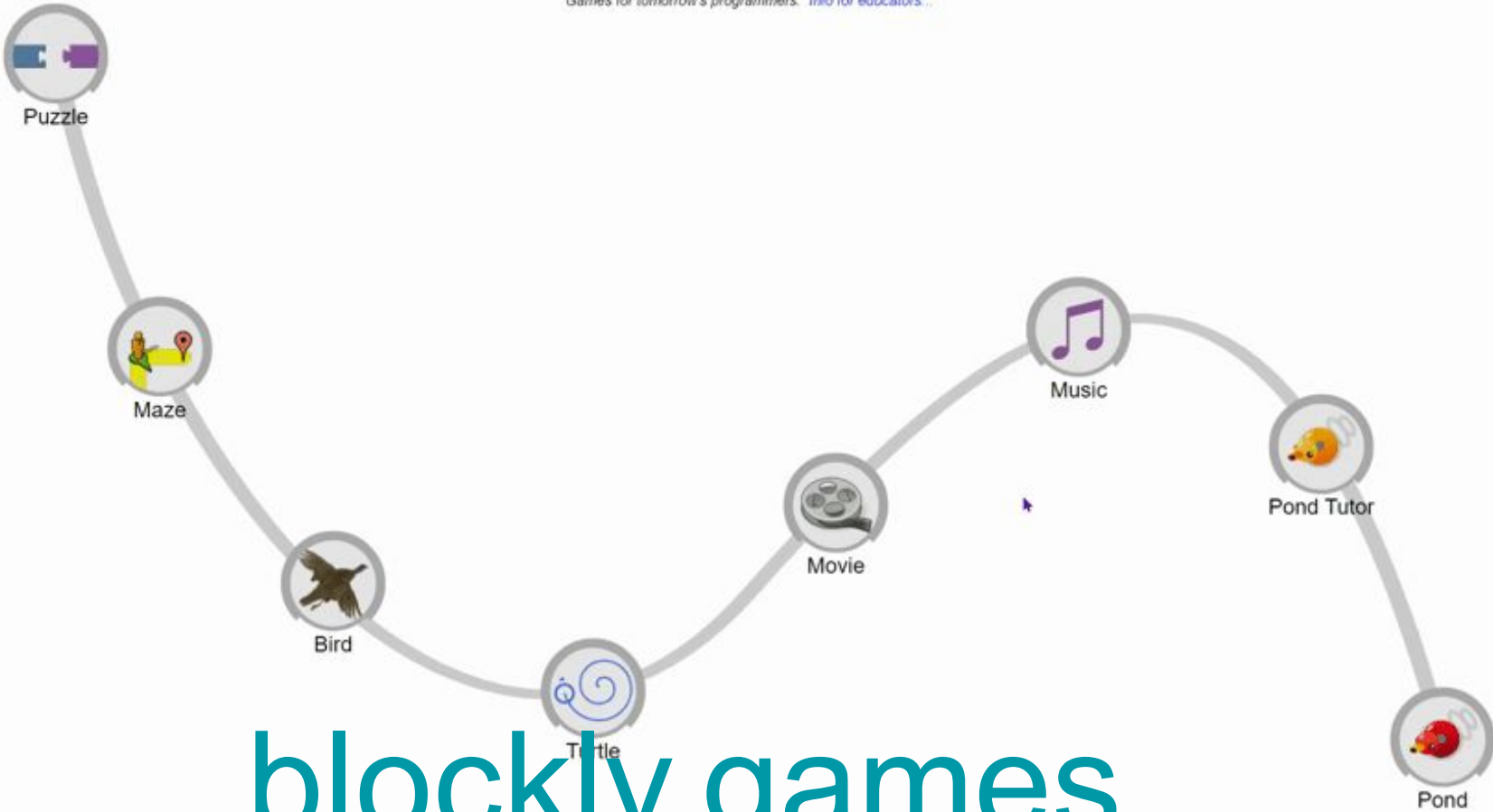
Video 2 · 2:43

In this video, we'll cover: how to create a teacher account, how to set up a class, and how to choose a lesson.

**What's inside the CS First curriculum**

Video 3 · 2:00

In this video, we'll cover: what's inside the CS First curriculum, how students can engage with activities, and how the curriculum can become part of your teaching.



blockly.games

# CODE.ORG

## Curriculum Catalog



Find the perfect fit for your learning environment:  
Code.org courses, tutorials, and more designed for all  
ages and experience levels.

<p><b>ARTIFICIAL INTELLIGENCE</b> 11 AI and Machine Learning Grades: 6-12 Duration: Quarter <a href="#">Quick View</a> <a href="#">Assign</a></p>	<p><b>ARTIFICIAL INTELLIGENCE</b> 11 AI for Oceans Grades: 3-12 Duration: Lesson <a href="#">Quick View</a> <a href="#">Assign</a></p>	<p><b>DATA</b> 11 AP CSA Consumer Review Lab Grades: 9-12 Duration: Month <a href="#">Quick View</a> <a href="#">Assign</a></p>	<p><b>PROGRAMMING</b> CS Fundamentals: Course B Grades: 1-2 Duration: Month <a href="#">Quick View</a> <a href="#">Assign</a></p>	<p><b>PROGRAMMING</b> CS Fundamentals: Course C Grades: 2-3 Duration: Month <a href="#">Quick View</a> <a href="#">Assign</a></p>	<p><b>GAMES AND ANIMATIONS</b> 12 CS Fundamentals: Course D Grades: 3-4 Duration: Month <a href="#">Quick View</a> <a href="#">Assign</a></p>	<p><b>PROGRAMMING</b> Code Break Grades: 8-12 Duration: Month <a href="#">Quick View</a> <a href="#">Assign</a></p>	<p><b>PROGRAMMING</b> Code Break for Younger Students Grades: K-7 Duration: Month <a href="#">Quick View</a> <a href="#">Assign</a></p>	<p><b>GAMES AND ANIMATIONS</b> 11 Code Your Own Sports Game Grades: 2-12 Duration: Lesson <a href="#">Quick View</a> <a href="#">Assign</a></p>	<p><b>GAMES AND ANIMATIONS</b> 11 Computer Science A Grades: 9-12 Duration: School Year <a href="#">Quick View</a> <a href="#">Assign</a></p>	<p><b>ARTIFICIAL INTELLIGENCE</b> 12 Computer Science Discoveries Grades: 6-12 Duration: School Year <a href="#">Quick View</a> <a href="#">Assign</a></p>	<p><b>CYBERSECURITY</b> 14 Computer Science Principles Grades: 9-12 Duration: School Year <a href="#">Quick View</a> <a href="#">Assign</a></p>
<p><b>DATA</b> 11 AP CSA Data Lab Grades: 9-12 Duration: Month <a href="#">Quick View</a> <a href="#">Assign</a></p>	<p><b>PROGRAMMING</b> AP CSA Magpie Lab Grades: 9-12 Duration: Week <a href="#">Quick View</a> <a href="#">Assign</a></p>	<p><b>PROGRAMMING</b> Accelerated Intro to CS Course Grades: 4-8 Duration: Month <a href="#">Quick View</a> <a href="#">Assign</a></p>	<p><b>INTERNET</b> 14 CS Fundamentals: Course E Grades: 4-5 Duration: Quarter <a href="#">Quick View</a> <a href="#">Assign</a></p>	<p><b>INTERNET</b> 14 CS Fundamentals: Course F Grades: 5 Duration: Quarter <a href="#">Quick View</a> <a href="#">Assign</a></p>	<p><b>PROGRAMMING</b> CS Fundamentals: Express Course Grades: 3-8 Duration: Quarter <a href="#">Quick View</a> <a href="#">Assign</a></p>	<p><b>ART AND DESIGN</b> 11 Code with Anna and Elsa Grades: 2-12 Duration: Lesson <a href="#">Quick View</a> <a href="#">Assign</a></p>	<p><b>ENGLISH LANGUAGE ARTS</b> 14 Coding Book Covers Grades: 3-5 Duration: Week <a href="#">Quick View</a> <a href="#">Assign</a></p>	<p><b>HISTORY</b> 14 Coding Interactive Maps Grades: 3-6 Duration: Lesson <a href="#">Quick View</a> <a href="#">Assign</a></p>	<p><b>PROGRAMMING</b> Counting Activity Grades: 3-5 Duration: Lesson <a href="#">Quick View</a> <a href="#">Assign</a></p>	<p><b>PROGRAMMING</b> Course 1 Grades: K-1 Duration: Month <a href="#">Quick View</a> <a href="#">Assign</a></p>	<p><b>PROGRAMMING</b> Course 2 Grades: 3-5 Duration: Month <a href="#">Quick View</a> <a href="#">Assign</a></p>
<p><b>ART AND DESIGN</b> 11 Artist Grades: 2-12 Duration: Lesson <a href="#">Quick View</a> <a href="#">Assign</a></p>	<p><b>CYBERSECURITY</b> Blockchain Grades: 7-12 Duration: Month <a href="#">Quick View</a> <a href="#">Assign</a></p>	<p><b>PROGRAMMING</b> CS Fundamentals: Course A Grades: K-1 Duration: Month <a href="#">Quick View</a> <a href="#">Assign</a></p>	<p><b>PROGRAMMING</b> CS Fundamentals: Pre-reader Express Grades: K-1 Duration: Month <a href="#">Quick View</a> <a href="#">Assign</a></p>	<p><b>GAMES AND ANIMATIONS</b> 11 Choose Your Team and Make a Basketball Game Grades: 2-12 Duration: Lesson <a href="#">Quick View</a> <a href="#">Assign</a></p>	<p><b>PROGRAMMING</b> Classic Maze Grades: 2-12 Duration: Lesson <a href="#">Quick View</a> <a href="#">Assign</a></p>	<p><b>MATH</b> 12 Coding a Geometric Star Quilt Grades: 3-8 Duration: Week <a href="#">Quick View</a> <a href="#">Assign</a></p>	<p><b>ENGLISH LANGUAGE ARTS</b> 14 Coding a Time Capsule Grades: 3-8 Duration: Week <a href="#">Quick View</a> <a href="#">Assign</a></p>	<p><b>ENGLISH LANGUAGE ARTS</b> 13 Coding with Poetry Grades: 3-8 Duration: Week <a href="#">Quick View</a> <a href="#">Assign</a></p>	<p><b>PROGRAMMING</b> Course 3 Grades: 3-5 Duration: Month <a href="#">Quick View</a> <a href="#">Assign</a></p>	<p><b>PROGRAMMING</b> Course 4 Grades: 4-5 Duration: Month <a href="#">Quick View</a> <a href="#">Assign</a></p>	<p><b>PHYSICAL COMPUTING</b> 13 Creating Apps with Devices (Circuit Playground) Grades: 6-12 Duration: Quarter <a href="#">Quick View</a> <a href="#">Assign</a></p>

# SCRATCH

[scratch.mit.edu](https://scratch.mit.edu)

## IDEAS



What will you create?

Choose a tutorial

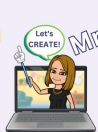


### Getting Started

New to Scratch? Try the Getting Started tutorial.

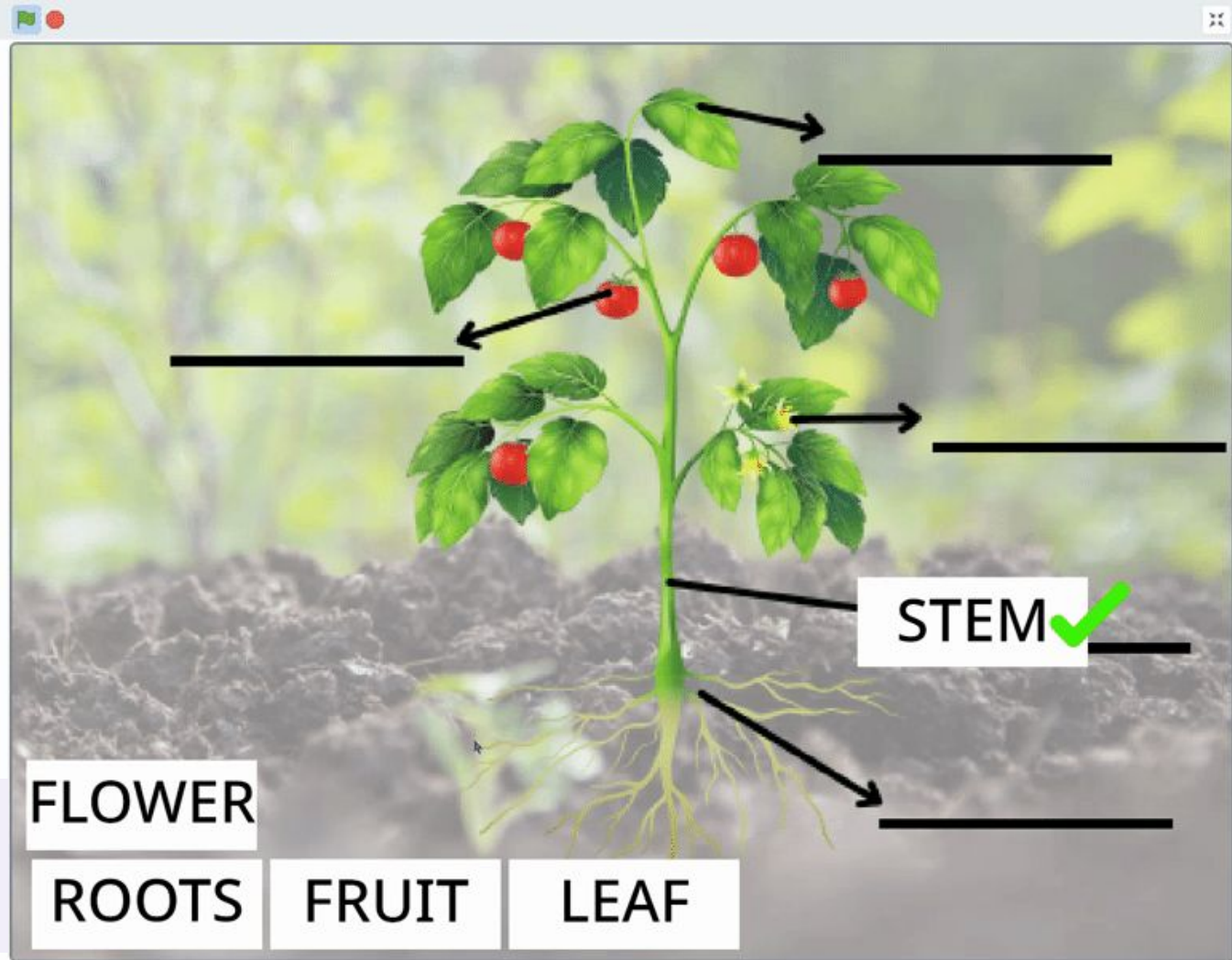
Try It!

[etwithmrsd.com](https://www.etwithmrsd.com)

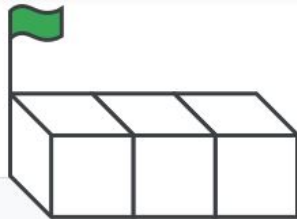


Mrs. D's

SCRATCH ACTIVITIES



# Google CS First



## Get started with CS First

Coding instructions like hints, highlights, and text-to-speech live inside *Scratch for CS First*



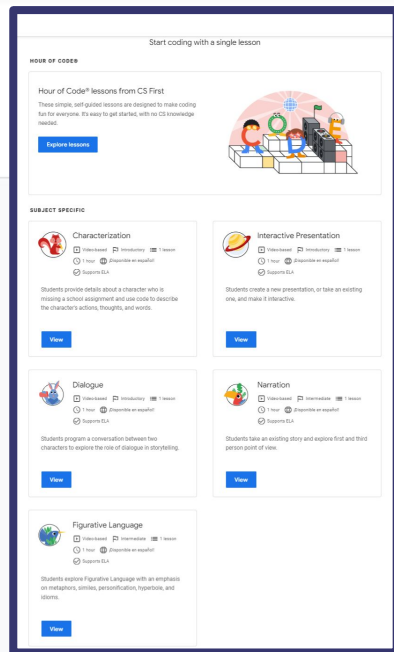
### Welcome to CS First

Text-based Introductory 4 lessons

4–6 hours

Students go on a first journey through Scratch for CS First with four fun projects that introduce the core elements of Scratch and foundational coding skills.

View



# 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



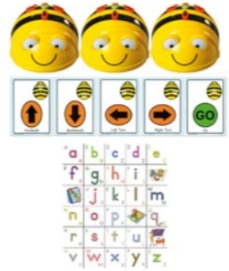
# BeeBots



I highly recommend!



\$134.95  
Bee Bot - Programmable Floor Robot -  
See & Say Version !  
Bee-Bot & Blue Bot Robotics



\$495.95  
Bee-Bot (3 Robot Pack)- Robot Bundle  
with Mat & Command Cards  
Bee-Bot & Blue Bot Robotics



# Code&Go Robot Mouse

I highly  
recommend!



## Code & Go



Learning Resources Code & Go  
Robot Mouse Activity Set - 83  
pieces, Ages 4+ Coding Robot For  
Kids, STEM Toys For Boys And...

★★★★★ ~ 2,006

\$77<sup>98</sup>

✓prime

## Robot Mouse



Learning Resources Code & Go  
Robot Mouse Classroom Set,  
STEM Coding Classroom Set

★★★★★ ~ 11

\$286<sup>56</sup>

Prime

# Botley

I highly recommend!



Learning Resources Botley the Coding Robot Activity Set, Homeschool, Coding Robot for Kids, STEM Toy, Programming for Kids, Ages 5+

Visit the Learning Resources Store

★★★★★ 152 ratings

\$123<sup>5</sup>

prime

