Making Connections

Energy

Computer Science

grade 2

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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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.

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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.

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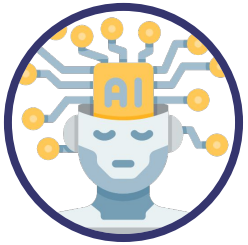
Many daily activities include repeated steps, such as • brushing teeth • tying one shoe and then using the same process on the other shoe	Instructions may be simplified by repeating steps.	Describe a situation in which repetition simplifies instructions. Exchange ideas to design clear three- to four-step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

Computational Thinking

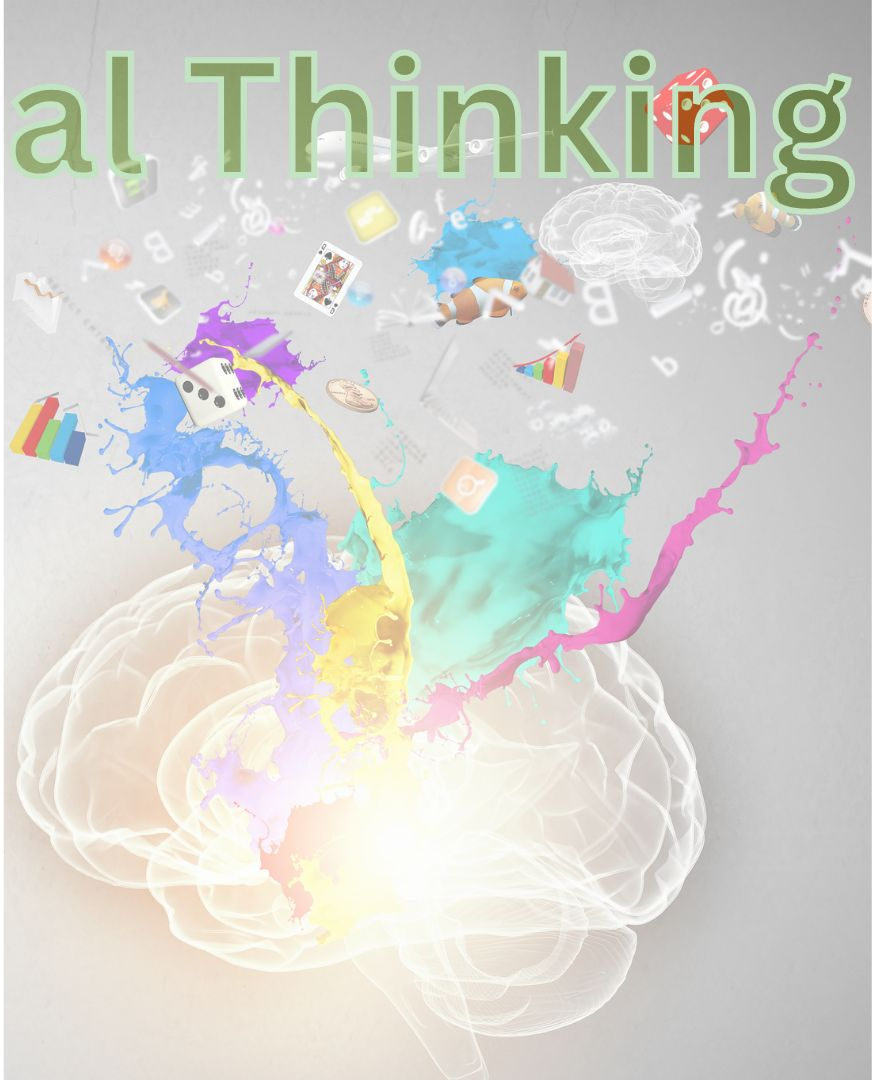
Decomposition



Pattern Recognition

Pattern Abstraction

Algorithm Design



Design Thinking Process

Learn About Your Audience

Empathize

Define

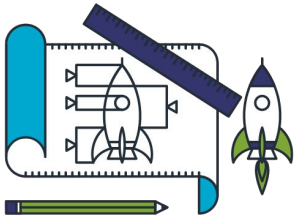
Construct Point of View Based on User Needs

Brainstorm and Come up with Creative Solutions

Ideate

Prototype

Build Representation of Your Ideas



Test Your Ideas

Test

Creativity

Finding different ways to reach the same outcome.

Problem solving to overcome obstacles to achieve a desired outcome.

Organizing Idea	Energy: Understandings of the physical world are deepened by investigating matter and energy.
Guiding Question	Where do light and sound come from, and how do they move?
Learning Outcome	Students investigate the behaviours of light and sound.

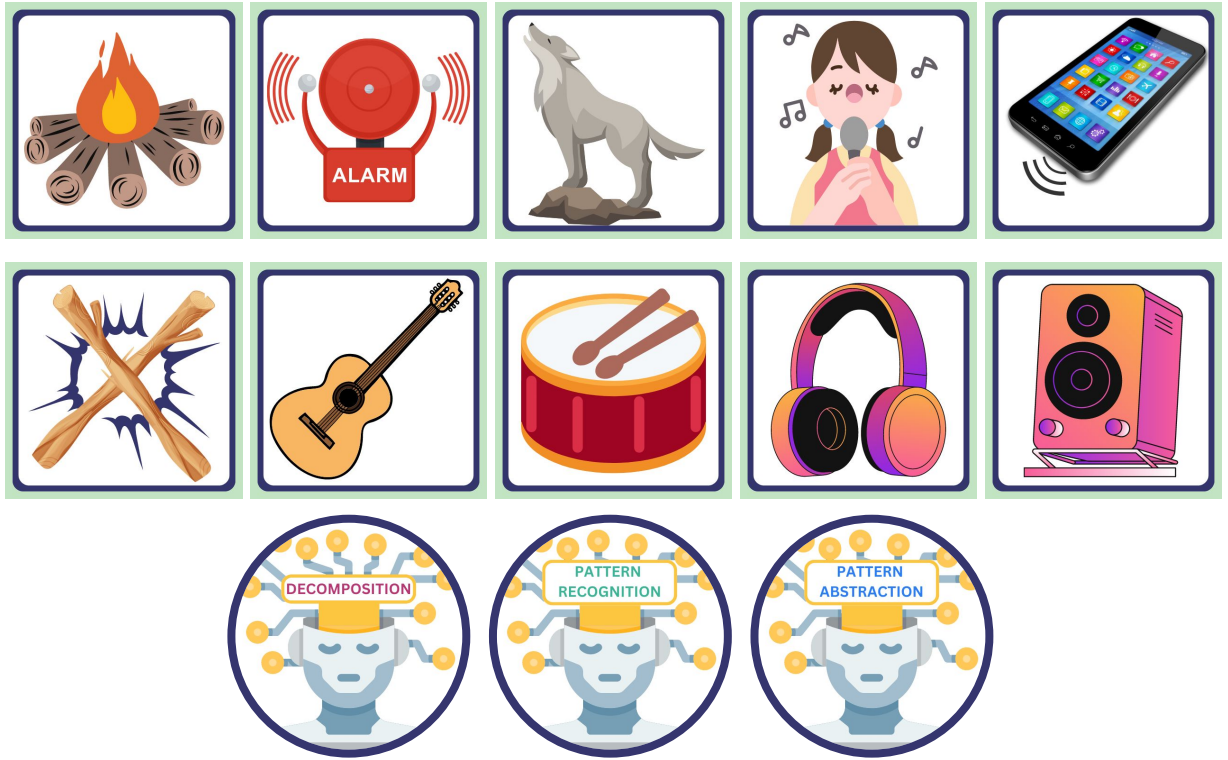
Skills & Procedures

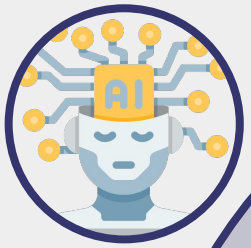
Relate vibration to the production of sound. Identify sources of sound.

Listen to sounds and describe their characteristics.

Safely explore the production and behaviour of sound.

Build a device to change the behaviour of sound.





HIGH

LOW

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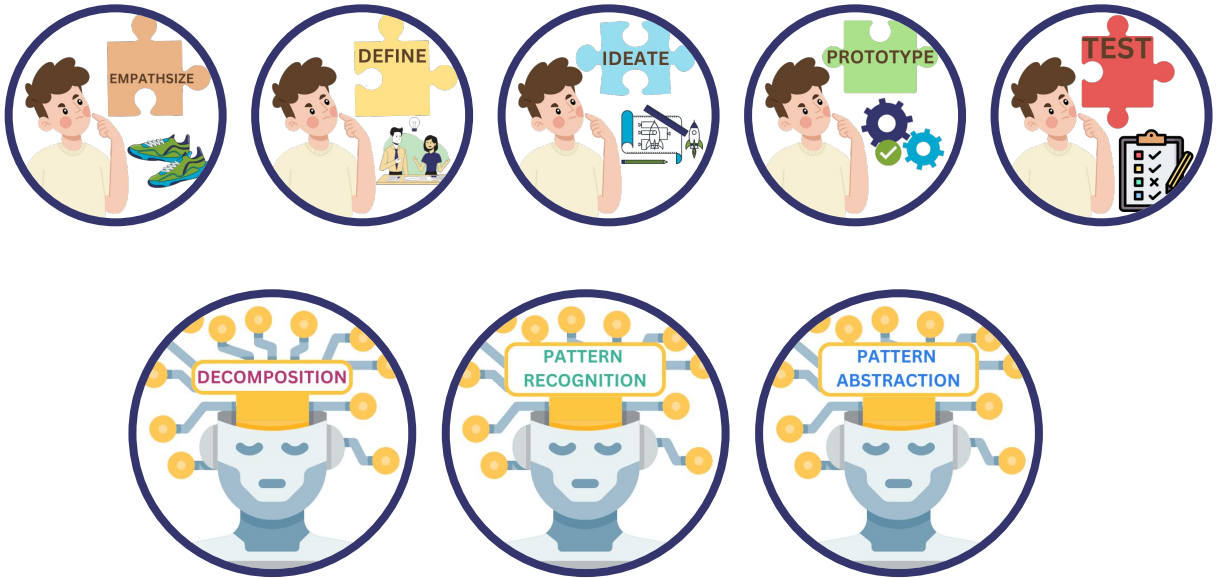

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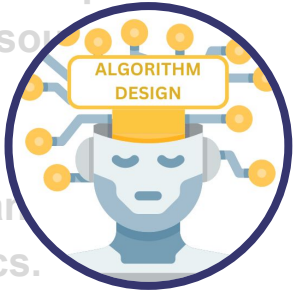

Listen to sounds a their characteristics.

Safely explore the production and behaviour of sound.

Build a device to change the behaviour of sound.

Write a set of instructions for how to play your instrument.

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.

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 & PROCESSES

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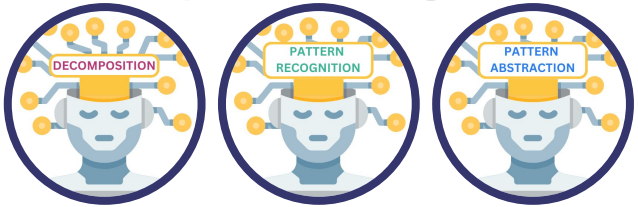
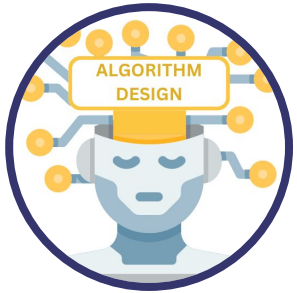
Skills & Procedures

Identify sources of light.

Conduct an investigation to determine how the path of light can be affected.

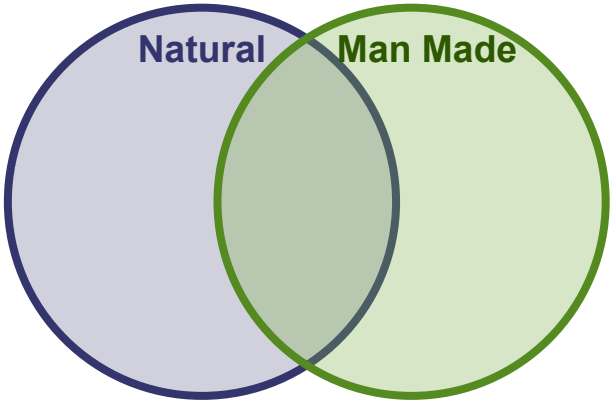
Examine how natural objects affect the path of sunlight.

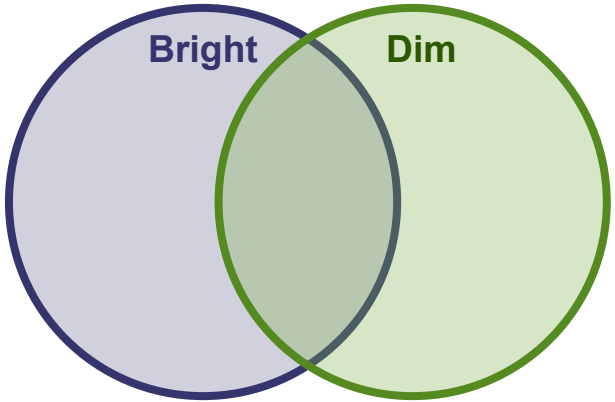




Can we write a rule for what makes something a source of light?

IF it gives off light THEN it is a source of light,
ELSE it is not a source of light.





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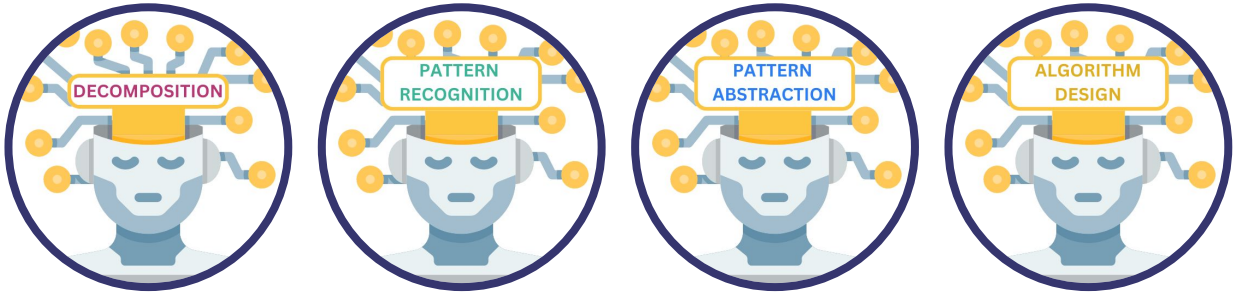

Let's write some algorithms for how light travels.

When light starts it moves forward FOREVER.

IF light hits a mirror THEN it REFRACTS.

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Identify ways creativity is used to design instructions.

SKILLS & PROCEDURES

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