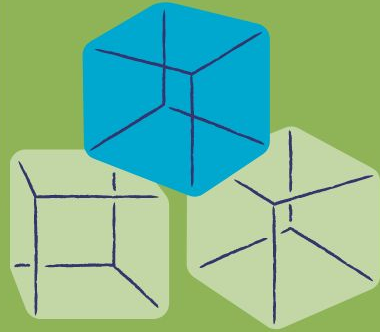


Making Connections



Matter



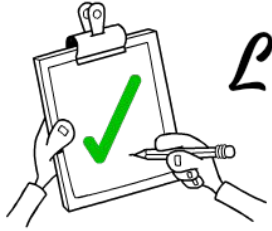
Computer
Science



grade 6

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.

Organizing Idea	Computer Science: Problem solving and scientific inquiry are developed through the knowledgeable application of creativity, design, and computational thinking.	
Guiding Question	In what ways are abstraction, design, and coding related?	
Learning Outcome	Students examine abstraction in relation to design and coding, and describe impacts of technologies.	
Knowledge	Understanding	Skills & Procedures
<p>The process of abstraction includes</p> <ul style="list-style-type: none"> • determining what details to keep and what to ignore • removing unnecessary details • identifying important information • generalizing patterns <p>Information is data that is organized to be more useful.</p> <p>An abstraction is a simplified version of something complex.</p> <p>Abstractions can make daily life easier; e.g.,</p> <ul style="list-style-type: none"> • simple controls on appliances • light switches • steering wheels • apps <p>Computational artifacts can be designed to address societal needs and wants; e.g.,</p> <ul style="list-style-type: none"> • weather modelling • communications • automotive controls • medical research • apps 	<p>Abstraction is used in design and coding of computational artifacts to make problems easier to think about.</p>	<p>Apply abstraction during the design process.</p> <p>Identify examples of abstractions encountered in daily life.</p> <p>Discuss the role of design and coding in society.</p> <p>Use a visual block-based language to design code that includes relevant design structures.</p>

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Knowledge	Understanding	Skills & Procedures
<p>Structures used in coding include</p> <ul style="list-style-type: none"> • sequences • conditionals (if-then-else statements) • loops <p>Sequence structures are ordered sets of instructions within code.</p> <p>Conditional structures are statements that tell computers to complete different actions based on different situations.</p>	<p>Abstraction is used in design and coding of computational artifacts to make problems easier to think about.</p>	<p>Apply abstraction during the design process.</p> <p>Identify examples of abstractions encountered in daily life.</p> <p>Discuss the role of design and coding in society.</p> <p>Use a visual block-based language to design code that includes relevant design structures.</p>

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	Knowledge	Understanding
<p>The use of computers, coding, and technology can have impacts that are</p> <ul style="list-style-type: none"> • personal • social • environmental • economic <p>Impacts of computers, coding, or technology may be intentional or unintentional.</p>	<p>Computers, coding, and technology can be used in ways that have positive or negative impacts.</p>	<p>Discuss how computers, coding, or technology have had impacts.</p> <p>Predict possible impacts of computers, coding, or technology.</p>

Creativity

Finding different ways to reach the same outcome.

Problem solving to overcome obstacles to achieve a desired outcome.





Design Thinking Process



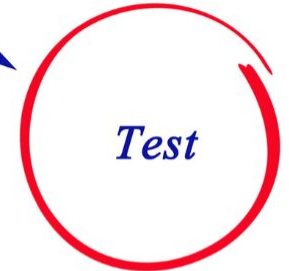
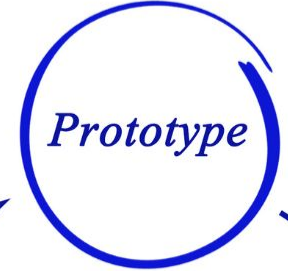
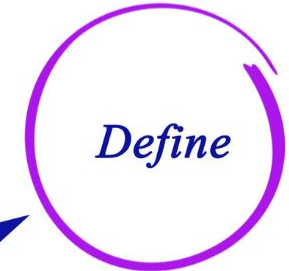
*Learn About
Your Audience*



*Brainstorm and
Come up with
Creative Solutions*

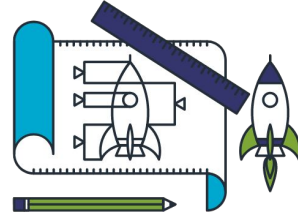


Test Your Ideas



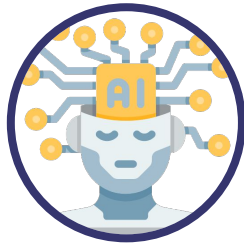
*Construct Point
of View Based
on User Needs*

*Build
Representation
of Your Ideas*



Computational Thinking

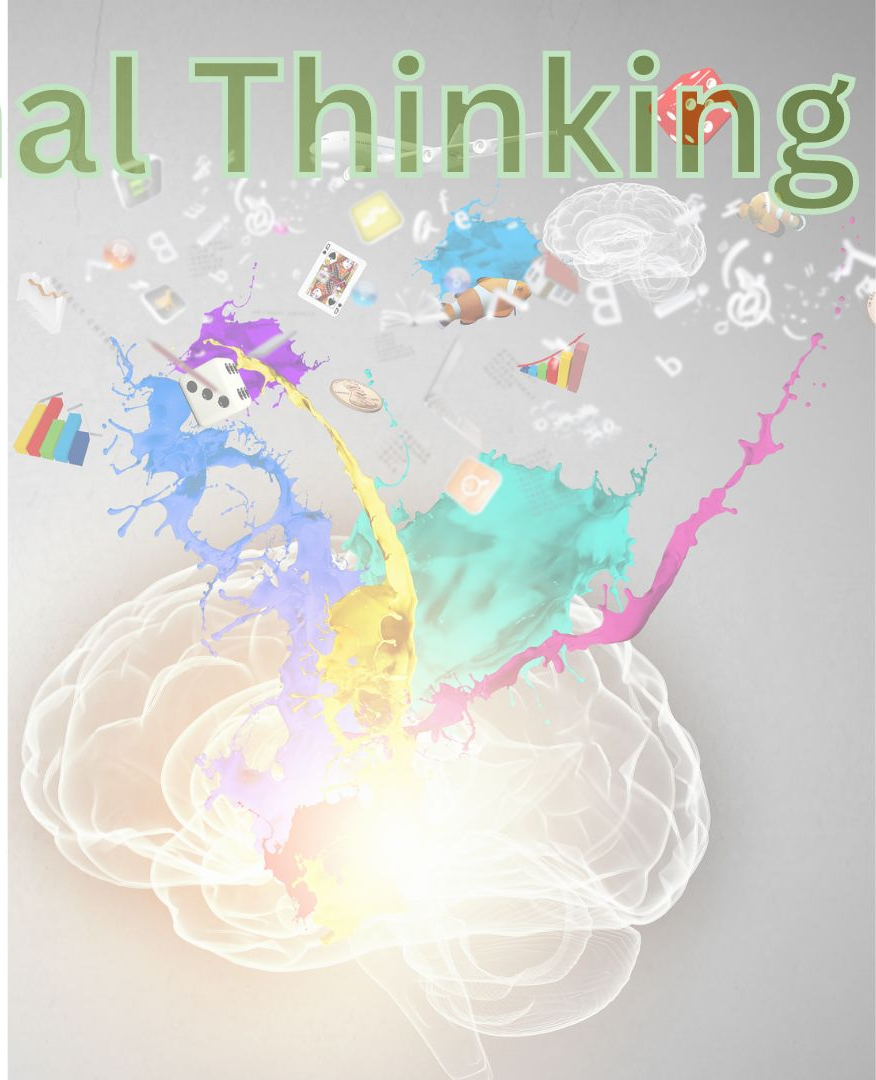
Decomposition



Pattern Recognition

Pattern Abstraction

Algorithm Design



Organizing Idea	Matter: Understandings of the physical world are deepened by investigating matter and energy.
Guiding Question	How can the particles of matter be influenced by heating or cooling?
Learning Outcome	Students investigate how particles of matter behave when heated or cooled and analyze effects on solids, liquids, and gases.

Skills & Procedures

Discuss the connection between movement of particles and temperature in degrees Celsius.

Explain phase changes of matter when heated or cooled using the particle model of matter.

Conduct a controlled experiment to prove the mass of a substance is the same after a phase change.

Use a visual block-based language to design code that includes relevant design structures.

SKILLS & PROCEDURES

Gr. 4

UNDERSTANDING
Design can be used by humans or machines to meet needs.

Gr. 5

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

Gr. 4

UNDERSTANDING
Design involves processes that can transform ideas into artifacts that meet needs.

DECOMPOSITION

PATTERN RECOGNITION

PATTERN ABSTRACTION

ALGORITHM DESIGN

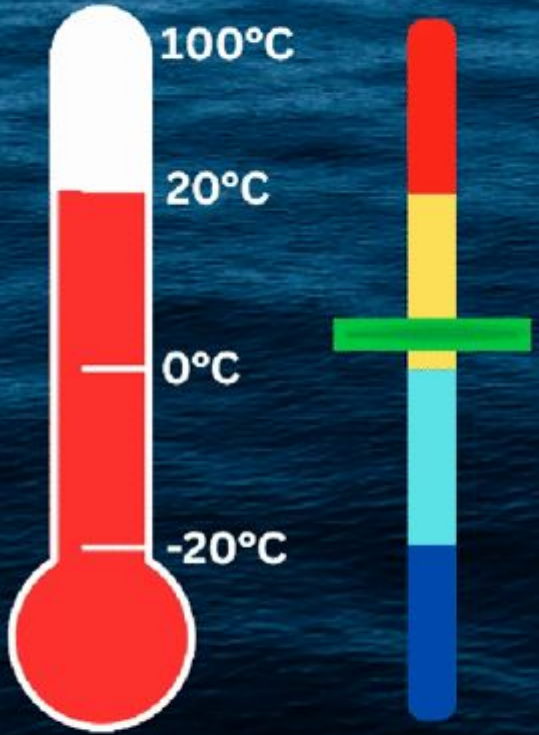
Scratch Template

<https://bit.ly/MrsDParticle>



Project Cards

<http://bit.ly/MrsDParticleCards>





Cat

CHOICE!
Delete the cat
sprite and
choose a
different garbage
dropping sprite
from the gallery.

Add this code to the cat sprite.

The cat will walk across the stage and
change costumes creating a walking
animation as it goes.

When the cat reaches the far right side of the stage
it will restart at the far left making it continually
move across the screen over and over.

```
when green flag clicked
  set drag mode to not draggable
  set Garbage to 0
  set SCORE to 0
  go to x: -240 y: -122
  forever loop
    go to front layer
    change x by 10
    next costume
    wait 0.3 seconds
    if x position = 240 then
      go to x: -240 y: -122
```



Organizing Idea	Matter: Understandings of the physical world are deepened by investigating matter and energy.
Guiding Question	How can the particles of matter be influenced by heating or cooling?
Learning Outcome	Students investigate how particles of matter behave when heated or cooled and analyze effects on solids, liquids, and gases.

Skills & Procedures
<p>Describe how a liquid thermometer works.</p> <p>Create a tool that measures temperature based on expansion and contraction of a liquid.</p> <p>Relate the melting/freezing and boiling points of water to the Celsius scale.</p> <p>Identify safety practices associated with measuring temperature and the use of measurement tools.</p>

Use a visual block-based language to design code that includes relevant design structures.

SKILLS & PROCEDURES

Gr. 4 UNDERSTANDING
Design can be used by humans or machines to meet needs.

Gr. 5 UNDERSTANDING
Computational thinking is a problem-solving process that uses creativity.

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DECOMPOSITION

PATTERN RECOGNITION

PATTERN ABSTRACTION

ALGORITHM DESIGN

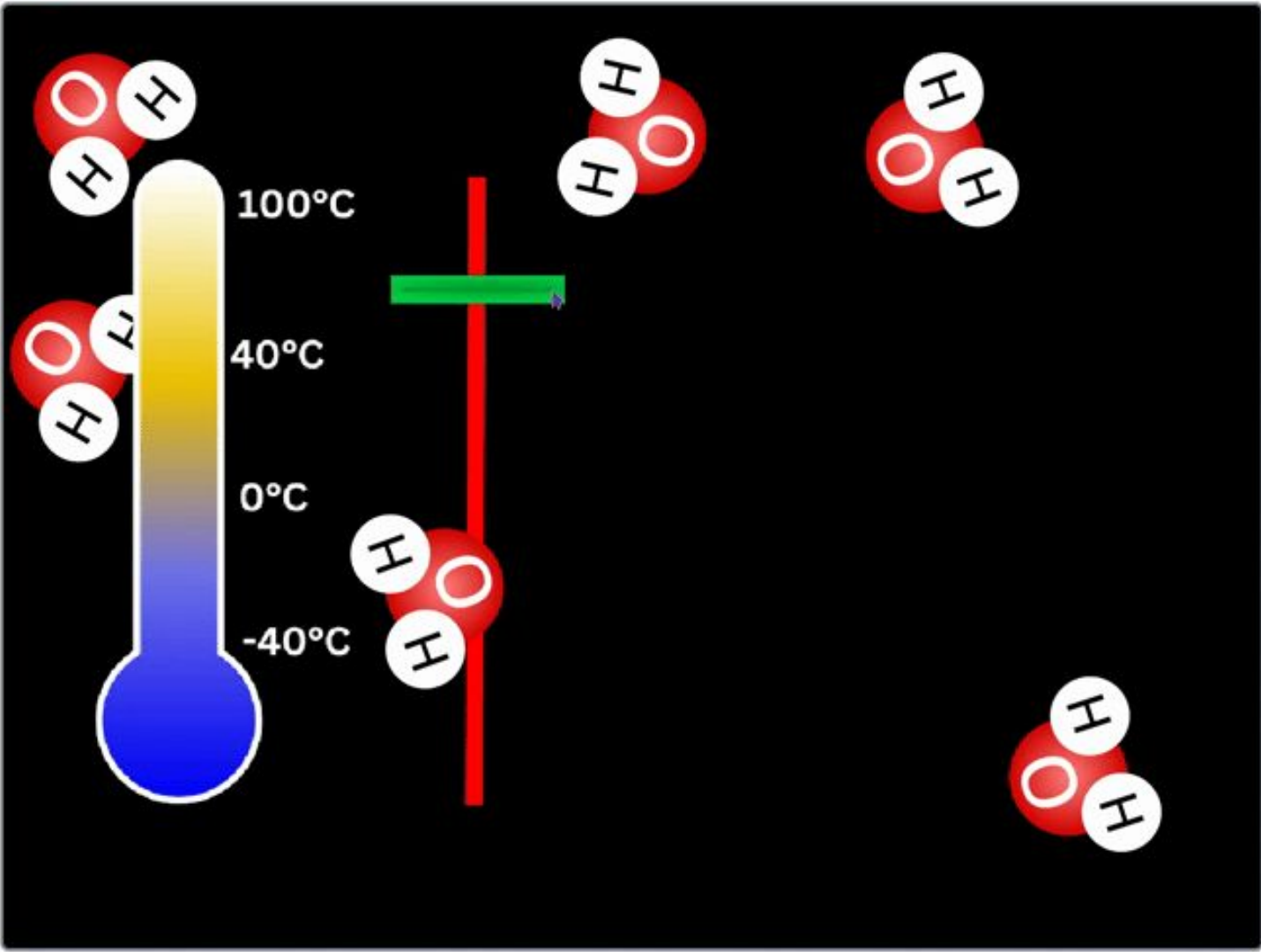
Scratch Template

<https://bit.ly/MrsDGarbage>



Project Cards

<http://bit.ly/MrsDParticleCards>



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Create a tool that measures temperature based on expansion and contraction of a liquid.
Relate the melting/freezing and boiling points of water to the Celsius scale.
Identify safety practices associated with measuring temperature and the use of measurement tools.

The image displays five circular icons arranged in a 2x3 grid (with the bottom-right cell empty), each featuring a cartoon boy pointing to a puzzle piece. The puzzle pieces are labeled with the following terms:

- Empathize:** An orange puzzle piece with a pair of green sneakers below it.
- IDEATE:** A yellow puzzle piece with a lightbulb and two people at a table below it.
- PROTOTYPE:** A light blue puzzle piece with a blueprint, a pencil, and a rocket below it.
- TEST:** A green puzzle piece with three interlocking gears (two blue, one green) below it.
- EVALUATE:** A red puzzle piece with a clipboard and pencil below it.

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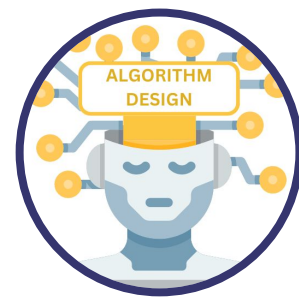
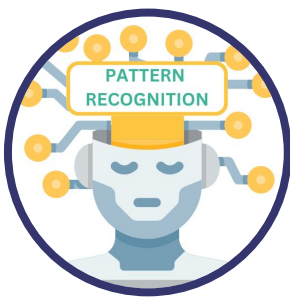
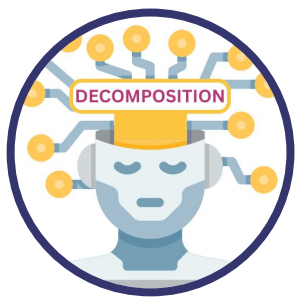
Skills & Procedures

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Identify safety practices associated with measuring temperature and the use of measurement tools.



Materials

What kinds of materials do you need to build your tool?

Are there alternative materials you can use?

How do you know the alternatives would work?

Apply abstraction during the design process.



SKILLS & PROCEDURES


 A graphic element resembling a notepad with a green spiral binding at the top. It contains the text 'Apply abstraction during the design process.' in bold black font. Below the text are two icons: a blue checkmark inside a white square box, and a target icon with a green arrow hitting the bullseye. The text 'SKILLS & PROCEDURES' is written in green between the two icons.

Organizing Idea	Matter: Understandings of the physical world are deepened by investigating matter and energy.
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Skills & Procedures

Conduct an investigation to demonstrate that liquid water is denser than solid water.

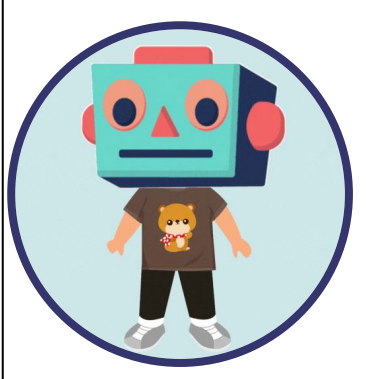
Hypothesize the effect on aquatic life if solid water were denser than liquid water.

Explain the significance of expansion or contraction in the design and construction of structures.



Apply abstraction during the design process.

SKILLS & PROCEDURES

 A blue checkmark icon is on the left, and a target icon with a green arrow and the letters 'CS' inside is on the right. The text 'SKILLS & PROCEDURES' is centered between them. The entire block is enclosed in a blue rounded rectangle with green spiral binding at the top.


BRIDGING: In K-2 the CS curriculum involves understanding instructions in a variety of forms, creating instructions and figuring out mistakes in instructions.