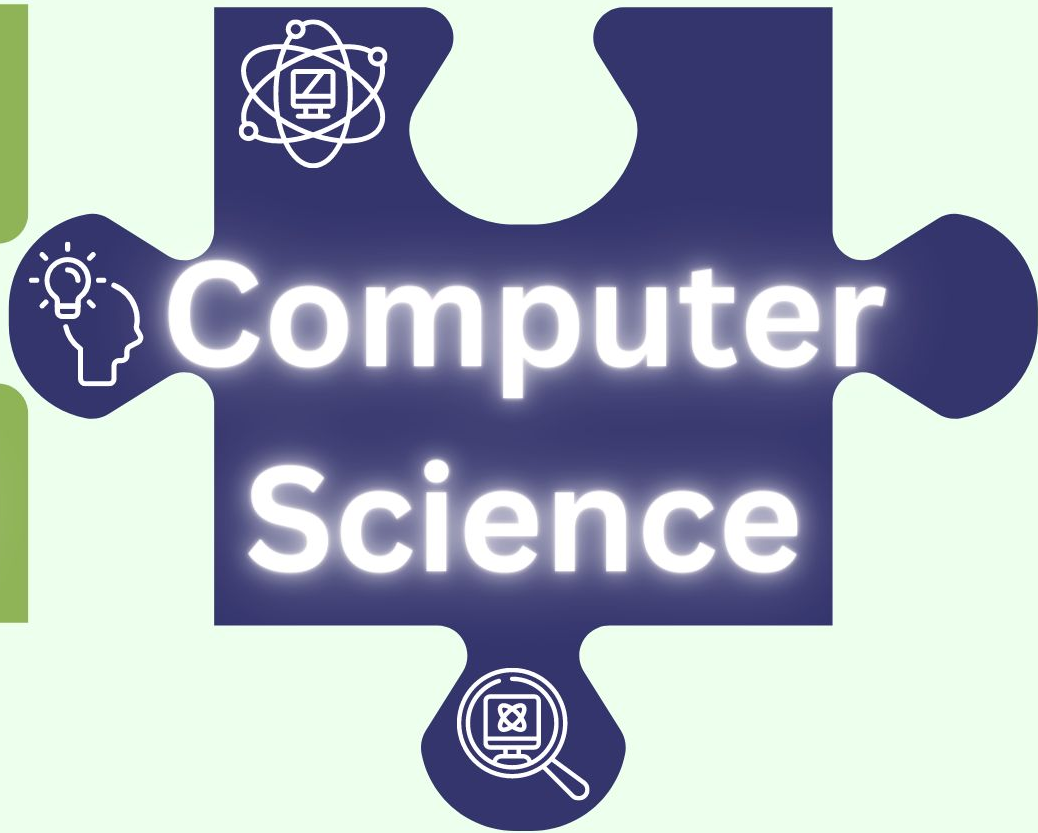


Making Connections



Energy



Computer
Science

grade 4

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 design meet needs?	
Learning Outcome	Students examine and apply design processes to meet needs.	
Knowledge	Understanding	Skills & Procedures
<p>Design processes include</p> <ul style="list-style-type: none"> • understanding the problem • forming ideas (ideating) • planning • creating • analyzing • testing • troubleshooting <p>Feedback helps to ensure all needs are considered during the design process.</p> <p>An algorithm is a sequence of instructions.</p> <p>Artifacts are objects or products made by humans, machines, or computers through the process of design.</p>	<p>Design involves processes that can transform ideas into artifacts that meet needs.</p>	<p>Plan and create an artifact to meet a need.</p> <p>Provide feedback to others during the design process.</p> <p>Test an artifact to confirm that it meets intended needs.</p> <p>Collaborate to design an algorithm to solve a problem.</p> <p>Examine availability and cost of materials during design.</p>

Organizing Idea	Computer Science: Problem solving and scientific inquiry are developed through the knowledgeable application of creativity, design, and computational thinking.
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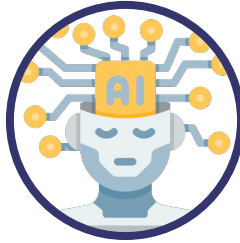
Guiding Question	How can design meet needs?
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Learning Outcome	Students examine and apply design processes to meet needs.
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Knowledge	Understanding	Skills & Procedures
<p>Design can produce many artifacts, including</p> <ul style="list-style-type: none">• algorithms• models• prototypes• blueprints• programs• experiments• objects <p>Design can deal with complex problems.</p> <p>Availability of materials and costs are considerations in design.</p>	<p>Design involves processes that can transform ideas into artifacts that meet needs.</p>	<p>Plan and create an artifact to meet a need.</p> <p>Provide feedback to others during the design process.</p> <p>Test an artifact to confirm that it meets intended needs.</p> <p>Collaborate to design an algorithm to solve a problem.</p> <p>Examine availability and cost of materials during design.</p>

Computational Thinking

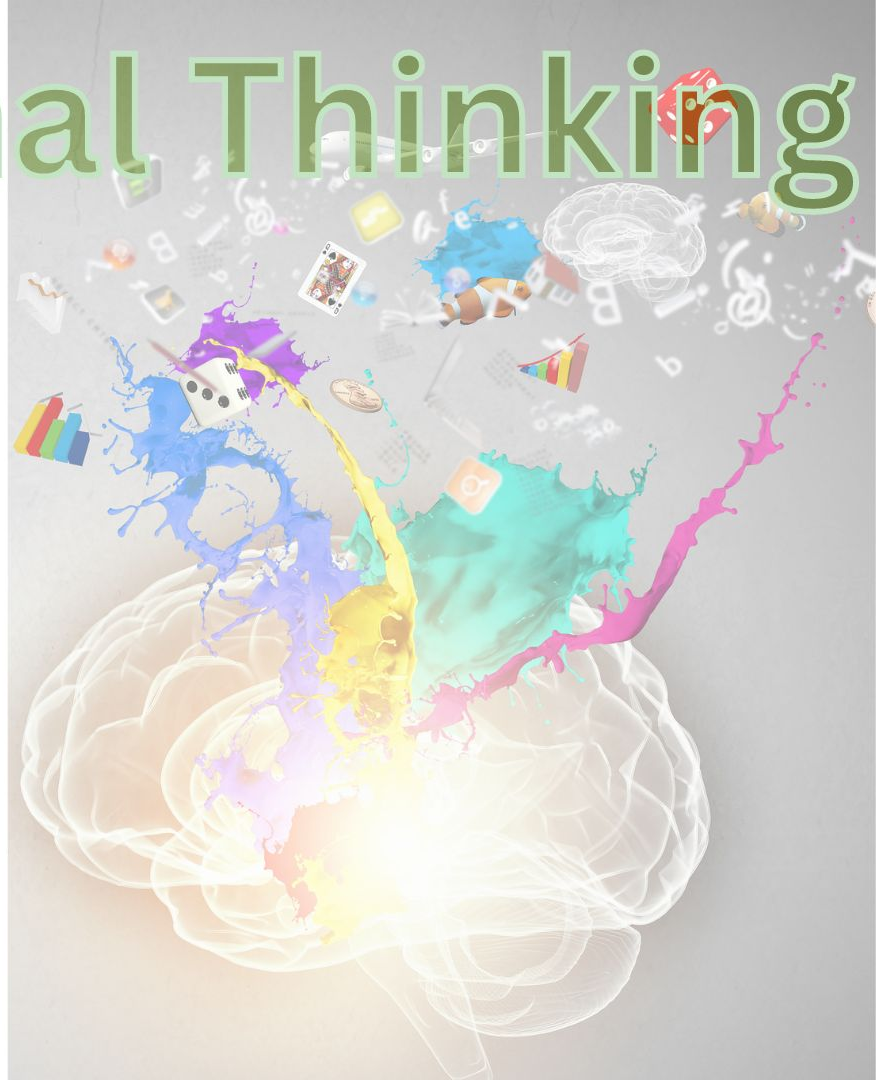
Decomposition



Pattern Recognition

Pattern Abstraction

Algorithm Design





Design Thinking Process



*Learn About
Your Audience*



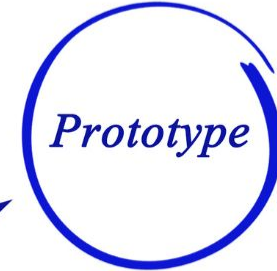
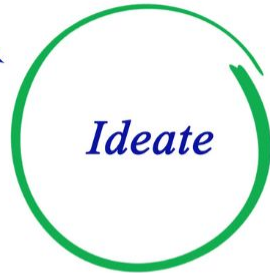
*Brainstorm and
Come up with
Creative Solutions*



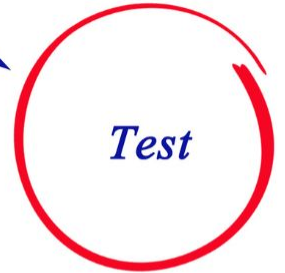
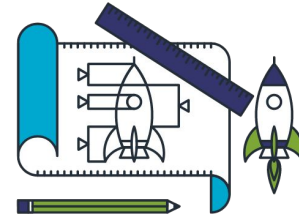
Test Your Ideas



*Construct Point
of View Based
on User Needs*



*Build
Representation
of Your Ideas*



Creativity

Finding different ways to reach the same outcome.

Problem solving to overcome obstacles to achieve a desired outcome.



Organizing Idea	Earth Systems: Understandings of the living world, Earth, and space are deepened by investigating natural systems and their interactions.
Guiding Question	How does Earth sustain life?
Learning Outcome	Students investigate the systems of Earth and reflect on how their interconnections sustain life.

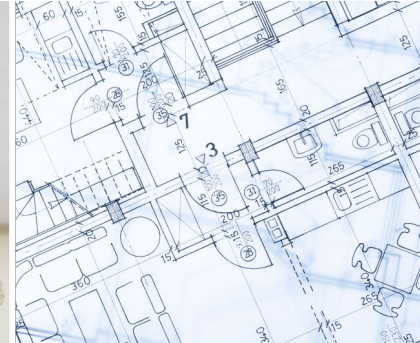
CS KNOWLEDGE

Design can produce many artifacts,

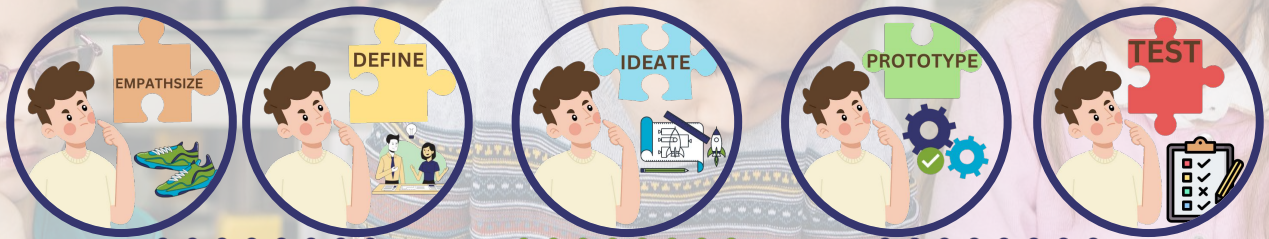
- algorithms
- models
- prototypes
- blueprints
- programs
- experiments
- objects



Plan and create an artifact to meet a need.



Organizing Idea	Earth Systems: Understandings of the living world, Earth, and space are deepened by investigating natural systems and their interactions.
Guiding Question	How does Earth sustain life?
Learning Outcome	Students investigate the systems of Earth and reflect on how their interconnections sustain life.



Plan and create an artifact to meet a need.

✓ SKILLS & PROCEDURES 


Provide feedback to others during the design process.

✓ SKILLS & PROCEDURES 

Test an artifact to confirm that it meets intended needs.

✓ SKILLS & PROCEDURES 

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



Organizing Idea	Energy: Understandings of the physical world are deepened by investigating matter and energy.
Guiding Question	How can forces affect objects from a distance?
Learning Outcome	Students investigate how forces can act on objects without contact.

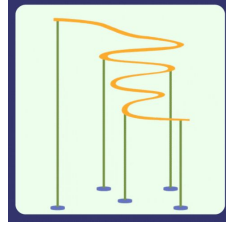
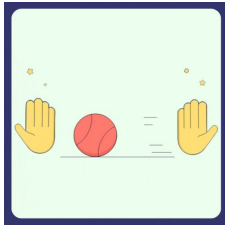
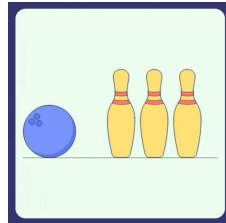
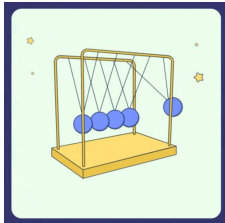
Skills & Procedures

Describe how non-contact forces affect objects.

Demonstrate the effect of gravity on an object.

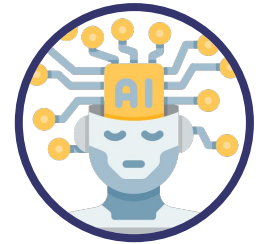
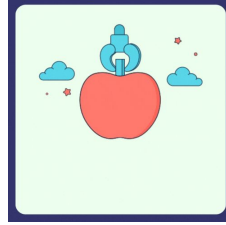
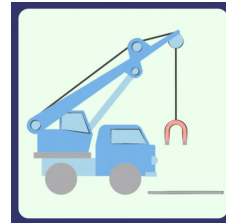
Conduct an investigation to demonstrate magnetic forces on objects.

Contact Force



If a FORCE makes an object by touching it THEN it is a CONTACT FORCE

Non-Contact Force



If a FORCE makes an object move without touching it THEN it is a NON-CONTACT FORCE

Organizing Idea	Energy: Understandings of the physical world are deepened by investigating matter and energy.
Guiding Question	How can forces affect objects from a distance?
Learning Outcome	Students investigate how forces can act on objects without contact.

Skills & Procedures

Describe how non-contact forces affect objects.

Demonstrate the effect of gravity on an object.

Conduct an investigation to demonstrate magnetic forces on objects.

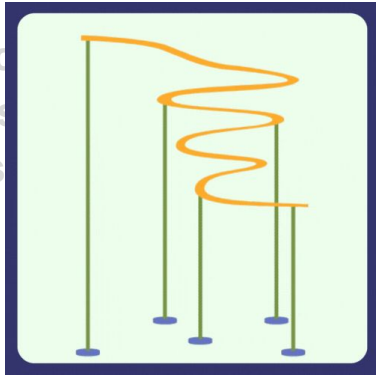


Organizing Idea	Energy: Understandings of the physical world are deepened by investigating matter and energy.
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Skills & Procedures

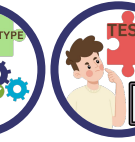
Describe how non-contact forces affect objects.

Demonstrate the effect of gravity on an object.



Conduct an investigation that demonstrates how forces affect objects.

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



Plan and create an artifact to meet a need.

SKILLS & PROCEDURES

Examine availability and cost of materials during design.

SKILLS & PROCEDURES

Provide feedback to others during the design process.

SKILLS & PROCEDURES

Test an artifact to confirm that it meets intended needs.

SKILLS & PROCEDURES

Marble Run Design Challenge

marblerun.at

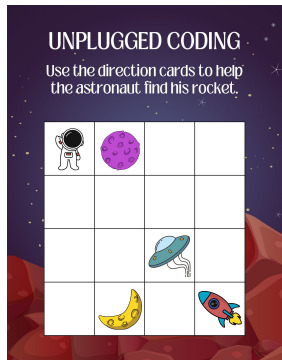
Organizing Idea	Energy: Understandings of the physical world are deepened by investigating matter and energy.
Guiding Question	How can forces affect objects from a distance?
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Skills & Procedures

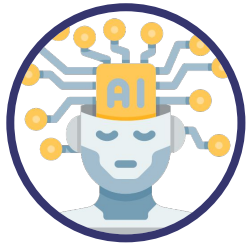
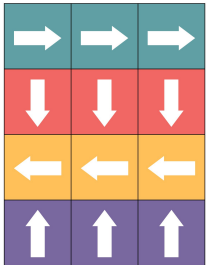
Describe how non-contact forces affect objects.

Demonstrate the effect of gravity on an object.

Conduct an investigation to demonstrate magnetic forces on objects.



DIRECTION CARDS



Collaborate to design an algorithm to solve a problem.

SKILLS & PROCEDURES

Icons: a checkmark, a target with an arrow, and a gear.

Science Sparks: Car Track Magnet Game



Organizing Idea	Energy: Understandings of the physical world are deepened by investigating matter and energy.
Guiding Question	How can forces affect objects from a distance?
Learning Outcome	Students investigate how forces can act on objects without contact.

Skills & Procedures

Describe how non-contact forces affect objects.

Demonstrate the effect of gravity on an object.

Conduct an investigation to demonstrate magnetic forces on objects.



Science Sparks: How to Defy Gravity Magnet Trick



Plan and create an artifact to meet a need.

SKILLS & PROCEDURES

Examine availability and cost of materials during design.

SKILLS & PROCEDURES

Organizing Idea	Energy: Understandings of the physical world are deepened by investigating matter and energy.
Guiding Question	How can forces affect objects from a distance?
Learning Outcome	Students investigate how forces can act on objects without contact.


Skills & Procedures

Analyze interactions between the magnetic poles of magnets.


Magnetize a material using a magnet.



Collaborate to design an algorithm to solve a problem.



SKILLS & PROCEDURES



**IF the poles are the same
THEN they push.**

**IF the poles are opposite
THEN they pull.**



Work with a partner to come up with a set of instructions for how to magnetize an object.

