Perimeter

v2.0

STEM Fundamentals: Applied Mathematics | Teacher Lesson Plan

Overview:

In this lesson, students will learn how to determine the perimeters (inside and outside dimensions) of square, rectangular, and circular three-dimensional objects. Then, students will work in teams to build a custom structure and determine its perimeters.

Click here **to explore the entire Kid Spark Curriculum Library.**

Activity Time:
60 Minutes

Targeted Grade Level:
3 - 5

Student Grouping:
Teams of 2

Additional Lesson Materials:
- Curriculum Packet
- Student Engineering Workbook

Kid Spark Mobile STEM Lab:
Young Engineers **OR**
Engineering Pathways

Note: *Two teams can share the engineering materials from one Kid Spark Mobile STEM Lab.*

Learning Objectives & NGSS Alignment:

- Define perimeter.
- Determine the outer and inner perimeters of square, rectangular, and circular three-dimensional objects.
- Build a custom structure and then determine its perimeters.

Scientific/Engineering Practice - Using mathematics
Crosscutting Concept - Scale, proportion, and quantity

Pre-Lesson Preparation:

1. Prepare enough lesson materials for each team. (curriculum packets, student engineering workbooks)
2. Using Kid Spark engineering materials, assemble a square, rectangle, and circle. *Curriculum Packet - Page 1*
3. Make sure to review how to determine the outer and inner perimeters of a square, rectangle, and circle. *Curriculum Packet - Pages 2 - 3*
4. Prepare an example solution for the design and engineering challenge. *Curriculum Packet - Page 4*

Convergent Learning Activity:

1. Introduce students to the concept of perimeter. *Note: Students should fill out lesson information in their Student Engineering Workbooks as they work through the lesson.*

   Perimeter is the distance or length around a shape or object. Use your finger to trace the perimeter of a few objects in the room (desk, book, door). Explain how an object can have an outer perimeter as well as an inner perimeter. Hold up the square, rectangle, or circle that you built prior to the lesson and trace the outer and inner perimeters of the object. *Curriculum Packet - Page 1*

   Perimeter can be measured in any type of unit such as centimeters or inches. For this lesson, we will be using metric units of measurement (centimeters) to determine the perimeters of a square, rectangle, and circle.

   Note: Make sure to review how Kid Spark engineering materials can be used to determine metric units of measurement (1 block represents 2 cm). *Curriculum Packet – Page 6*

2. Instruct each team to assemble a square, rectangle, and circle using the engineering materials in the lab. *Curriculum Packet – Page 1*

3. Work with students to determine the outer and inner perimeters of the square, rectangle, and circle. *Curriculum Packet – Pages 2 - 3*

   Note: Work with students to determine the outer perimeter of each object, then challenge teams to determine the inner perimeter of each object and record their answers in the Student Engineering Workbook.

Divergent Learning Activity:

1. Review the Design & Engineering Challenge with teams. *Curriculum Packet - Page 4*

2. *Instruct teams to use the Kid Spark Design & Engineering Process to develop a solution to the challenge. Curriculum Packet - Page 4, Student Engineering Workbook - Page 2*

   Challenge tips & information :

   - *Two teams will share the engineering materials from one Kid Spark Mobile STEM Lab.*
   - *House floor plans should only be a single layer in height.*
   - *Consider asking students to sketch out their designs on paper before trying to build them.*
   - *If limited on time, consider modifying the challenge specifications/criteria. (Example: Students are only required to determine the outer perimeter of the house floor plan.)*
   - *Set a time limit on how long students have to complete their design.*
   - *In some instances, you may want to limit the number of engineering materials students have access to out of the Mobile STEM Lab. (Example: Instruct students to pull out X number of engineering materials before the start of the lesson.)*

Lesson Closure:

1. Project presentations - Instruct each team to share the design they created with the rest of the class. Be specific with what information you want students to share. (Example: teams are required to share how each member contributed, the overall perimeter of the house floor plan that was built, etc...)

2. Lab cleanup - After teams have finished their presentations, instruct them to disassemble their designs and pack all engineering materials back into the labs correctly. *Note: each lab should include a laminated inventory and organization guide to help students pack engineering materials back correctly.*

3. Lesson reflection - If time permits, do a quick recap/review of the lesson.

Assessment/Evaluation:

A. Student Engineering Workbook (10 Points)

B. Design & Engineering Challenge (20 Points)

Perimeter

v2.0

STEM Fundamentals: Applied Mathematics | Student Engineering Workbook

Team Members:

1. _____ 2. _____

Total Points	
Workbook:	..... /10 pts
Challenge:	..... /20 pts

What is Perimeter?

Fill in the blanks in the statement below.

1. ___Perimeter___ is the distance or length around a shape or object. An object can have an ___Outer___ perimeter as well as an ___Inner___ perimeter.

Assemble a Square, Rectangle, and Circle

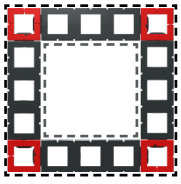
Place a check in each box as each step is completed.

2. [X] Assemble a **square** using Kid Spark engineering materials.
3. [X] Assemble a **rectangle** using Kid Spark engineering materials.
4. [X] Assemble a **circle** using Kid Spark engineering materials.

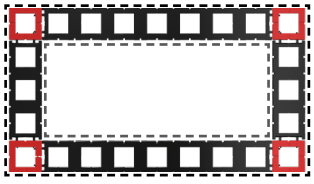
Determine the Outer and Inner Perimeters of a Square, Rectangle, and Circle

Fill out the correct information in the spaces provided.

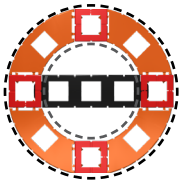
5. **Outer** perimeter of **square**: ___40___ cm
6. **Inner** perimeter of **square**: ___24___ cm
7. **Outer** perimeter of **rectangle**: ___56___ cm
8. **Inner** perimeter of **rectangle**: ___40___ cm
9. **Outer** perimeter of **circle**: ___31.4___ cm
10. **Inner** perimeter of **circle**: ___18.8___ cm



Square



Rectangle



Circle

Design & Engineering Challenge

Follow each step in the design & engineering process to develop a solution to the challenge.
Place a check in each box as each step is completed. Fill in the blanks when necessary.

1. Identify The Challenge

   [X] Challenge: **Design and engineer a simple, single-layer floor plan for a house.**

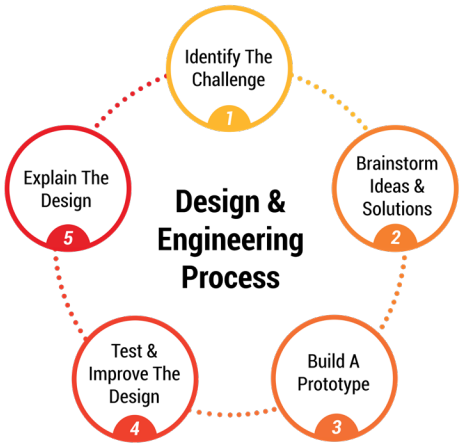
2. Brainstorm Ideas & Solutions

   [X] Discuss design ideas.

   [X] Consider building components.

   [X] Sketch out design ideas on paper.

   [X] Choose the best design.



3. Build A Prototype

   [X] Use Kid Spark engineering materials to build a prototype.

4. Test & Improve The Design

   [X] Look for opportunities to improve the design. (Is it practical, proportional, etc..)

   [X] Review challenge specifications/criteria and grading rubric.

5. Explain The Design

   [X] Determine the specifications of the design that was created (page 3).

   [X] Discuss the following items with your team and be prepared to share with the rest of the class.

   a. How did the team arrive at the final design solution? Discuss how each step in the Design & Engineering process was used to develop the design.

   b. Is the design realistic and well-proportioned? Are all the rooms the same size or proportioned appropriately as in a real house? Which rooms are usually smaller/larger in a typical house?

   c. How did each team member contribute towards the overall design? Do you feel like everyone had an equal opportunity to contribute in the creative process?

   d. Is the team prepared to share detailed specifications of the design to others?

Design Specifications

Record the inner and outer perimeters of the house in the spaces provided.

Inner Perimeters

Living	Kitchen	Laundry	Bedroom 1	Bedroom 2	Bath	Total Outer Perimeter
Total cm	Total cm	Total cm	Total cm	Total cm	Total cm	Total cm

Challenge Evaluation

When teams have completed the design & engineering challenge, it should be presented to the teacher and classmates for evaluation. Teams will be graded on the following criteria:

- **Specifications:** Does the design meet all specifications as stated in the design brief?
- **Team Collaboration:** How well did the team work together? Can each student describe how they contributed?
- **Design Quality/Aesthetics:** Is the design of high quality? Is it structurally strong, attractive, and well proportioned?
- **Presentation:** How well did the team communicate all aspects of the design to others?

Grading Rubric	Advanced 5 Points	Proficient 4 Points	Partially Proficient 3 Points	Not Proficient 0 Points
Specifications	☐ Meets all specifications	☐ Meets most specifications	☐ Meets some specifications	☐ Does not meet specifications
Team Collaboration	☐ Every member of team contributed	☐ Most members of team contributed	☐ Some members of team contributed	☐ Team did not work together
Design Quality/ Aesthetics	☐ Great design/ aesthetics	☐ Good design/ aesthetics	☐ Average design/ aesthetics	☐ Poor design/ aesthetics
Presentation	☐ Great presentation/ well explained	☐ Good presentation/ well explained	☐ Poor presentation/ explanation	☐ No presentation/ explanation
Points	Column Total	Column Total	Column Total	Column Total
Total Points				Total Points /20