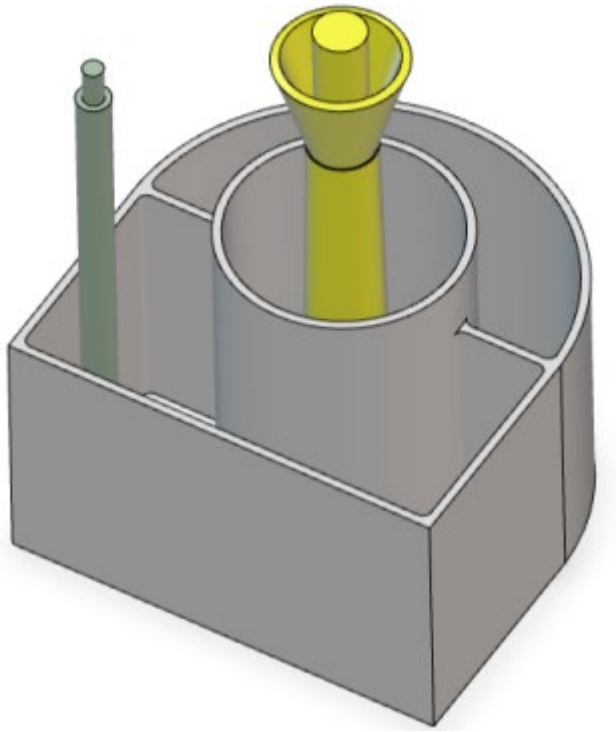
DESIGN PROJECTS



PEN HOLDER

GRADE LEVEL

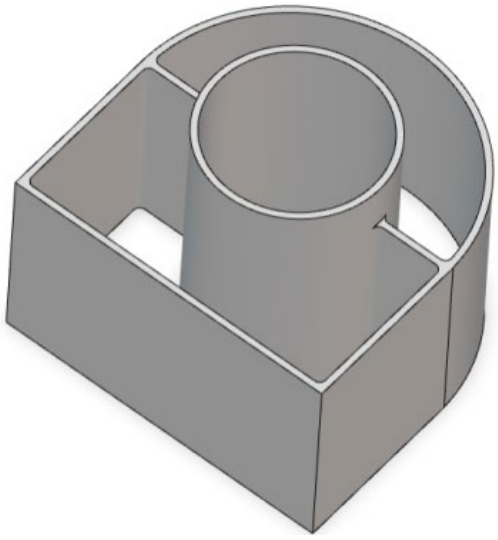
Grades 6–8

MODELING TIME

1-2 hours

MATERIALS

- CAD software (SOLIDWORKS Design)
- 3D printer with filament (e.g., PLA) for fabrication.
- Pens, markers, and pencils for testing.



DESIGN OBJECTIVES

- The model supports the storage of your pens, pencils, and markers.
- Model is 3D Print ready.

EDUCATIONAL CONCEPTS

MATHEMATICS

- Adding geometric relations between circles and rectangles.
- Using a common thickness.

ENGINEERING PRINCIPLES

- Understanding material properties

TECHNOLOGY

- Using CAD software to model components.
- 3D printing techniques.

CREATIVITY AND PROBLEM-SOLVING

- Designing a desktop storage unit for all of your writing utensils.

DESCRIPTION

Every desktop needs a holder for pens, pencils, and markers.
This example uses a sketch to create thin features, of different heights, to model the holder.
Students are also encouraged to be creative. For example, they may change the size or height of the holder.

LESSON TOPICS

Phase 1: Brainstorming and Planning

- Think about the end goal: Storage for pens and pencils.
- How high should the walls be?
- How many pens and pencils do you need to store?

Phase 2: CAD Modeling

- **Sketching and Features**
  - Create thin extrusions, from the same sketch, to create a thin-walled model.
  - Round off and strengthen corners with fillets.

Phase 3: Prototyping

- **3D Printing:** Print the piece, ensuring dimensional accuracy.
- **Testing:** Add your pens and pencils to the pen holder.
- **Iteration:** Modify CAD designs based on testing feedback and remake as needed.

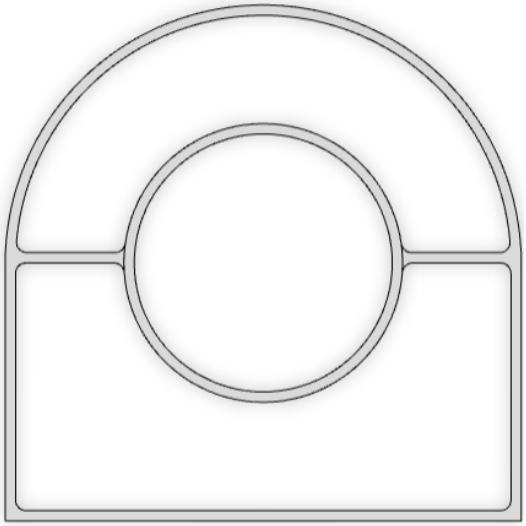
Phase 4: Final Assembly and Presentation

- Present the finished pen holder to the class, including the design process and challenges faced.

DISCUSSION STARTERS

- How can I make the pen holder smaller, or larger?
- What are implications of a thickness change?

OPTIONAL CHALLENGES



Additions:

- Increase or decrease the size of the pen holder.
- Close the bottom of your pen holder.
- Add additional rings or dividers.

Design Twist:

- Use an open bottom to save material.

ADVANCED OPTIONS

Modified design:

- Use your own pen holder shape.
- Create a personalized pen holder.
- Include a cell phone holder in the design.

ASSESSMENT CRITERIA

- Do the components fit within the parameters of the 3D printer, and print properly?
- Can you store pens and pencils in the pen holder?
- Are the pen holder pen walls thick enough or high enough?

ADDITIONAL RESOURCES

- LINK TO DOCUMENTS
- LINK TO YOUTUBE VIDEO
- LINK TO STEP-BY-STEP

PEN HOLDER IDEAS

