

For this project, you are going to choose a real-world object and then use OnShape to create a precise virtual model of it.

Every object around you – tools, toys, appliances, furnishings – was designed by someone. For this final project, you will reverse engineer a design by carefully studying a real-world object and recreating it as an accurate 3-D model.

Your challenge is to choose an object with more than one part or component and to **measure, analyze, and recreate** the object so precisely that someone could use your digital files to reproduce it.

Steps in the project

1. **Choose a real, physical object** that you can safely bring to class and store at school. It should be interesting enough to require multiple CAD tools. The object should not be soft in a way that would yield inconsistent measurements (i.e., a stuffed animal). Have it approved by your teacher as a feasible choice.
2. **Analyze the object:**
 - What are its constituent parts? How do they fit together? What materials are they made of?
 - What are the ways the parts interact and what measurements do they have in common?
 - In what ways are each part, or regions of each part, reproducible using the CAD tools that you have learned?
 - Does the part or region have symmetry? Repeating elements?
 - Extrusion (or sweep): Are there congruent or scaled (similar) cross-sections in a direction?
 - Revolution: Are there circular cross-sections in one direction (and also congruent cross-sections as you cut the shape radially)?
 - Loft: Can you pick key cross-sections that the shape morphs between?
3. **Measure it carefully** (in centimeters or meters), paying attention to:
 - Lengths (diameters, widths, distances between objects, etc.)
 - Angles and proportions
 - Repetitions
 - The location of key points of curves
4. Complete the **CAD Part Diagrams** orthographic drawings and variable lists for each part. Choose a scale for your diagrams that will fit the views within the grids (or work with separate graph paper).
5. **Recreate the object in Onshape** using sketches, extrusions, revolutions, fillets and chamfers, and assemblies.
6. **Explain any design decisions** that help you match your object or that differ from it.

Design Expectations

Your CAD model should:

- Show evidence of **planning and problem-solving**. Take your time.
- Match the real object's **size and proportions**.
- Use **appropriate modeling strategies**.
- Be built with **accurate, well-constrained sketches**.
- Use variables, established from the beginning, to control important within-part measurements and to match between-part measurements.
- Have part tabs and variables with informative names, be organized, and easy to understand.

The final product will be a document with:

1. A screen shot of your completed OnShape model and a link to the file.
2. Your orthographic drawings and variable lists.
3. A short design reflection answering:
 - Why you choose your object.
 - What the hardest part to model was.
 - Which OnShape tools were most important.
 - What you would improve if you had additional time.

This skateboard was completed by a 7th grader for their final CAD project.

