

Reverse Engineer a Hand Tool

Difficulty Intermediate	Time 1-2 class periods	Type Engineering Challenge
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Background

A maintenance team needs replacement documentation for a hand tool whose original drawings are unavailable. Your team must create a clear measured sketch package.

Engineering Problem

Produce accurate multiview and isometric documentation for an approved hand tool.

Learning Objectives

- Measure real objects accurately
- Create multiview and isometric sketches
- Apply dimensioning conventions
- Estimate functional tolerances

Materials

- Approved hand tool
- Ruler and calipers
- Graph and isometric paper
- Engineering notebook

Procedure

1. Select an approved tool such as an Allen wrench, screwdriver, small wrench, or pliers.
2. Identify the primary functional features and measurement datums.
3. Measure overall dimensions, thicknesses, diameters, and feature locations.
4. Create front, top, and right-side orthographic views aligned correctly.
5. Add dimensions without duplication.
6. Create an isometric sketch using the same measurements.
7. Identify two dimensions that require tighter tolerance and explain why.
8. Have a peer use only your drawings to identify the tool and verify three dimensions.

Engineering Requirements

- Include three aligned orthographic views
- Include one isometric view
- Show at least eight dimensions with units
- Avoid duplicate or missing critical dimensions
- Identify two tolerance recommendations

Constraints & Safety

- Do not measure moving or sharp surfaces unsafely

- All drawings must be created by hand
- Use only the approved measuring tools

Deliverables

- Measurement table
- Three-view drawing
- Isometric drawing
- Tolerance notes
- Peer verification results

Reflection Questions

1. Which view communicated the most information?
2. Which dimension was hardest to measure?
3. Where could measurement error affect function?
4. What would be needed to manufacture the tool?

Engineering Tip

Choose datums before measuring so feature locations are referenced consistently.

Common Mistake

Dimensioning every visible line creates clutter. Dimension the features needed to define the part.

Stretch Goal

Create a sectional or detail view of the most complex feature.

Career Connection

Drafters, CAD technicians, and mechanical engineers create drawings that allow products to be manufactured and inspected.