

Reverse Engineer a Tape Measure Hook

Difficulty Intermediate	Time 2 class periods	Type Engineering Challenge
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Background

A maintenance department needs a replacement tape hook, but the supplier no longer provides the part file.

Engineering Problem

Measure and model a tape measure hook as a fully constrained, parametric CAD part.

Learning Objectives

- Use calipers to collect part dimensions
- Create fully constrained sketches
- Build a parametric model
- Compare CAD geometry to a physical part

Materials

- Tape measure hook or similar flat metal part
- Calipers
- Fusion 360
- Engineering notebook
- Optional flatbed photo with scale

Procedure

1. Identify the part's datums and create a measurement plan.
2. Measure overall length, width, thickness, holes, slots, bends, and feature spacing.
3. Create a parameter table before sketching.
4. Build the base profile with geometric and dimensional constraints.
5. Add holes, slots, fillets, and bends or approximations in a logical feature order.
6. Verify that every sketch is fully constrained.
7. Create a technical drawing with the dimensions needed for inspection.
8. Compare at least five CAD measurements with the physical part and calculate error.

Engineering Requirements

- Fully constrained sketches
- All critical dimensions driven by parameters
- Five comparison measurements within +/-0.5 mm
- Realistic fillets and feature order
- Complete drawing and STL export

Constraints & Safety

- Do not disassemble a tape measure spring mechanism

- Model only the approved hook component
- Use metric units
- Complete within two class periods

Deliverables

- Measurement plan and table
- Fusion 360 file
- Parameter list
- Technical drawing PDF
- STL file
- CAD-to-part error table

Reflection Questions

1. Which measurement controlled the most geometry?
2. Where was the largest error?
3. How did constraints make revision easier?
4. What manufacturing process likely created the original part?

Engineering Tip

Photographing the part next to a ruler can help verify overall proportions, but use calipers for final dimensions.

Common Mistake

Do not trace a photo and assume it is accurate; camera perspective can distort geometry.

Stretch Goal

Redesign the hook for easier grip while preserving all connection dimensions.

Career Connection

Reverse-engineering and sustaining engineers recreate legacy parts when drawings or suppliers are unavailable.