

## Introduction to Engineering Design

# Unit 2: CAD Modeling, Parametric Design & 3D Printing

Student learning deck • LockwoodSTEM aerospace-aligned IED curriculum

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### Skills

Fusion setup, sketches, constraints, features, parametric edits, and slicer prep.

### Evidence

CAD screenshots, exported files, slicer settings, test prints, and revision notes.

### Challenge

Design and justify a 3D printed tolerance tester for rocket assembly.

# Unit 2 Learning Arc

CAD turns documented ideas into accurate, editable, printable models.

## Start with evidence

Use sketches and measurements as inputs.

## Build controlled models

Use planes, constraints, dimensions, and features.

## Prepare for printing

Check the CAD model and slicer setup.

## Use the print as data

Test fit and recommend clearances for Unit 3.



## Unit 2 Deliverables Map

Track these artifacts as the unit develops.

### CAD evidence

- Fusion project setup
- Constrained and dimensioned sketches
- Extrudes, cuts, fillets, revolves, and patterns
- Screenshots showing revisions

### Print evidence

- STL/exported files
- Slicer preview and settings
- Tolerance tester print
- Fit test recommendation

***Your deliverables should prove how your design decisions were made.***

# Unit 2 Project: Tolerance Tester

Your final print is a test tool, not just a decoration.



## Purpose

Measure and compare fit between printed features and rocket assembly parts.

## Evidence

Use repeated holes, pegs, slots, or couplers to identify reliable clearances.

## Recommendation

Use test results to recommend a clearance for Unit 3 rocket assembly.

**Lesson 2.1****From Engineering Documentation to CAD**

**How do engineers turn sketches and measurements into digital models?**

**Lesson 2.1**

From Engineering Documentation to CAD

*Connect today's work to your Unit 2 CAD and 3D printing evidence.*



# From Engineering Documentation to CAD

Big ideas you should understand before you start the work

## Big Ideas

- 1 CAD models should be based on documented measurements, not guesses.
- 2 Unit 1 sketches become a modeling plan.
- 3 Good planning prevents wrong-size digital parts.



***Ask yourself: How does this CAD decision improve accuracy, editability, or printability?***

## From Engineering Documentation to CAD

Use the lesson skill to make a more accurate, editable, or printable model.

### Modeling moves

Use your sketch as the source, not your memory.

Identify which dimensions control the shape.

Name files so they can be found later.

### Quality checks

Does the model match the intended measurements?

Can another student understand the feature?

Will the part be printable or testable?

***Good CAD work is controlled enough to revise and clear enough to explain.***

## From Engineering Documentation to CAD

Save the strongest artifact from today for your Unit 2 portfolio.

### Deliverable checklist

Notebook entry connects sketch evidence to a planned CAD model.

CAD file or screenshot is saved with a clear name.

Model decisions are explained with measurements.

### Portfolio evidence

Dated notebook entry

Screenshot or exported file

Short claim explaining what the evidence proves

***Your final portfolio should show how the model improved across the unit.***

**Lesson 2.2****Fusion 360 Interface and File Setup**

**How do engineers set up a CAD workspace so work is organized and accurate?**

**Lesson 2.2**

Fusion 360 Interface and File Setup

*Connect today's work to your Unit 2 CAD and 3D printing evidence.*

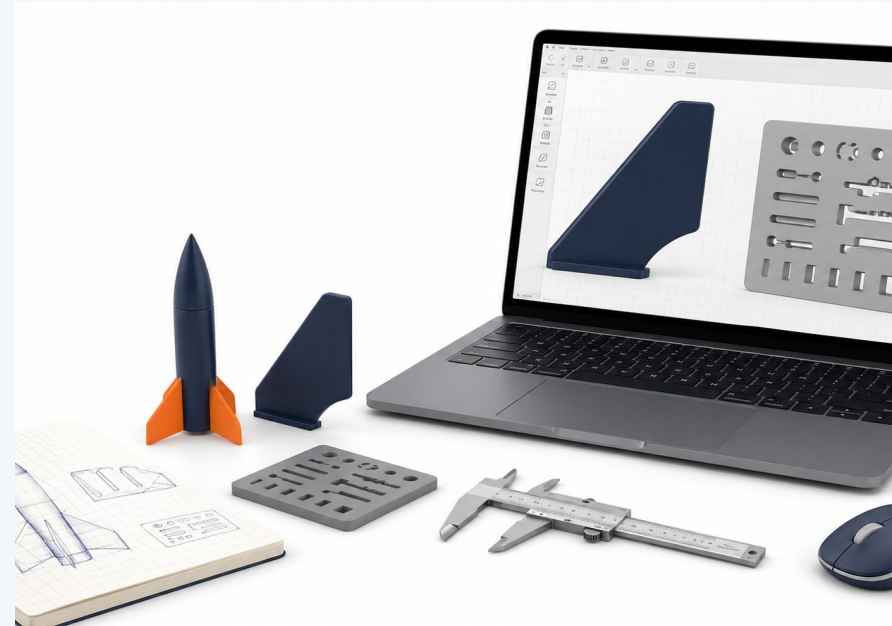


## Fusion 360 Interface and File Setup

Big ideas you should understand before you start the work

### Big Ideas

- 1 The interface is a tool system: browser, timeline, sketch tools, view cube, and units.
- 2 File setup affects every model made afterward.
- 3 A clean project folder prevents lost or duplicated work.



***Ask yourself: How does this CAD decision improve accuracy, editability, or printability?***

## Fusion 360 Interface and File Setup

Use the lesson skill to make a more accurate, editable, or printable model.

### Modeling moves

Create/open the correct project location.  
Set units before modeling.  
Save early with a professional file name.

### Quality checks

Does the model match the intended measurements?  
Can another student understand the feature?  
Will the part be printable or testable?

***Good CAD work is controlled enough to revise and clear enough to explain.***

## Fusion 360 Interface and File Setup

Save the strongest artifact from today for your Unit 2 portfolio.

### Deliverable checklist

- Fusion project is created or located.
- Test file is saved correctly.
- Student can identify key interface areas.

### Portfolio evidence

- Dated notebook entry
- Screenshot or exported file
- Short claim explaining what the evidence proves

***Your final portfolio should show how the model improved across the unit.***

Lesson 2.3

# Sketch Planes and 2D Sketching





## Why does every CAD model start with a carefully planned 2D sketch?

Lesson 2.3

### Sketch Planes and 2D Sketching

Connect today's work to your Unit 2 CAD and 3D printing evidence.

Different tools for different jobs. Choose the right tool for accuracy and efficiency.

1. RULER	2. TAPE MEASURE	3. CALIPER	4. MICROMETER
			
<p><b>Best for short, straight measurements.</b> Great for quick checks and measuring lengths of small objects.</p>	<p><b>Best for larger objects and layouts.</b> Ideal for measuring long distances, rooms, and overall layouts.</p>	<p><b>Best for precise outside, inside, and depth measurements.</b> Measures external width, internal diameter, and depths with high accuracy.</p>	<p><b>Best for very precise thickness or diameter measurements.</b> Used for the smallest dimensions where the highest accuracy is needed.</p>
<p><b>PRECISION COMPARISON (Relative)</b></p> <p>RULER (Least Precise) &gt; TAPE MEASURE (More Precise) &lt; CALIPER (Very Precise) &lt; MICROMETER (Most Precise)</p> <p>★☆☆☆ &gt; ★★★★★ &lt; ★★★★★★ &lt; ★★★★★★</p>			



## Sketch Planes and 2D Sketching

Use the lesson skill to make a more accurate, editable, or printable model.

### Modeling moves

Choose a plane that matches the intended view.  
Start with simple geometry before details.  
Keep sketches readable and organized.

### Quality checks

Does the model match the intended measurements?  
Can another student understand the feature?  
Will the part be printable or testable?

***Good CAD work is controlled enough to revise and clear enough to explain.***

## Sketch Planes and 2D Sketching

Save the strongest artifact from today for your Unit 2 portfolio.

### Deliverable checklist

- Sketch plane is selected intentionally.
- Base sketch is visible and understandable.
- Student explains why the plane was chosen.

### Portfolio evidence

- Dated notebook entry
- Screenshot or exported file
- Short claim explaining what the evidence proves

***Your final portfolio should show how the model improved across the unit.***

## Lesson 2.4

## Sketch Constraints

**How do engineers control how a CAD sketch behaves when dimensions change?**

## Lesson 2.4

## Sketch Constraints

*Connect today's work to your Unit 2 CAD and 3D printing evidence.*

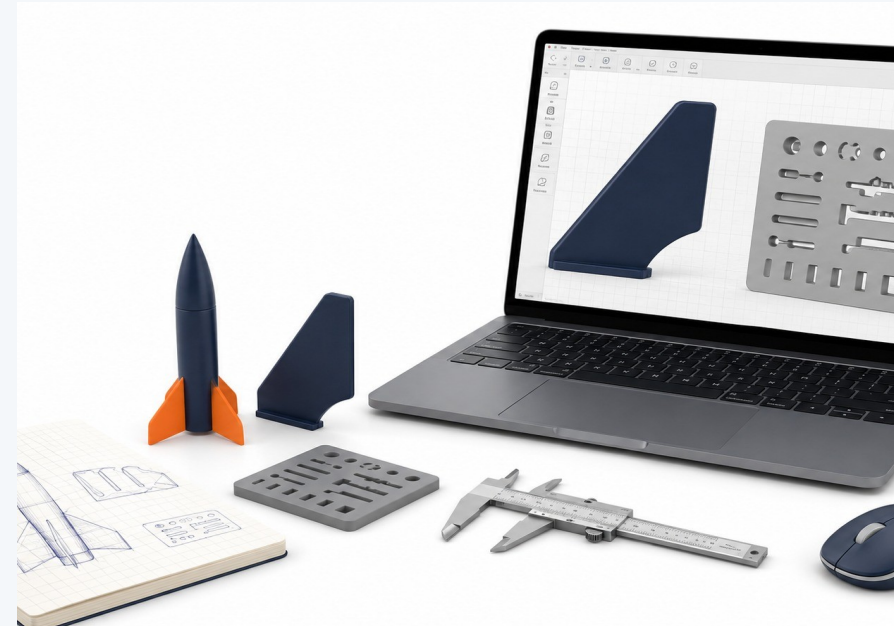


## Sketch Constraints

Big ideas you should understand before you start the work

### Big Ideas

- 1 Constraints describe relationships between sketch entities.
- 2 A fully defined sketch behaves predictably.
- 3 Uncontrolled sketches can shift unexpectedly.



***Ask yourself: How does this CAD decision improve accuracy, editability, or printability?***

## Sketch Constraints

Use the lesson skill to make a more accurate, editable, or printable model.

### Modeling moves

Apply horizontal, vertical, parallel, perpendicular, tangent, and coincident constraints.

Watch how constraints change degrees of freedom.

Test the sketch by changing a dimension.

### Quality checks

Does the model match the intended measurements?

Can another student understand the feature?

Will the part be printable or testable?

***Good CAD work is controlled enough to revise and clear enough to explain.***

## Sketch Constraints

Save the strongest artifact from today for your Unit 2 portfolio.

### Deliverable checklist

Constrained sketch is saved.  
At least three constraint types are identified.  
Student explains why constraints improve model quality.

### Portfolio evidence

Dated notebook entry  
Screenshot or exported file  
Short claim explaining what the evidence proves

***Your final portfolio should show how the model improved across the unit.***

## Sketch Constraints

Optional video resource to reinforce the lesson ideas.

### What to watch for

Fusion 360: Sketch Constraints  
how constraints control sketch behavior  
why fully defined sketches are more predictable  
what happens when a dimension changes

### Scan or open



[Open Video](#)

[https://www.youtube.com/watch?v=J\\_2If5zVp84](https://www.youtube.com/watch?v=J_2If5zVp84)

Lesson 2.5





# Dimensioned CAD Sketches

## How do dimensions turn a rough CAD sketch into an accurate engineering model?

**Lesson 2.5**  
Dimensioned CAD Sketches

*Connect today's work to your Unit 2 CAD and 3D printing evidence.*

*Different tools for different jobs. Choose the right tool for accuracy and efficiency.*


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# Dimensioned CAD Sketches


Big ideas you should understand before you start the work

## Big Ideas


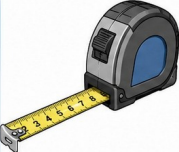
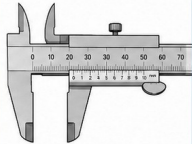

- 1 Dimensions convert rough geometry into measurable engineering intent.
- 2 Key dimensions should come from sketches, requirements, or measured objects.
- 3 Over-dimensioning can make sketches hard to edit.







### Measurement Tools Overview



*Different tools for different jobs. Choose the right tool for accuracy and efficiency.*

1. RULER	2. TAPE MEASURE	3. CALIPER	4. MICROMETER
			
<p><b>Best for short, straight measurements.</b> Great for quick checks and measuring lengths of small objects.</p>	<p><b>Best for larger objects and layouts.</b> Ideal for measuring long distances, rooms, and overall layouts.</p>	<p><b>Best for precise outside, inside, and depth measurements.</b> Measures external width, internal diameter, and depths with high accuracy.</p>	<p><b>Best for very precise thickness or diameter measurements.</b> Used for the smallest dimensions where the highest accuracy is needed.</p>

**PRECISION COMPARISON (Relative)**

 <p><b>RULER</b> Least Precise ★☆☆☆☆</p>	>	 <p><b>TAPE MEASURE</b> More Precise ★★★★☆</p>	<	 <p><b>CALIPER</b> Very Precise ★★★★★</p>	<	 <p><b>MICROMETER</b> Most Precise ★★★★★</p>	
LEAST PRECISE		→				MOST PRECISE	

**TIP:** Use the simplest tool that provides the accuracy you need. The right tool saves time and improves results.

**Ask yourself: How does this CAD decision improve accuracy, editability, or printability?**

## Dimensioned CAD Sketches

Use the lesson skill to make a more accurate, editable, or printable model.

### Modeling moves

Add dimensions to control size and spacing.

Use consistent units.

Revise dimensions when the design intent changes.

### Quality checks

Does the model match the intended measurements?

Can another student understand the feature?

Will the part be printable or testable?

***Good CAD work is controlled enough to revise and clear enough to explain.***

## Dimensioned CAD Sketches

Save the strongest artifact from today for your Unit 2 portfolio.

### Deliverable checklist

- Sketch includes necessary dimensions.
- Dimensions match documentation or requirements.
- Student can identify controlling dimensions.

### Portfolio evidence

- Dated notebook entry
- Screenshot or exported file
- Short claim explaining what the evidence proves

***Your final portfolio should show how the model improved across the unit.***

Lesson 2.6

## Extrude Basics

# How does a 2D sketch become a 3D CAD model?

Lesson 2.6

## Extrude Basics

*Connect today's work to your Unit 2 CAD and 3D printing evidence.*



## Extrude Basics

Big ideas you should understand before you start the work

### Big Ideas

- 1 Extrude adds depth to a closed profile.
- 2 Extrude distance controls thickness, length, or height.
- 3 Extrude direction matters for assembly and print planning.



***Ask yourself: How does this CAD decision improve accuracy, editability, or printability?***

## Extrude Basics

Use the lesson skill to make a more accurate, editable, or printable model.

### Modeling moves

Select a closed profile.

Choose join, new body, or cut intentionally.

Check the 3D view after the feature is created.

### Quality checks

Does the model match the intended measurements?

Can another student understand the feature?

Will the part be printable or testable?

***Good CAD work is controlled enough to revise and clear enough to explain.***

## Extrude Basics

Save the strongest artifact from today for your Unit 2 portfolio.

### Deliverable checklist

- Basic extruded part is complete.
- Feature is named or easy to identify.
- Student can explain sketch-to-solid workflow.

### Portfolio evidence

- Dated notebook entry
- Screenshot or exported file
- Short claim explaining what the evidence proves

***Your final portfolio should show how the model improved across the unit.***

## Lesson 2.7

## Cut Features and Holes

**How do engineers remove material from a CAD model to create functional features?**

## Lesson 2.7

## Cut Features and Holes

*Connect today's work to your Unit 2 CAD and 3D printing evidence.*



## Cut Features and Holes

Big ideas you should understand before you start the work

### Big Ideas

- 1 Cuts create holes, slots, pockets, and clearance features.
- 2 Functional openings must be placed and dimensioned accurately.
- 3 Cut direction and depth affect whether the feature works.



***Ask yourself: How does this CAD decision improve accuracy, editability, or printability?***

## Cut Features and Holes

Use the lesson skill to make a more accurate, editable, or printable model.

### Modeling moves

Sketch the removal area on the correct face.

Use cut distance or through-all when appropriate.

Inspect the model from multiple views.

### Quality checks

Does the model match the intended measurements?

Can another student understand the feature?

Will the part be printable or testable?

***Good CAD work is controlled enough to revise and clear enough to explain.***

## Cut Features and Holes

Save the strongest artifact from today for your Unit 2 portfolio.

### Deliverable checklist

Part includes at least one accurate cut feature.  
Holes or slots are dimensioned.  
Student checks that the feature goes where intended.

### Portfolio evidence

Dated notebook entry  
Screenshot or exported file  
Short claim explaining what the evidence proves

***Your final portfolio should show how the model improved across the unit.***

**Lesson 2.8****Fillets, Chamfers, and Design Intent**

**Why do engineers modify sharp edges in a CAD model?**

**Lesson 2.8**

Fillets, Chamfers, and Design Intent

*Connect today's work to your Unit 2 CAD and 3D printing evidence.*



# Fillets, Chamfers, and Design Intent

Big ideas you should understand before you start the work

## Big Ideas

- 1 Fillets and chamfers can improve safety, strength, fit, and printability.
- 2 Edge treatment should support the function, not just appearance.
- 3 Design intent explains why a feature exists.



***Ask yourself: How does this CAD decision improve accuracy, editability, or printability?***

## Fillets, Chamfers, and Design Intent

Use the lesson skill to make a more accurate, editable, or printable model.

### Modeling moves

Identify edges that need treatment.  
Apply fillets or chamfers with reasonable sizes.  
Avoid changing critical fit surfaces without a reason.

### Quality checks

Does the model match the intended measurements?  
Can another student understand the feature?  
Will the part be printable or testable?

***Good CAD work is controlled enough to revise and clear enough to explain.***

## Fillets, Chamfers, and Design Intent

Save the strongest artifact from today for your Unit 2 portfolio.

### Deliverable checklist

Part includes intentional edge treatment.  
Student explains why each treatment was added.  
Critical dimensions are still protected.

### Portfolio evidence

Dated notebook entry  
Screenshot or exported file  
Short claim explaining what the evidence proves

***Your final portfolio should show how the model improved across the unit.***

**Lesson 2.9****Revolve Features: Nose Cone and Nozzle**

**How can engineers create round 3D parts from a 2D sketch?**

**Lesson 2.9**

Revolve Features: Nose Cone and Nozzle

*Connect today's work to your Unit 2 CAD and 3D printing evidence.*

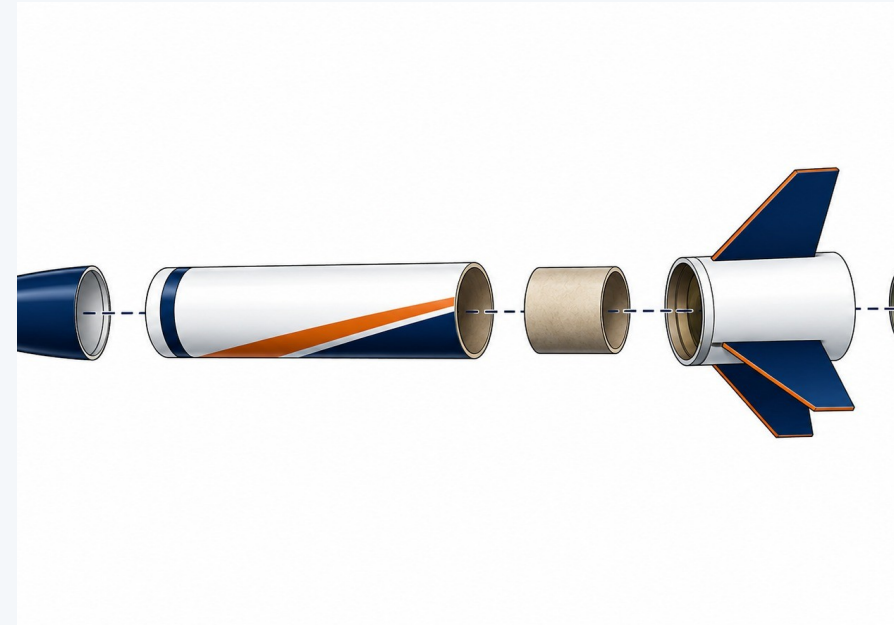


## Revolve Features: Nose Cone and Nozzle

Big ideas you should understand before you start the work

### Big Ideas

- 1 Revolve creates circular parts from a profile and axis.
- 2 Profiles must be planned around the centerline.
- 3 Nose cones and nozzles are natural revolve examples.



***Ask yourself: How does this CAD decision improve accuracy, editability, or printability?***

## Revolve Features: Nose Cone and Nozzle

Use the lesson skill to make a more accurate, editable, or printable model.

### Modeling moves

Sketch half of the profile.

Add a centerline or axis.

Use revolve angle to create the 3D body.

### Quality checks

Does the model match the intended measurements?

Can another student understand the feature?

Will the part be printable or testable?

***Good CAD work is controlled enough to revise and clear enough to explain.***

## Revolve Features: Nose Cone and Nozzle

Save the strongest artifact from today for your Unit 2 portfolio.

### Deliverable checklist

Revolved part is complete.

Axis and profile are visible or explainable.

Student connects the feature to a rocket component.

### Portfolio evidence

Dated notebook entry

Screenshot or exported file

Short claim explaining what the evidence proves

***Your final portfolio should show how the model improved across the unit.***

## Revolve Features: Nose Cone and Nozzle

Optional video resource to reinforce the lesson ideas.

### What to watch for

Using the REVOLVE TOOL in Autodesk Fusion 360

how a 2D profile turns into a round part where the revolve axis is selected

why nose cones and nozzles are good revolve examples

### Scan or open



Open Video

<https://www.youtube.com/watch?v=SY1fGI7XAz4>

## Lesson 2.10

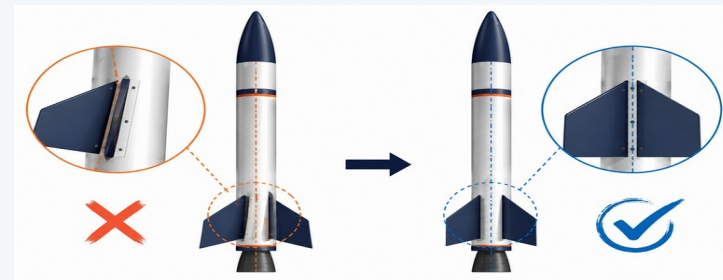
## Patterns and Symmetry: Rocket Fins

**How do engineers create repeated parts that are evenly spaced and aligned?**

## Lesson 2.10

Patterns and Symmetry: Rocket Fins

*Connect today's work to your Unit 2 CAD and 3D printing evidence.*

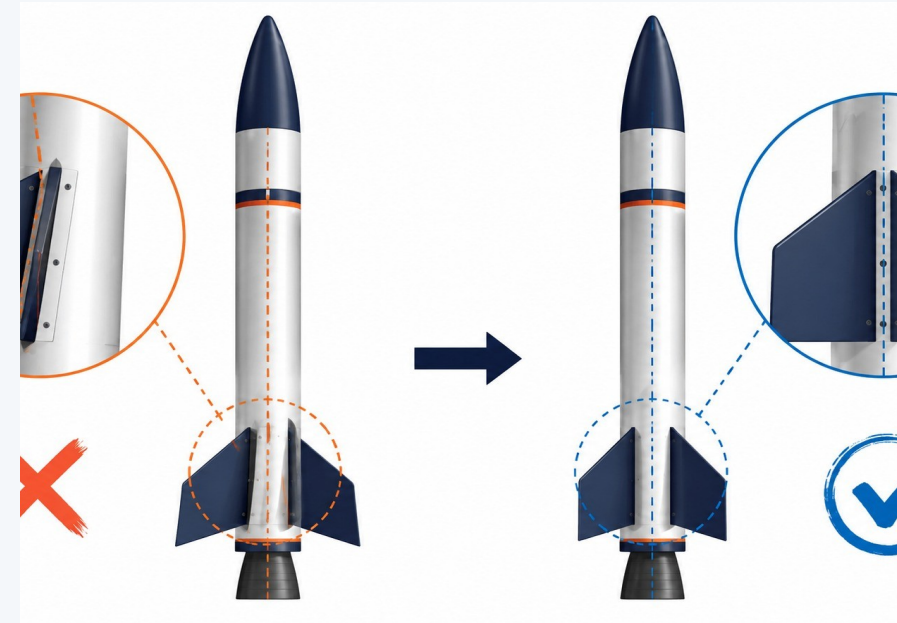


# Patterns and Symmetry: Rocket Fins

Big ideas you should understand before you start the work

## Big Ideas

- 1 Patterns create consistent repeated features.
- 2 Symmetry improves alignment and reduces modeling errors.
- 3 Rocket fins must be evenly placed for balanced design.



***Ask yourself: How does this CAD decision improve accuracy, editability, or printability?***

## Patterns and Symmetry: Rocket Fins

Use the lesson skill to make a more accurate, editable, or printable model.

### Modeling moves

Create or place one accurate fin feature first.  
Use circular pattern when spacing around a centerline.  
Check fin count, angle, and alignment.

### Quality checks

Does the model match the intended measurements?  
Can another student understand the feature?  
Will the part be printable or testable?

***Good CAD work is controlled enough to revise and clear enough to explain.***

## Patterns and Symmetry: Rocket Fins

Save the strongest artifact from today for your Unit 2 portfolio.

### Deliverable checklist

Fin pattern or symmetry model is complete.  
Student explains the pattern method used.  
Alignment is checked visually and with CAD tools.

### Portfolio evidence

Dated notebook entry  
Screenshot or exported file  
Short claim explaining what the evidence proves

***Your final portfolio should show how the model improved across the unit.***

**Lesson 2.11****Parametric Rocket Part Modeling**

**How can engineers design CAD models so they are easy to change later?**

**Lesson 2.11**

Parametric Rocket Part Modeling

*Connect today's work to your Unit 2 CAD and 3D printing evidence.*



# Parametric Rocket Part Modeling

Big ideas you should understand before you start the work

## Big Ideas

- 1 Parameters allow key values to update the model.
- 2 A parametric model is easier to revise than a fixed model.
- 3 Useful parameters connect to real design requirements.



***Ask yourself: How does this CAD decision improve accuracy, editability, or printability?***

## Parametric Rocket Part Modeling

Use the lesson skill to make a more accurate, editable, or printable model.

### Modeling moves

Identify values that may change later.

Use named dimensions or editable parameters.

Test by changing one value and observing the result.

### Quality checks

Does the model match the intended measurements?

Can another student understand the feature?

Will the part be printable or testable?

***Good CAD work is controlled enough to revise and clear enough to explain.***

## Parametric Rocket Part Modeling

Save the strongest artifact from today for your Unit 2 portfolio.

### Deliverable checklist

Model includes editable dimensions or parameters.

Student identifies which values control the design.

A quick revision test is documented.

### Portfolio evidence

Dated notebook entry

Screenshot or exported file

Short claim explaining what the evidence proves

***Your final portfolio should show how the model improved across the unit.***

**Lesson 2.12****CAD Model Check and Revision**

**How do engineers check whether a CAD model is correct before moving forward?**

**Lesson 2.12**

CAD Model Check and Revision

*Connect today's work to your Unit 2 CAD and 3D printing evidence.*



# CAD Model Check and Revision

Big ideas you should understand before you start the work

## Big Ideas

- 1 CAD review prevents printing the wrong part.
- 2 Models should be checked for size, units, features, and printability.
- 3 Revision is normal engineering work.



***Ask yourself: How does this CAD decision improve accuracy, editability, or printability?***

## CAD Model Check and Revision

Use the lesson skill to make a more accurate, editable, or printable model.

### Modeling moves

Inspect dimensions and units.

Compare the model to the design intent.

Revise the model before exporting.

### Quality checks

Does the model match the intended measurements?

Can another student understand the feature?

Will the part be printable or testable?

***Good CAD work is controlled enough to revise and clear enough to explain.***

## CAD Model Check and Revision

Save the strongest artifact from today for your Unit 2 portfolio.

### Deliverable checklist

CAD check list is complete.

At least one revision is documented.

Final screenshot shows the corrected model.

### Portfolio evidence

Dated notebook entry

Screenshot or exported file

Short claim explaining what the evidence proves

***Your final portfolio should show how the model improved across the unit.***

**Lesson 2.13****Preparing CAD Files for 3D Printing**

**How do engineers prepare a CAD model so it can be printed reliably?**

**Lesson 2.13**

Preparing CAD Files for 3D Printing

*Connect today's work to your Unit 2 CAD and 3D printing evidence.*



## Preparing CAD Files for 3D Printing

Big ideas you should understand before you start the work

### Big Ideas

- 1 A printable model must be exported correctly.
- 2 Orientation and geometry affect support, strength, and surface quality.
- 3 STL files should represent the final checked design.



***Ask yourself: How does this CAD decision improve accuracy, editability, or printability?***

## Preparing CAD Files for 3D Printing

Use the lesson skill to make a more accurate, editable, or printable model.

### Modeling moves

Inspect the model before export.

Export the correct body or component.

Use clear file naming for print submission.

### Quality checks

Does the model match the intended measurements?

Can another student understand the feature?

Will the part be printable or testable?

***Good CAD work is controlled enough to revise and clear enough to explain.***

## Preparing CAD Files for 3D Printing

Save the strongest artifact from today for your Unit 2 portfolio.

### Deliverable checklist

- STL/export file is prepared.
- Print orientation is considered.
- Student can explain why the file is ready.

### Portfolio evidence

- Dated notebook entry
- Screenshot or exported file
- Short claim explaining what the evidence proves

***Your final portfolio should show how the model improved across the unit.***

**Lesson 2.14****Slicer Basics and Print Settings**

**How do slicer settings affect print success, time, material, and accuracy?**

**Lesson 2.14**

Slicer Basics and Print Settings

*Connect today's work to your Unit 2 CAD and 3D printing evidence.*



## Slicer Basics and Print Settings

Big ideas you should understand before you start the work

### Big Ideas

- 1 A slicer converts a model into machine instructions.
- 2 Layer height, infill, walls, and supports change print performance.
- 3 Preview mode helps catch problems before printing.



***Ask yourself: How does this CAD decision improve accuracy, editability, or printability?***

## Slicer Basics and Print Settings

Use the lesson skill to make a more accurate, editable, or printable model.

### Modeling moves

Import and orient the model.

Check supports, estimated time, and material use.

Preview layers before submitting.

### Quality checks

Does the model match the intended measurements?

Can another student understand the feature?

Will the part be printable or testable?

***Good CAD work is controlled enough to revise and clear enough to explain.***

## Slicer Basics and Print Settings

Save the strongest artifact from today for your Unit 2 portfolio.

### Deliverable checklist

- Slicer screenshot is captured.
- Settings are recorded or justified.
- Student explains one trade-off in the settings.

### Portfolio evidence

- Dated notebook entry
- Screenshot or exported file
- Short claim explaining what the evidence proves

***Your final portfolio should show how the model improved across the unit.***

## Slicer Basics and Print Settings

Optional video resource to reinforce the lesson ideas.

### What to watch for

PrusaSlicer Beginner Tutorial: Learn the Basics

how a model is imported and oriented  
where print settings affect time and material  
how preview helps catch problems before printing

### Scan or open



[Open Video](https://www.youtube.com/watch?v=_kIqMPNQNSw)

[https://www.youtube.com/watch?v=\\_kIqMPNQNSw](https://www.youtube.com/watch?v=_kIqMPNQNSw)

## Lesson 2.15

## FabLab 3D Printer Certification

**What must students know before using the 3D printers safely and responsibly?**

## Lesson 2.15

FabLab 3D Printer Certification

*Connect today's work to your Unit 2 CAD and 3D printing evidence.*



# FabLab 3D Printer Certification

Big ideas you should understand before you start the work

## Big Ideas

- 1 Certification protects people, tools, and materials.
- 2 Safe printer use includes setup, monitoring, and cleanup.
- 3 Responsible use means respecting the queue and documenting prints.



***Ask yourself: How does this CAD decision improve accuracy, editability, or printability?***

## FabLab 3D Printer Certification

Use the lesson skill to make a more accurate, editable, or printable model.

### Modeling moves

Review printer safety expectations.

Identify what to do before, during, and after a print.

Check print request or certification requirements.

### Quality checks

Does the model match the intended measurements?

Can another student understand the feature?

Will the part be printable or testable?

***Good CAD work is controlled enough to revise and clear enough to explain.***

## FabLab 3D Printer Certification

Save the strongest artifact from today for your Unit 2 portfolio.

### Deliverable checklist

- Certification evidence is complete.
- Student can describe safe printer behavior.
- Student understands print queue expectations.

### Portfolio evidence

- Dated notebook entry
- Screenshot or exported file
- Short claim explaining what the evidence proves

***Your final portfolio should show how the model improved across the unit.***

**Lesson 2.16****Final 3D Printed Tolerance Tester Workday**

**How can a printed test tool help make better rocket assembly decisions?**

**Lesson 2.16**

Final 3D Printed Tolerance Tester Workday

*Connect today's work to your Unit 2 CAD and 3D printing evidence.*



# Final 3D Printed Tolerance Tester Workday

Big ideas you should understand before you start the work

## Big Ideas

- 1 Tolerance testers help compare real fits, not assumptions.
- 2 A useful tester includes multiple sizes or clear labeled features.
- 3 The print should produce data for the next design decision.



***Ask yourself: How does this CAD decision improve accuracy, editability, or printability?***

## Final 3D Printed Tolerance Tester Workday

Use the lesson skill to make a more accurate, editable, or printable model.

### Modeling moves

Finalize the CAD model.

Check labels, clearances, and print orientation.

Submit or prepare the final print file.

### Quality checks

Does the model match the intended measurements?

Can another student understand the feature?

Will the part be printable or testable?

***Good CAD work is controlled enough to revise and clear enough to explain.***

## Final 3D Printed Tolerance Tester Workday

Save the strongest artifact from today for your Unit 2 portfolio.

### Deliverable checklist

- Final tolerance tester file is ready or submitted.
- Tester features are labeled or documented.
- Student predicts what data the tester will provide.

### Portfolio evidence

- Dated notebook entry
- Screenshot or exported file
- Short claim explaining what the evidence proves

***Your final portfolio should show how the model improved across the unit.***

## Lesson 2.17

## 3D Printing Post-Processing

**Why is a 3D print not always finished when it comes off the printer?**

## Lesson 2.17

### 3D Printing Post-Processing

*Connect today's work to your Unit 2 CAD and 3D printing evidence.*



## 3D Printing Post-Processing

Big ideas you should understand before you start the work

### Big Ideas

- 1 Supports, brim, stringing, and rough edges can affect the final part.
- 2 Post-processing can change dimensions and fit.
- 3 Cleanup should be documented as part of fabrication.



***Ask yourself: How does this CAD decision improve accuracy, editability, or printability?***

## 3D Printing Post-Processing

Use the lesson skill to make a more accurate, editable, or printable model.

### Modeling moves

Remove supports carefully.

Clean only what should be cleaned.

Measure again after cleanup if fit matters.

### Quality checks

Does the model match the intended measurements?

Can another student understand the feature?

Will the part be printable or testable?

***Good CAD work is controlled enough to revise and clear enough to explain.***

## 3D Printing Post-Processing

Save the strongest artifact from today for your Unit 2 portfolio.

### Deliverable checklist

- Post-processing steps are documented.
- Part is inspected for damage or dimensional change.
- Student records any cleanup that affects fit.

### Portfolio evidence

- Dated notebook entry
- Screenshot or exported file
- Short claim explaining what the evidence proves

***Your final portfolio should show how the model improved across the unit.***

## 3D Printing Post-Processing

Optional video resource to reinforce the lesson ideas.

### What to watch for

How to Remove 3D Print Support Marks  
how supports affect the final part  
why sanding or cleanup can change dimensions  
what should be documented after cleanup

### Scan or open



[Open Video](https://www.youtube.com/watch?v=iwFKuCesQiA)

<https://www.youtube.com/watch?v=iwFKuCesQiA>

**Lesson 2.18****Final Tolerance Tester Review and Recommendation**

**What clearance should be recommended for the next rocket assembly project?**

**Lesson 2.18**

Final Tolerance Tester Review and Recommendation

*Connect today's work to your Unit 2 CAD and 3D printing evidence.*



# Final Tolerance Tester Review and Recommendation

Big ideas you should understand before you start the work

## Big Ideas

- 1 A recommendation should be based on fit evidence.
- 2 Testing should identify too tight, too loose, and acceptable fits.
- 3 The final conclusion connects Unit 2 to the rocket assembly unit.



***Ask yourself: How does this CAD decision improve accuracy, editability, or printability?***

## Final Tolerance Tester Review and Recommendation

Use the lesson skill to make a more accurate, editable, or printable model.

### Modeling moves

Test each feature consistently.

Record observations and measurements.

Choose a recommended clearance with evidence.

### Quality checks

Does the model match the intended measurements?

Can another student understand the feature?

Will the part be printable or testable?

***Good CAD work is controlled enough to revise and clear enough to explain.***

## Final Tolerance Tester Review and Recommendation

Save the strongest artifact from today for your Unit 2 portfolio.

### Deliverable checklist

- Final recommendation is written.
- Evidence table or photos support the claim.
- Student explains how the result will guide Unit 3.

### Portfolio evidence

- Dated notebook entry
- Screenshot or exported file
- Short claim explaining what the evidence proves

***Your final portfolio should show how the model improved across the unit.***

## Unit 2 Close

# CAD evidence becomes fabrication evidence.

Your tolerance tester should help make a real design recommendation for the next rocket assembly project.

### Model

A controlled CAD model with meaningful features.

### Print

A test part prepared with documented settings.

### Recommend

A fit decision supported by evidence.