

Basics of CAD Modeling with Autodesk Fusion 360 and 3D Printing

Ronny Bergmann

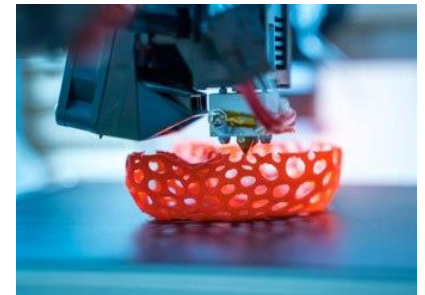
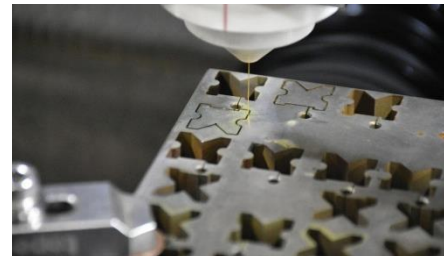
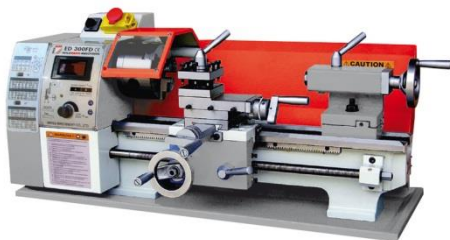
02.12.2021

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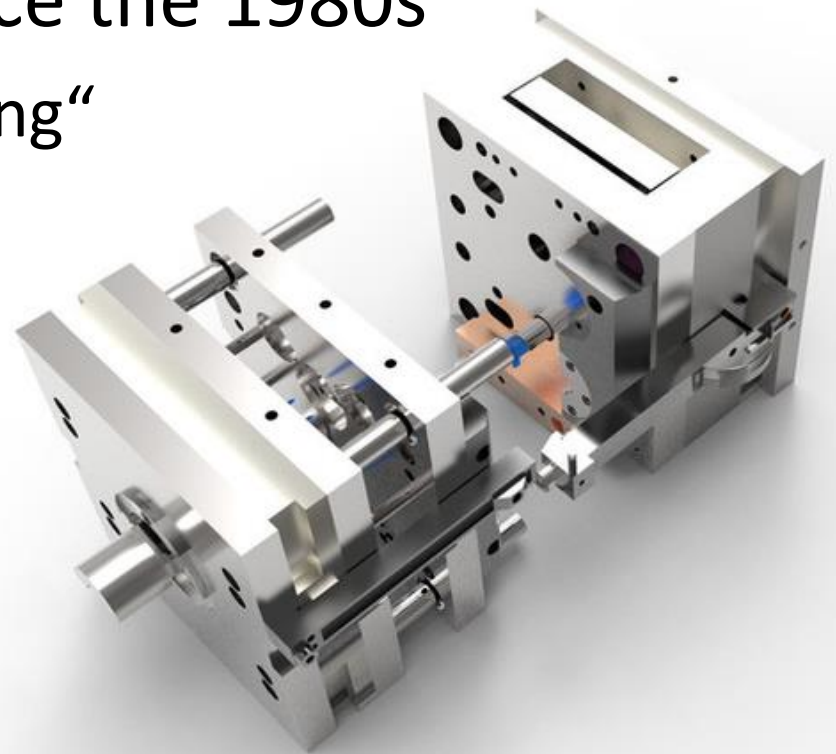
What is 3D printing and why you should care

- Branch of CNC machining (computer numerical control)
 - Automated control of a machining tool
 - Drills, Lathes, Mills, Punchers, Plasmacutters, Water-Jet Cutters, EDM, 3D Printers and many more

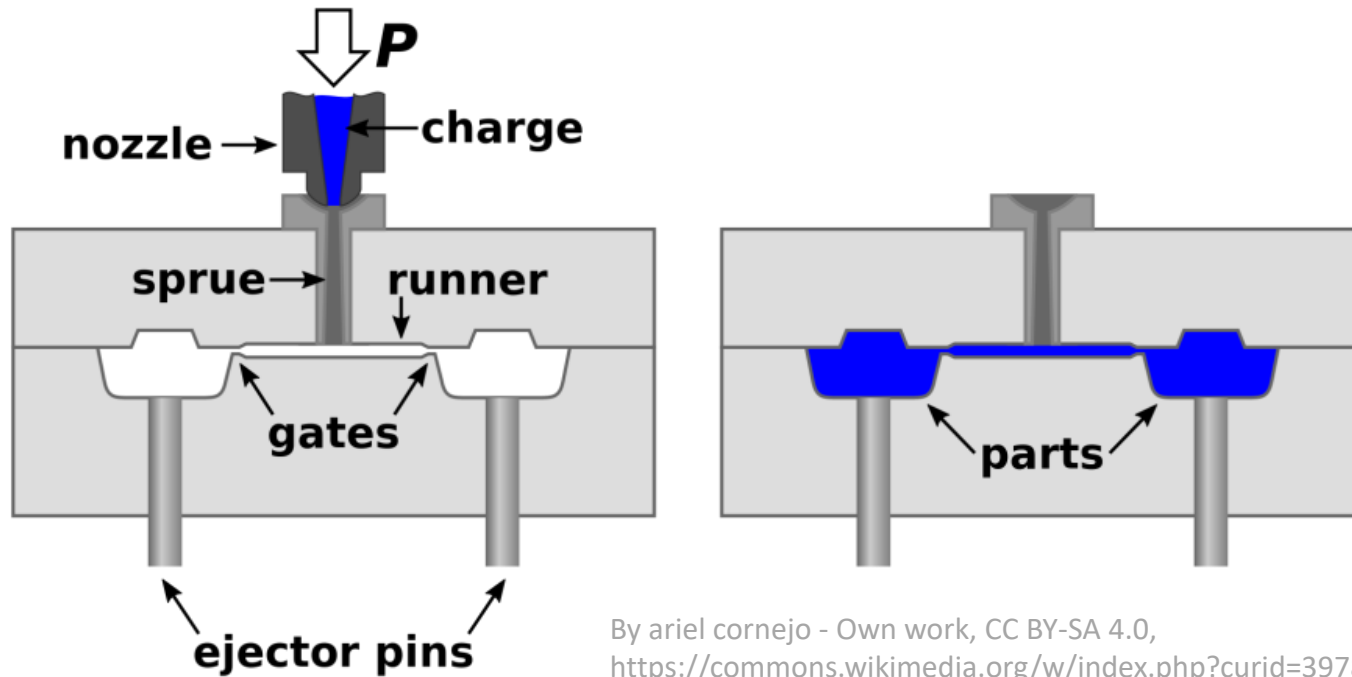


What is 3D printing and why you should care

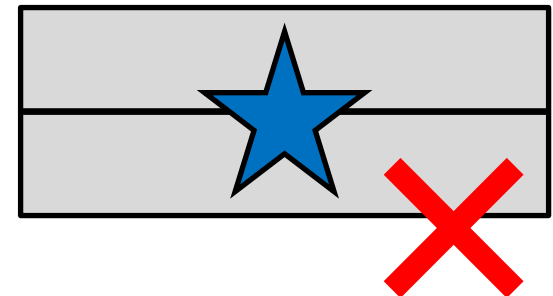
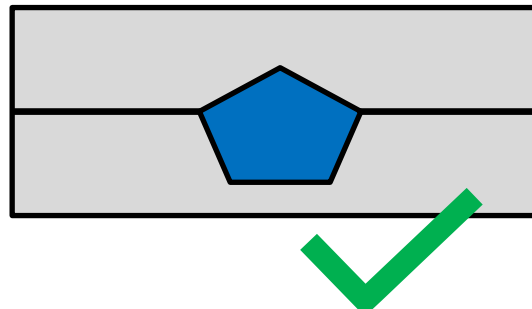
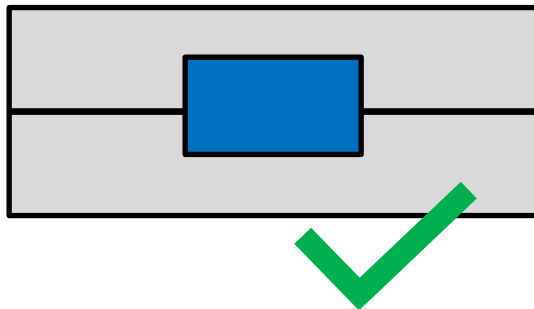
- Additive Manufacturing
 - Material is applied instead of removed
- Under development since the 1980s
 - Termed „rapid prototyping“



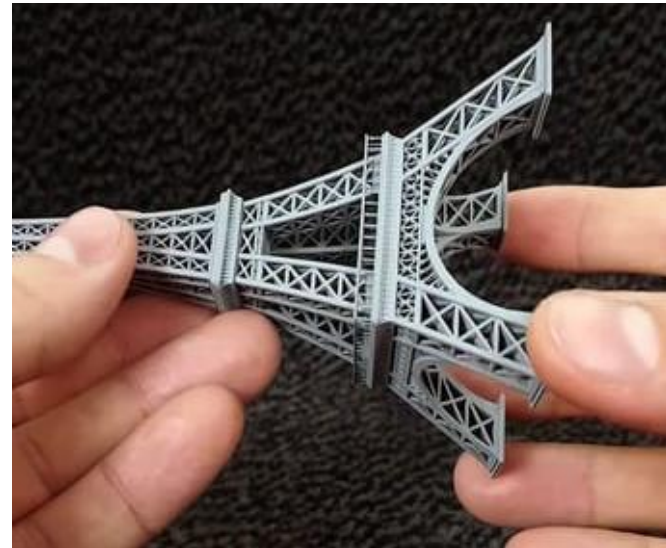
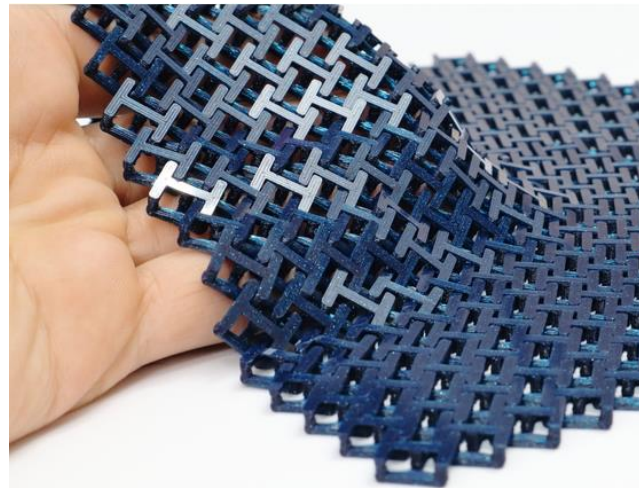
What is 3D printing and why you should care



By ariel cornejo - Own work, CC BY-SA 4.0,
<https://commons.wikimedia.org/w/index.php?curid=39782900>

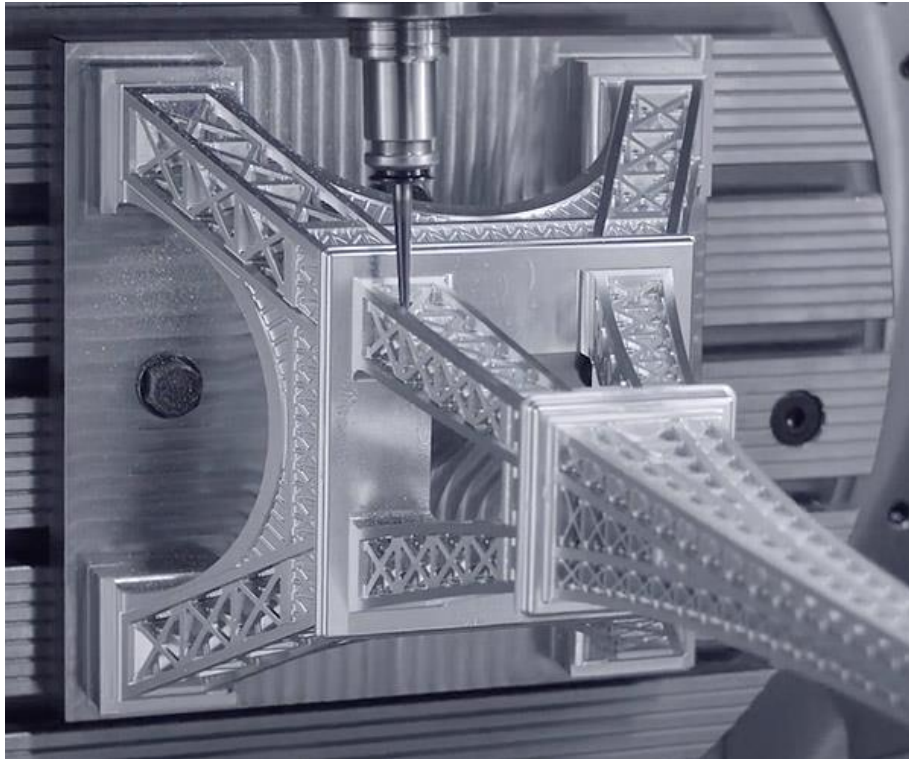


What is 3D printing and why you should care

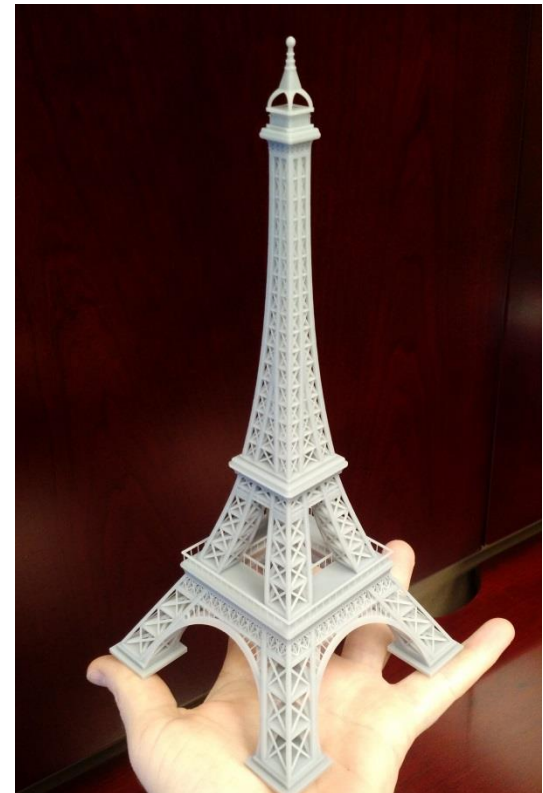


What is 3D printing and why you should care

~ \$50.000 - \$100.000

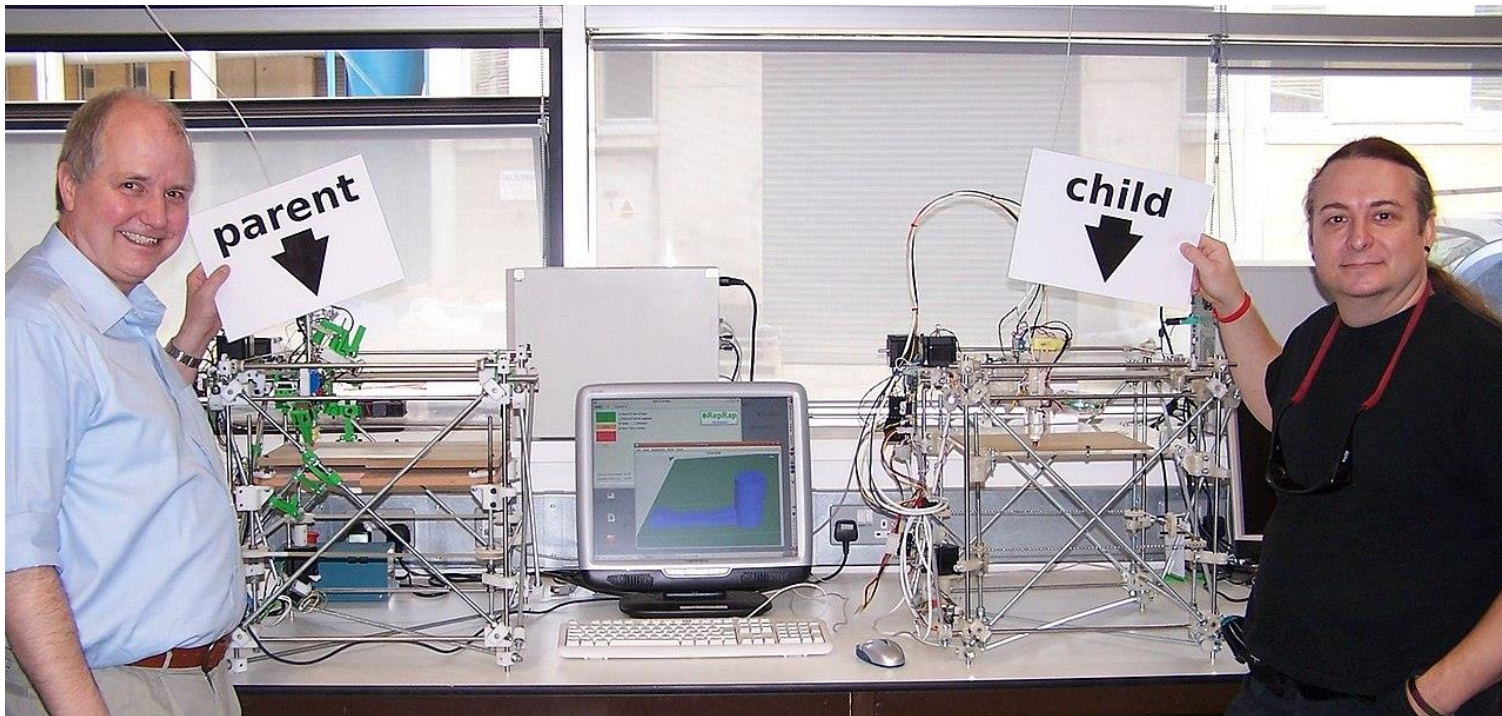


~ \$200 - \$2000



What is 3D printing and why you should care

- What made 3D Printing so accessible?
 - 2005 Start of the Replicating Rapid prototyper project

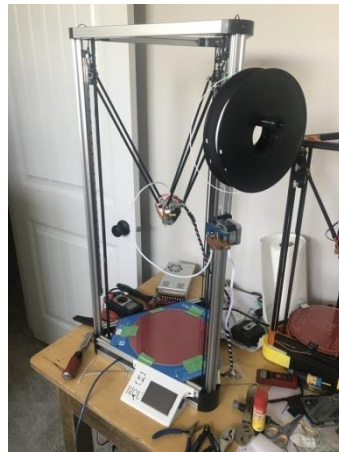


What is 3D printing and why you should care

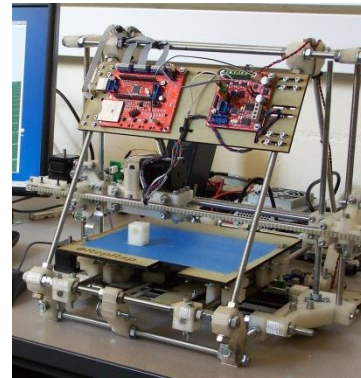
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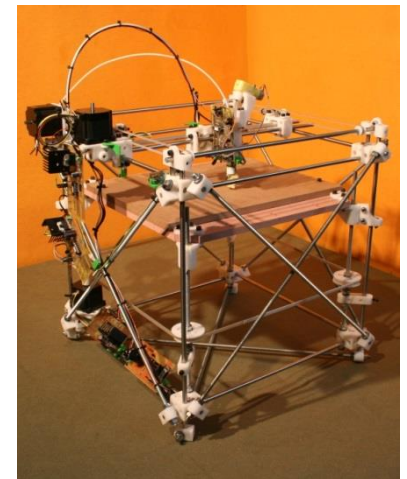
Prusa_i3



Delta Printers



RepRap Mendel



RepRap Darwin

What is 3D printing and why you should care



Creality Ender 3



Biqu b1



Alfawise u30

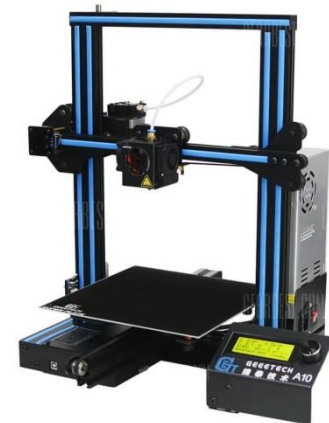
TRONXY



Tronxy xy-2



Longer IK4



Geeetech a10

What is 3D printing and why you should care



Creality Ender 3



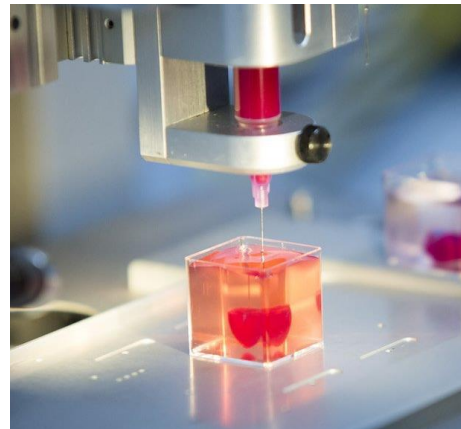
Formlabs Form 2



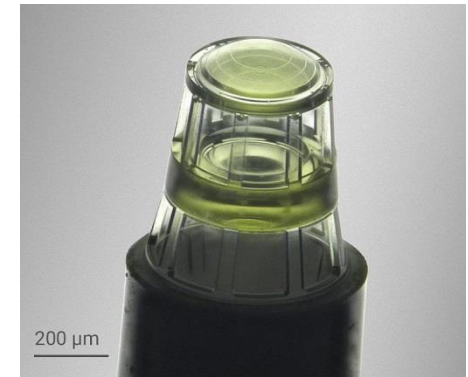
Relativity Space
Stargate



PERI Concrete Printer



Bioprinters



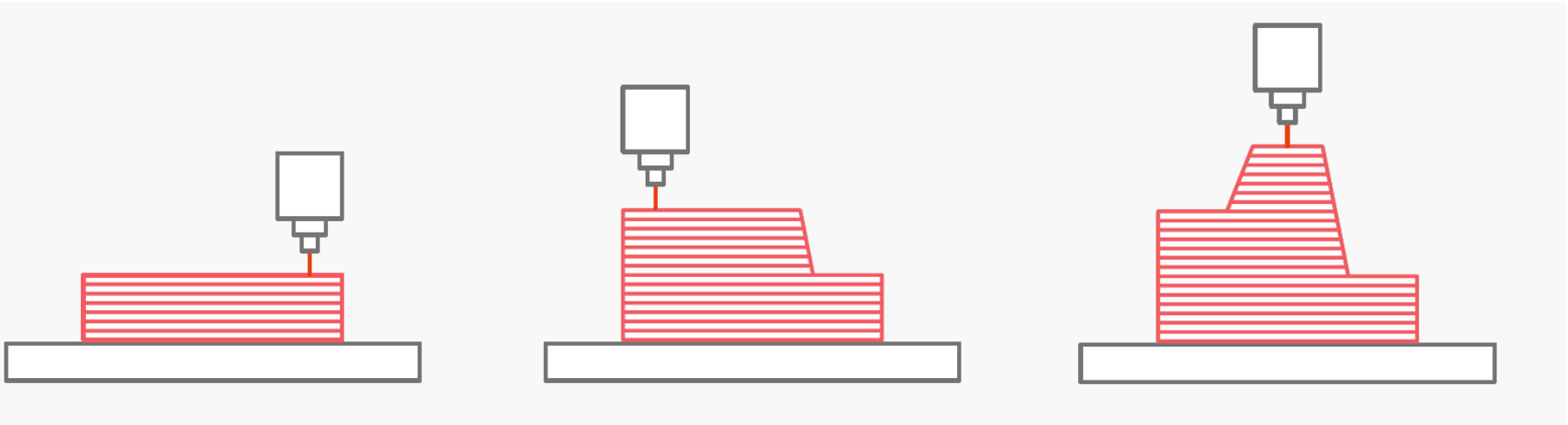
Nanoscribe

What is 3D printing and why you should care

- 3D printing blends into every aspect of our every day life
- Increasing Accessibility
 - Printers and printing materials more affordable
- Opens new ways of thinking

How 3D printing works

- Start on a Build plate
- Object is constructed layer by layer



How 3D printing works

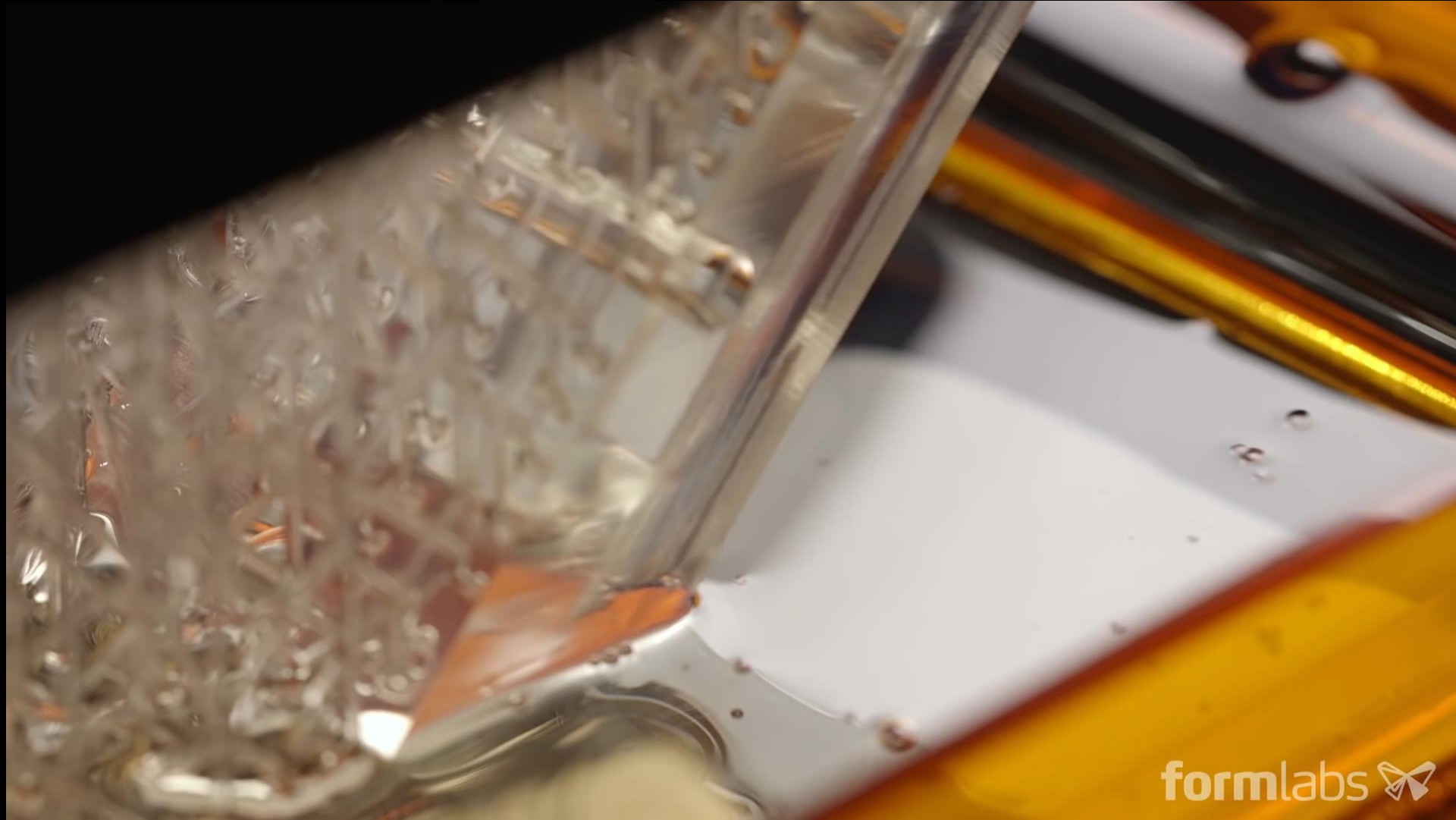
- FDM Printer:
 - **Fused Deposition Modeling**
 - Plastic Filament as Printing Material
 - Material melted at Hotend and pushed forward with a motor – the Extruder
 - Similar to a glue gun
 - Nozzle „draws“ model cross-sections by placing thin lines of molten plastic on previous layers
 - Overhangs need extra support
 - Weaker along building axis – non isotropic



SOLID CONCEPTS

How 3D printing works

- SLA and mSLA Printer:
 - (masked) **S**tereolithography **A**pparatus
 - UV-sensitive polymer Resin as printing material
 - Resin monomers polymerize upon UV exposure
 - Buildplate descends into liquid resin
 - Model built upside down from bottom of the buildplate
 - Cross-section either cured by laser beam (SLA) or by illumination of the entire area at once (mSLA)
 - Models need to be washed and cured after printing
 - Isotropic properties
 - Very fine details possible



How 3D printing works

Comparison FDM and SLA

FDM

- + Quick and few post processing steps required
- + Good for large and structural parts like cases and frames
- + Parts are lightweight and sturdy
- Reduced stability along z-axis
- Lower XY-resolution compared to SLA
- Difficult to get watertight
- More moving parts than SLA

SLA

- + Very high level of detail
- + Ideal for small and complex parts
- + Reliable watertightness
- + Isotropic properties
- Washing and curing required
- Resin is usually more expensive
- Uncured resin is hazardous
- Parts with high volume need to be printed hollow

The Slicer

- Every 3D printing technique needs a slicer
- Link between computer and printer
- Very high customizability of the print
- Many different host interfaces / slicers available:

– Cura, Pronterface, Repetier Host, Prusa Slicer,



Preform, Chitubox, Flashprint



The Slicer

- Translates the model geometry into G-code
- G-code is a repository of commands the firmware of a CNC machine can understand:
- Every model is translated into a sequence of gcode lines that the machine runs until print is finished

G-code	meaning
G1 X0 Y0 Z0	Move print head to Coordinates 0,0,0
G28	Move all axes to their Min-endstop
M92 X300	Set X-axis steps per rotation to 300
M104 230	Set hotend temperature to 230°C
M500	Save changes to EEPROM

The Slicer

```
%  
(Header)  
(Generated by gcodetools from Inkscape.)  
(Using default header. To add your own header create file  
"header" in the output dir.)  
M3  
(Header end.)  
G21 (All units in mm)  
  
(Start cutting path id: path29632)  
(Change tool to Cylindrical cutter)  
  
G00 Z5.000000  
G00 X33.655106 Y11.817060  
  
G01 Z-1.000000 F100.0(Penetrate)  
G01 X247.951560 Y11.817060 Z-1.000000 F400.000000  
G01 X247.951560 Y30.935930 Z-1.000000  
G01 X106.963450 Y30.935930 Z-1.000000  
G03 X106.587404 Y32.243414 Z-1.000000 I-7.576860 J-1.471361  
G03 X105.974610 Y33.458880 Z-1.000000 I-6.445333 J-2.487300  
G03 X104.697090 Y35.083261 Z-1.000000 I-7.601246 J-4.663564  
G03 X103.141830 Y36.435630 Z-1.000000 I-10.087550 J-10.030472  
G03 X102.969400 Y38.107779 Z-1.000000 I-20.252028 J-1.243405  
G03 X102.369430 Y39.685740 Z-1.000000 I-3.842423 J-0.557919  
G03 X100.419761 Y41.664361 Z-1.000000 I-6.181245 J-4.140917  
G02 X98.333794 Y43.482560 Z-1.000000 I7.045018 J10.188229
```

Practical part

- Designing a part
 - Preconsiderations
 - Measuring precisely
 - Make a draft
- CAD design
- Print with Flashforge Creator 3
- Print with Formlabs Form 2
- Outlook

How to design 3D objects

Preconsiderations

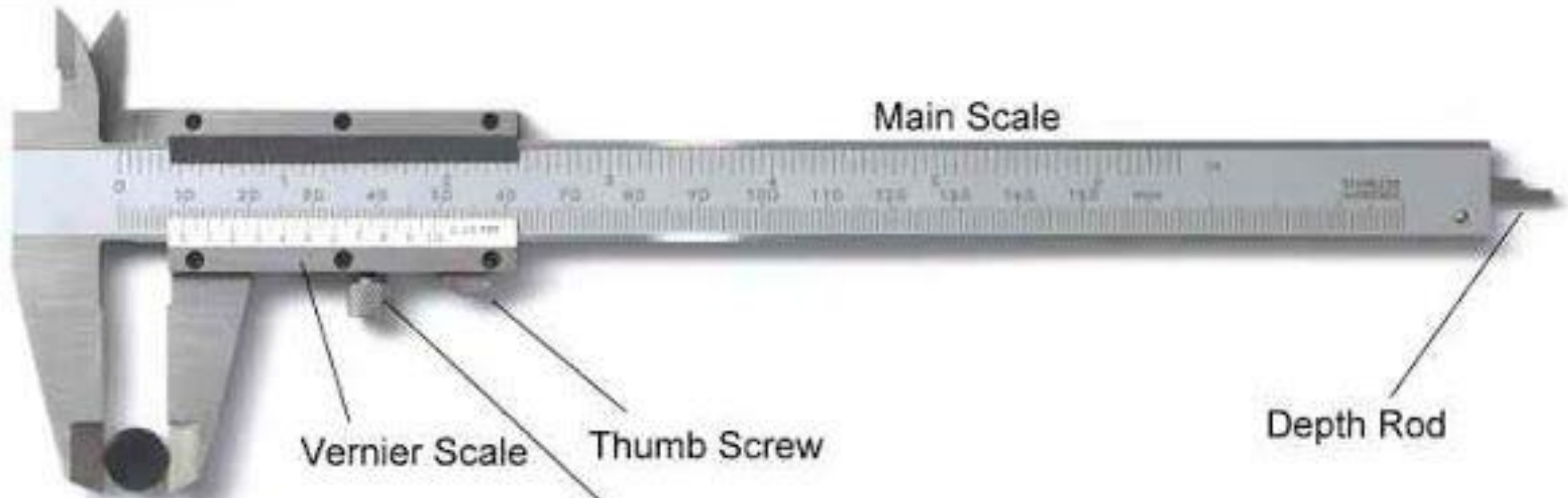
- 3D printed parts commonly attached to surfaces
 - Thorlabs breadboards, supports, connectors, screwholes, aluminum profiles and more



- Geometries must be measured accurately to fit
- ideal case: print fits perfectly. no excessive play or force needed to attach. no redesign

How to design 3D objects accurate measurements

Upper Jaws for inside
measurement



Lower Jaws for
Outside measurements

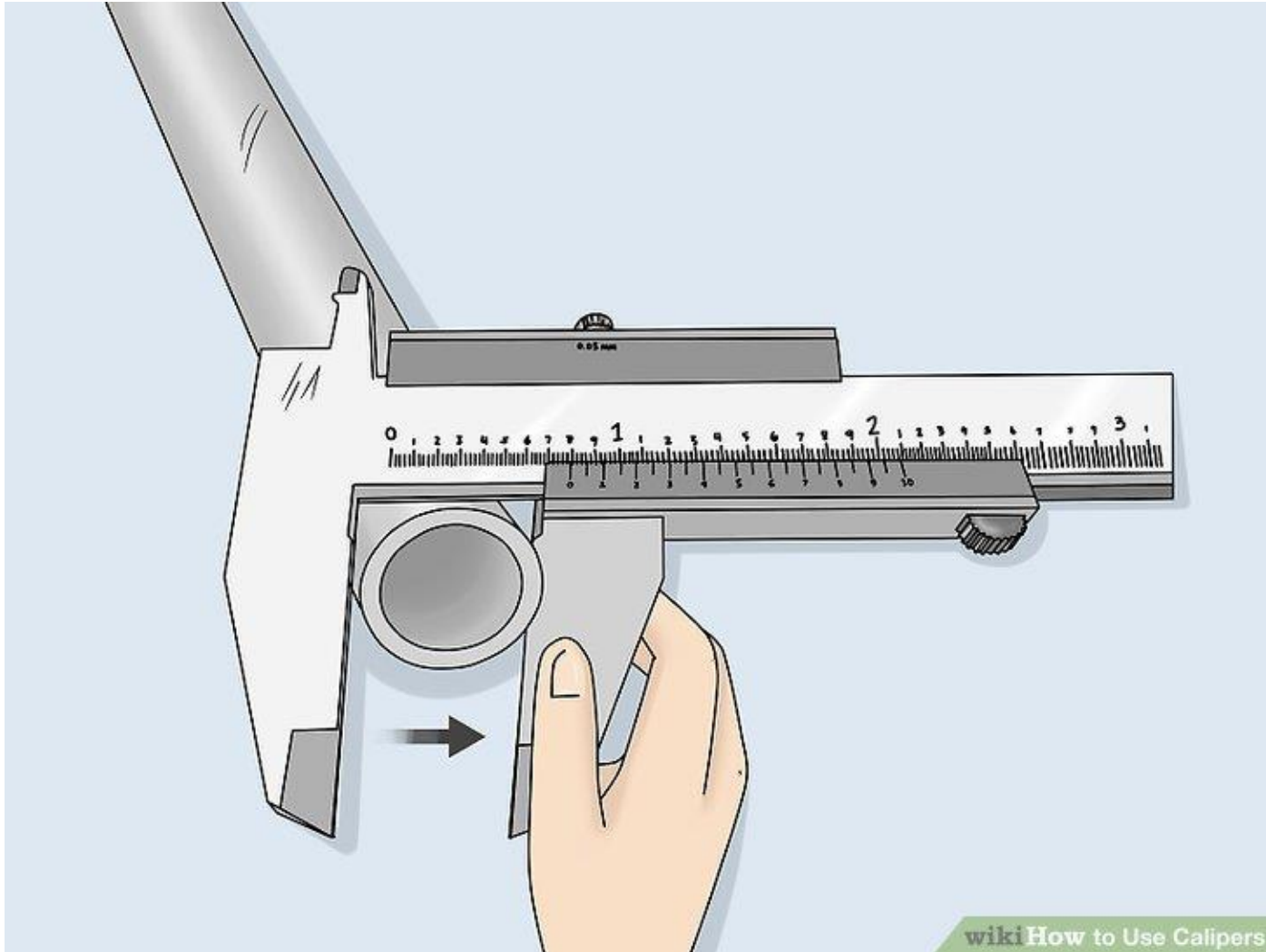
Vernier Scale

Thumb Screw

Lock Screw

Depth Rod

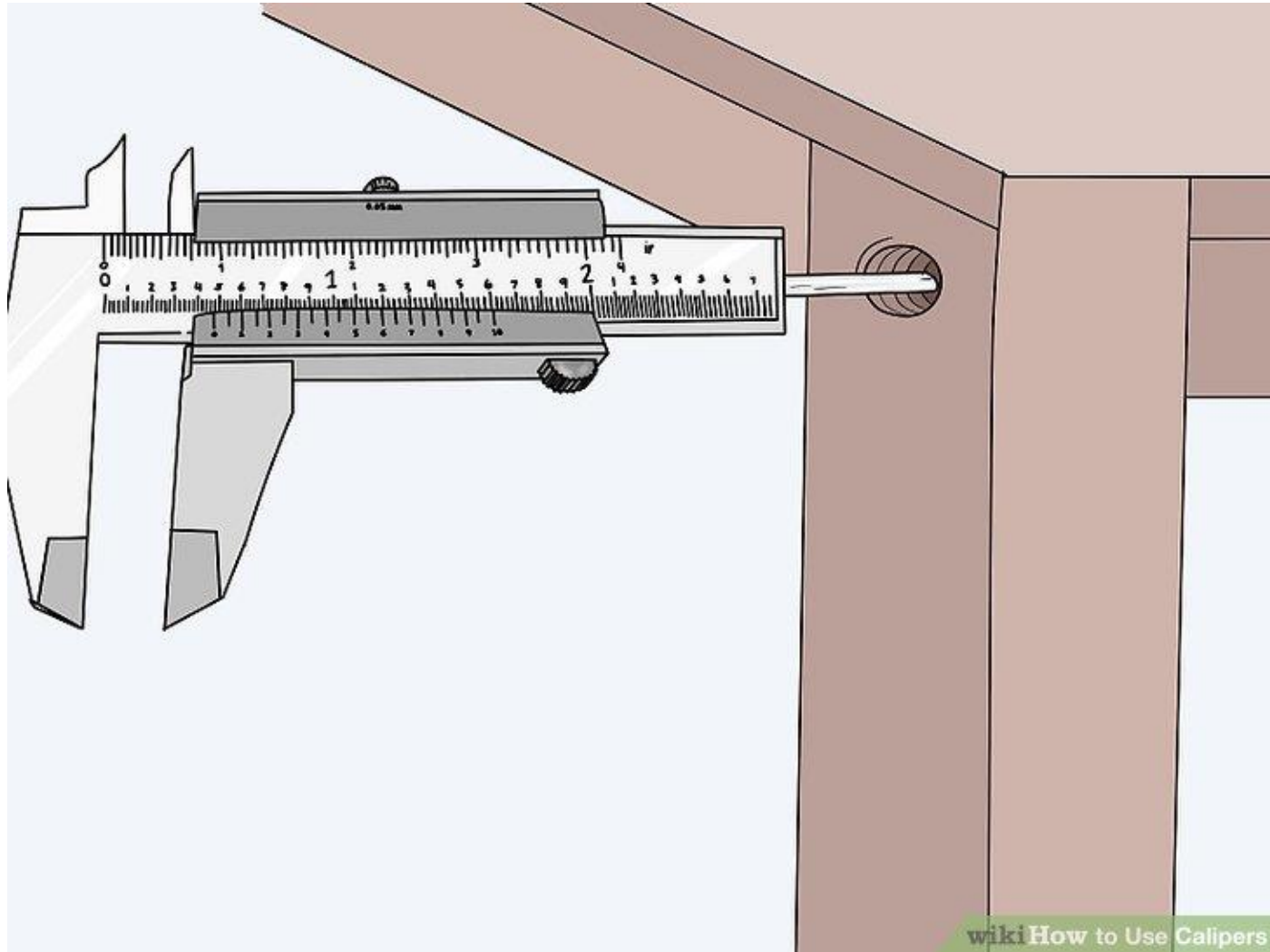
How to design 3D objects accurate measurements



How to design 3D objects accurate measurements



How to design 3D objects accurate measurements



How to design 3D objects

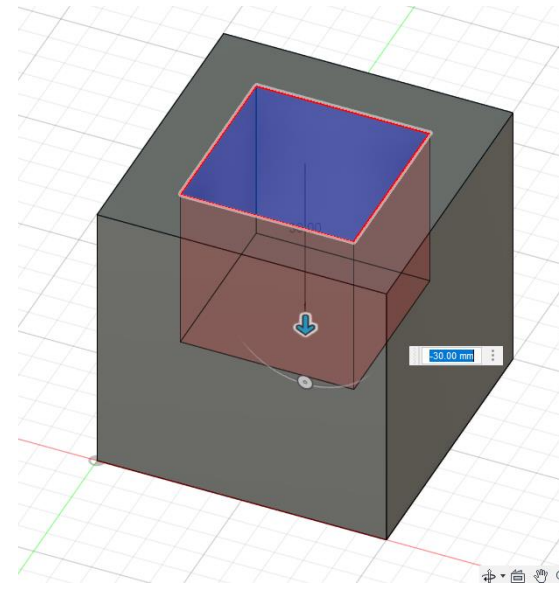
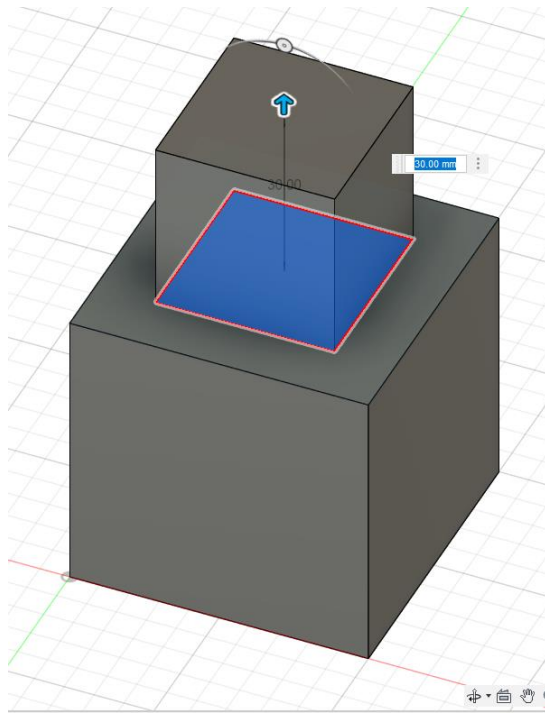
CAD Basics

- CAD = Computer aided design
 - made for Computer aided machinery
 - helpful for making changes
 - Quick
- **sketch**: closed geometry to use for further manipulation
- **constraints**: decrease a geometries degree of freedom
- **Volume**: uses sketch to add to or remove from existing geometry

How to design 3D objects

CAD Basics

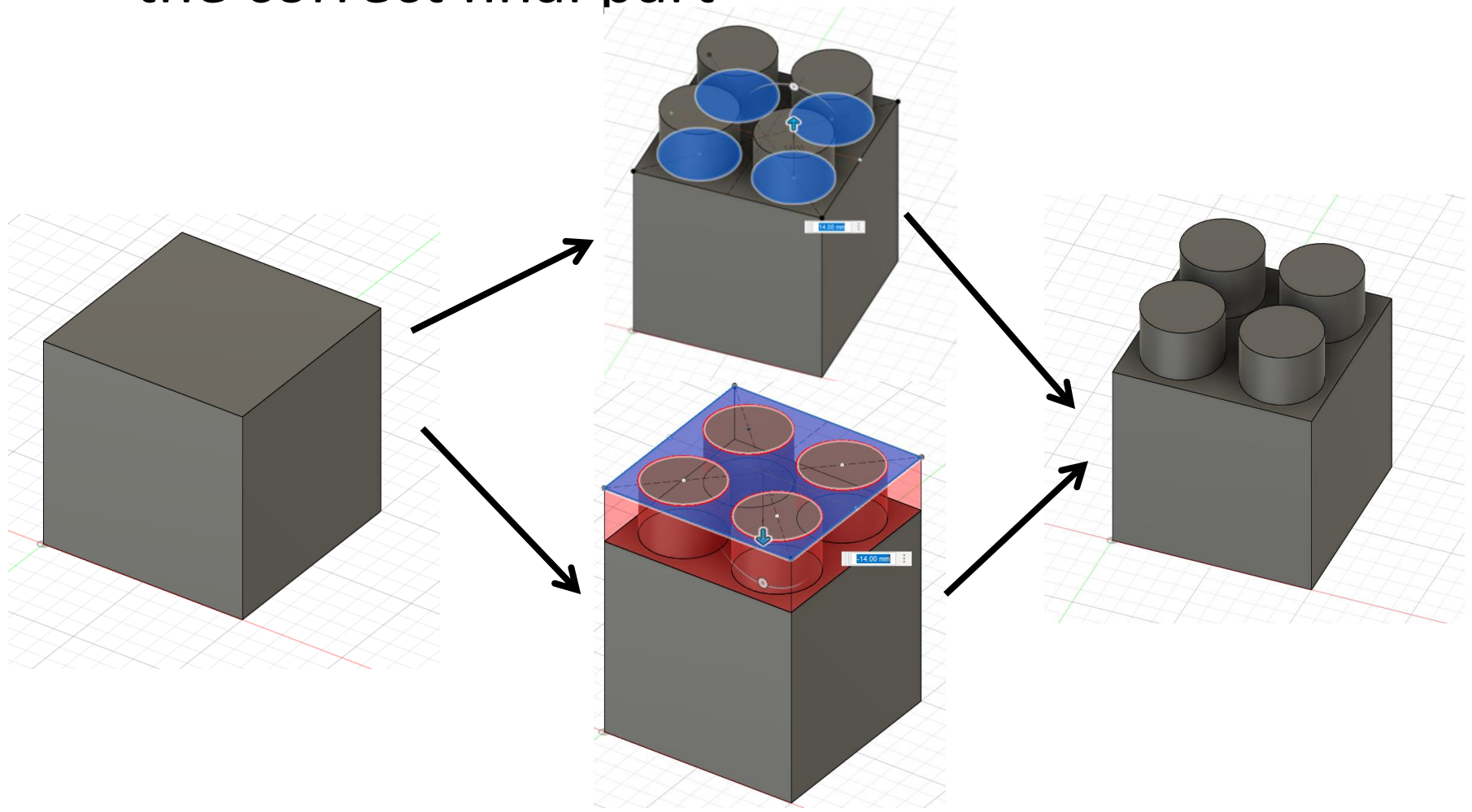
- In CAD closed geometries are extruded to form volumes
 - Volumes can be applied to **add** or **subtract** an existing volume



How to design 3D objects

CAD Basics

- different modelling approaches can lead to the correct final part



How to design 3D objects

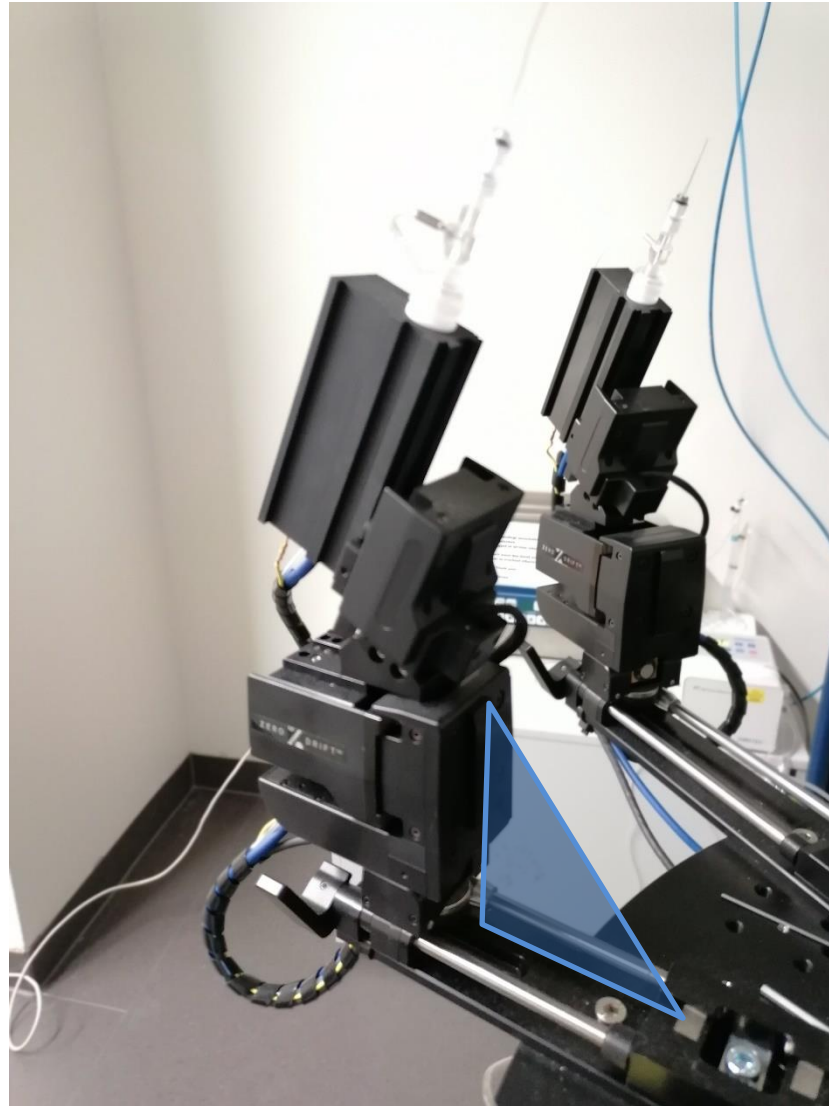
Fusion 360



- good example for well engineered CAD
- good for demonstrating basics of CAD modelling
- HU and Charite Accounts can be used to acquire free educator or student access
- Alternatives:
 - Solidworks, Inventor, Blender, FreeCAD, openSCAD, TinkerCAD

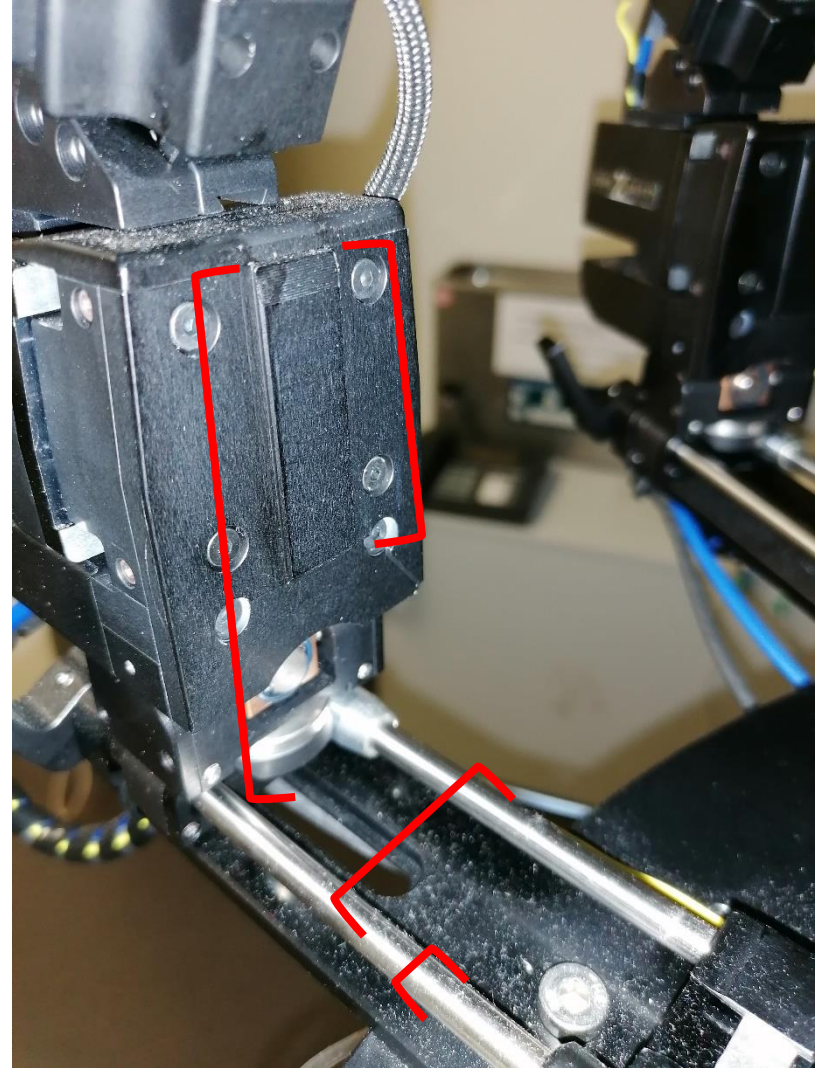
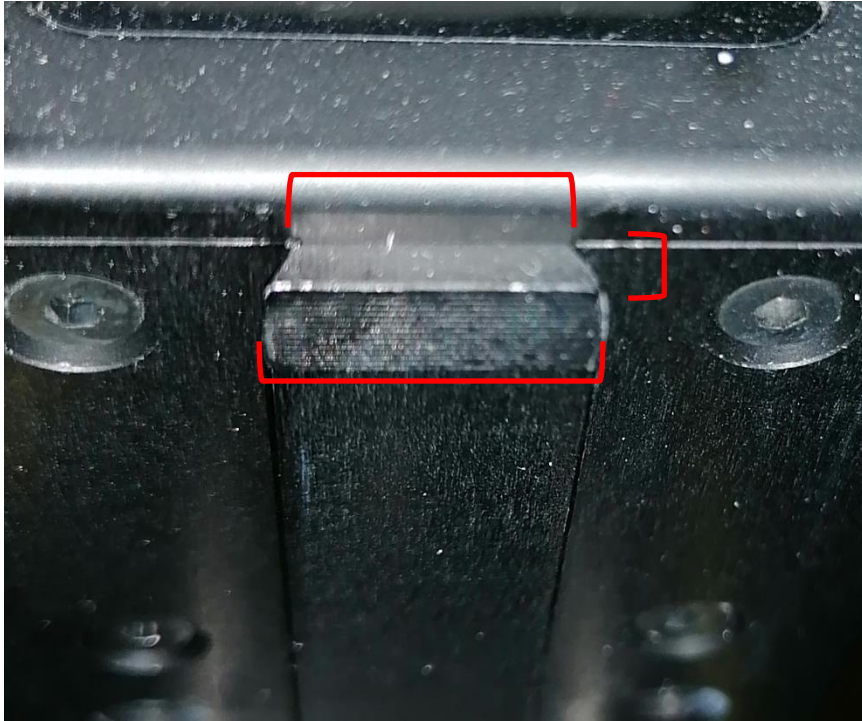
How to design 3D objects

The draft

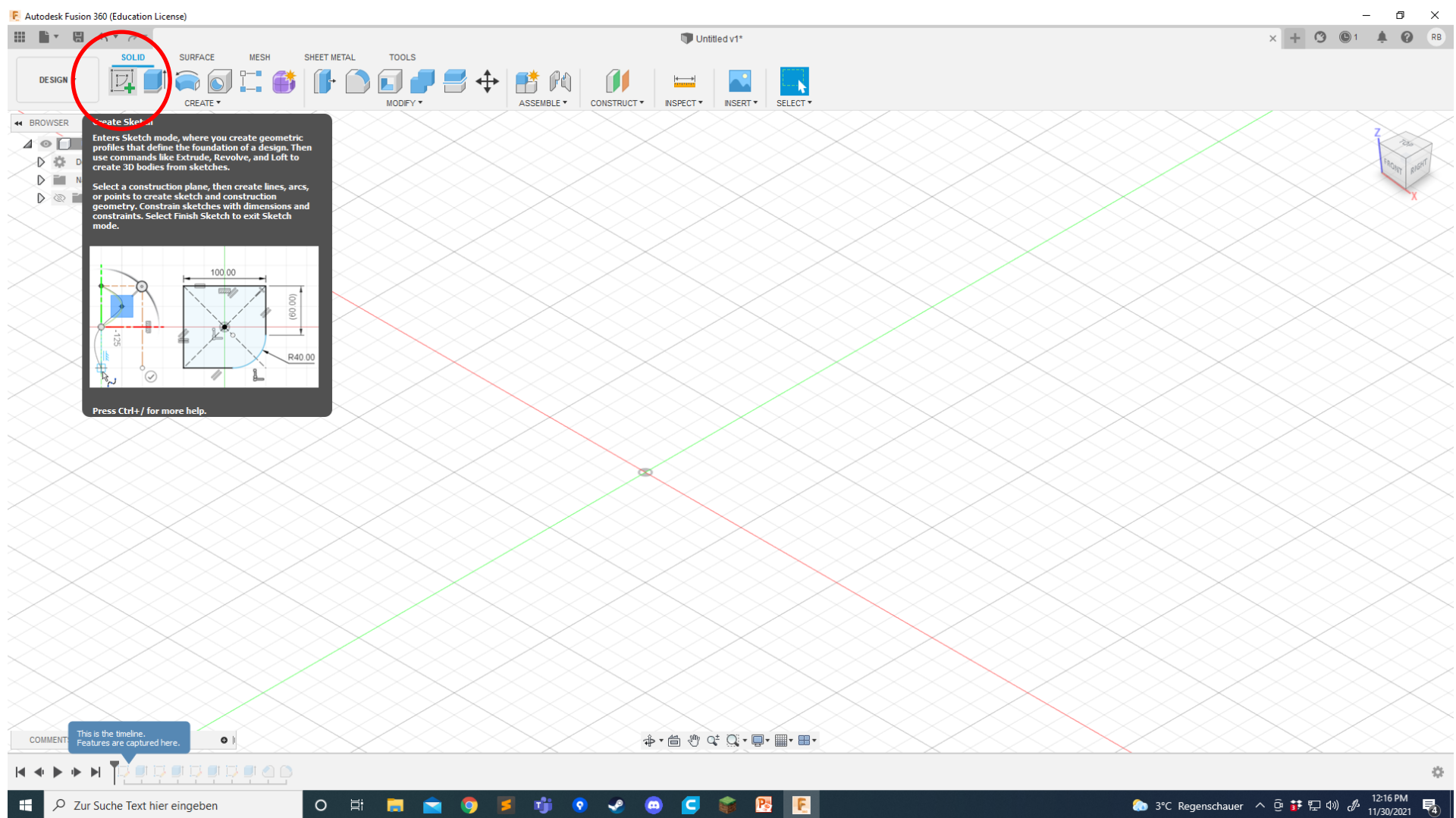


How to design 3D objects

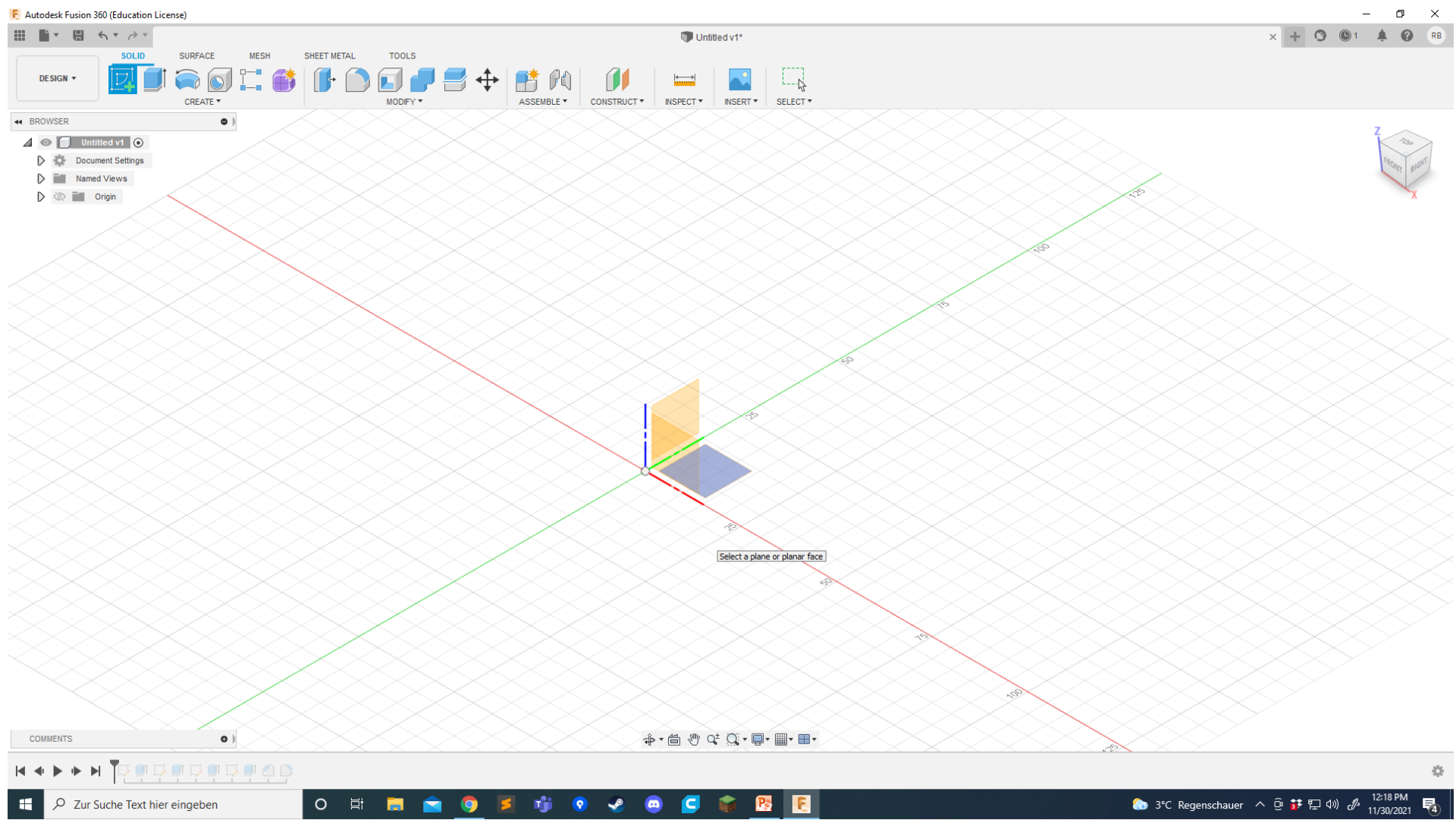
The draft



How to design 3D objects: The draft



How to design 3D objects: The draft



How to design 3D objects: The draft

The image shows the Autodesk Fusion 360 interface with a 2D sketch of a trapezoidal part. The sketch is light blue and features several dimensions and constraints. A vertical green line represents the centerline. Dimensions include a total height of 2.00, a top width of 13.50, a bottom width of 11.46, and a slanted side length of 2.77. Horizontal offsets of 2.00 are shown from the centerline to the bottom corners. The interface includes a top toolbar with 'CREATE' and 'CONSTRAINTS' sections, a left browser with 'Sketch Dimension' highlighted, and a right 'SKETCH PALETTE' with 'Finish Sketch' circled. The text 'Adding dimensions' is placed near the dimension lines, 'Sketching tools' near the 'CREATE' section, and 'Constraints' near the 'CONSTRAINTS' section. The text 'Finish sketch' is placed at the bottom right.

Autodesk Fusion 360 (Education License)

Untitled v1*

DESIGN

SOLID SURFACE MESH SHEET METAL TOOL

CREATE

MODIFY

CONSTRAINTS

INSPECT INSERT SELECT FINISH SKETCH

BROWSER

Sketching tools

Constraints

Adding dimensions

Sketch Dimension

Finish sketch

SKETCH PALETTE

Options

Linetype

Look At

Sketch Grid

Snap

Slice

Show Profile

Show Points

Show Dimensions

Show Constraints

Show Projected Geometries

3D Sketch

Finish Sketch

COMMENTS

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3°C Regenschauer

12:21 PM 11/30/2021

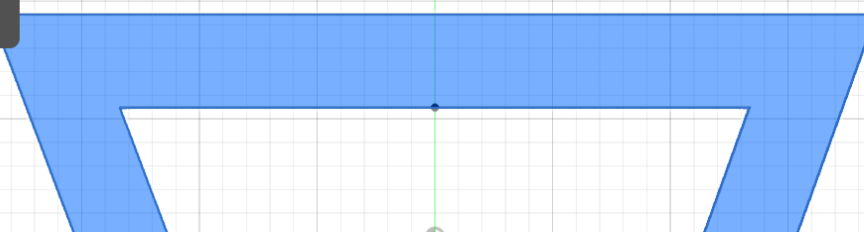
How to design 3D objects: The draft

Autodesk Fusion 360 (Education License)

DESIGN **SOLID** SURFACE MESH SHEET METAL TOOLS

CREATE MODIFY ASSEMBLE CONSTRUCT INSPECT INSERT SELECT

Extrude (e)
Adds depth to open or closed sketch profiles or faces.
Select an extrusion type, select sketch profiles or faces to extrude, then specify the distance and taper angle. For the Thin Extrude type, specify the wall thickness.
Press Ctrl+/ for more help.

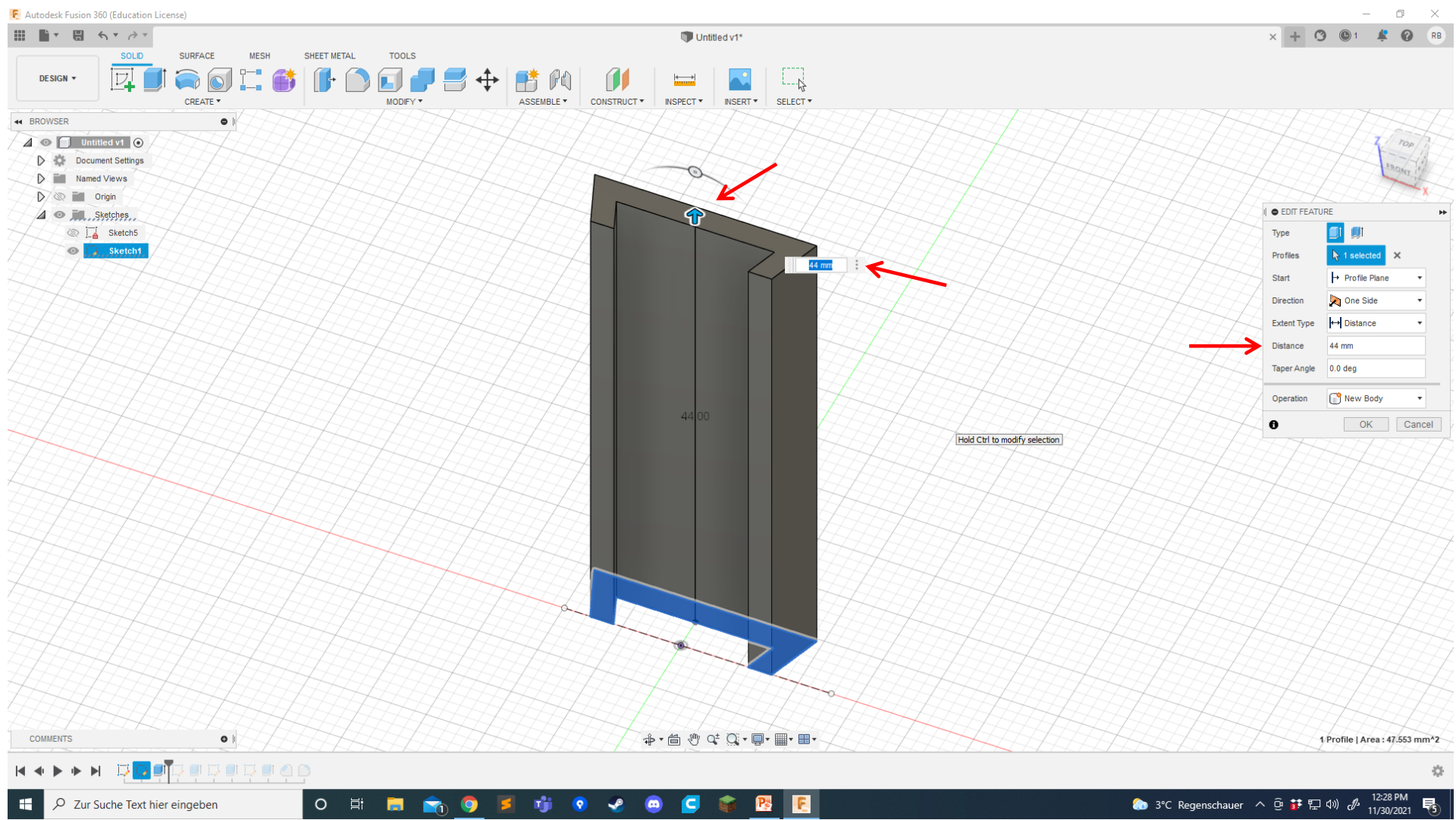


1 Profile | Area : 47.553 mm*2

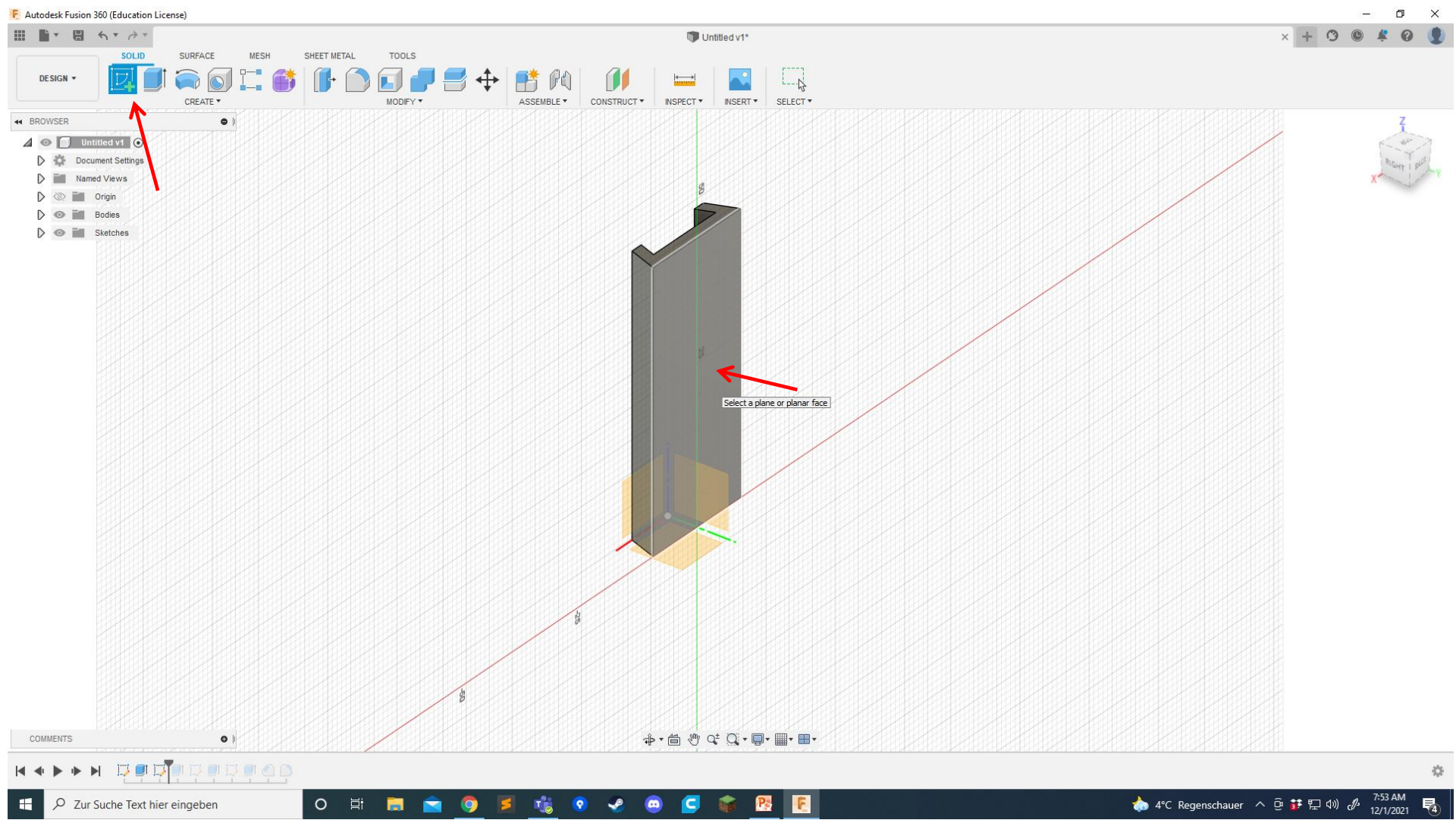
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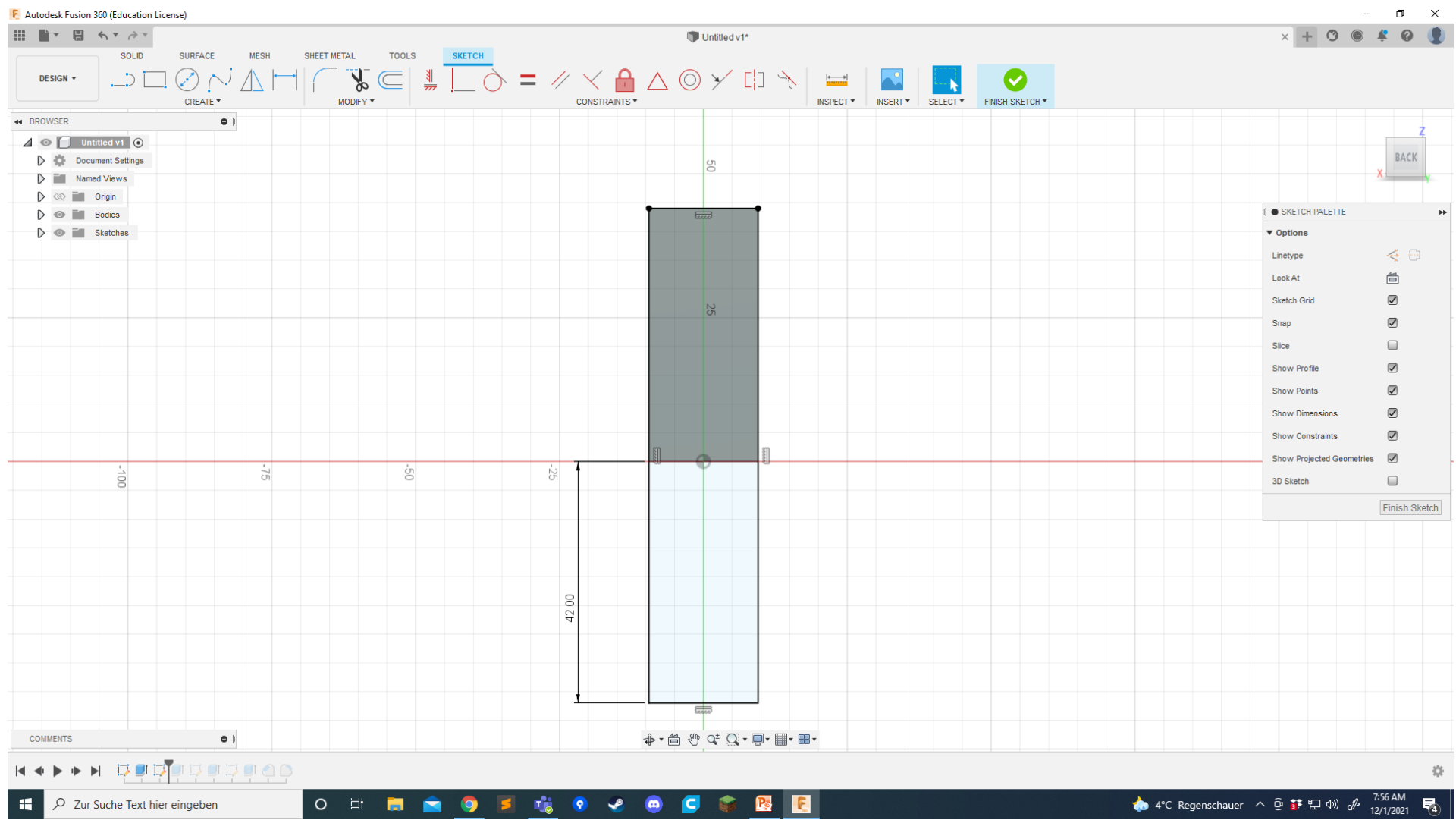
How to design 3D objects: The draft



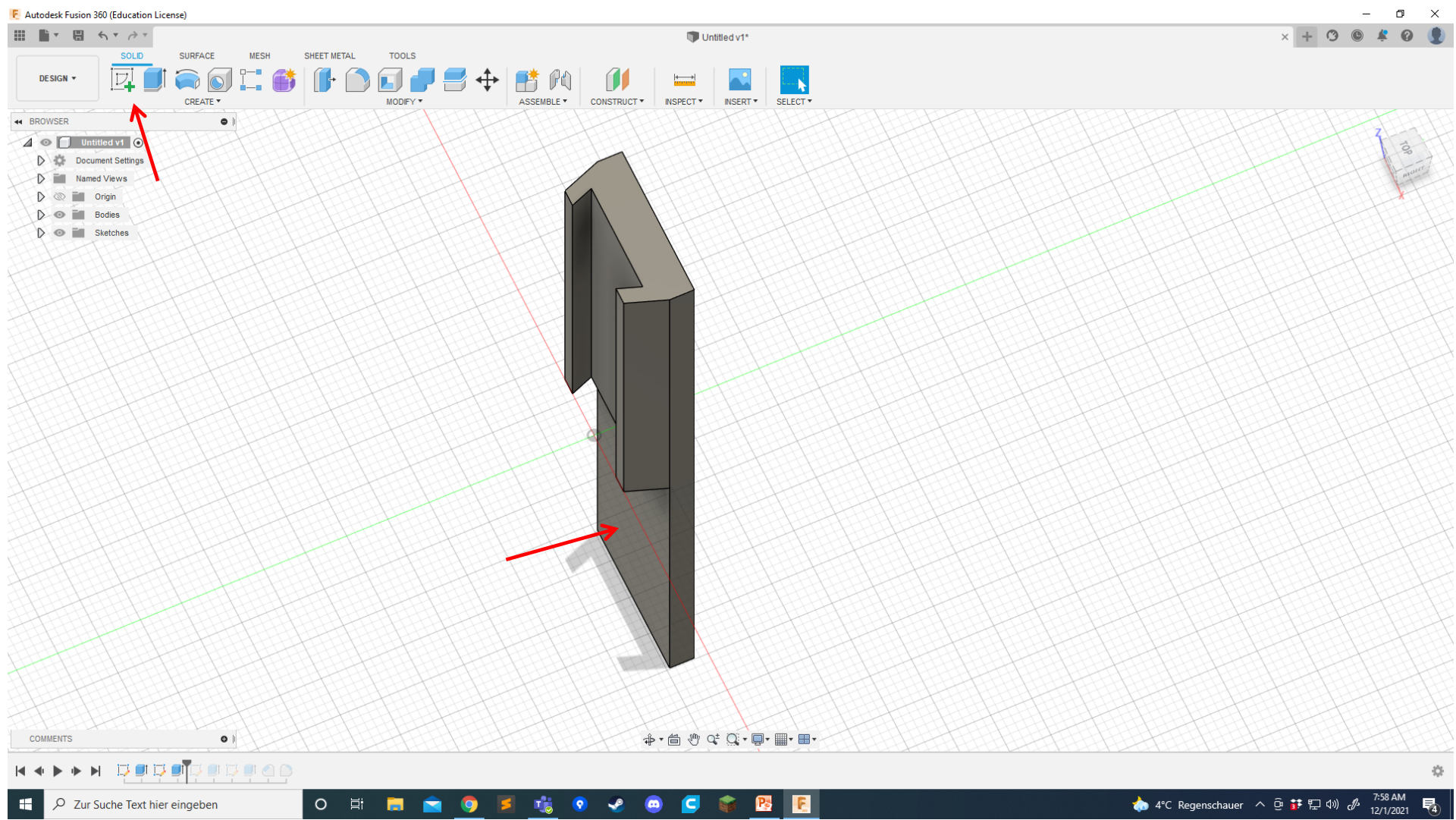
How to design 3D objects: The draft



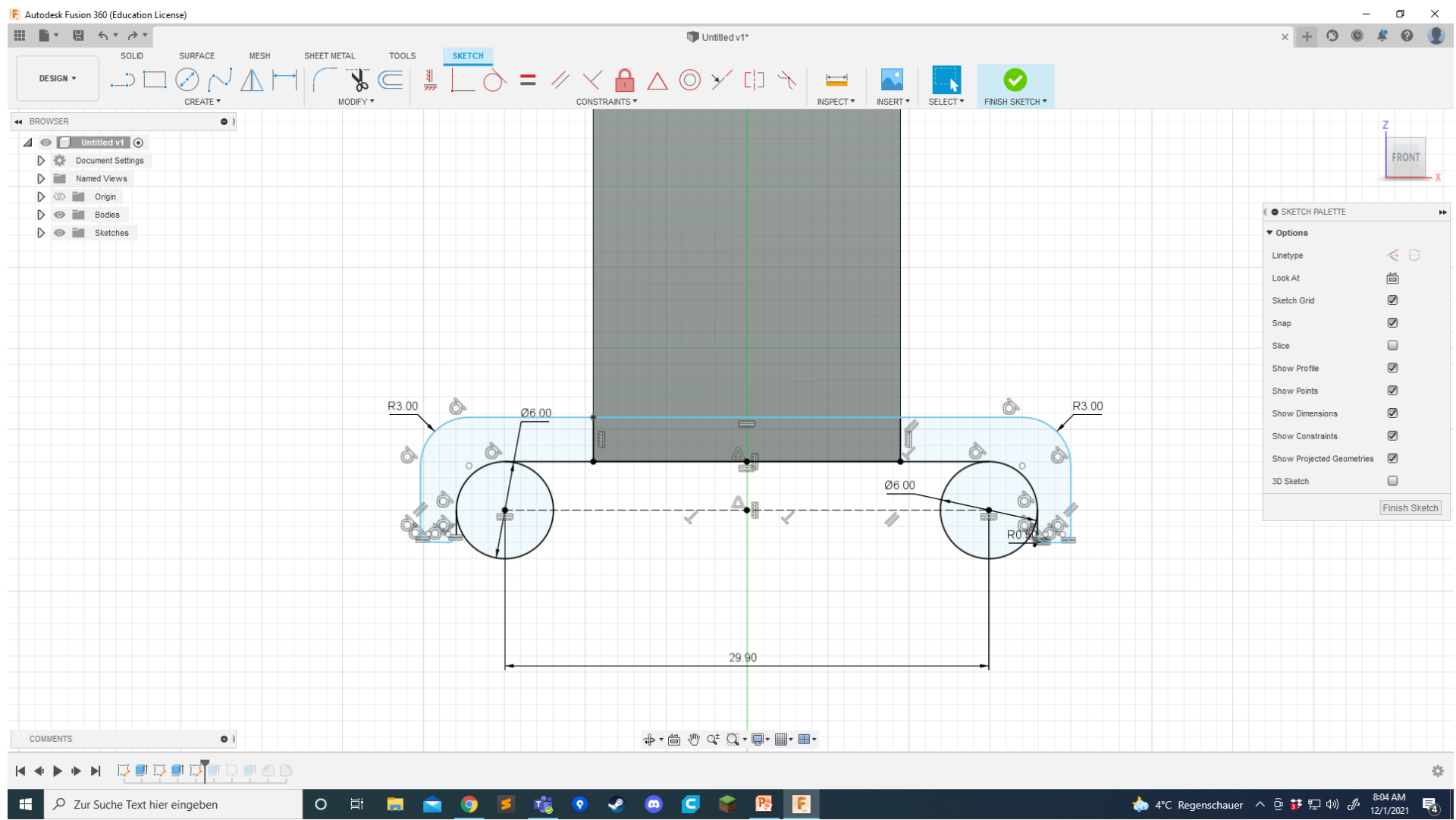
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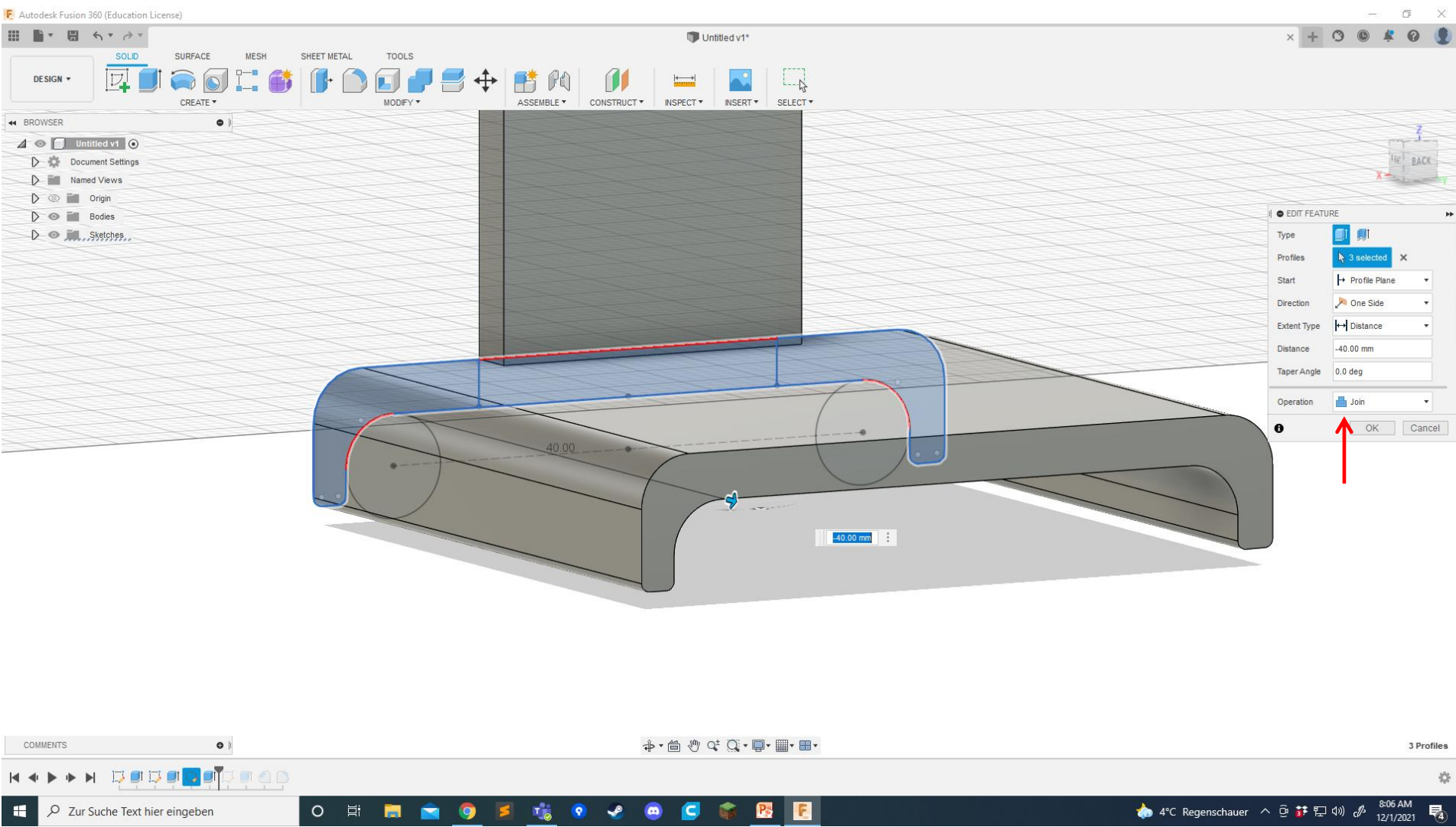
How to design 3D objects: The draft



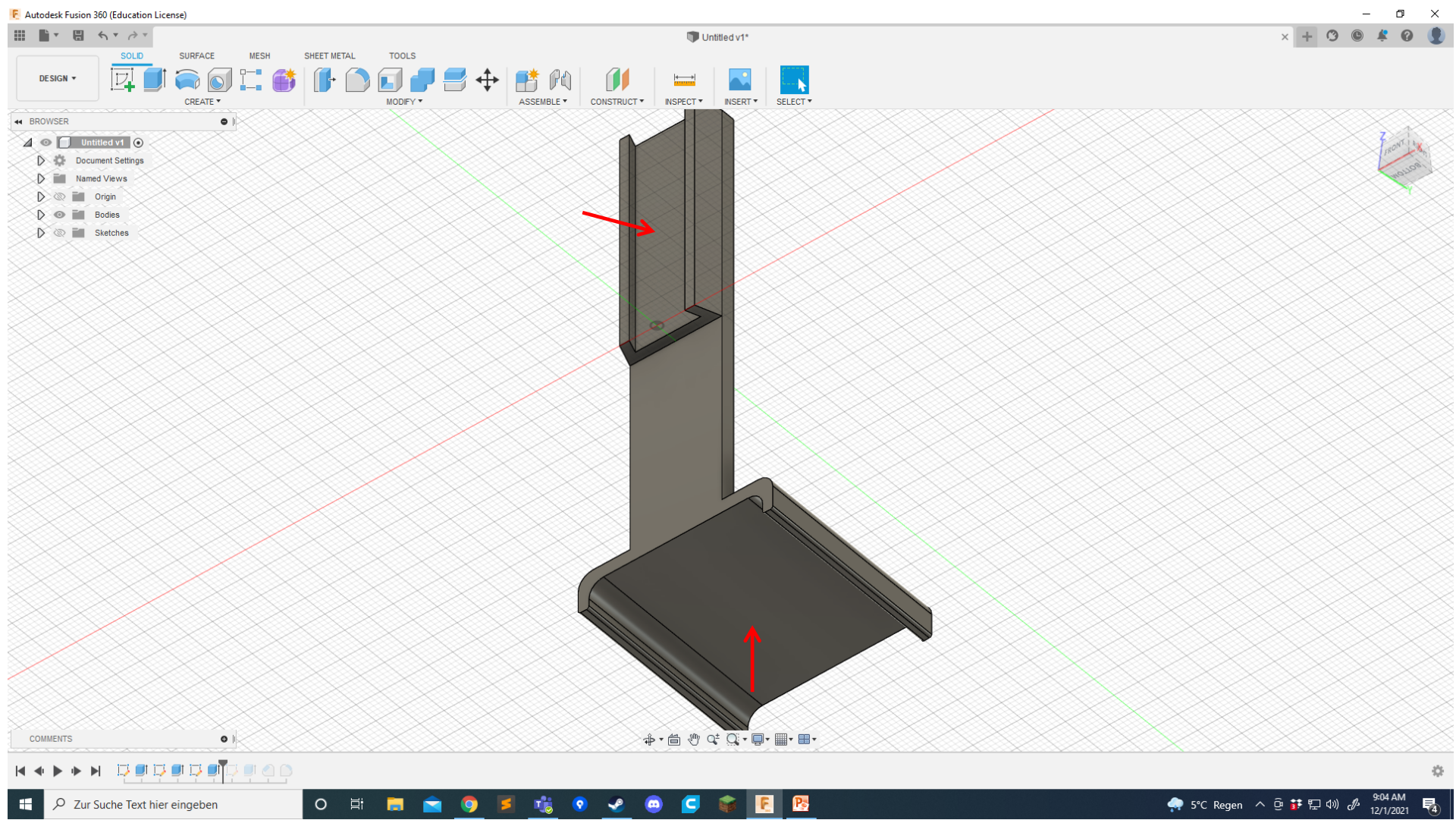
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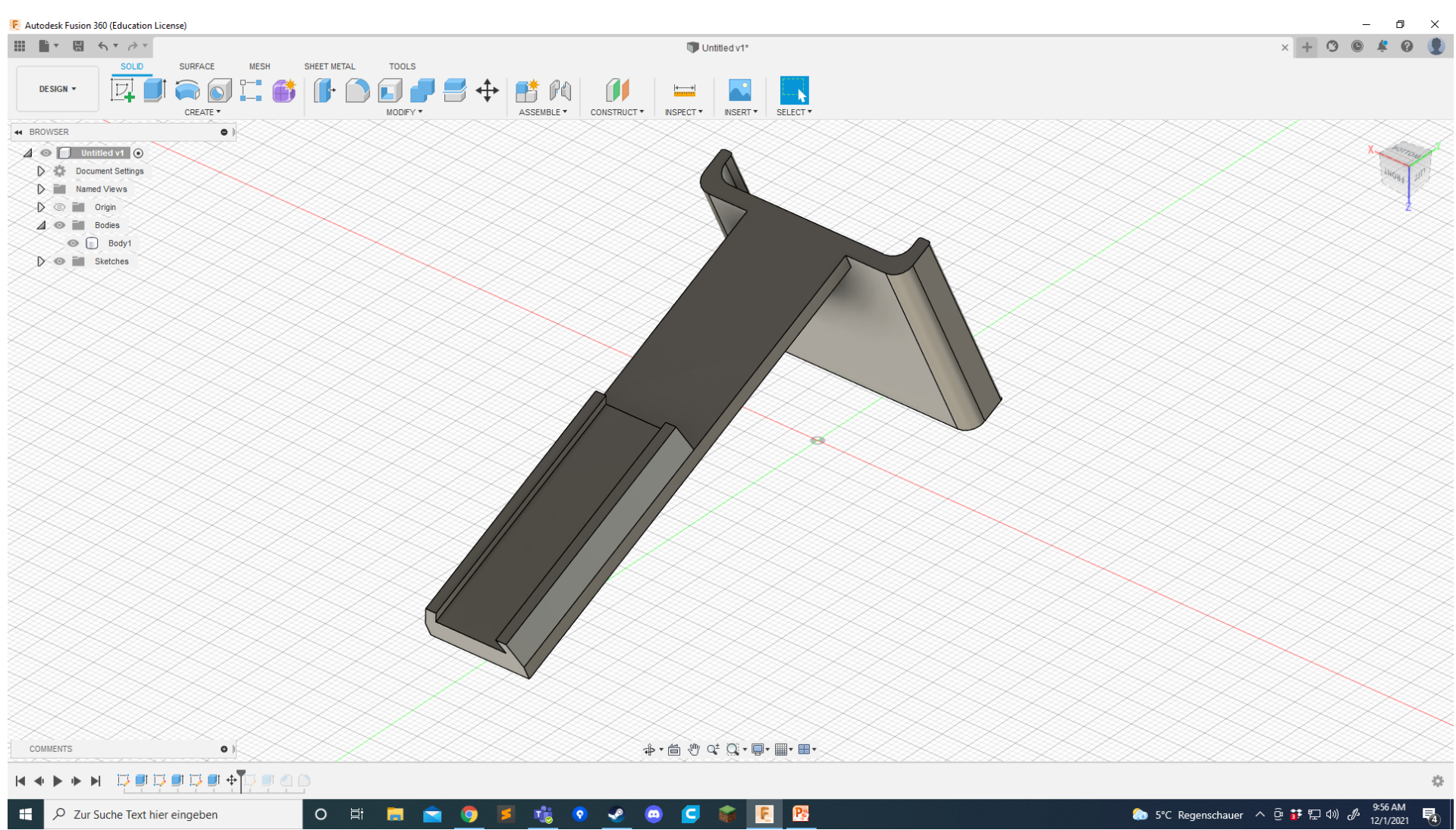
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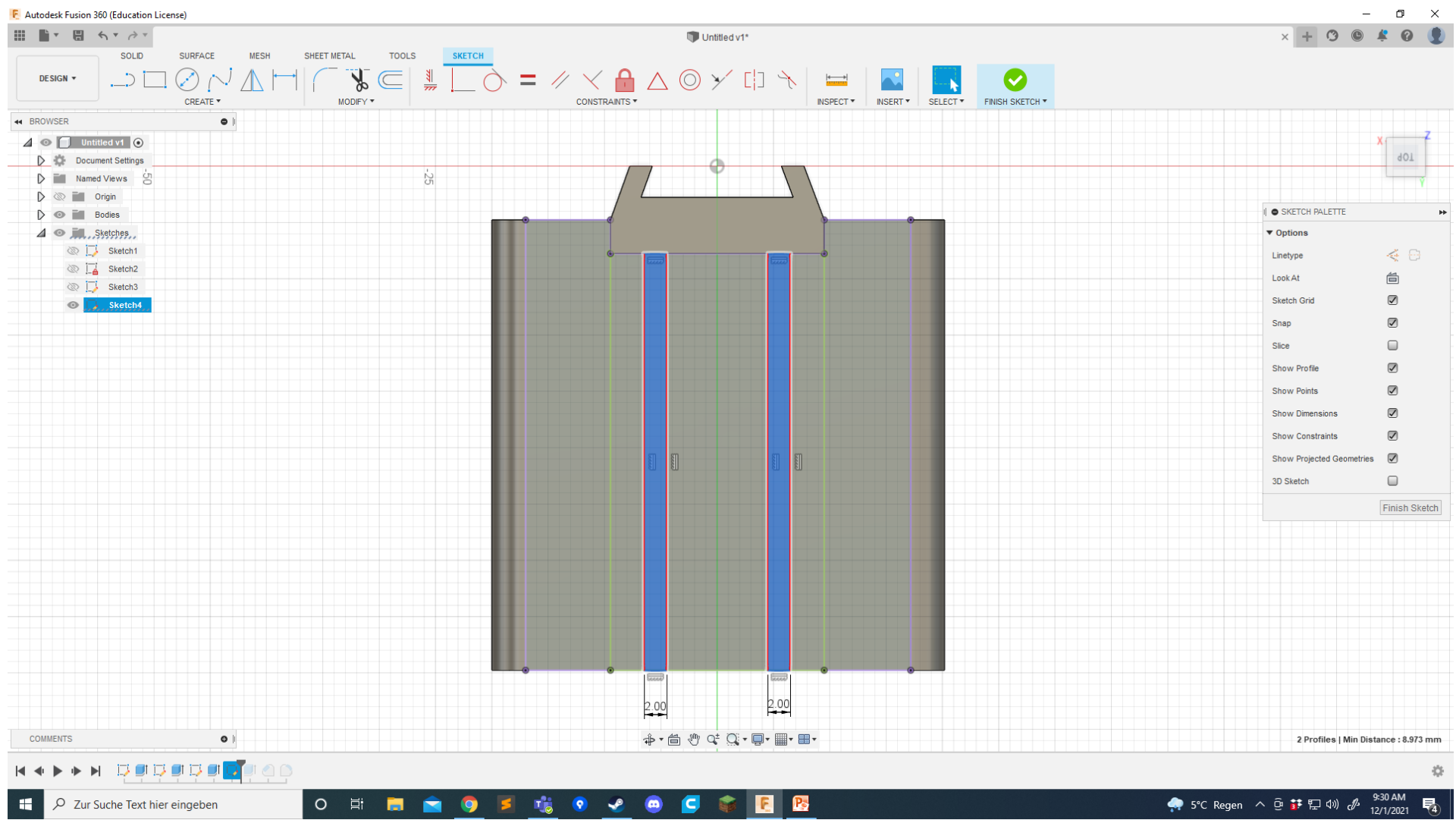
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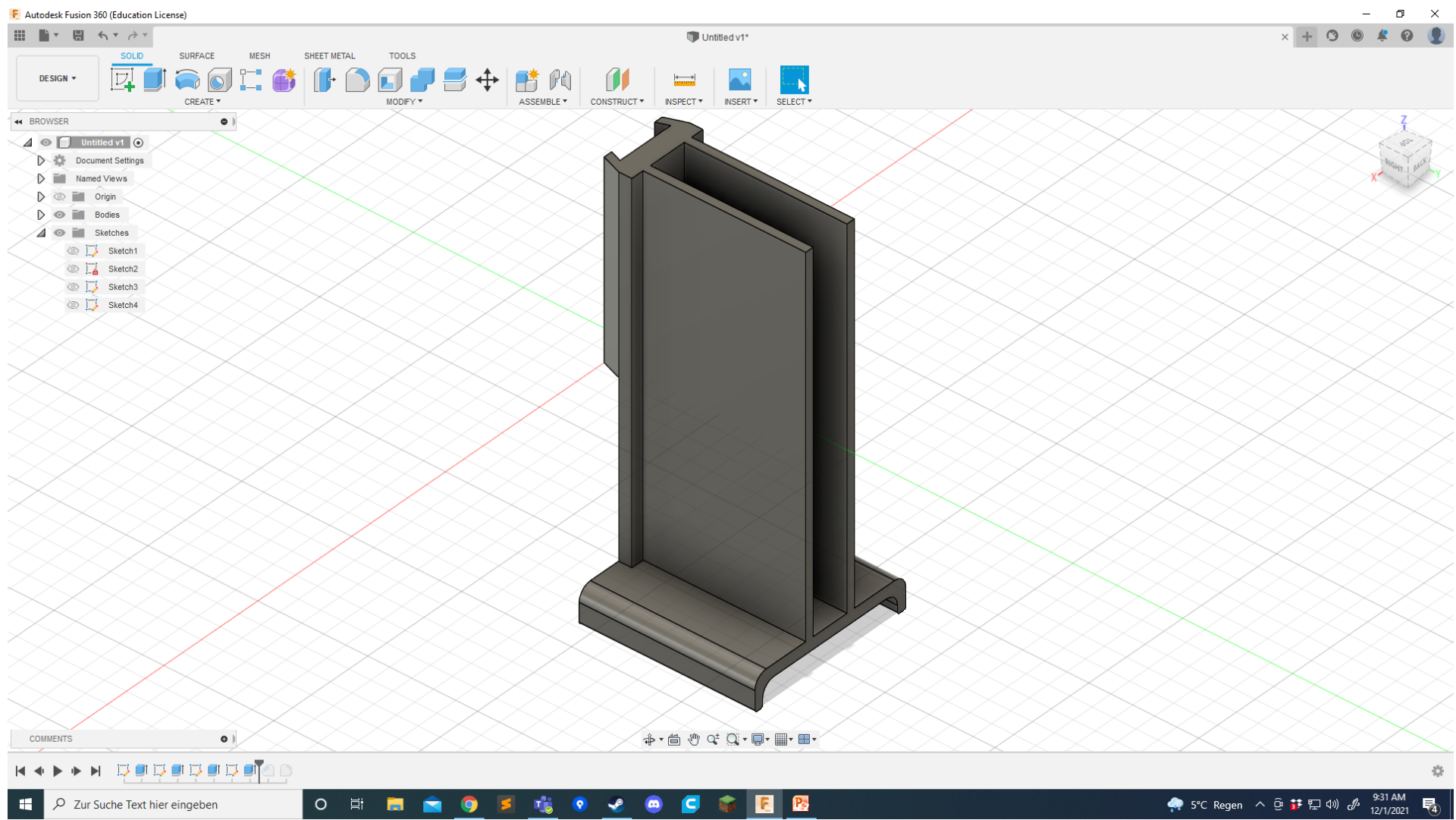
How to design 3D objects: The draft



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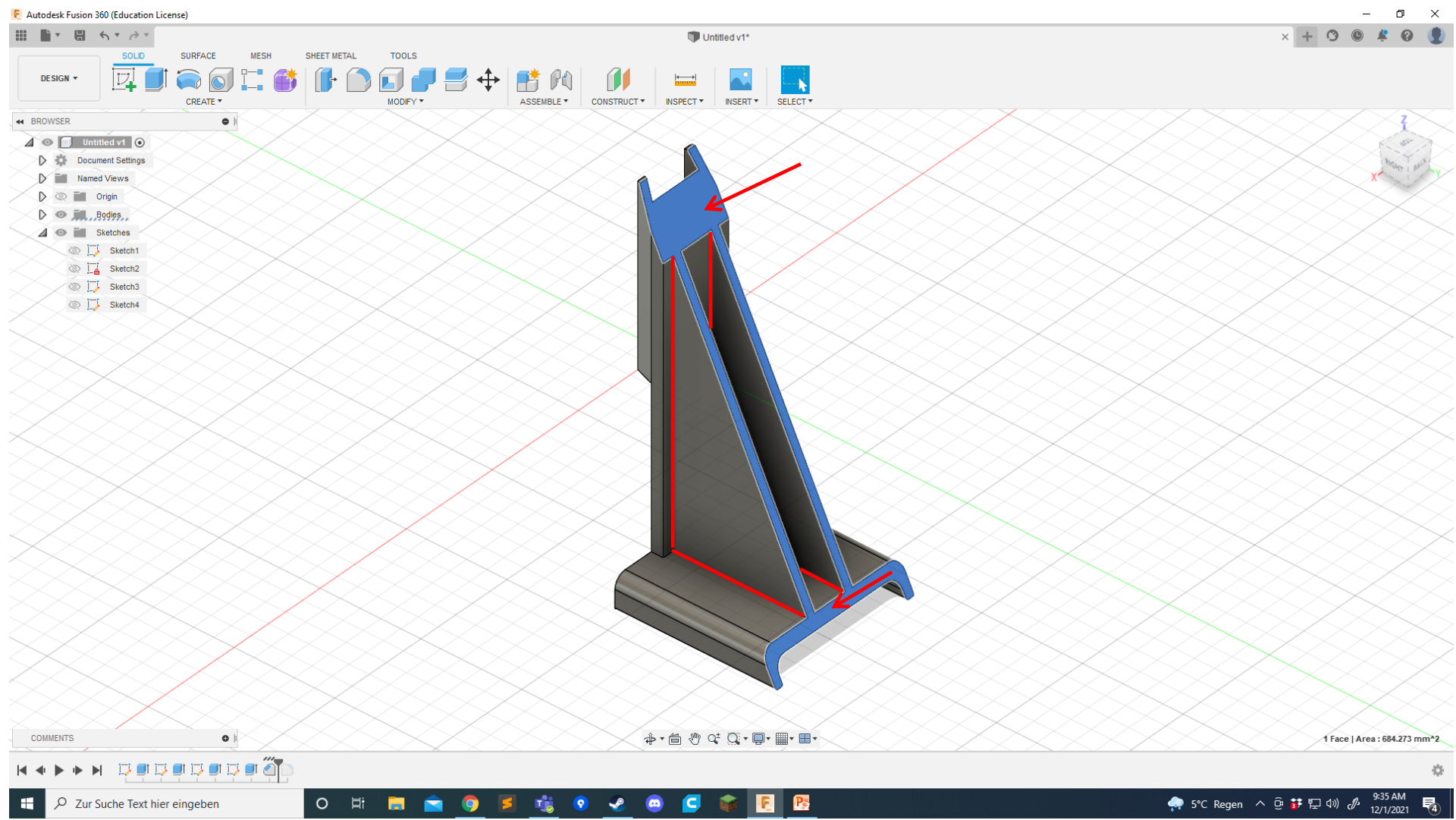
How to design 3D objects: The draft



How to design 3D objects: The draft

The image shows the Autodesk Fusion 360 software interface. The top toolbar has the 'MODIFY' tab selected, with a red arrow pointing to the 'Draft' icon. The 'DRAFT' tooltip is visible, explaining that it bevels edges by removing material from exterior edges or adding material to interior edges. It instructs the user to select edges, faces, or features and specify one distance, two distances, or a distance and an angle. Below the tooltip are two diagrams: a cube and a chamfered cube. The main 3D view shows a mechanical part with a draft feature being applied to its top edge, indicated by a blue arrow and a '25.00 mm' dimension. The 'EDIT FEATURE' dialog box is open on the right, showing '2 Edges' selected with dimensions of 25.00 mm and 20.00 mm. The 'Type' is set to 'Two Distance', and the 'Corner Type' is 'Chamfer'. A red arrow points to the 'Select' button in the dialog. The left sidebar shows the 'BROWSER' with 'Untitled v1' selected. The bottom status bar shows '2 Edges'.

How to design 3D objects: The draft



How to design 3D objects: The draft

Autodesk Fusion 360 (Education License)

DESIGN SOLID SURFACE MESH SHEET METAL TOOLS

CREATE MODIFY ASSEMBLE CONSTRUCT INSPECT INSERT SELECT

Browser: Untitled v1, Document Settings, Named Views, Origin, Edges, Sketches, Sketch1, Sketch2, Sketch3, Sketch4

Fillet (f)
Rounds the edges of a solid body by adding material to interior edges and removing material from exterior edges.
Select edges, faces, or features, then specify a radius. Use the Rule Fillet type to add fillets based on specified rules. Use the Full Round Fillet type to round the edges over three adjacent faces.
Press Ctrl+/ for more help.

EDIT FEATURE
Type: Fillet
9 Edges 4.00 mm Tangent (G1)
Radius Type: Constant
Edges/Faces/Features: Select
Tangent Chain:
Tangency Weight: 1
Corner Type: Rolling Ball
OK Cancel

4.00 mm

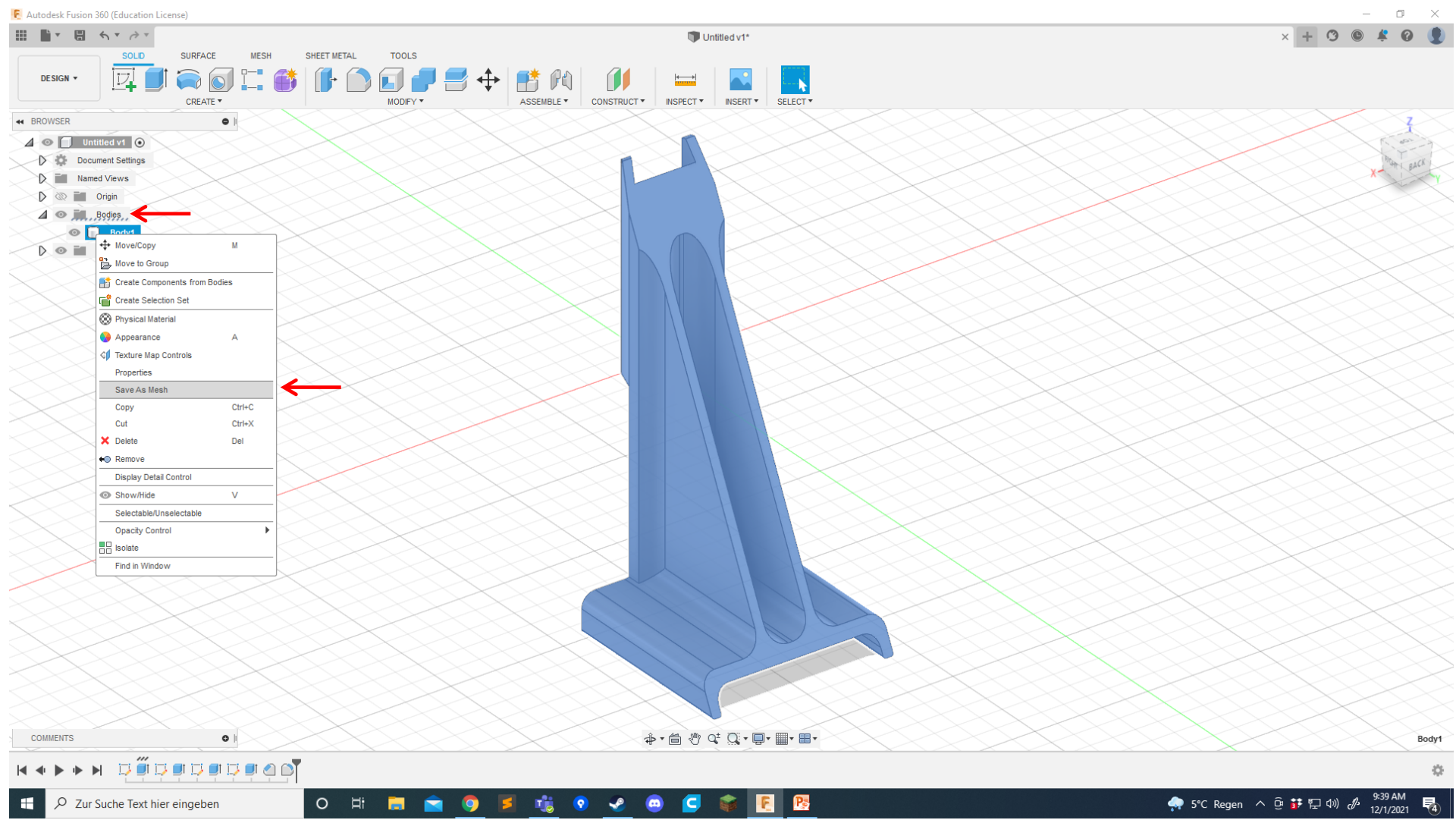
9 Edges

COMMENTS

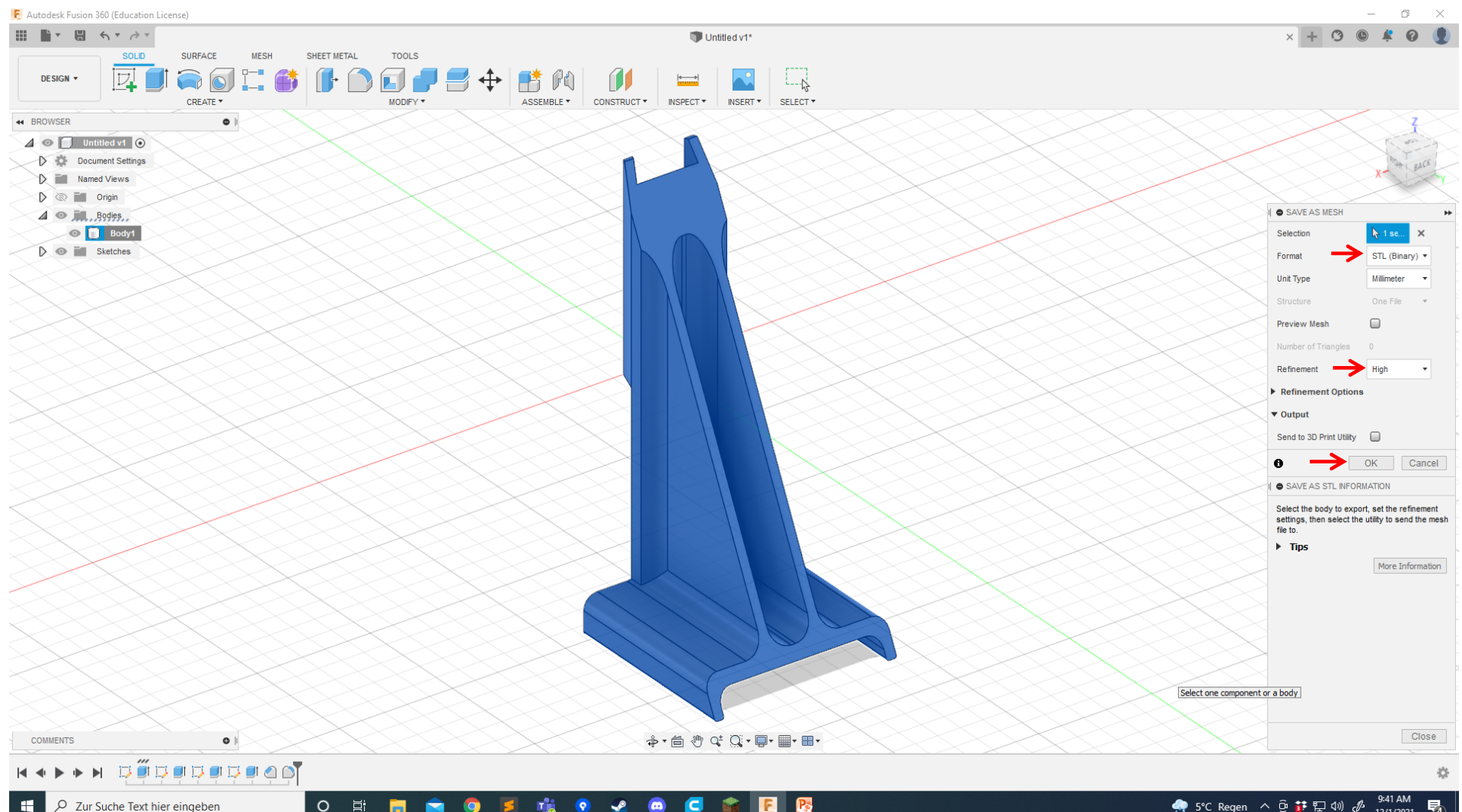
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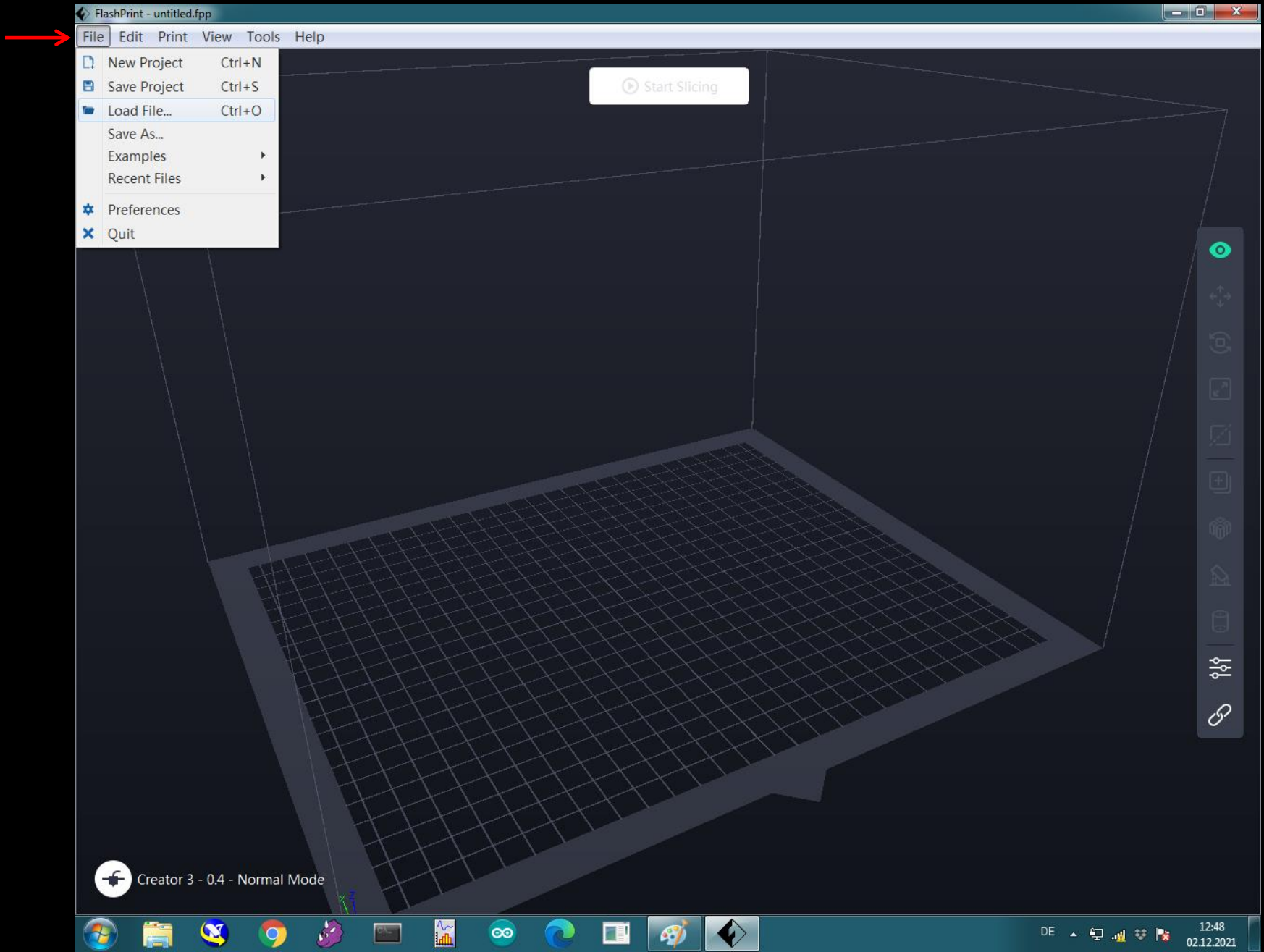
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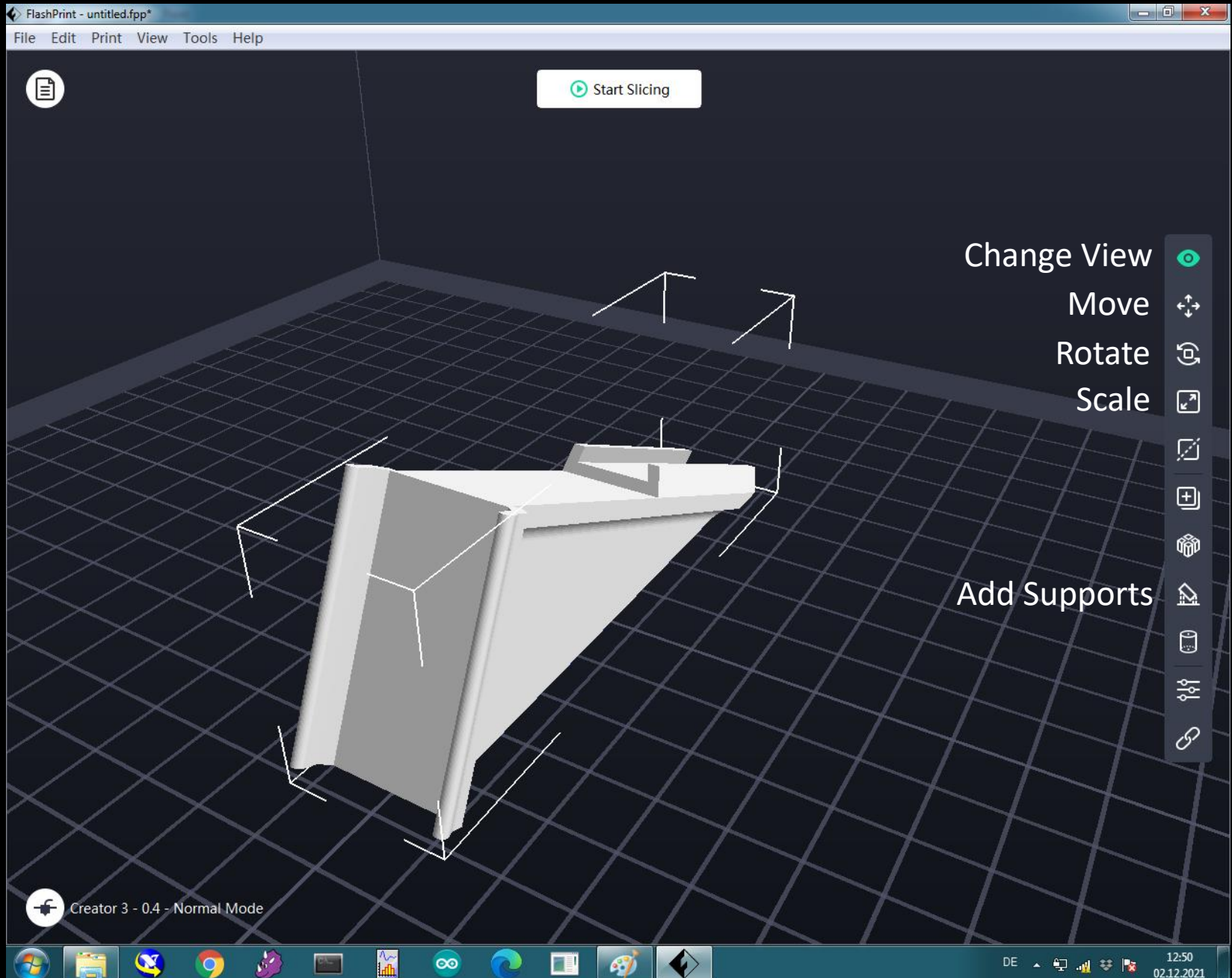
How to print with the Flashforge Creator 3



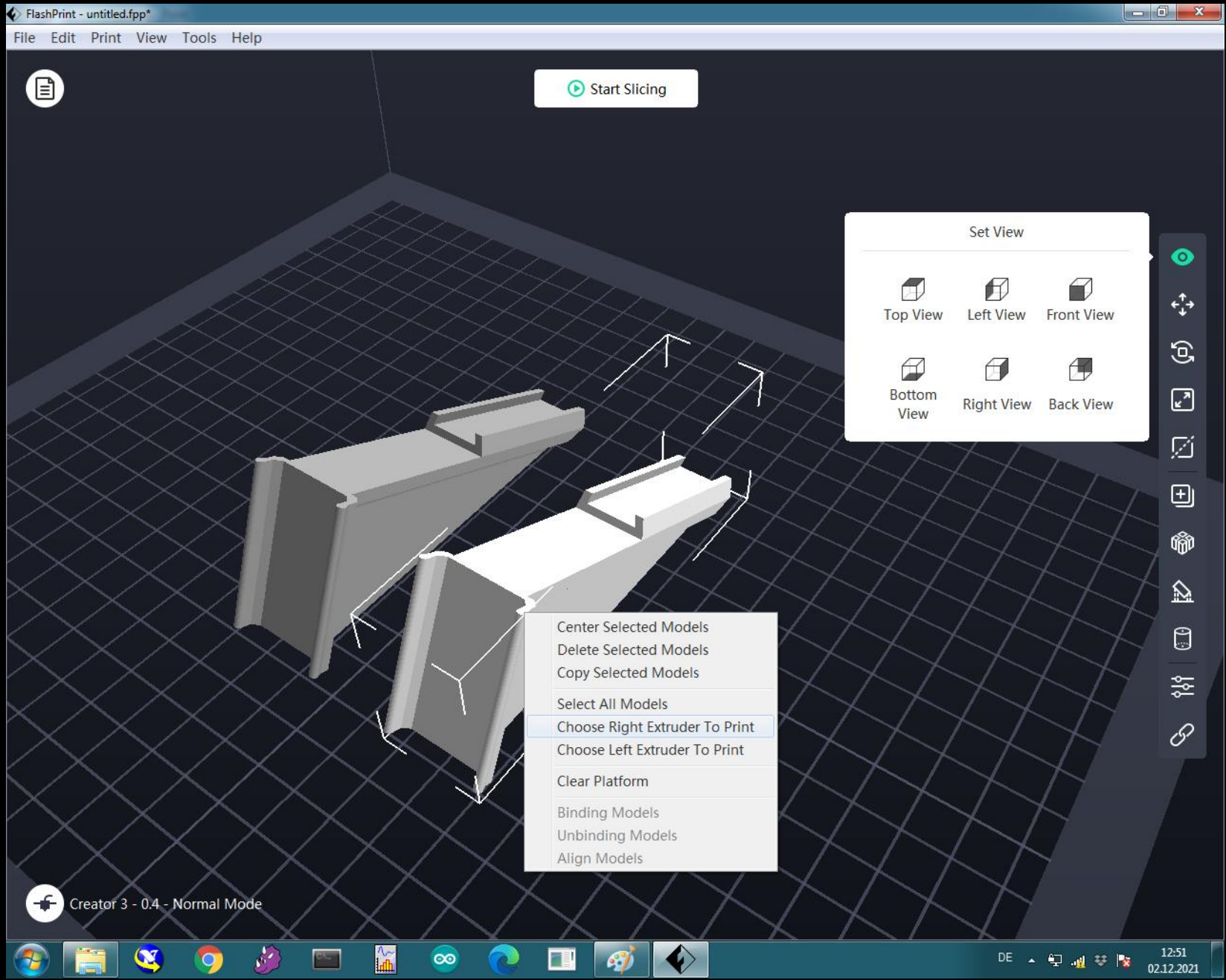
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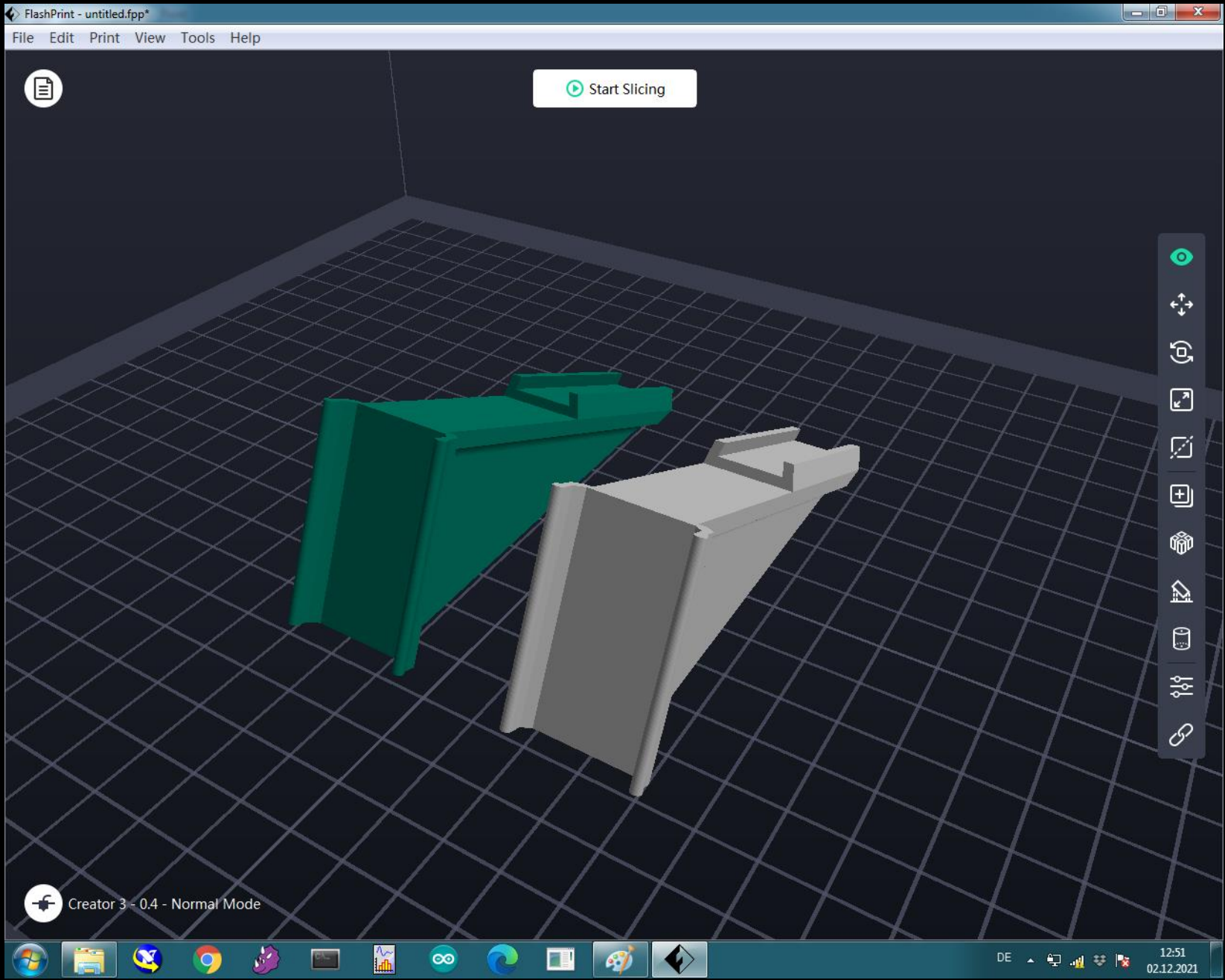
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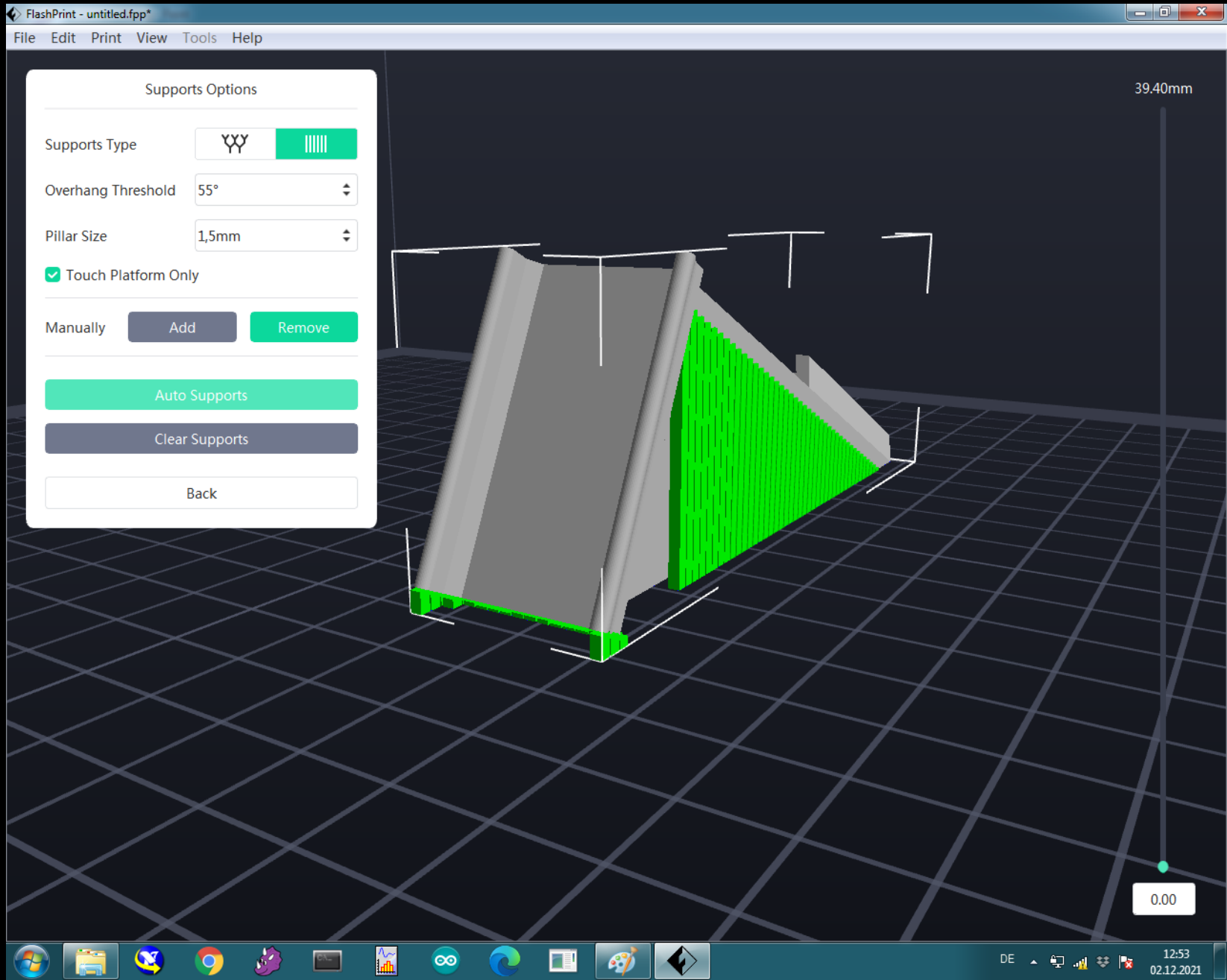
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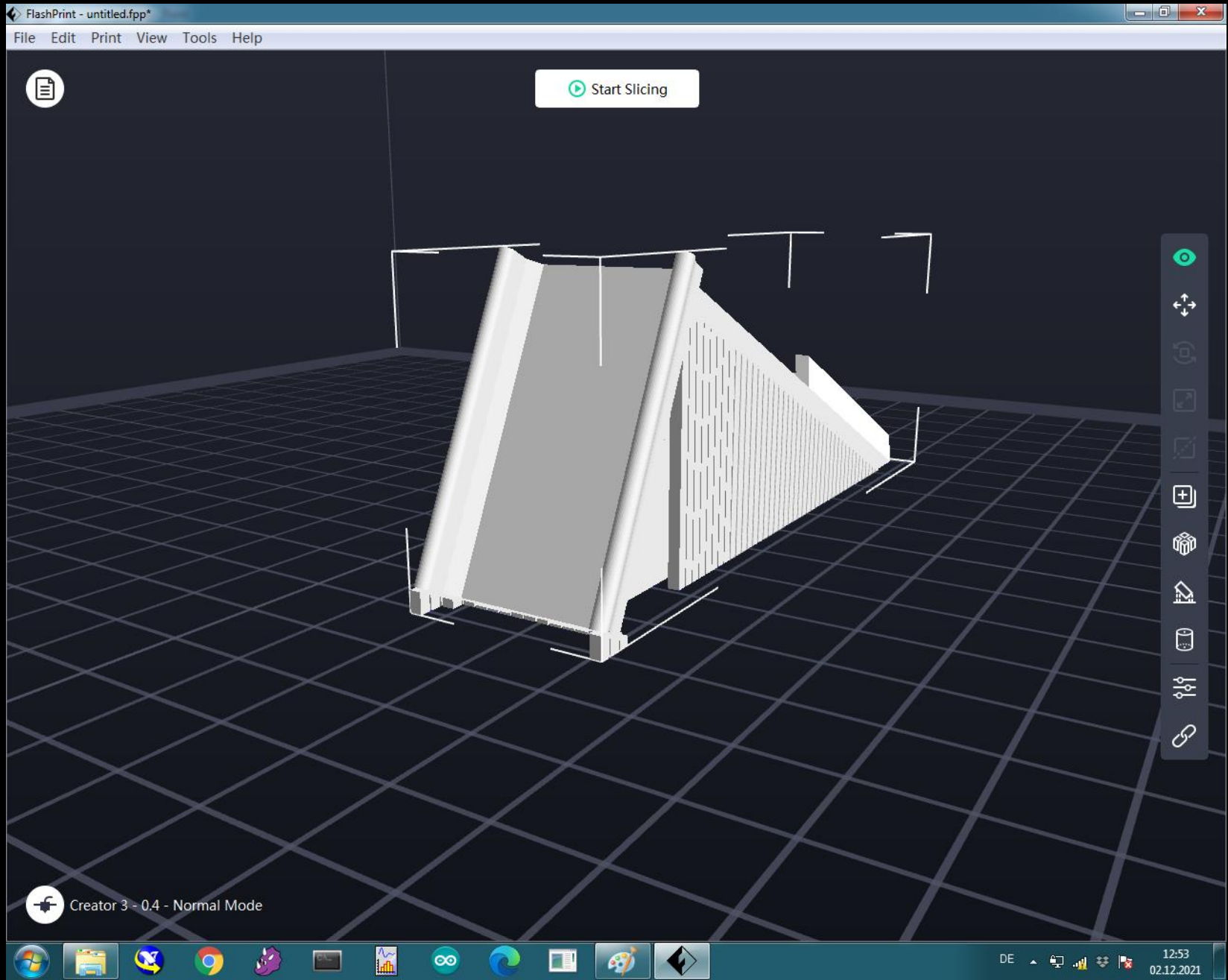
How to print: Flashforge



How to print: Flashforge



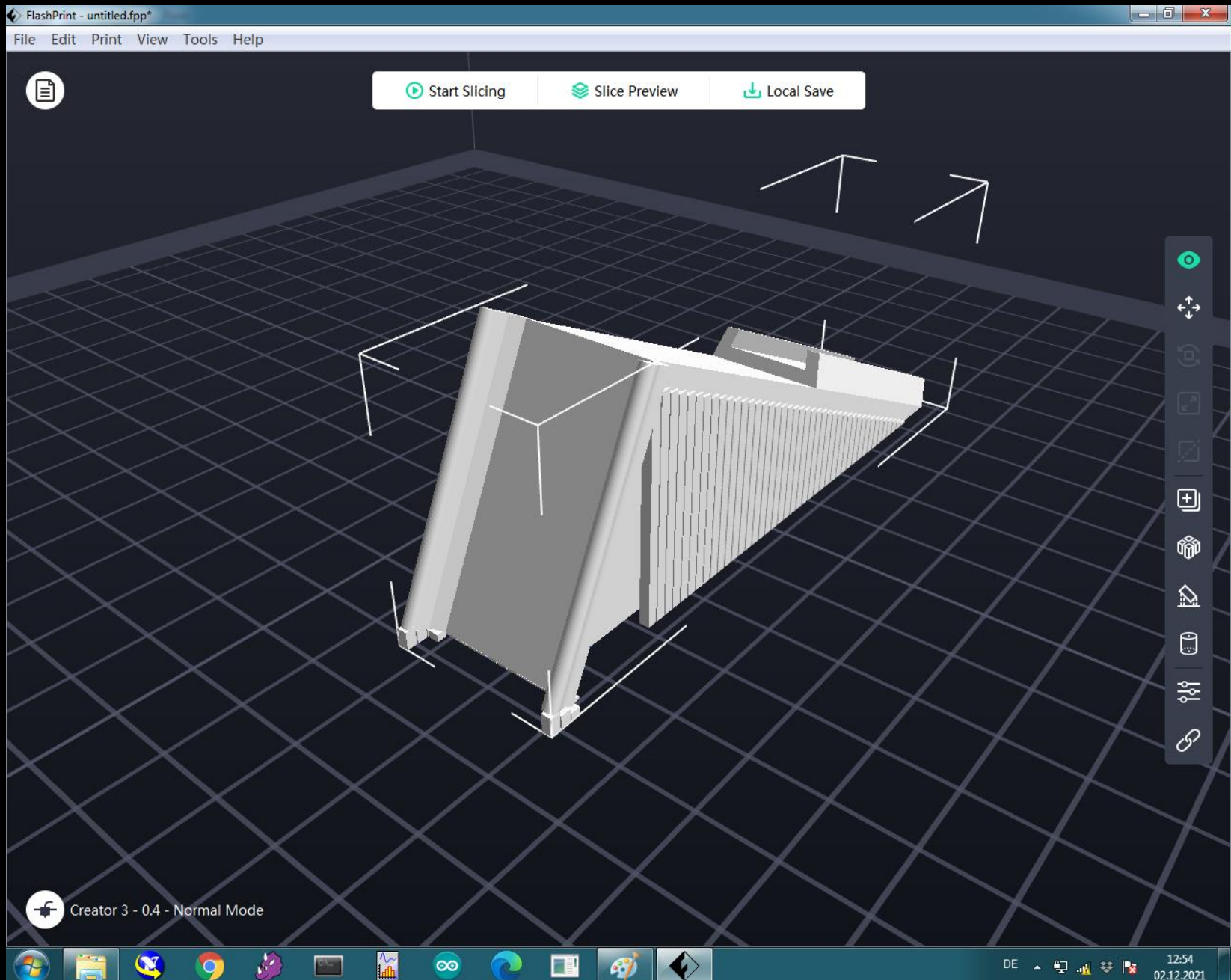
How to print: Flashforge



How to print: Flashforge

The screenshot displays the FlashPrint software interface. At the top, a menu bar includes 'File', 'Edit', 'Print', 'View', 'Tools', and 'Help'. A 'Start Slicing' button is prominently displayed in the center. The main area features a 'Slice' configuration window with a sidebar on the left listing categories: Printer, General, Shells, Infill, Supports, Raft, Additions, Cooling, Advanced, and Others. The 'Printer' category is selected, showing settings for 'Machine Type' (Creator 3), 'Material Right' (PLA, 1.75mm), 'Material Left' (PLA, 1.75mm), 'Slice Profile' (Standard), 'Right Extruder Temperature' (200°C), 'Left Extruder Temperature' (200°C), 'Platform Temperature' (60°C), 'Temperature Control List' (checked), and 'Control Module' (Right Extruder). A table at the bottom of the configuration window has columns for 'Start Layer', 'End Layer', and 'Temperature'. On the right side of the 'Slice' window, there are buttons for 'Basic Mode >', 'Save Configuration', 'Restore Defaults', 'Import', 'Export', 'Remove', and 'Save As New'. A large green 'Slice' button is at the bottom right. The background shows a 3D grid and a 'Creator 3 - 0.4 - Normal Mode' status bar. The Windows taskbar at the bottom includes icons for various applications and the system tray showing the date and time (12:54, 02.12.2021).

How to print: Flashforge



How to print: Flashforge

The screenshot displays the FlashPrint software interface for a file named "Sensapex_holder.gx". The main window shows a 3D model of a printed part on a grid. The model is composed of several layers, with the top layer being a light brown color and the bottom layer being a teal color. A red line is drawn on the grid, indicating a specific path or boundary.

At the top of the interface, there are three buttons: "Start Slicing" (green play icon), "Close Preview" (red X icon), and "Local Save" (green download icon). To the right of these buttons, a panel displays the following information:

- Print File Name: Sensapex_holder.gx
- Estimated Print Time: 2 Hours 21 Minutes
- Estimated Material Right: 17.87g / 5.99m

On the left side, a "Structure" panel lists various print settings with corresponding color-coded squares:

- Infill (Yellow)
- Solid Fill (Orange)
- Bridge (Red)
- Inner Shell (Green)
- Outer Shell (Light Brown)
- Supports (Teal)
- Brim (Blue)
- Raft (Purple)
- Wiping Tower (Olive)
- Wall (Grey)
- Travel (Dark Blue)
- Retraction (Dark Orange)
- Others (Dark Red)

At the bottom of the interface, a control panel shows the following settings:

- Structure: Sensapex_holder.gx
- Only Current Layer:
- Retraction:
- Travel:
- Layers: 218 / 39.34mm
- Steps: 12

The bottom of the screen shows the Windows taskbar with various application icons and the system tray displaying the time as 12:54 on 02.12.2021.

How to print: Flashforge

FlashPrint - Sensapex_holder.gx

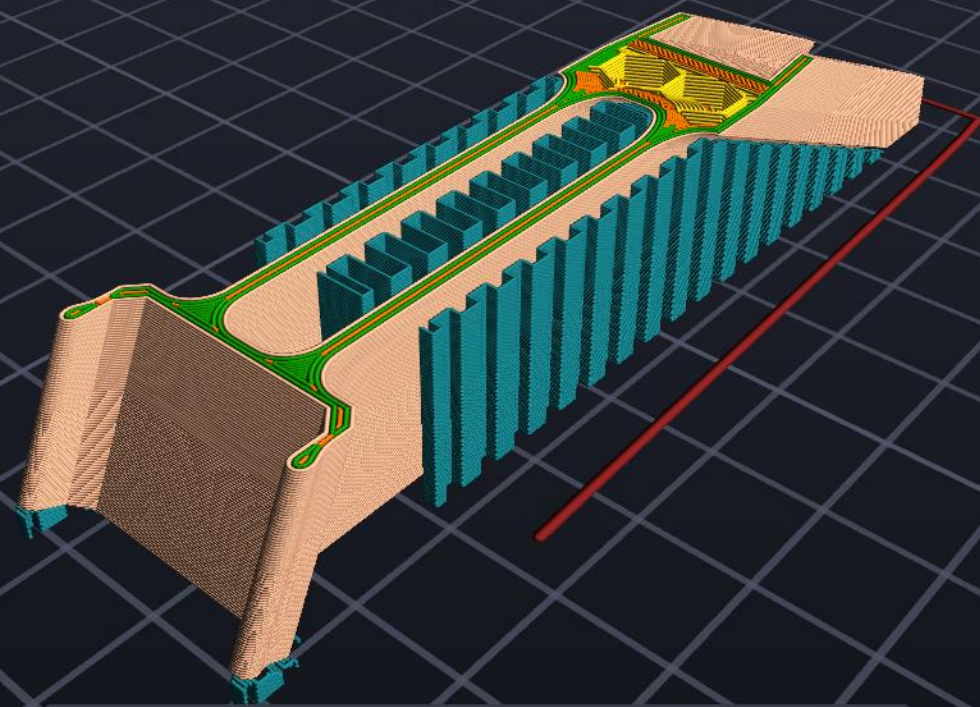
File Edit Print View Tools Help

Start Slicing Close Preview Local Save

Print File Name: Sensapex_holder.gx
Estimated Print Time: 2 Hours 21 Minutes
Estimated Material Right: 17.87g / 5.99m

Structure

- Infill
- Solid Fill
- Bridge
- Inner Shell
- Outer Shell
- Supports
- Brim
- Raft
- Wiping Tower
- Wall
- Travel
- Retraction
- Others



Structure

Sensapex_holder.gx

Only Current Layer
Retraction
Travel

Layers : 92 / 16.66mm

Steps : 782

Creator 3 - 0.4 - Normal Mode

DE 12:55 02.12.2021

How to print: Flashforge

FlashPrint - Sensapex_holder.gx

File Edit Print View Tools Help

Start Slicing Close Preview Local Save

Slicing File Name: Sensapex_holder.gx
Estimated Print Time: 2 Hours 21 Minutes
Estimated Material Right: 17.87g / 5.99m

Save To Local
Send To Printer

Structure

- Infill
- Solid Fill
- Bridge
- Inner Shell
- Outer Shell
- Supports
- Brim
- Raft
- Wiping Tower
- Wall
- Travel
- Retraction
- Others

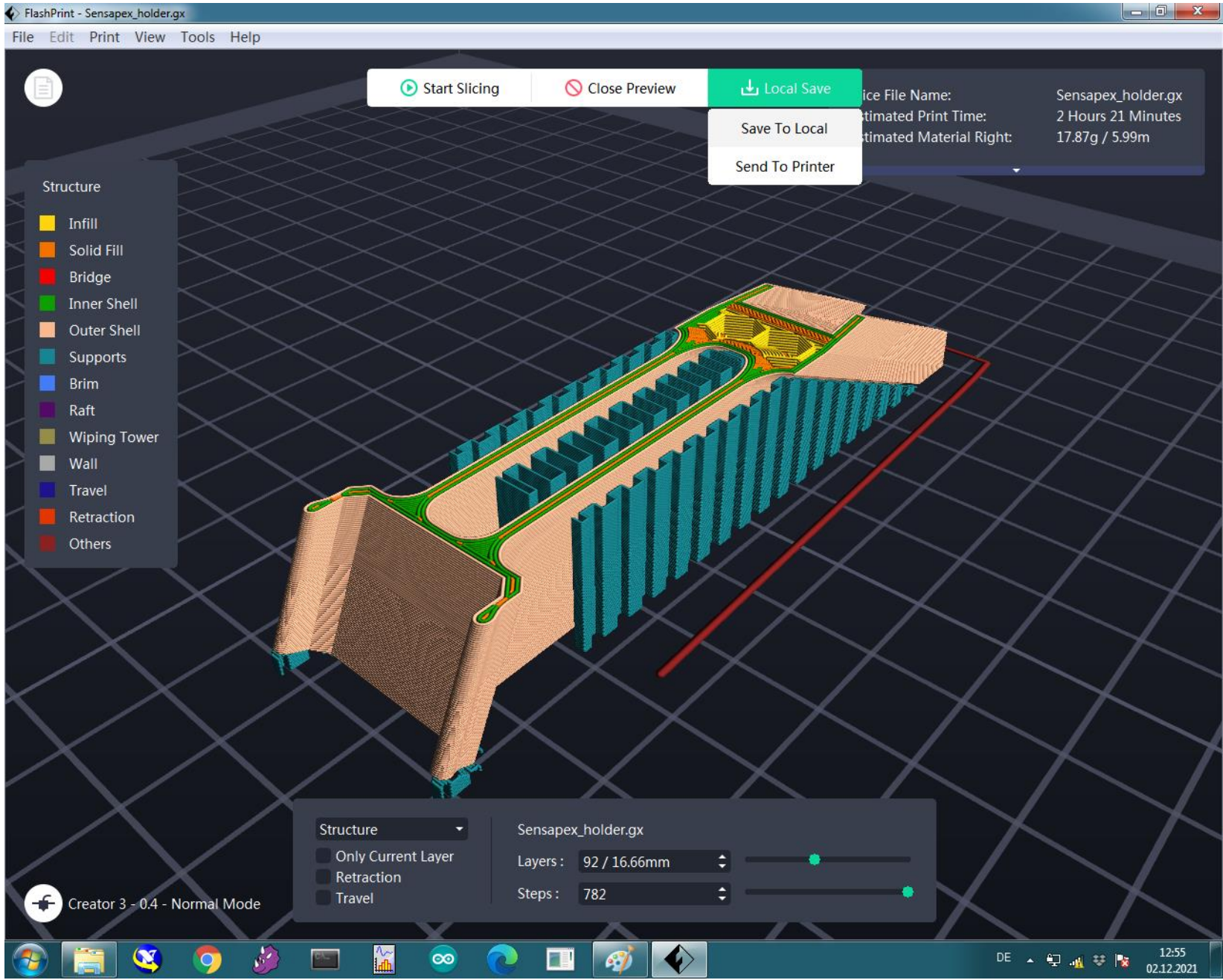
Structure Sensapex_holder.gx

Only Current Layer
Retraction
Travel

Layers: 92 / 16.66mm
Steps: 782

Creator 3 - 0.4 - Normal Mode

DE 12:55
02.12.2021



How to print with the Formlabs Form 2



How to print: Form 2

PreForm

File Edit View Help

JOB INFO

PRINTER

VIRTUAL PRINTER
Form 2

Resin Black V4
Layer Thickness 0.1 mm

DETAILS

Print Time N/A
Layers 0
Volume 0.00 mL

PRINTABILITY

Printability
Show Minima
Show Cups

MODEL LIST

DE 12:38
02.12.2021

How to print: Form 2

The screenshot displays the PreForm software interface. The main window shows a 3D wireframe model of a rectangular box on a grid. The 'File' menu is open, with 'Open...' selected. The right sidebar contains the following information:

- JOB INFO**
- PRINTER**: VIRTUAL PRINTER, Form 2
- Resin: Black V4
- Layer Thickness: 0.1 mm
- DETAILS**
- Print Time: N/A
- Layers: 0
- Volume: 0.00 mL
- PRINTABILITY** (toggle on)
- Printability: --
- Show Minima:
- Show Cups:
- MODEL LIST**

The Windows taskbar at the bottom shows the time as 12:38 on 02.12.2021.

How to print: Form 2

The screenshot displays the PreForm software interface for a 3D printing job. The main window shows a blue 3D model of a printer component, labeled 'Form 2', positioned on a grid within a transparent virtual build volume. The interface includes a top menu bar with 'File', 'Edit', 'View', and 'Help'. A left toolbar contains various icons for navigation and editing. The right sidebar provides job information and printability details.

JOB INFO

PRINTER

- VIRTUAL PRINTER
- Form 2
- Resin: Black V4
- Layer Thickness: 0.1 mm

DETAILS

- Print Time: ~ 5 h
- Layers: 924
- Volume: 15.28 mL

PRINTABILITY

- Printability: Warning
- Models Directly on Build Platform: Models may not print properly when placed directly on the build platform. Using supports to elevate them is recommended.
- Show Minima:
- Show Cups:

MODEL LIST (1)

- Sensapex_holder

The Windows taskbar at the bottom shows the system clock at 12:39 on 02.12.2021, along with various application icons.

How to print: Form 2

Sensapex_holder.stl [*] - PreForm

File Edit View Help

ORIENTATION

Auto-Orient Selected

ORIENT TO FACE

Select Base...

Choose a face on the model to align it with build platform

ORIENT AXES

Orient X

Orient Y

Orient Z

ORIENT TO BOUNDING BOX

Reset Selected

JOB INFO

PRINTER

VIRTUAL PRINTER

Form 2

Resin Black V4

Layer Thickness 0.1 mm

DETAILS

Print Time ~ 3 h 15 min

Layers 448

Volume 15.28 mL

PRINTABILITY

Printability Warning

Models Directly on Build Platform

Models may not print properly when placed directly on the build platform. Using supports to elevate them is recommended.

Show Minima

Show Cups

MODEL LIST (1)

Sensapex_holder

WIPER SIDE

FRONT

12:44 02.12.2021

How to print: Form 2

ORIENT FACE MODE

Use your mouse to select a face to orient towards the build platform. You will need to regenerate supports for any currently-supported models.

Done

JOB INFO

PRINTER

VIRTUAL PRINTER

Form 2

Resin Black V4
Layer Thickness 0.1 mm

DETAILS

Print Time ~ 3 h 15 min
Layers 448
Volume 15.28 mL

PRINTABILITY

Printability Warning

Models Directly on Build Platform

Models may not print properly when placed directly on the build platform. Using supports to elevate them is recommended.

Show Minima
Show Cups

MODEL LIST (1)

Sensapex_holder

How to print: Form 2

The screenshot displays the PreForm software interface for printing a 3D model. The main window shows a dark grey 3D model of a 'Sensapex_holder' on a white grid. The grid has labels 'FRONT' and 'RIGHT' on its edges. The software window title is 'Sensapex_holder.stl [*] - PreForm'. The top menu bar includes 'File', 'Edit', 'View', and 'Help'. A toolbar on the left contains icons for various functions, with a print icon highlighted in orange. The right sidebar contains the following information:

- JOB INFO**
- PRINTER**: VIRTUAL PRINTER, Form 2
- Resin: Black V4
- Layer Thickness: 0.1 mm
- DETAILS**
- Print Time: ~ 3 h
- Layers: 393
- Volume: 15.28 mL
- PRINTABILITY**: Warning
- Models Directly on Build Platform**: Models may not print properly when placed directly on the build platform. Using supports to elevate them is recommended.
- Show Minima:
- Show Cups:
- MODEL LIST (1)**: Sensapex_holder

The Windows taskbar at the bottom shows the time as 12:45 on 02.12.2021.

How to print: Form 2

The screenshot displays the PreForm software interface for a 3D printing job. The main window shows a 3D model of a black 'Sensapex_holder' on a white grid. A 'SUPPORTS' panel is open on the left, featuring an 'Auto-Generate All' button and a 'Generate Supports' tooltip. The panel includes sections for 'EDIT SUPPORTS', 'BASIC SETTINGS' (Raft Type: Mini Rafts, Density: 1.00, Touchpoint Size: 0.80 mm, Internal Supports: checked), and 'ADVANCED SETTINGS'. A 'Reset' button is at the bottom of the panel. On the right, the 'JOB INFO' sidebar shows 'VIRTUAL PRINTER Form 2' with 'Resin: Black V4' and 'Layer Thickness: 0.1 mm'. Below this, 'DETAILS' shows 'Print Time: ~ 3 h', 'Layers: 393', and 'Volume: 15.28 mL'. The 'PRINTABILITY' section is set to 'Warning'. A warning message states: 'Models Directly on Build Platform. Models may not print properly when placed directly on the build platform. Using supports to elevate them is recommended.' The 'MODEL LIST (1)' shows 'Sensapex_holder' is selected. The Windows taskbar at the bottom shows the time as 12:45 on 02.12.2021.

Sensapex_holder.stl [*] - PreForm

File Edit View Help

SUPPORTS

Auto-Generate All

Generate Supports

EDIT SUPPORTS

Edit All... Clear All

BASIC SETTINGS

Raft Type Mini Rafts

Raft Label

Density 1.00

Touchpoint Size 0.80 mm

Internal Supports

ADVANCED SETTINGS

Reset

JOB INFO

PRINTER

VIRTUAL PRINTER

Form 2

Resin Black V4

Layer Thickness 0.1 mm

DETAILS

Print Time ~ 3 h

Layers 393

Volume 15.28 mL

PRINTABILITY

Printability Warning

Models Directly on Build Platform

Models may not print properly when placed directly on the build platform. Using supports to elevate them is recommended.

Show Minima

Show Cups

MODEL LIST (1)

Sensapex_holder

FRONT

12:45 02.12.2021

How to print: Form 2

The screenshot displays the PreForm software interface for a 3D printing job. The main window shows a 3D model of a dark grey, elongated rectangular object with a complex, lattice-like support structure underneath. The model is positioned on a white grid. The interface includes a top menu bar with 'File', 'Edit', 'View', and 'Help'. A toolbar on the left contains various icons for editing and viewing. On the right, a 'JOB INFO' panel provides details about the printer and job settings.

JOB INFO

PRINTER

- VIRTUAL PRINTER
- Form 2
- Resin: Black V4
- Layer Thickness: 0.1 mm

DETAILS

- Print Time: ~ 3 h 30 min
- Layers: 451
- Volume: 18.98 mL

PRINTABILITY

- Printability: Pass
- Show Minima:
- Show Cups:

MODEL LIST (1)

- Sensapex_holder

The Windows taskbar at the bottom shows the system tray with the time 12:47 and date 02.12.2021, along with several application icons.

How to print: Form 2

Sensapex_holder.stl [*] - PreForm

File Edit View Help

ORIENTATION

Auto-Orient All

ORIENT TO FACE

Select Base...

ORIENT AXES

Orient X

Orient Y

Orient Z

ORIENT TO BOUNDING BOX

Reset Selected

JOB INFO

PRINTER

VIRTUAL PRINTER

Form 2

Resin Black V4

Layer Thickness 0.1 mm

DETAILS

Print Time ~ 3 h

Layers 394

Volume 15.28 mL

PRINTABILITY

Printability Error

Models Directly on Build Platform

Models may not print properly when placed directly on the build platform. Using supports to elevate them is recommended.

Show Minima

Unsupported Minima Detected

Regions outlined in red are unsupported and will not adhere to the print. Manually add more supports.

Show Cups

Cup Detected

Regions outlined in yellow are cups and may result in blowout or poor surface finish. Consider adding vent holes or reorienting the model.

MODEL LIST (1)

Sensapex_holder

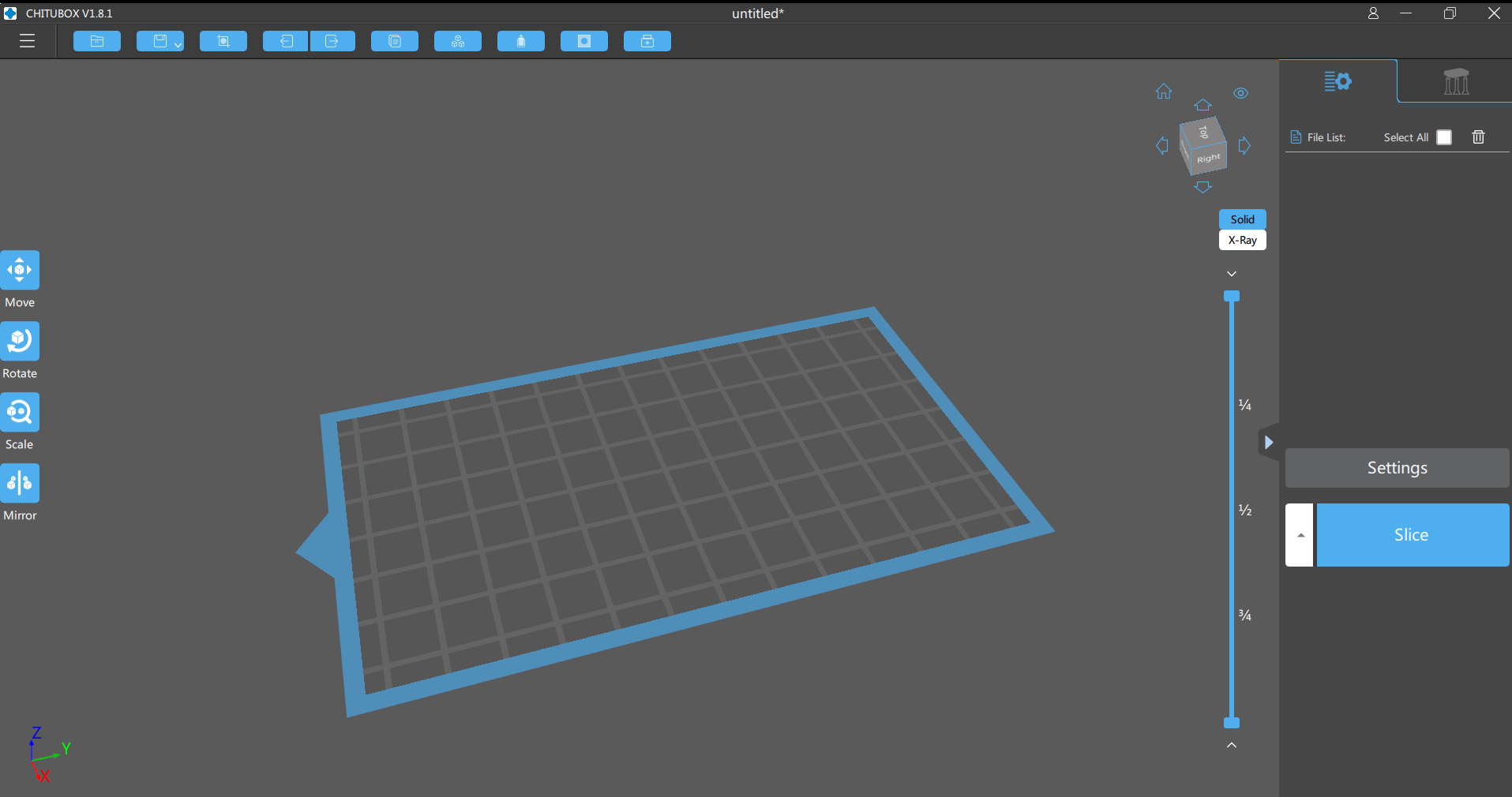
FRONT

12:46 02.12.2021

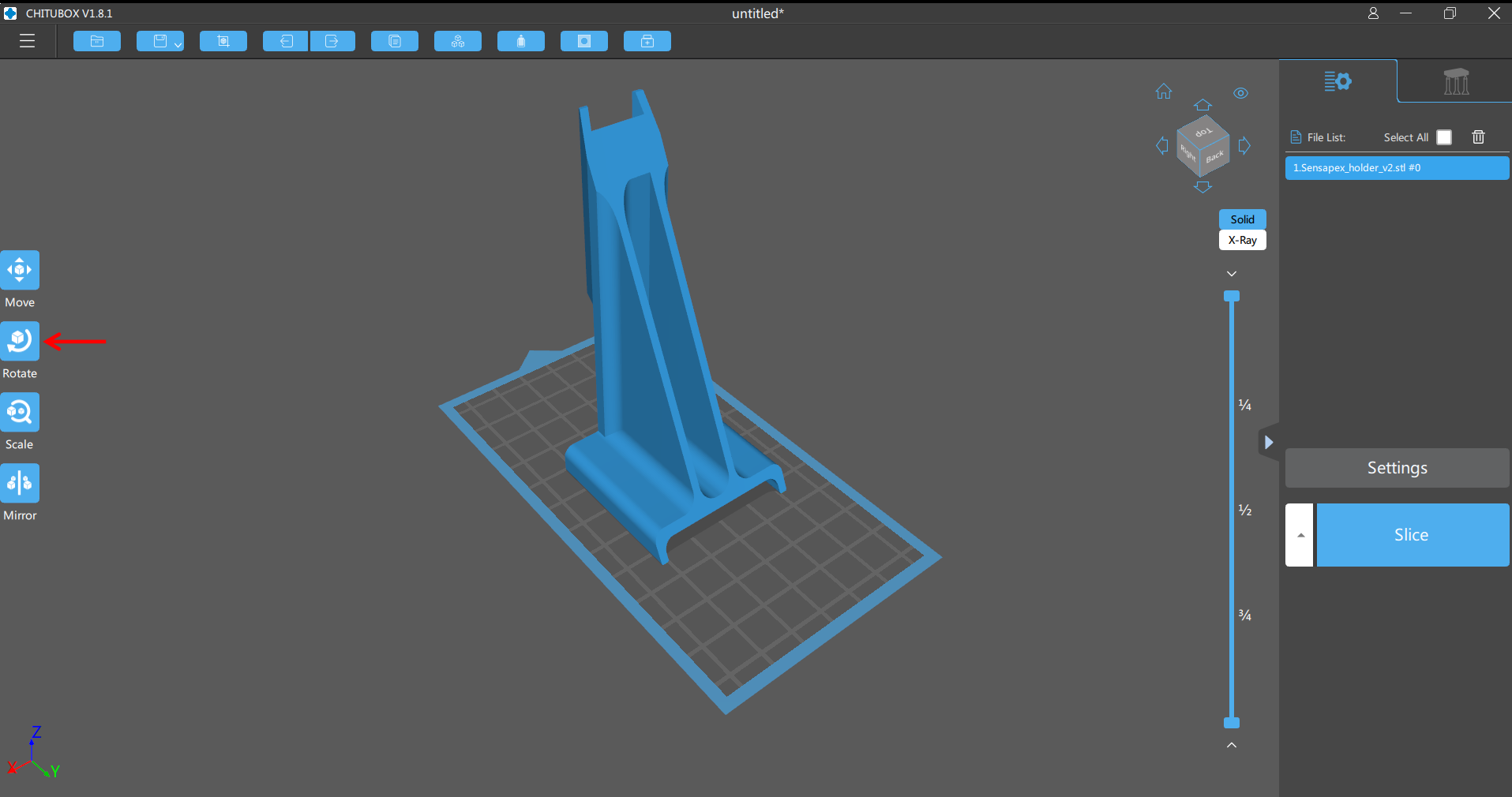
How to print with the Creality LD002



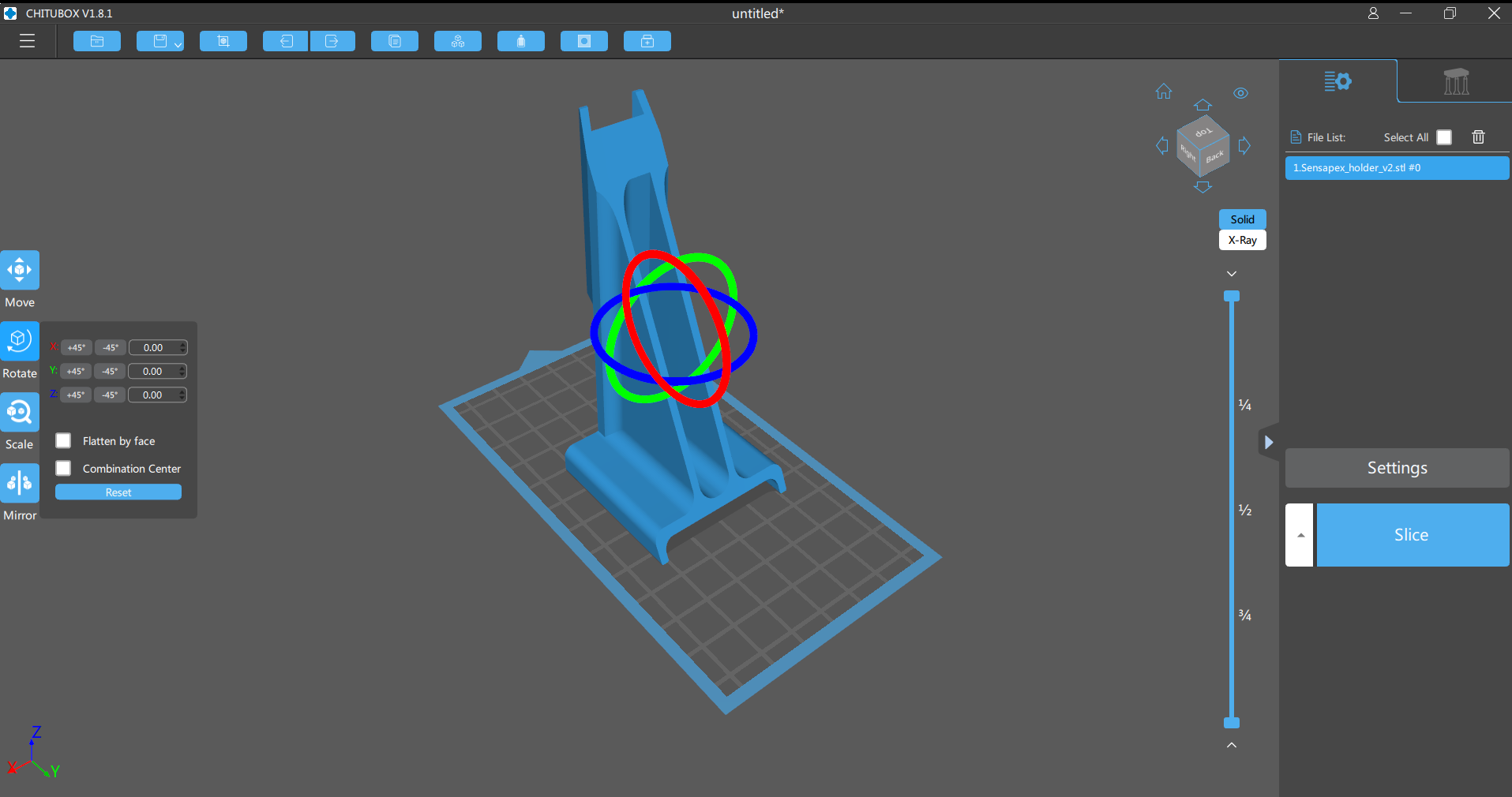
How to print: Creality LD002



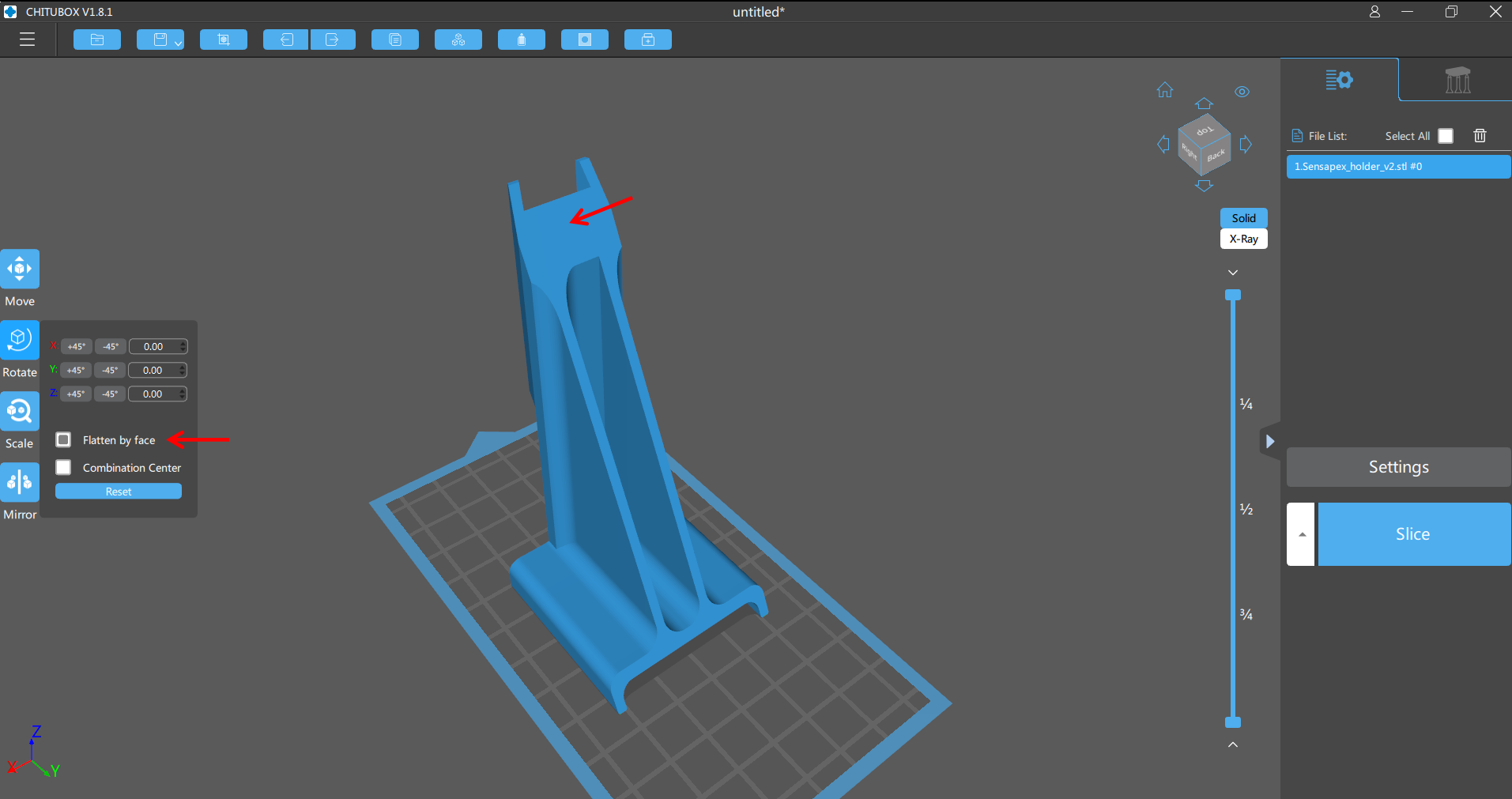
How to print: Creality LD002



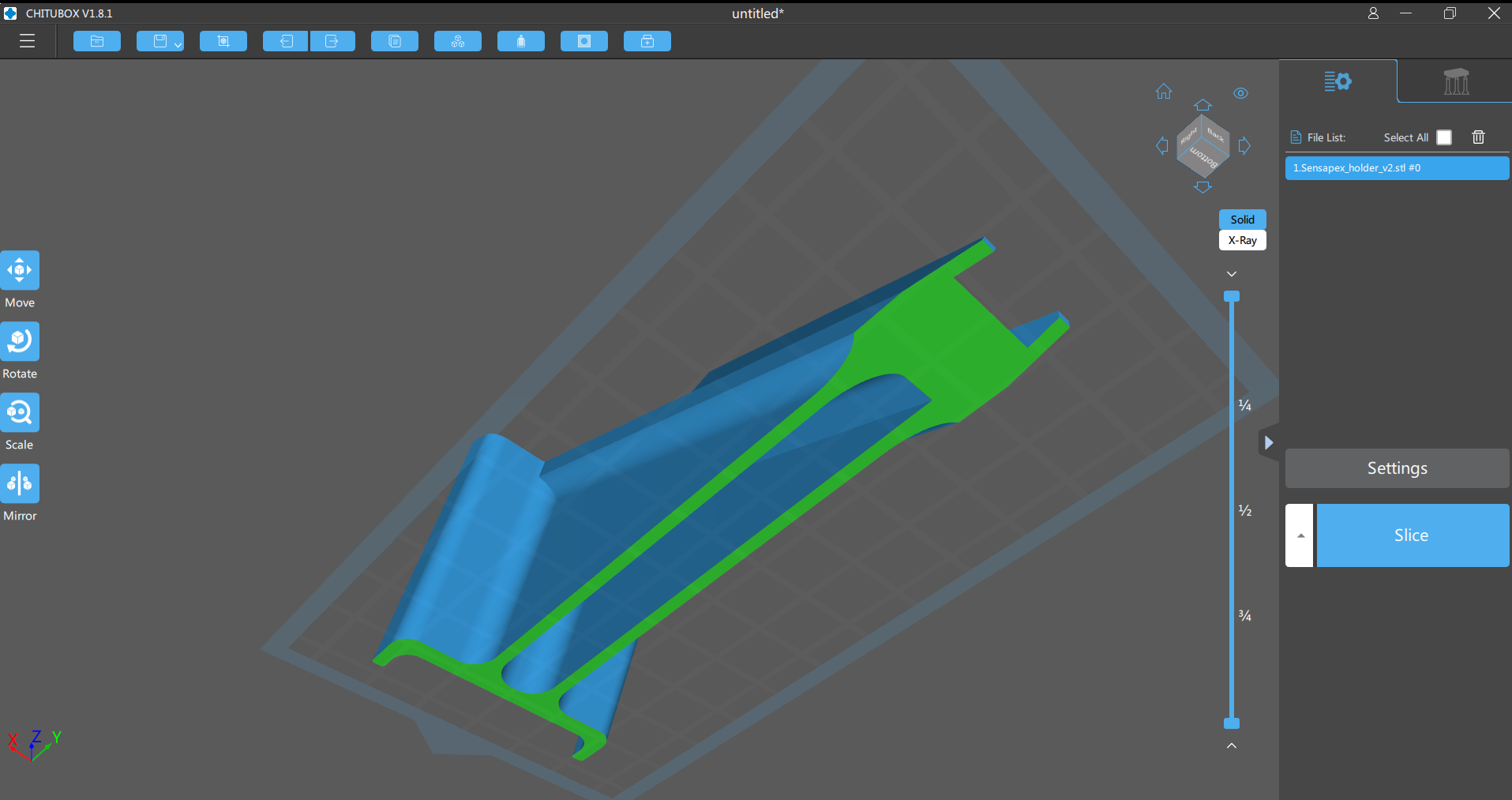
How to print: Creality LD002



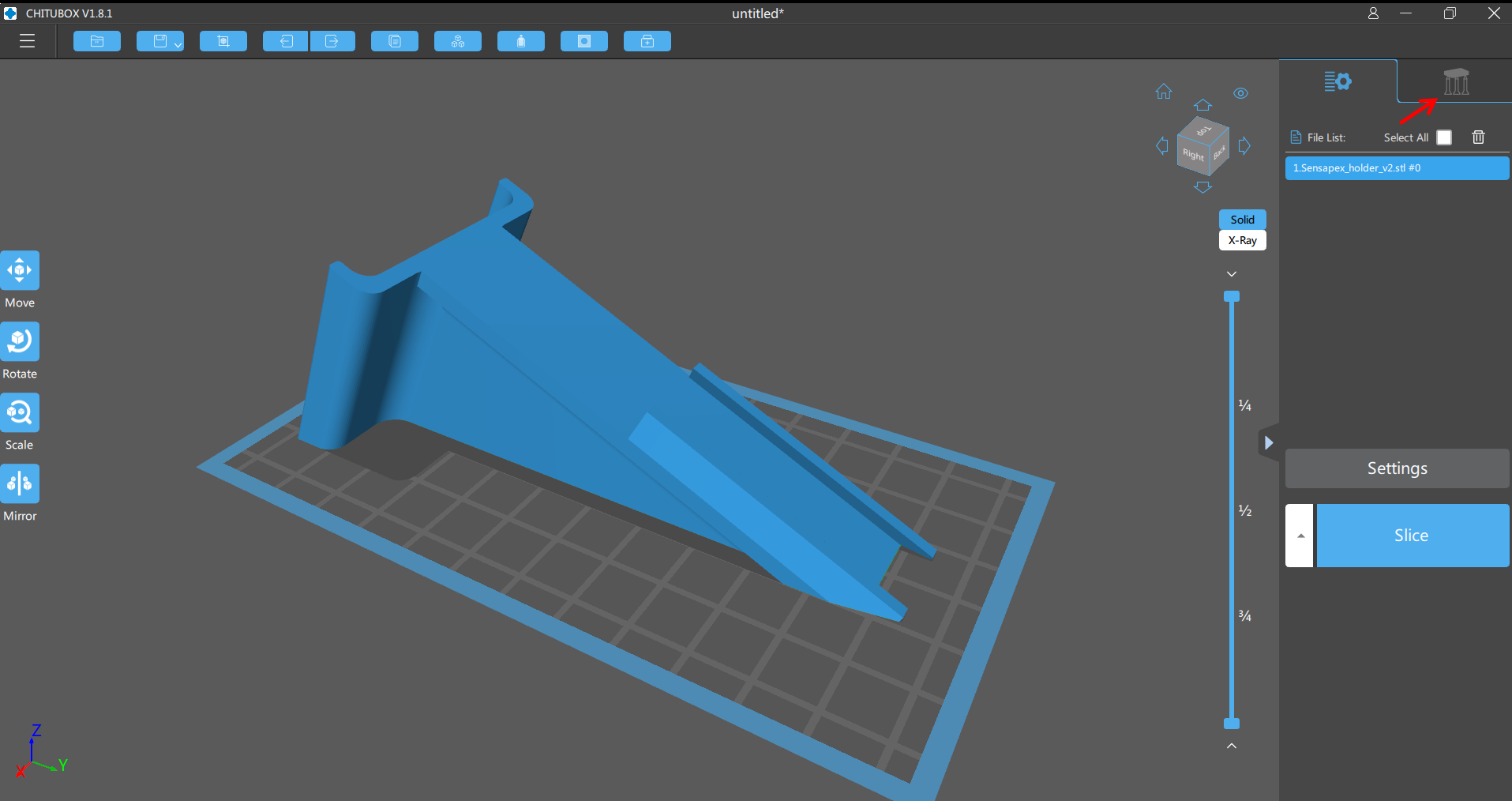
How to print: Creality LD002



How to print: Creality LD002



How to print: Creality LD002



How to print: Creality LD002

CHITUBOX V1.8.1 untitled* [User Icon] [Min] [Max] [Close]

Navigation: Home, Rotate, Zoom, Pan, Right, Back, Solid

Support Settings:

- Z Lift Height(mm): 5.00
- Support Setting: [Icons]
- Light
- Medium
- Heavy

Support Structure Options: Top | Middle | Bottom | Raft

- Contact Shape: None
- Contact Diameter(mm): 0.80
- Contact Depth(mm): 0.40
- Connection Shape: Cone
- Upper Diameter(mm): 0.40
- Lower Diameter(mm): 1.20
- Connection Length(mm): 2.00

Auto/Manual Support: [Icons]

- Cross Width(mm): 4.00
- Cross Start Height(mm): 3.00
- Density(%): 80.00
- Angle(°): 75.00

Buttons: +Platform, +All (highlighted with a red arrow), Remove All

Coordinate System: X (red), Y (green), Z (blue)

How to print: Creality LD002

CHITUBOX V1.8.1 untitled* [User Icon] [Close Icon]

The image shows the Chitubox software interface. The main window displays a 3D model of a blue, curved part with a grey support structure on a grid. The right sidebar contains the following settings:

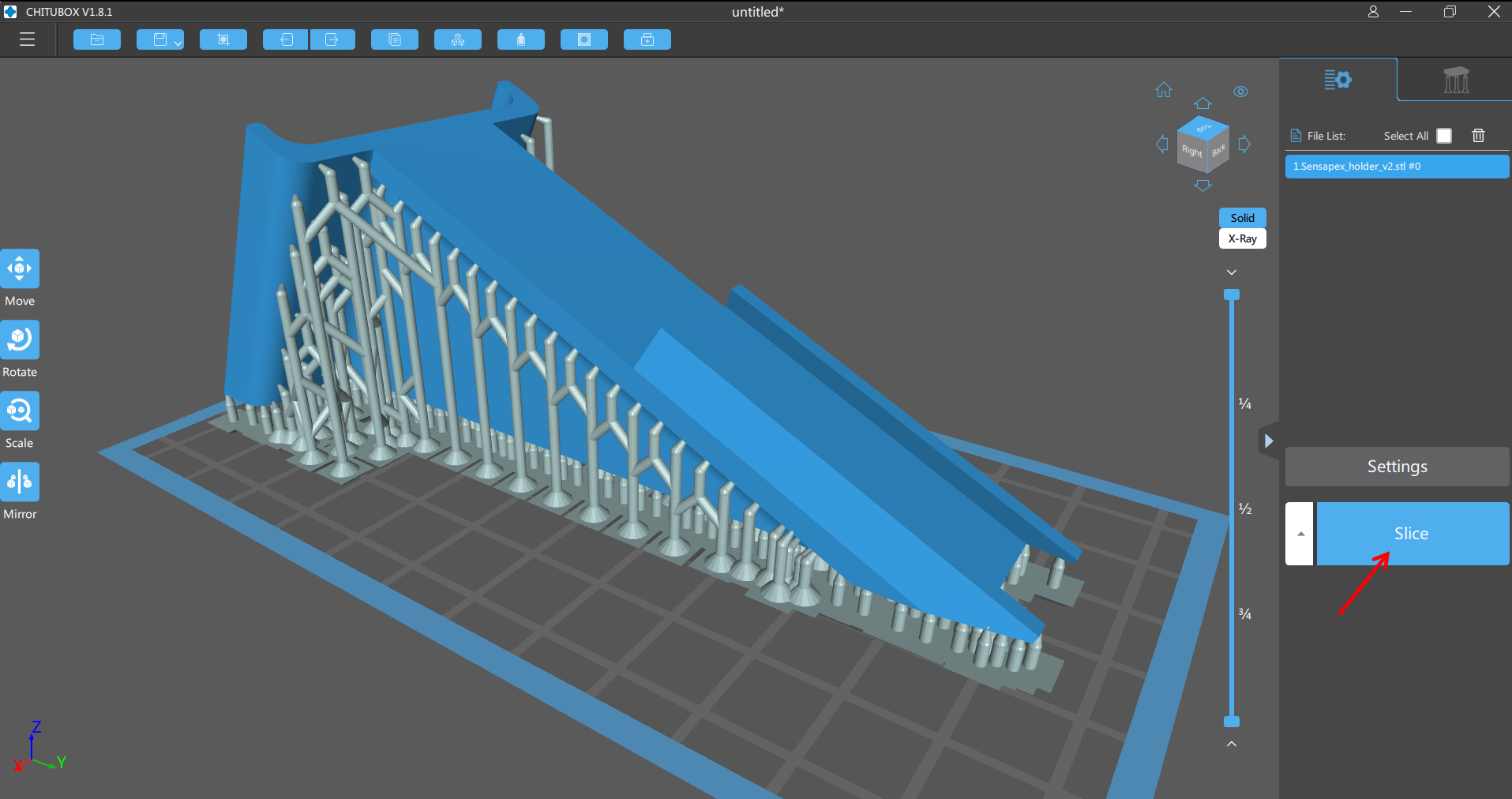
- Z Lift Height(mm)**: 5.00
- Support Setting**: Light, Medium, Heavy (Medium is selected)
- Auto/Manual Support**:
 - Top: Contact Shape (None), Contact Diameter (0.80), Contact Depth (0.40)
 - Middle: Connection Shape (Cone), Upper Diameter (0.40), Lower Diameter (1.20), Connection Length (2.00)
 - Bottom: Cross Width (4.00), Cross Start Height (3.00), Density (80.00), Angle (75.00)

Buttons: +Platform, +All, Remove All

Navigation: Home, Rotate, Zoom, Solid, Z-axis slider (1/4, 1/2, 3/4)

Coordinate System: X, Y, Z

How to print: Creality LD002

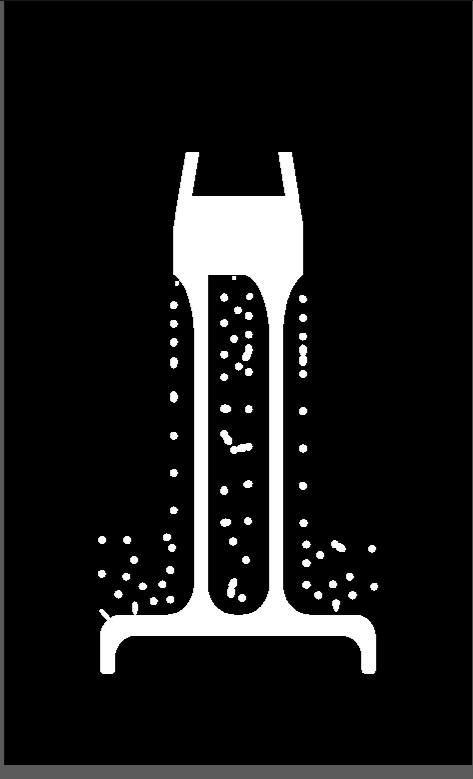
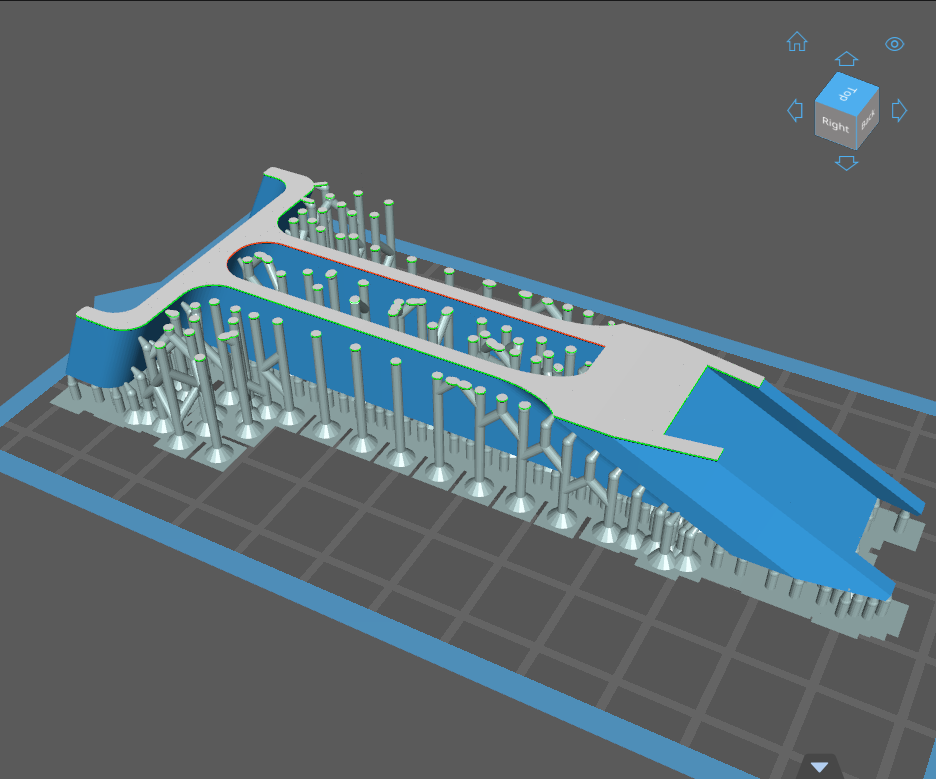


How to print: Creality LD002

CHITUBOX V1.8.1 untitled* [User Icon] [Minimize] [Maximize] [Close]

[Home] [Reset] [Eye]

Right



Machine: default
Resin: normal
Volume: 22.66 (ml)
Weight: 24.9 (g)
Price: 0.68\$
Time: 3h3m44s

312

1/4
1/2
3/4

Network Sending

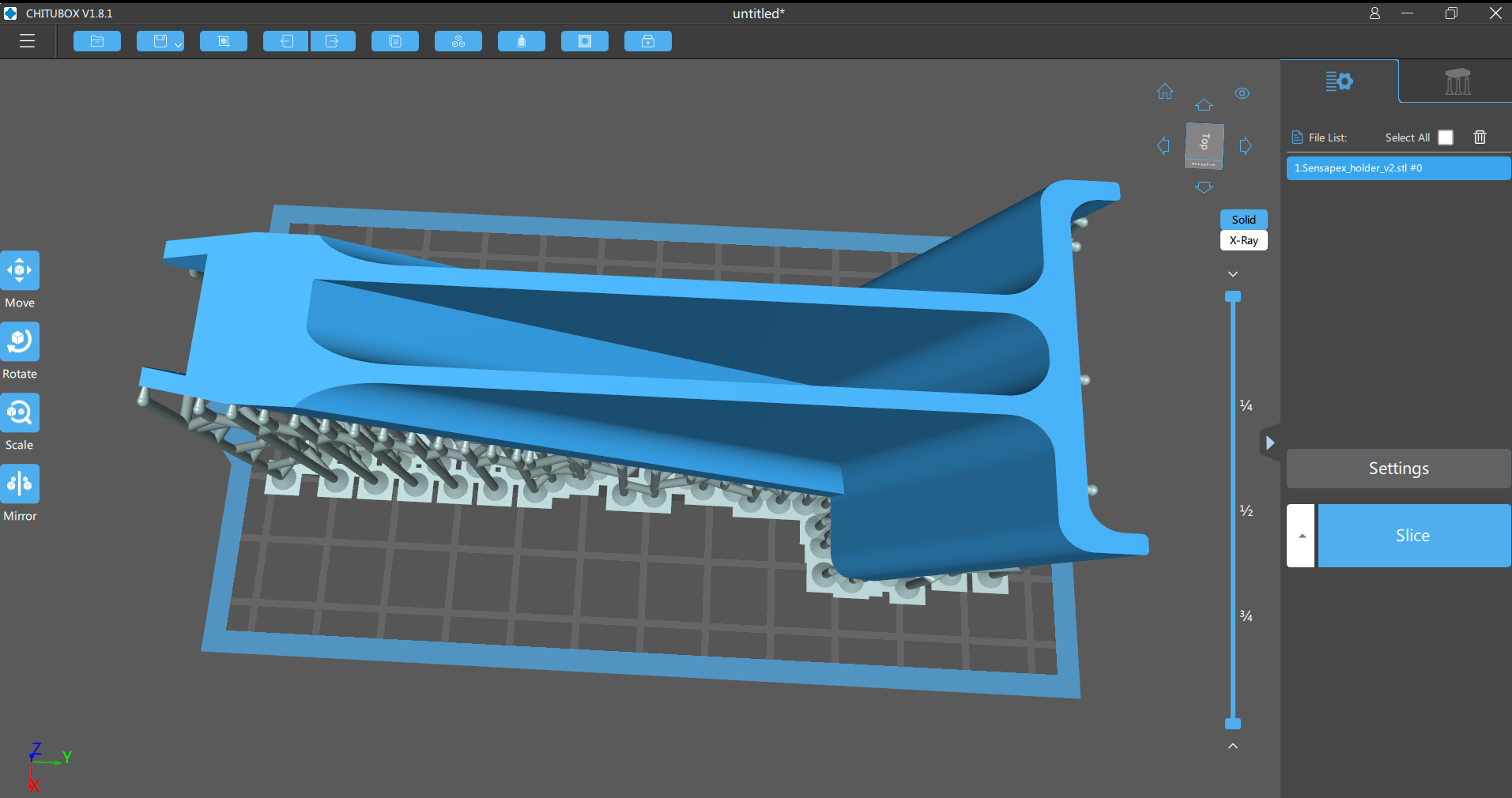
Save

Back

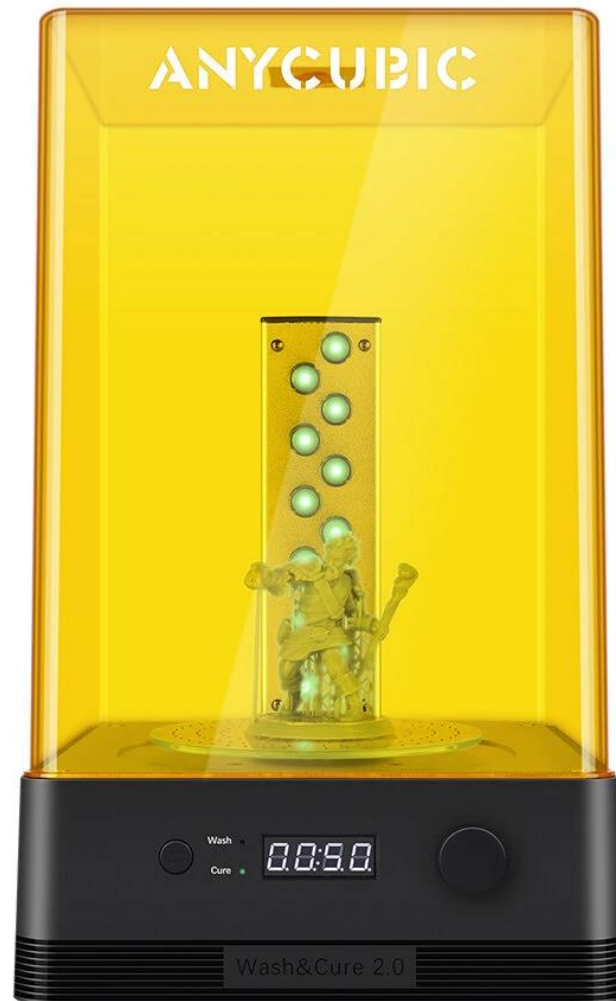
Exposure Time(s):	<input type="text" value="6"/>	Bottom Exposure Time(s):	<input type="text" value="50"/>
Lift Distance(mm)	<input type="text" value="5"/>	Layer Height(mm)	<input type="text" value="0.050"/>
Lift Speed(mm/min):	<input type="text" value="65"/>	Retract Speed(mm/min):	<input type="text" value="150"/>

Islands : 0

How to print: Creality LD002



Washing and curing with Anycubic Wash and cure station



Outlook

- Many online repositories where 3D models can be downloaded for free


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- www.thingiverse.com

MakerBot Thingiverse

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+ Collect Thing

1198


Share



+ Collect Thing

1036


Share



+ Collect Thing

1022

Share




+ Collect Thing


975

Share


Hot Glue Gun Stand - Narrow



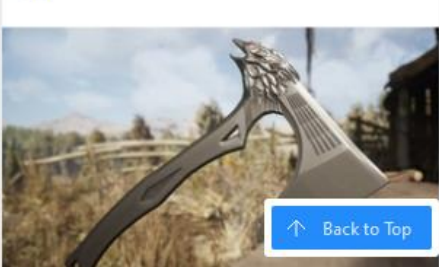
Kabelschelle NYM-J 3x1,5 mm²



Lamp base for lithophane



Apex Legends | Raven's Bite (Blood...)



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- www.thingiverse.com

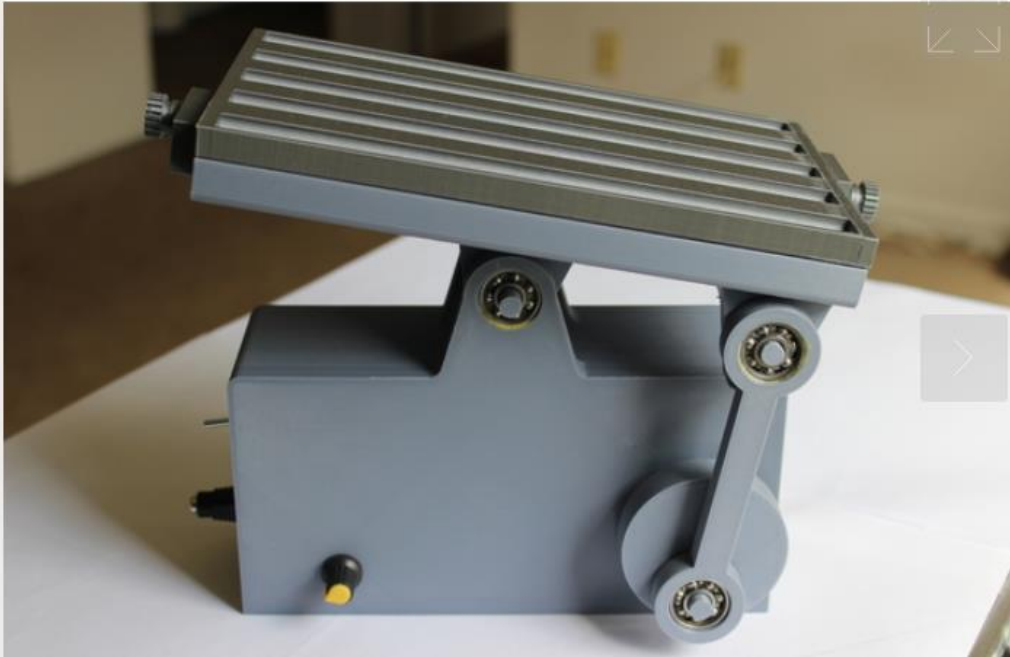
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Open Source Laboratory Rocker / Mixer / Shaker (Lab Rocker)
by akshay_d21 June 06, 2018



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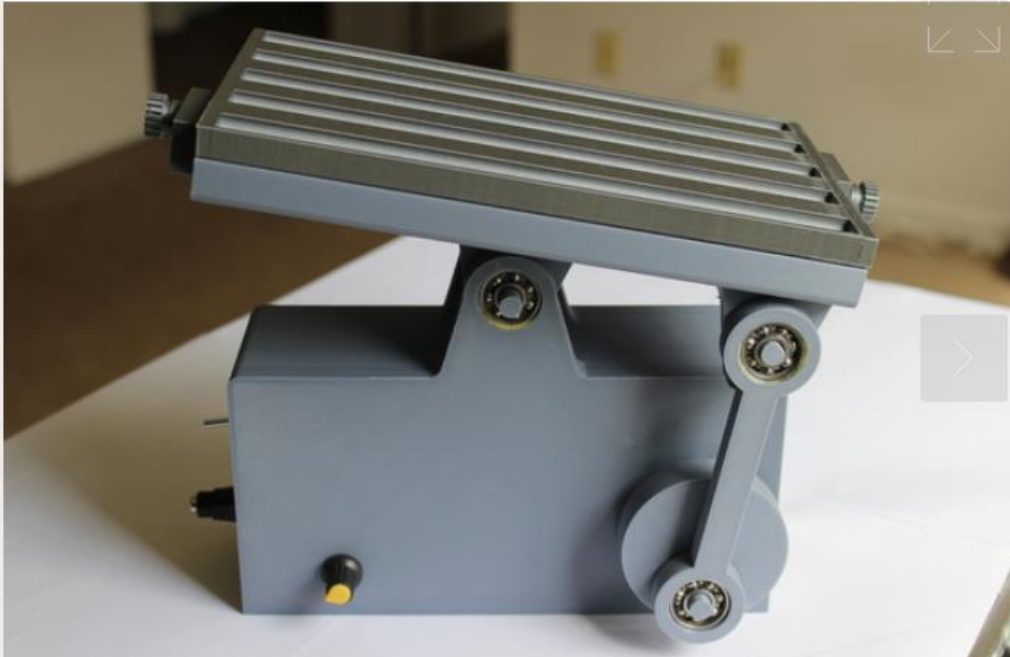
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Open Source Laboratory Rocker / Mixer / Shaker (Lab Rocker)
by akshay_d21 June 06, 2018



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- www.labonthecheap.com



Automated Western Blotting

📅 July 24, 2020

Western Blots are a ubiquitous technique in biological and biochemical laboratories used to detect a specific protein in a sample using antibody binding. Running a western blot is one of the more mundane and time consuming tasks of a lab researcher. A new paper "Open source automated western blot processor" from Jorge Bravo-Martinez describes a [...]

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- www.cults3d.com



FIND AND DOWNLOAD THE GREATEST 3D MODELS FOR YOUR 3D PRINTER.

FEATURED



3D PRINTING STL FILE PRINT-IN-PLACE FLEXI LLAMACORN

By FlexiFactory

This Flexi llamacorn is an articulated print-in-place model that needs no supports, no assembly, and prints great with PLA. Flexi's are really fun to play with because they flop around and move in any which way. Like with all FlexiFactory's creations this one is strong, and easy to print without supports.

[DOWNLOAD 3D MODEL](#)



 Alphonse Marcel

3D PRINTING CONTEST

Outlook

- Other useful places:
 - www.hackaday.com
 - www.instructables.com
 - github

Thank you for your attention!