



END00: 2022/08/10

## SOP: Creality Ender 3

**Date Updated:** 03/04/2020

**Key Points:**

- Cheaper but good quality
- Faster uniform bed heat up.
- Quieter than most.
- Layer thickness 0.1 - 0.4mm
- Print size: 220 x 220 x 250mm

**Responsible Party:** All users

**When SOP Should be Performed:**

**Materials/Resources Needed:**

**PPE Recommended:** PPE consistent with normal operations. No gloves. No jewelry, be aware of anything loose on your person. Respirator recommended. See Casey Dixon for training]

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**NOTE:** Any step with a “◆” symbol has a more detailed step in the “Instructions Set 2” section of this booklet.

# Tool Safety

## **Safety considerations: Ender 3 v.2**

- Unexpected movement
  - Hot parts (table and nozzle)
  - Crushing and pinch points.
  - Faulty equipment must not be used, instead immediately report any faulty equipment to a staff member.
- 
- Do not lean on the machine.
  - Do not place hands on or near hot or moving points.
  - Do not insert objects into the rotating parts.
  - Do not attempt to disassemble, repair, or modify the 3d printer without staff consent.
  - Do not rewire the power lines or make adjustments to the 3D printer in any way unless directed by staff.

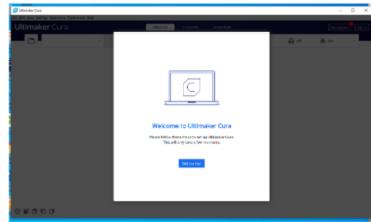
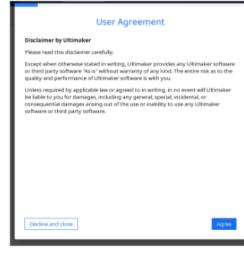
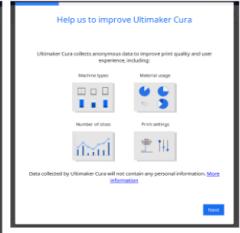
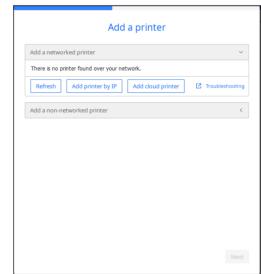
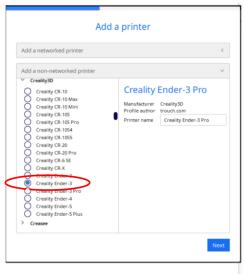
**Failure to follow safety protocols may result in serious injury or death.**

Don't be like Garry →



## Instructions Set 1

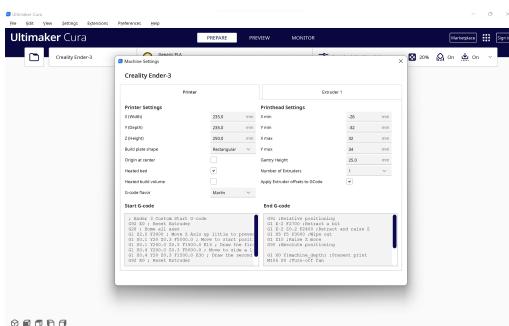
### Using Slicing Software: Ultimaker Cura

#	Instructions	Key point:
1.	Open Ultimaker Cura to prepare your model for printing.	 <b>END01: 2022/08/10</b>
2.	Once open go through the prompts getting you to the work area.	   <b>END02: 2022/08/10</b>
3.	<p>Check the printer you will be using is selected. If not you may need to add a printer.</p> <p>We have selected <b>Creality Ender-3</b></p>	  <b>END03: 2022/08/10</b>

**4.**

Check your machine settings.

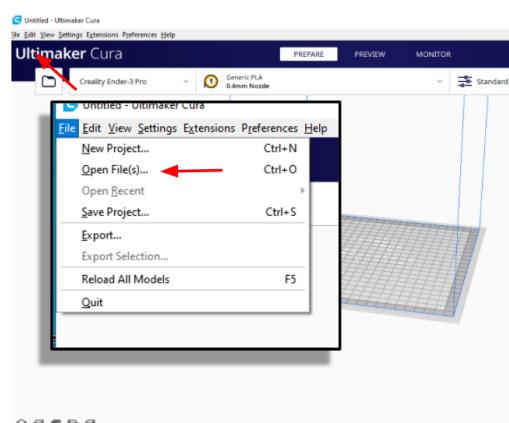
If you are using the Ender 3, the settings shown should match your own.



**END04: 2022/08/10**

**5.**

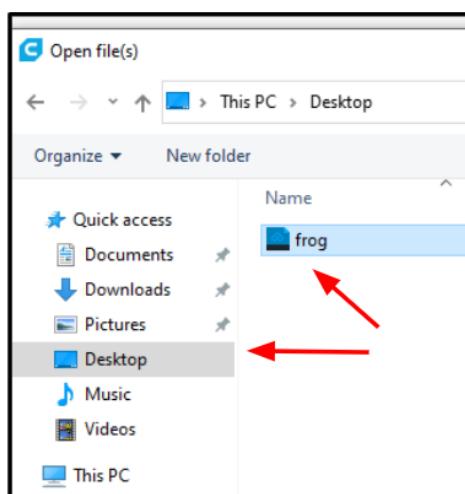
Go to File and open file.



**END05: 2022/08/10**

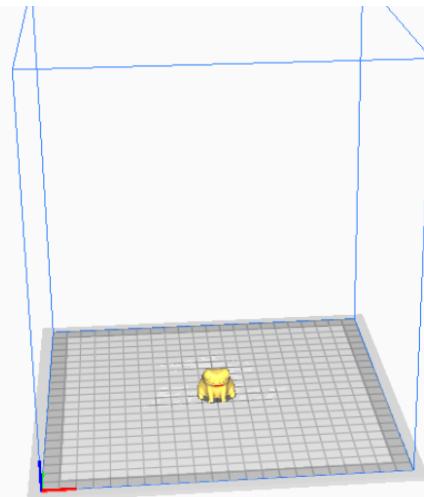
**6.**

Locate and open your file.



**END06: 2022/08/10**

7. Your file will show up on the digital platform.



END07: 2022/08/10

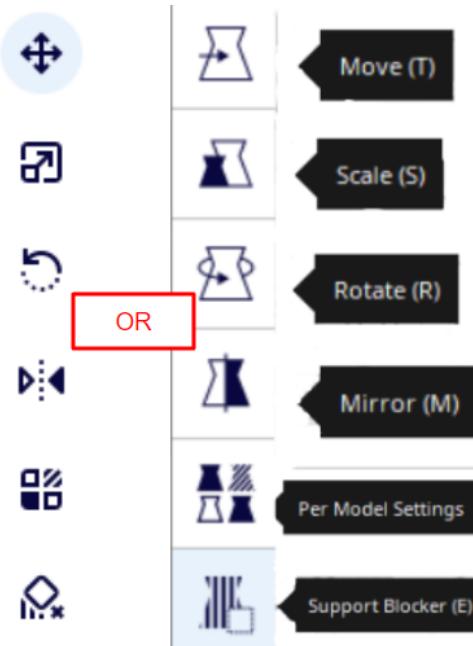
8. The toolbar on the left will let you do a number of things

There are 6 functions in this toolbar, namely,

- Move
- Scale
- Rotate
- Mirror
- Per Model Setting
- Support Blocker

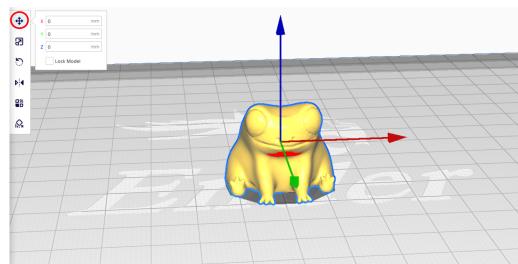
Which are explained in the following steps.

The appearances of each function may take the form of one of two icons...

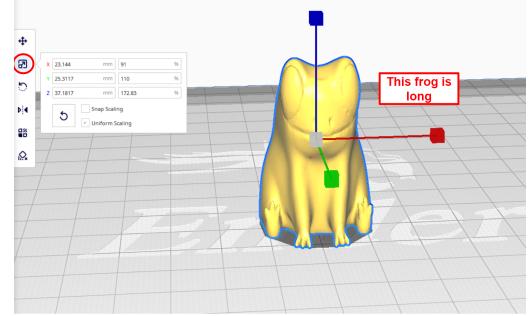
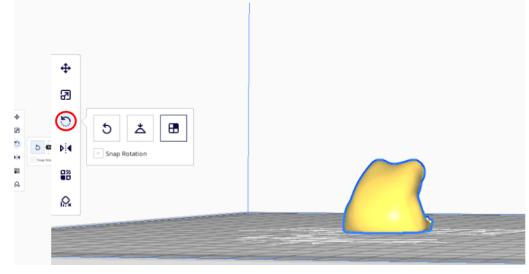
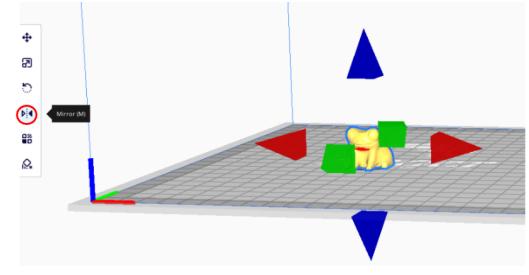
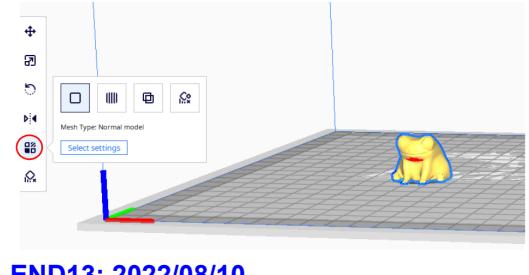


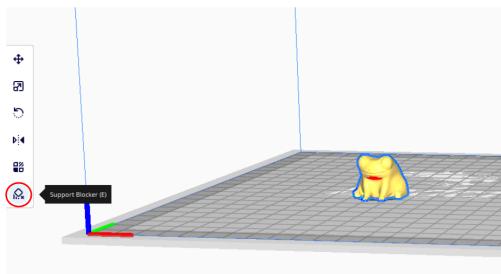
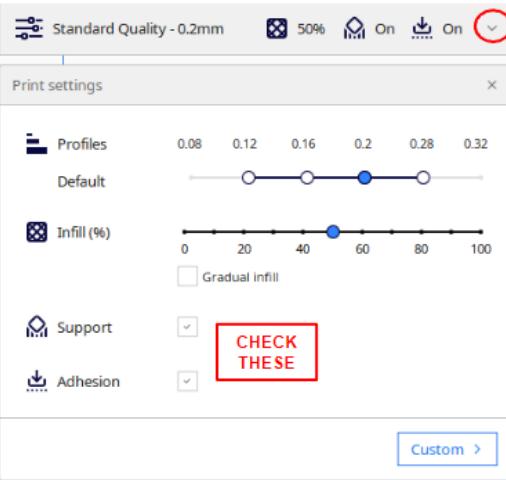
END08: 2022/08/10

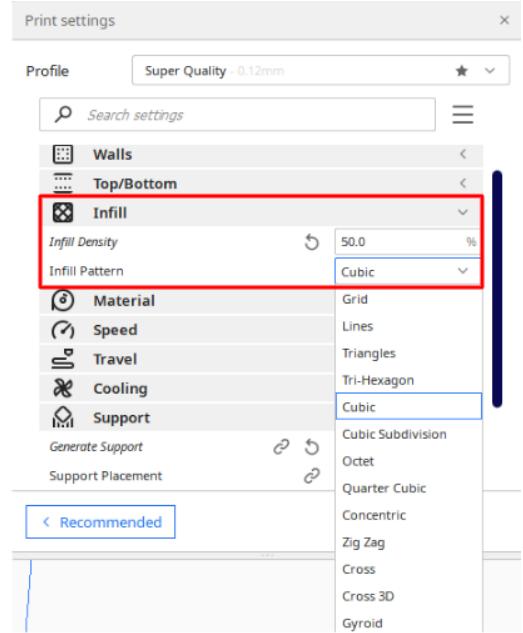
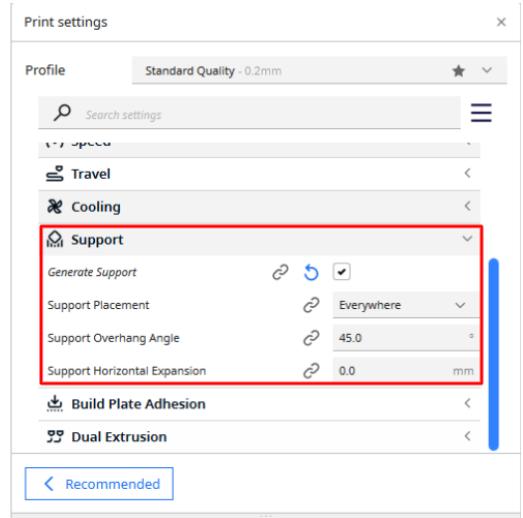
9. **Move** your model about the xyz plane. Make sure that the model is within the confines of the print bed.

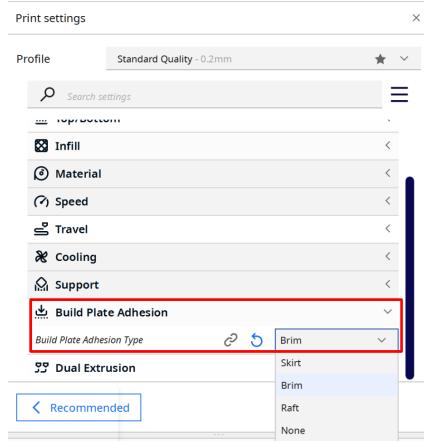
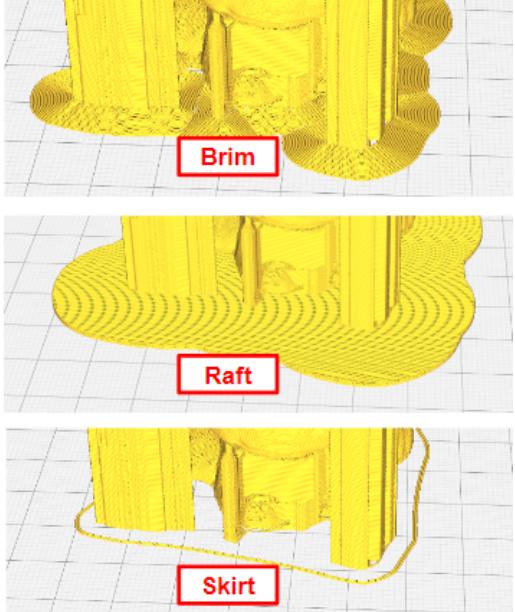
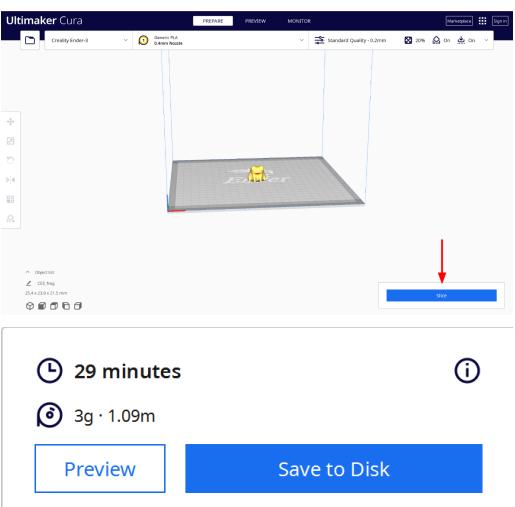


END09: 2022/08/10

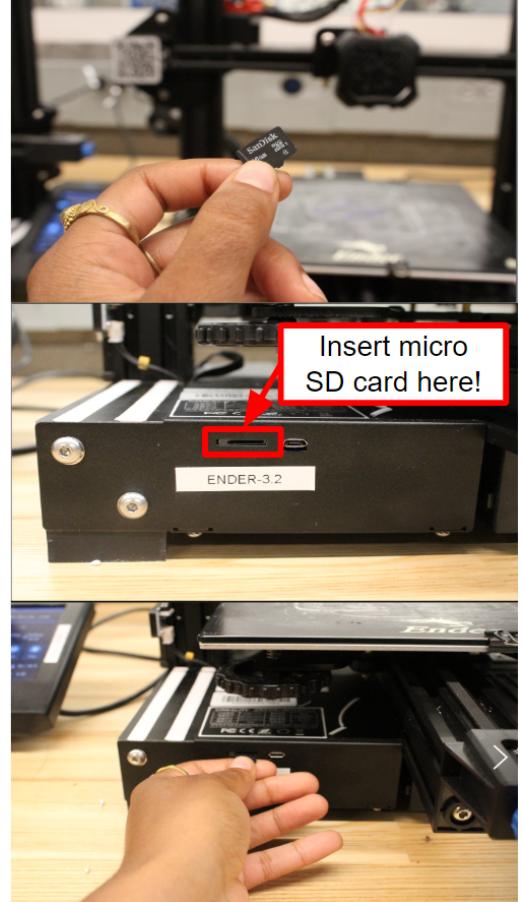
10.	<p>◆ <b>Scaling.</b> Change model size as a whole or along a particular axis. Lock aspect ratio if you want your model to maintain dimensional relationships.</p>	 <p><b>END10: 2022/08/10</b></p>
11.	<p>◆ <b>Rotation</b> along an axis or face of the model. The base/footprint of the model should have a sufficient amount of surface area to support your print</p>	 <p><b>END11: 2022/08/10</b></p>
12.	<p>◆ <b>Mirror model.</b> This will conveniently reflect your model about one of its major axes.</p>	 <p><b>END12: 2022/08/10</b></p>
13.	<p>◆ <b>Per model setting.</b> This setting dictates the mesh type(internal structural geometry): If you don't know what this means, use default settings ("Normal model").</p>	 <p><b>END13: 2022/08/10</b></p>

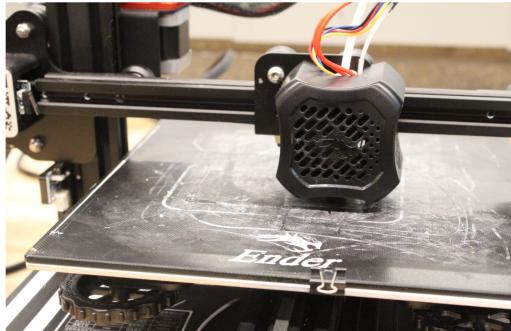
	<p><b>14.</b>  <b>Support blocker:</b> Makes supports for the models.</p>	 <p><b>END14: 2022/08/10</b></p>
	<p><b>15.</b>  Open the Print settings menu by clicking the drop down arrow near the right hand upper corner</p> <ol style="list-style-type: none"> <li>1. Dictate quality of print by altering Profiles. The lower the value, the higher printing quality (slower, smoother print)</li> <li>2. Change infill based on functionality of the part <ul style="list-style-type: none"> <li>• <b>Early Prototyping:</b> 10%-20% Infill</li> <li>• <b>General Printing:</b> 20%-40% Infill</li> <li>• <b>Functional Part:</b> 40%-80% Infill</li> </ul> </li> <li>3. Make sure to select BOTH Support and Adhesion</li> </ol> <p>Click "Custom" to specify print settings further</p>	 <p><b>END15: 2022/08/10</b></p>

	<p><b>16.</b> Within custom settings, alter the <b>infill density and the infill pattern</b> as desired. The pattern you choose is dictated by the functionality of the print</p> <ul style="list-style-type: none"> <li>• <b>Early Prototyping:</b> Lines, Zig Zag</li> <li>• <b>General Printing:</b> Lines, Grid, Triangles, or Tri-hexagon</li> <li>• <b>Functional Part:</b> Cubic, Cubic Subdivision, Octet, Quarter cubic, or Gyroid</li> </ul>  <p><b>END16: 2022/08/10</b></p>
<p><b>17.</b></p> <p>Within custom settings, make sure that you have the following <b>Support</b> settings selected.</p> <ul style="list-style-type: none"> <li>• Select <b>Generate Support</b></li> <li>• Make sure that Supports are placed <b>Everywhere</b></li> <li>• Further default setting are okay to leave as they are</li> </ul>	 <p><b>END17: 2022/08/10</b></p>

<p><b>18.</b> Within custom settings, select the type of <b>Build Plate Adhesion Type</b> that is appropriate for the desired amount of force required to remove your part from the print bed. Too little, the part may detach while printing. Too much, the part may be extremely difficult to remove from the print bed. Choose from:</p> <ul style="list-style-type: none"> <li>• <b>Brim</b> - a 1-layer thick extra margin around a part that helps keep the part from sliding during printing and primes the nozzle.</li> <li>• <b>Rafts</b> - a multi-layer base that the slicer will generate beneath a print. This avoids the part warping and primes the nozzles but can be difficult to remove, takes longer to print, uses more material, and may leave a rough surface on the bottom of your part.</li> <li>• <b>Skirts</b> - an offset line around the part which only helps to prime the nozzle. Skirts should only be used if the surface area in contact with the bed is sufficient to secure the part during printing.</li> </ul>	  <p><b>END18: 2022/08/10</b></p>
<p><b>19.</b> Once all settings are finalized, click the <b>Slice</b> button in the lower right hand corner to convert your file into a gcode file.</p> <p>You will also be shown print time and filament use estimates. Click <b>Save to Disk</b> and save the file to a Micro SD card.</p>	 <p><b>END19: 2022/08/10</b></p>

## Using the Machine: Ender-3

	<p><b>20.</b> Having safely removed the micro SD card from your device, take the card to the the Ender and locate the port on the left side of the front of the printer</p> <p>Insert the SD card into the first port.</p>	 <b>END20: 2022/08/10</b>
	<p><b>21.</b> If your job lacks surface area contact between the model and the print bed,you may add glue to the print bed for extra adhesive support.</p> <p>Staff can provide you with glue.</p>	 <b>END21: 2022/08/10</b>
	<p><b>22.</b> When using the printer interface, <b>turn</b> the dial to browse presented options, and <b>press</b> the dial to select desired option.</p> <p>Select “Print”</p>	 <b>END22: 2022/08/10</b>

<p><b>23.</b></p>	<p>Select your job from the files on the micro SD card</p>	 <p>END23: 2022/08/10</p>
<p><b>24.</b></p>	<p>This screen will show once your job has started.  This screen gives you an estimation of your print time and the option to Pause/Stop your print if something goes wrong.</p>	 <p>END24: 2022/08/10</p>
<p><b>25.</b></p>	<p>Stick around and watch your print for the first few layers. This gives staff/technicians an early chance of catching filament clogs and other problems.</p>	 <p>END25: 2022/08/10</p>
<p><b>26.</b></p>	<p>Once your print is done, use the provided chisel and mallet to remove the print <b>and</b> its build plate adhesion from the print bed.</p>	 <p>END26: 2022/08/10</p>

**27.**

Put the tapered edge of the chisel against the bottom corner of your part. Repeatedly, purposefully, strike the end of the chisel handle with the mallet.

Please don't use too much force, otherwise your part will go soaring across the room.

Finish by returning the mallet to where you found them, and throwing away all filament scraps.



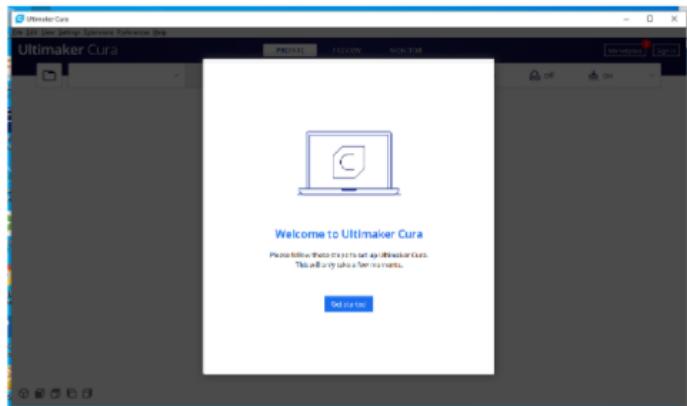
**END27: 2022/08/10**

## Instructions Set 2



END01: 2022/08/10

#	Instructions	Key point:
1.	Open Ultimaker Cura to prepare your model for printing.	A thumbnail image showing the same Ultimaker Cura interface as the main image, featuring the 'C' logo and the text 'Ultimaker Cura 4.11.0'.  END01: 2022/08/10



**User Agreement**

**Disclaimer by Ultimaker**

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**Help us to improve Ultimaker Cura**

Ultimaker Cura collects anonymous data to improve print quality and user experience, including:

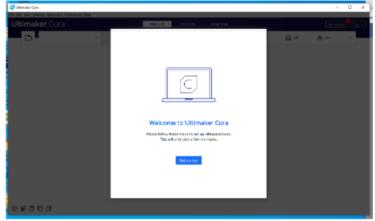
Machine types	Material usage

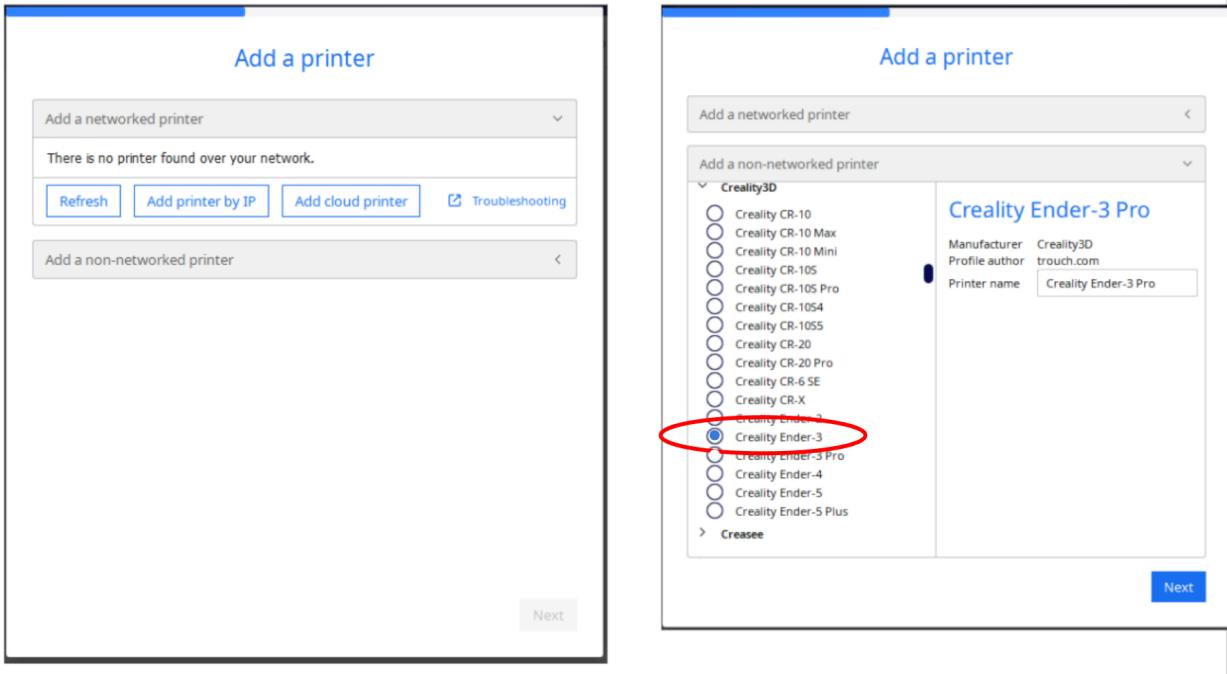
Number of slices	Print settings

Data collected by Ultimaker Cura will not contain any personal information. [More information](#)

[Help](#)

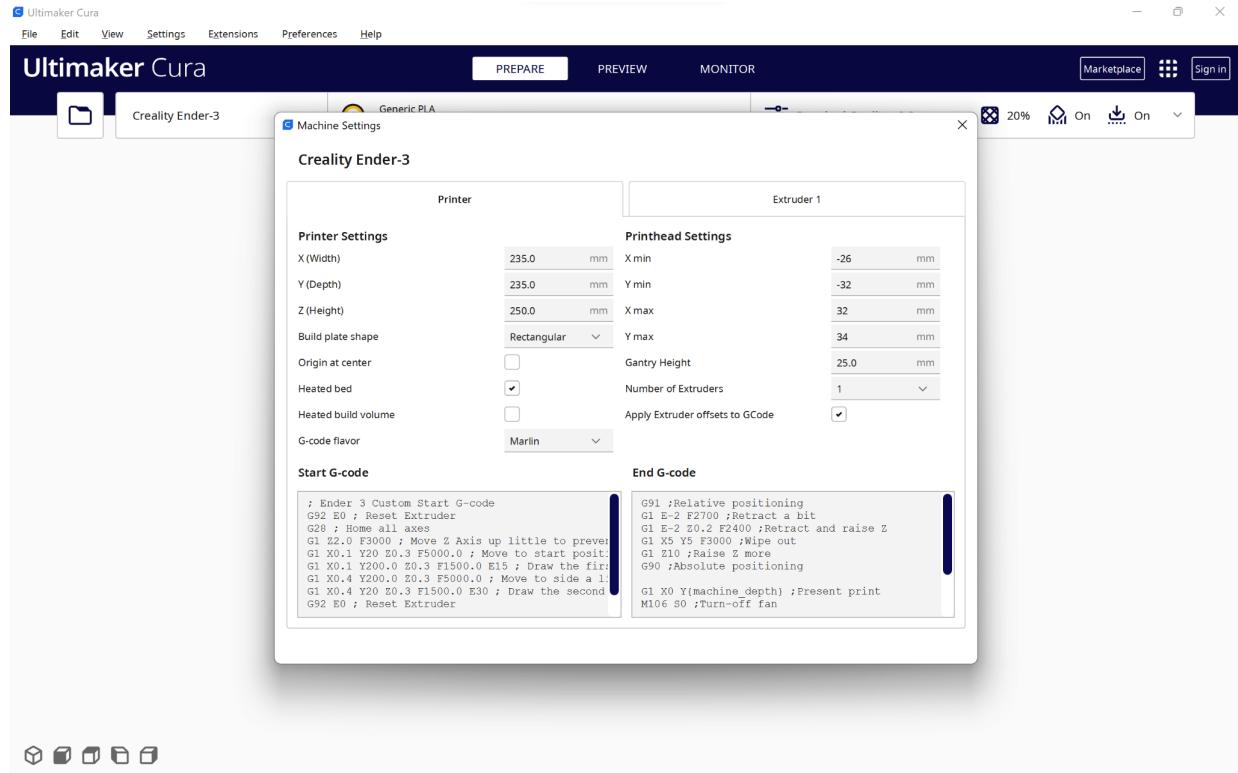
**END02: 2022/08/10**

#	Instructions	Key point:								
2.	Once open go through the prompts getting you to the work area.	 <div style="display: flex; justify-content: space-around; margin-top: 10px;"> <div style="width: 45%;"> <p><b>User Agreement</b></p> <p><b>Disclaimer by Ultimaker</b></p> <p>Please read this disclaimer carefully.</p> <p>Except when otherwise stated in writing, Ultimaker provides any Ultimaker software or third party software "As is" without warranty of any kind. The entire risk as to the quality and performance of Ultimaker software is with you.</p> <p>Unless required by applicable law or agreed to in writing, in no event will Ultimaker be liable to you for damages, including any general, special, incidental, or consequential damages arising out of the use or inability to use any Ultimaker software or third party software.</p> <p><a href="#">Decline and close</a> <a href="#">Agree</a></p> </div> <div style="width: 45%;"> <p><b>Help us to improve Ultimaker Cura</b></p> <p>Ultimaker Cura collects anonymous data to improve print quality and user experience, including:</p> <table border="0"> <tr> <td style="text-align: center;">Machine types</td> <td style="text-align: center;">Material usage</td> </tr> <tr> <td></td> <td></td> </tr> </table> <table border="0"> <tr> <td style="text-align: center;">Number of slices</td> <td style="text-align: center;">Print settings</td> </tr> <tr> <td></td> <td></td> </tr> </table> <p>Data collected by Ultimaker Cura will not contain any personal information. <a href="#">More information</a></p> <p><a href="#">Help</a></p> </div> </div> <p><b>END02: 2022/08/10</b></p>	Machine types	Material usage			Number of slices	Print settings		
Machine types	Material usage									
Number of slices	Print settings									



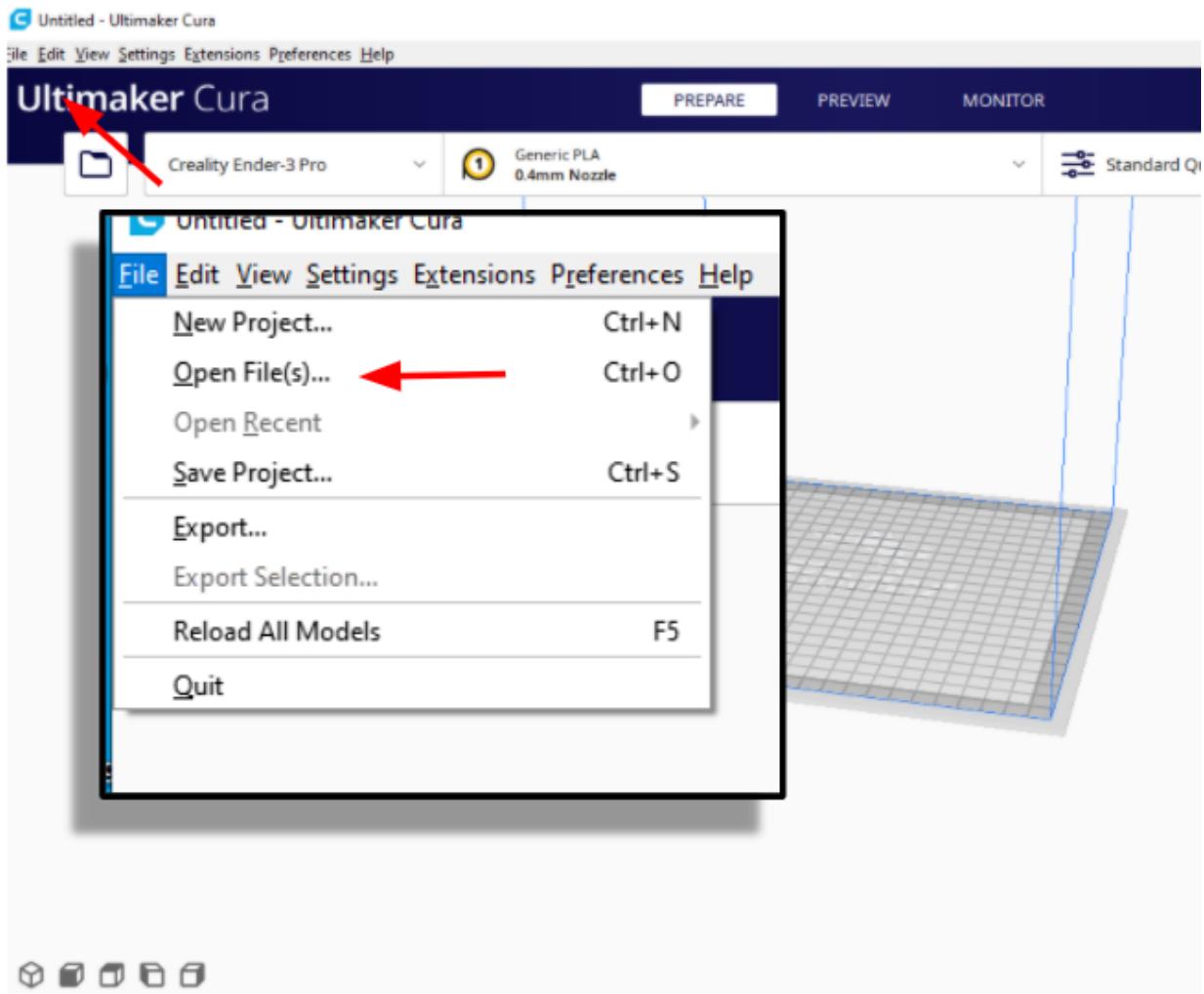
**END03: 2022/08/10**

#	Instructions	Key point:
3.	<p>Check the printer you will be using is selected. If not you may need to add a printer.</p> <p>We have selected <b>Creality Ender-3</b></p>	<p><b>END03: 2022/08/10</b></p>



**END04: 2022/08/10**

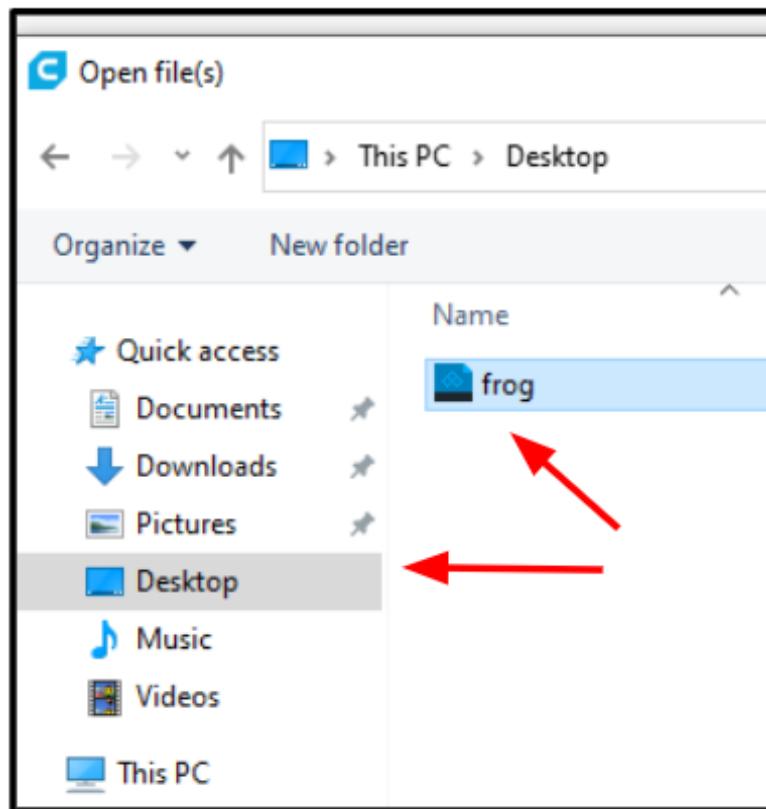
#	Instructions	Key point:
4.	<p>Check your machine settings.</p> <p>If you are using the Ender 3, the settings shown should match your own.</p>	<p><b>END04: 2022/08/10</b></p>



**END05: 2022/08/10**

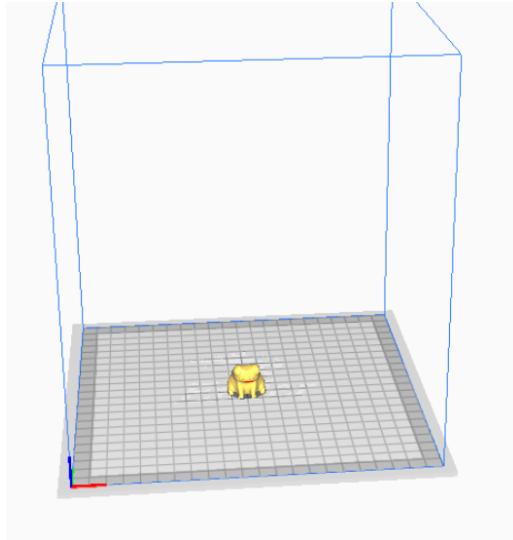
#	Instructions	Key point:
5.	Go to File and open file.	<p>The screenshot shows the same Ultimaker Cura interface as the previous one, but with a larger view of the 'File' menu. A red arrow points to the 'Open File(s)...' option in the 'File' menu. The rest of the interface, including the toolbar and the main workspace, is visible.</p>

**END05: 2022/08/10**



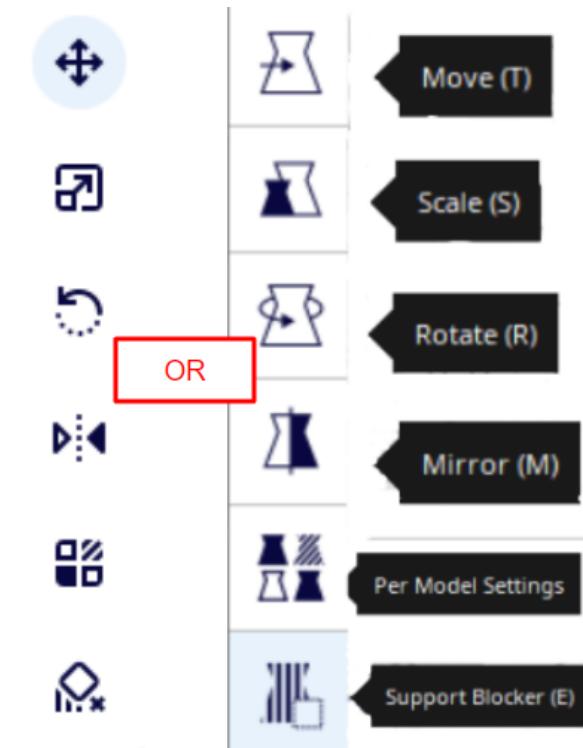
END06: 2022/08/10

#	Instructions	Key point:
6.	Locate and open your file.	A screenshot of the Windows File Explorer interface, identical to the one above. It shows the 'Desktop' folder selected in the sidebar and the file 'frog' listed in the main pane. A red arrow points from the word 'Desktop' in the sidebar to the 'frog' file in the main pane. <p>END06: 2022/08/10</p>



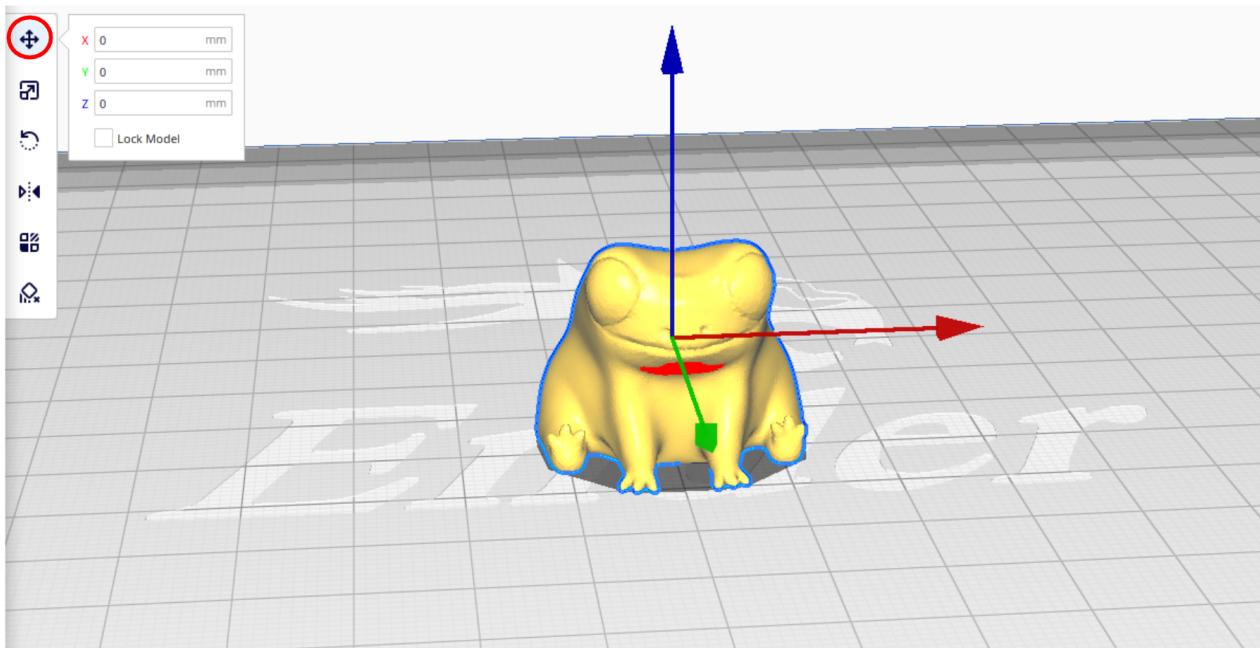
END07: 2022/08/10

#	Instructions	Key point:
7.	Your file will show up on the digital platform.	 END07: 2022/08/10

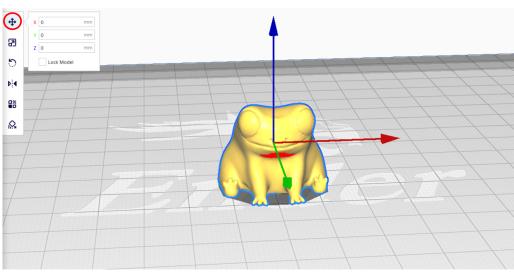


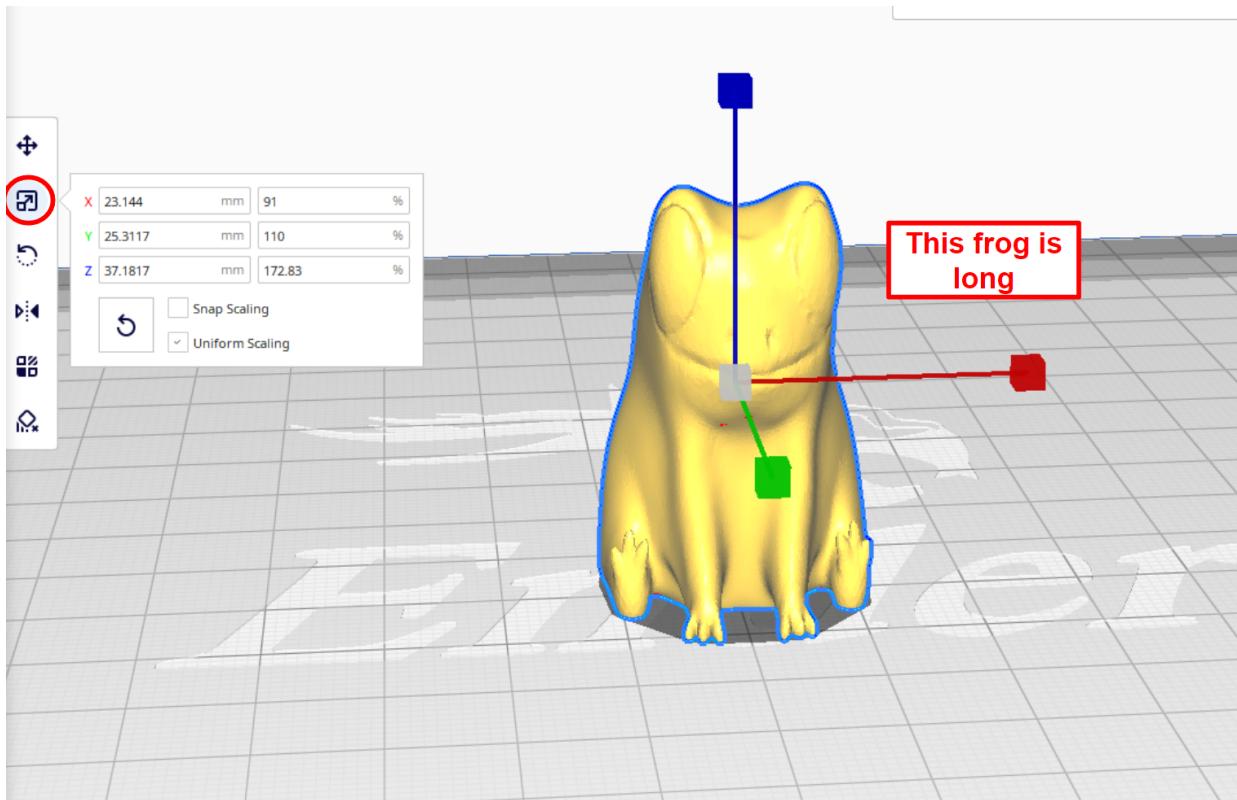
END08: 2022/08/10

#	Instructions	Key point:
8.	<p>The toolbar on the left will let you do a number of things</p> <p>There are 6 functions in this toolbar, namely,</p> <ul style="list-style-type: none"> <li>• Move</li> <li>• Scale</li> <li>• Rotate</li> <li>• Mirror</li> <li>• Per Model Setting</li> <li>• Support Blocker</li> </ul> <p>Which are explained in the following steps.</p> <p>The appearances of each function may take the form of one of two icons...</p>	<p>END08: 2022/08/10</p>



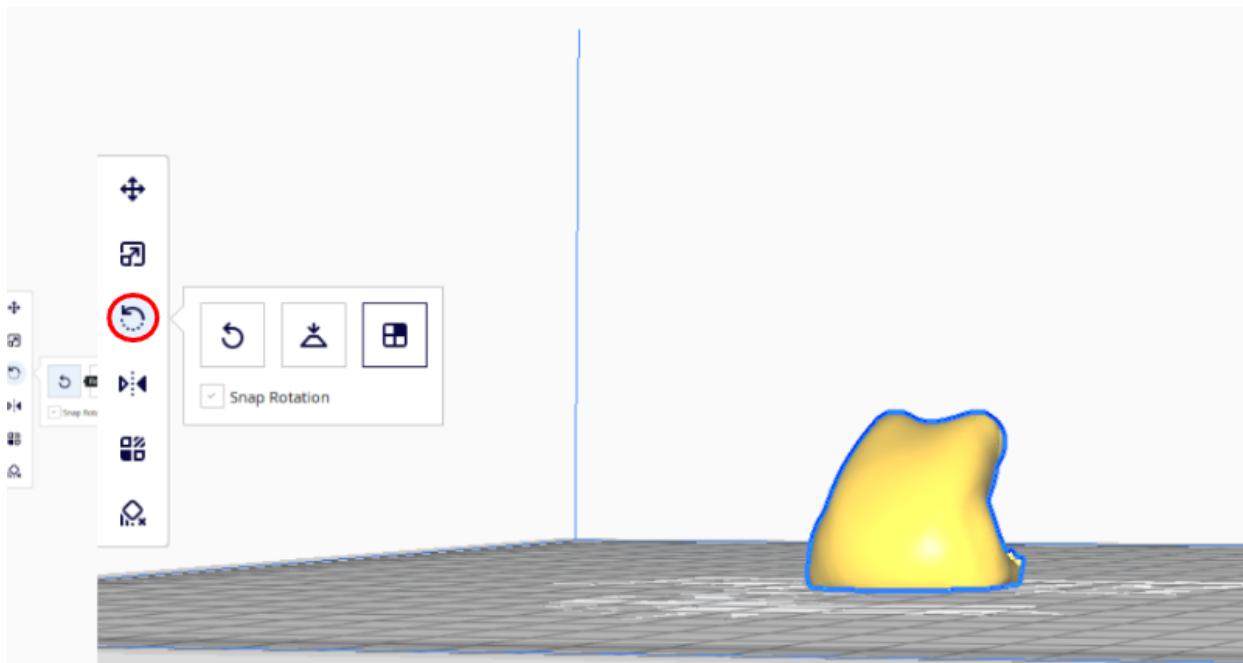
END09: 2022/08/10

#	Instructions	Key point:
9.	<b>Move</b> your model about the xyz plane. Make sure that the model is within the confines of the print bed.	 <p>END09: 2022/08/10</p>



END10: 2022/08/10

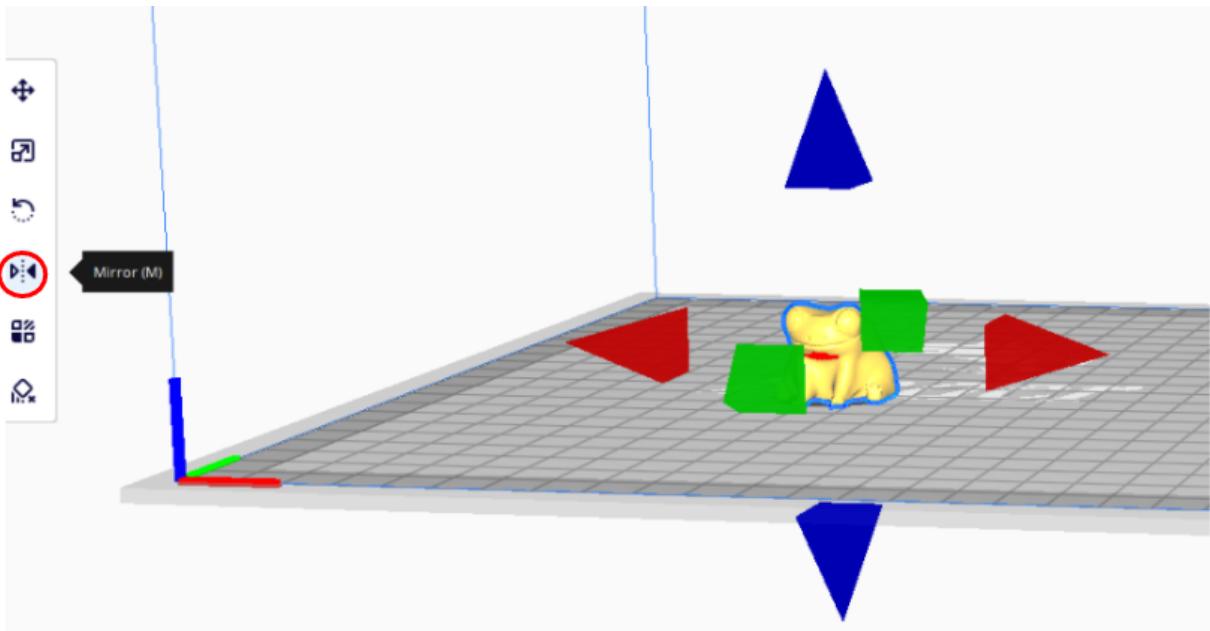
#	Instructions	Key point:
10.	<b>Scaling.</b> Change model size as a whole or along a particular axis. Lock aspect ratio if you want your model to maintain dimensional relationships.	<p>END10: 2022/08/10</p>



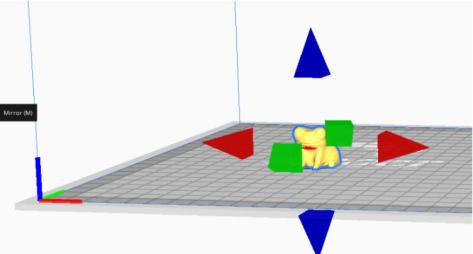
END11: 2022/08/10

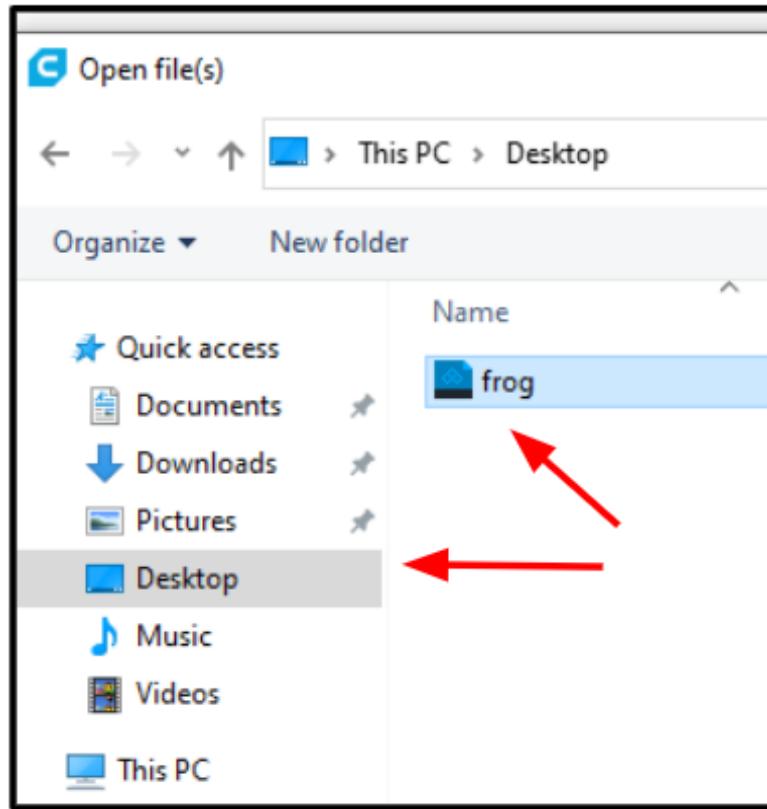
#	Instructions	Key point:
11.	<b>Rotation</b> along an axis or face of the model. The base/footprint of the model should have a sufficient amount of surface area to support your print	

END11: 2022/08/10



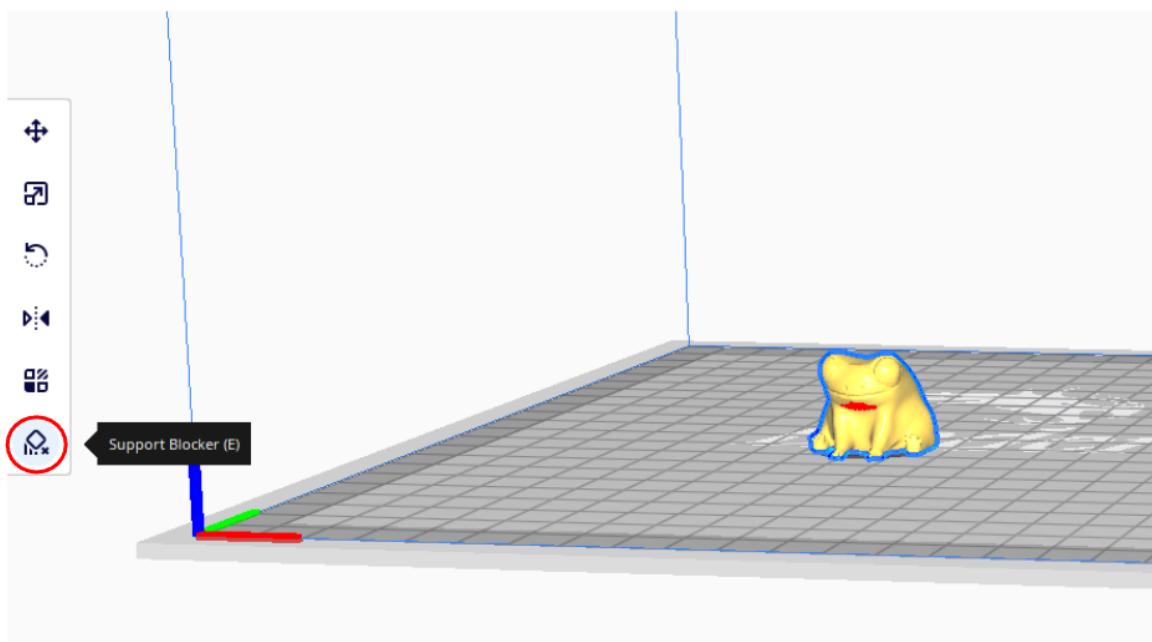
END12: 2022/08/10

#	Instructions	Key point:
12.	<b>Mirror model.</b> This will conveniently reflect your model about one of its major axes.	 <p>END12: 2022/08/10</p>

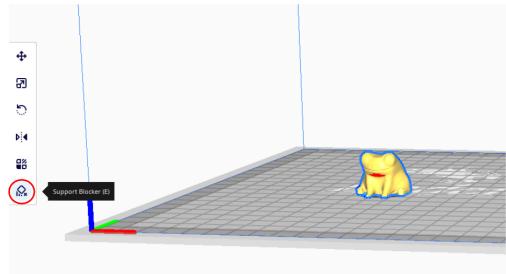


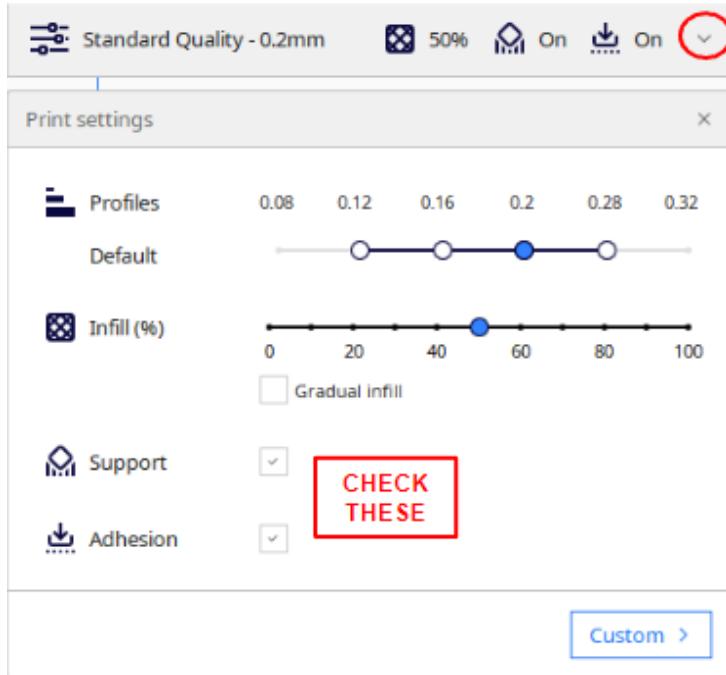
END13: 2022/08/10

#	Instructions	Key point:
13.	<b>Per model setting.</b> This setting dictates the mesh type(internal structural geometry): If you don't know what this means, use default settings ("Normal model").	 END13: 2022/08/10



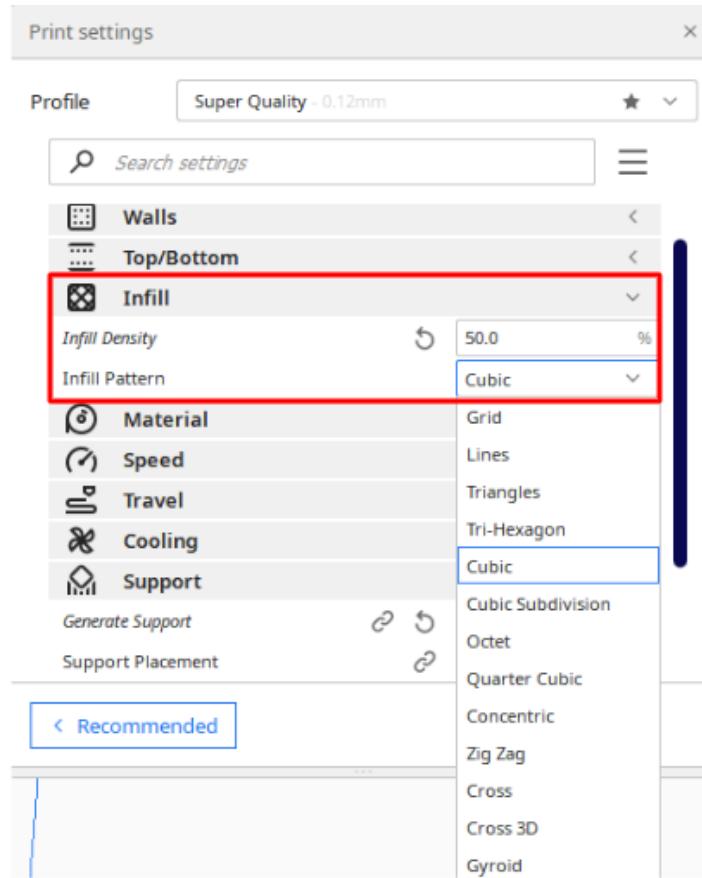
END14: 2022/08/10

#	Instructions	Key point:
14.	<b>Support blocker:</b> Makes supports for the models.	 <p>END14: 2022/08/10</p>

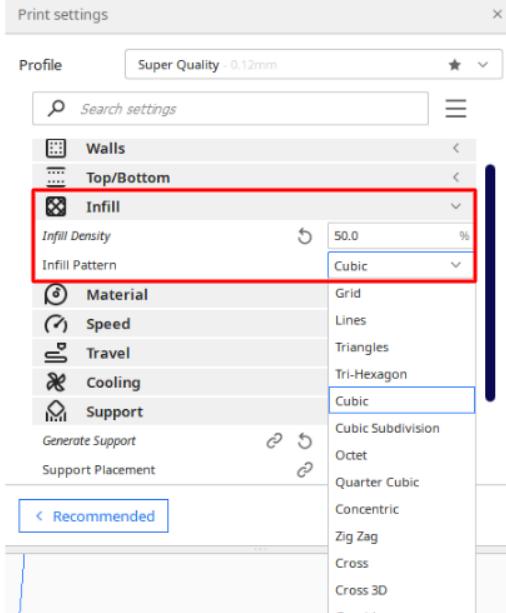


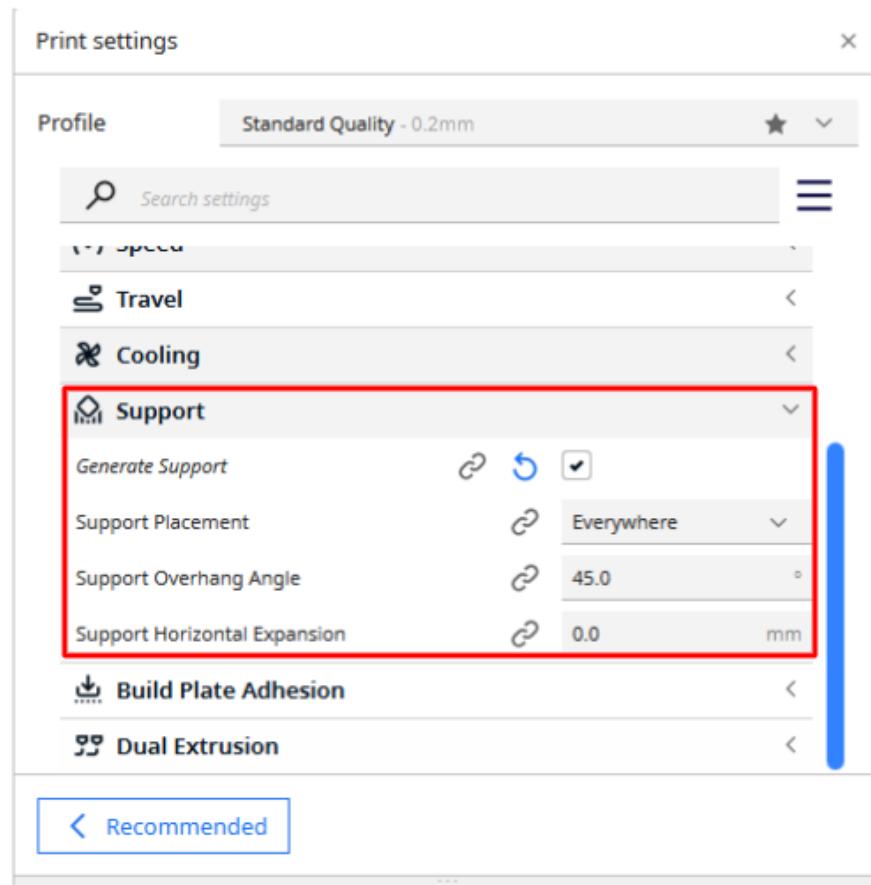
END15: 2022/08/10

#	Instructions	Key point:
15.	<p>Open the Print settings menu by clicking the drop down arrow near the right hand upper corner</p> <p>4. Dictate quality of print by altering Profiles. The lower the value, the higher printing quality (slower, smoother print)</p> <p>5. Change infill based on functionality of the part</p> <ul style="list-style-type: none"> <li>• <b>Early Prototyping:</b> 10%-20% Infill</li> <li>• <b>General Printing:</b> 20%-40% Infill</li> <li>• <b>Functional Part:</b> 40%-80% Infill</li> </ul> <p>6. Make sure to select BOTH Support and Adhesion</p> <p>Click "Custom" to specify print settings further</p>	<p>END15: 2022/08/10</p>



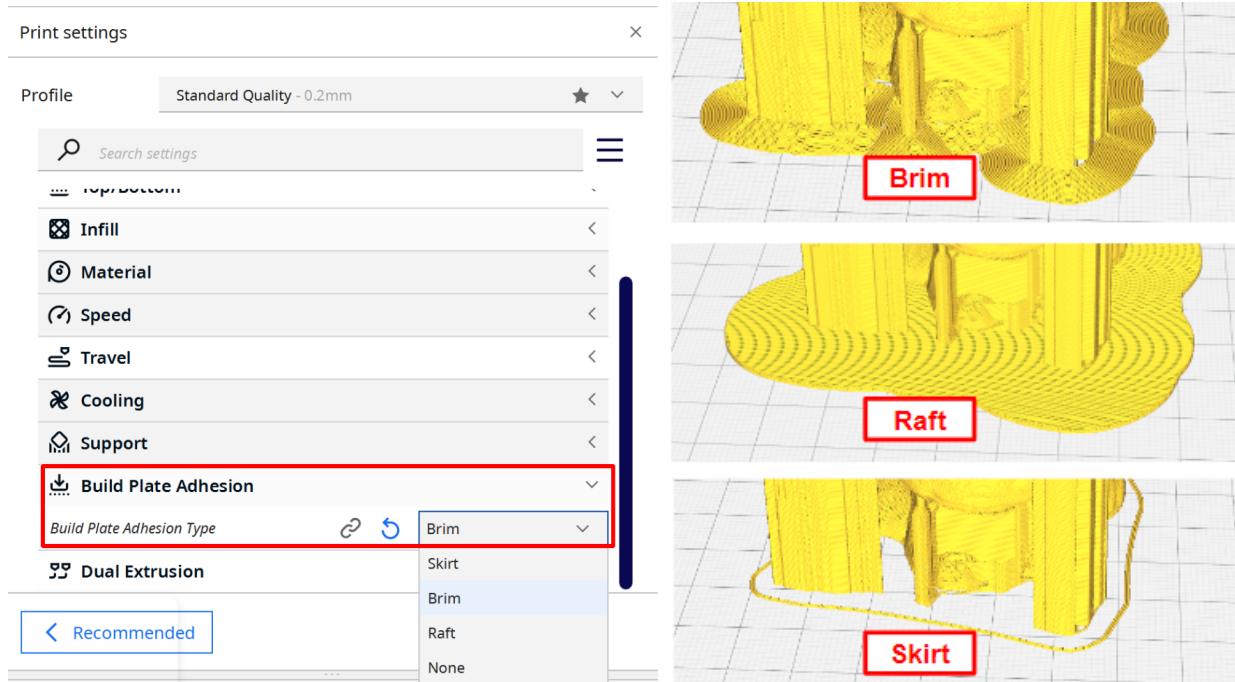
END16: 2022/08/10

#	Instructions	Key point:
16.	<p>Within custom settings, alter the <b>infill density</b> and the <b>infill pattern</b> as desired. The pattern you choose is dictated by the functionality of the print</p> <ul style="list-style-type: none"> <li>• <b>Early Prototyping:</b> Lines, Zig Zag</li> <li>• <b>General Printing:</b> Lines, Grid, Triangles, or Tri-hexagon</li> <li>• <b>Functional Part:</b> Cubic, Cubic Subdivision, Octet, Quarter cubic, or Gyroid</li> </ul>	 <p>END16: 2022/08/10</p>



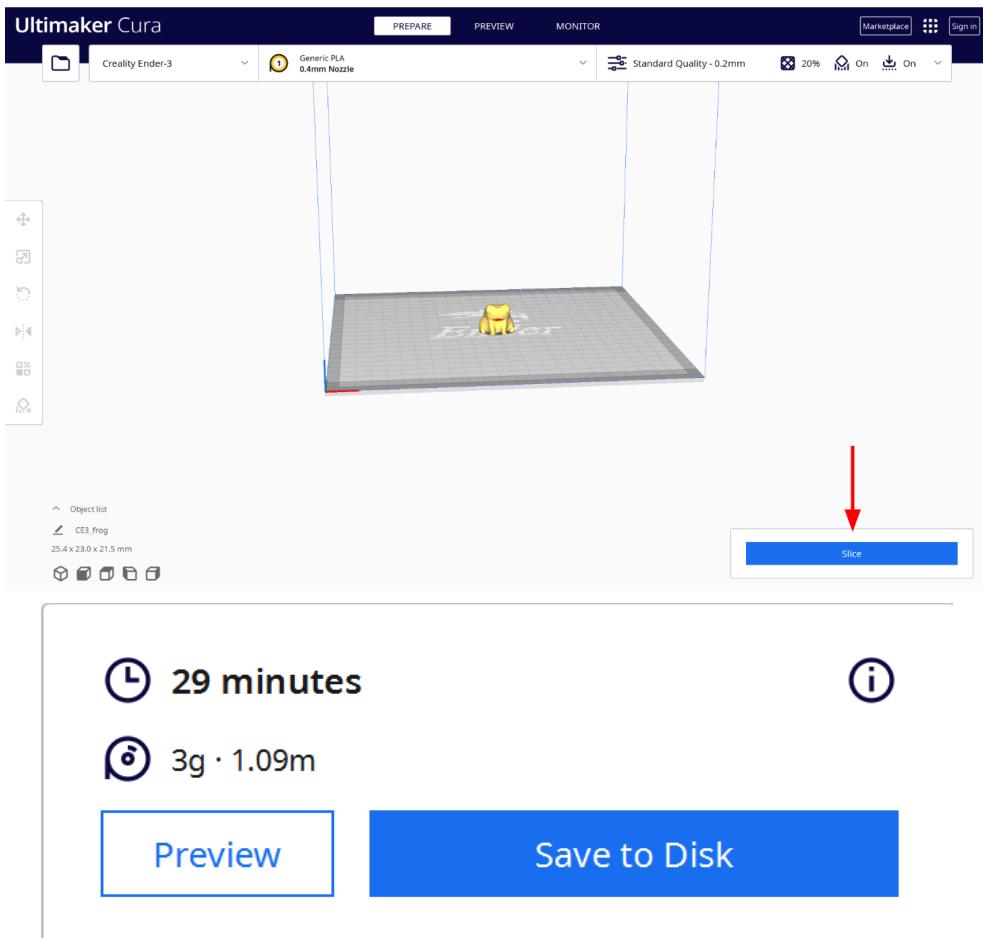
END08: 2022/08/10

#	Instructions	Key point:
17.	<p>Within custom settings, make sure that you have the following <b>Support</b> settings selected.</p> <ul style="list-style-type: none"> <li>• Select <b>Generate Support</b></li> <li>• Make sure that Supports are placed <b>Everywhere</b></li> <li>• Further default setting are okay to leave as they are</li> </ul>	<p>END08: 2022/08/10</p>



END18: 2022/08/10

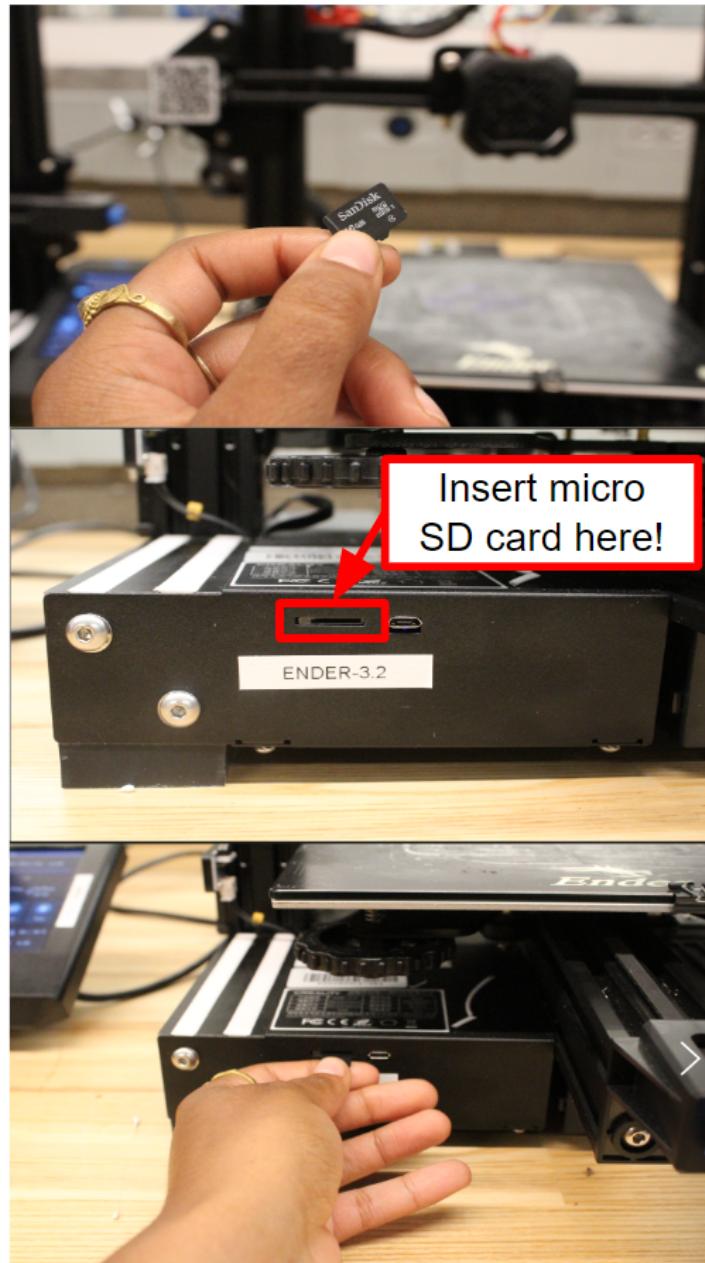
#	Instructions	Key point:
18.	<p>The toolbar on the left will let you do a number of things</p> <p>There are 6 functions in this toolbar, namely,</p> <ul style="list-style-type: none"> <li>• Move</li> <li>• Scale</li> <li>• Rotate</li> <li>• Mirror</li> <li>• Per Model Setting</li> <li>• Support Blocker</li> </ul> <p>Which are explained in the following steps.</p> <p>The appearances of each function may take the form of one of two icons...</p>	<p>Print settings</p> <p>Profile Standard Quality - 0.2mm</p> <p>Build Plate Adhesion Type Brim</p> <p>Brim Raft Skirt None</p> <p>END18: 2022/08/10</p>



**END19: 2022/08/10**

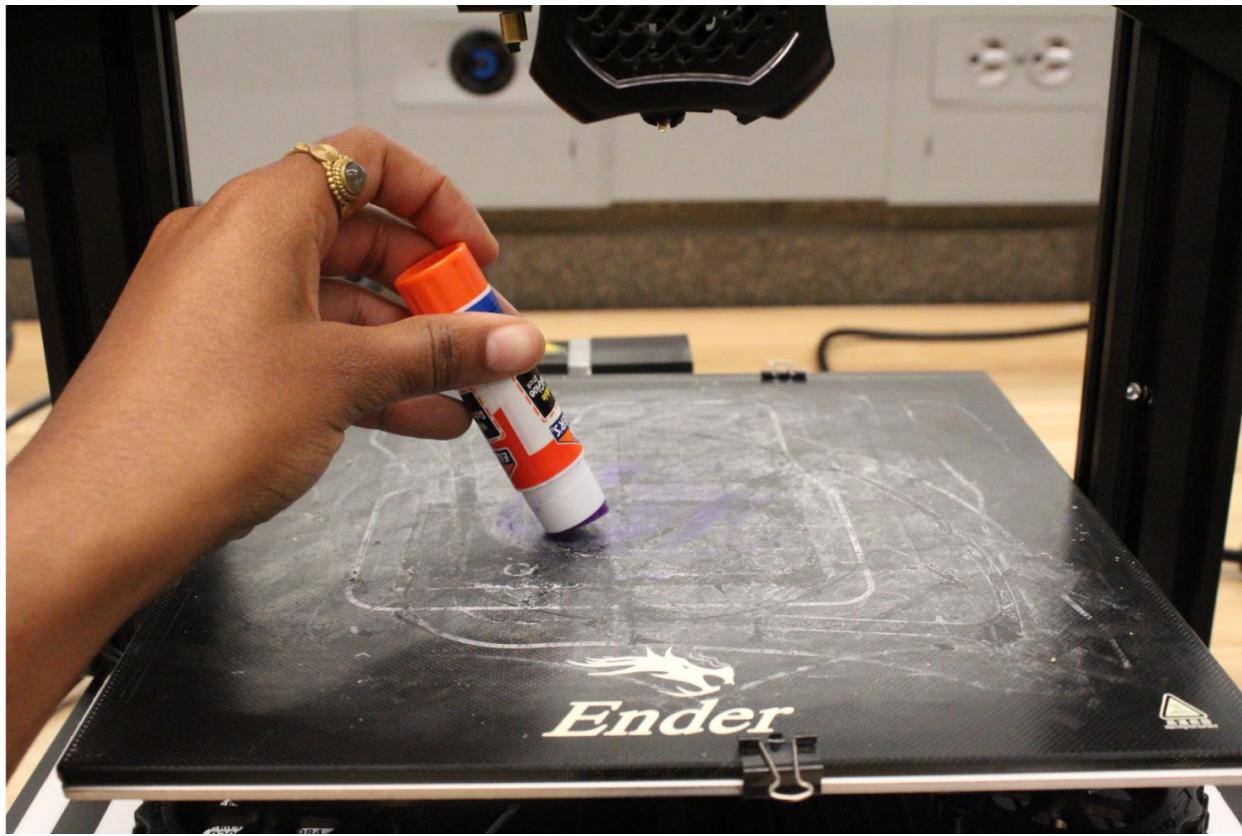
#	Instructions	Key point:
19.	<p>Once all settings are finalized, click the <b>Slice</b> button in the lower right hand corner to convert your file into a gcode file.</p> <p>You will also be shown print time and filament use estimates. Click <b>Save to Disk</b> and save the file to a Micro SD card.</p>	<p>⌚ 29 minutes ⓘ ⌚ 3g · 1.09m</p> <p>Preview Save to Disk</p> <p><b>END19: 2022/08/10</b></p>

## Using the Machine: Ender-3

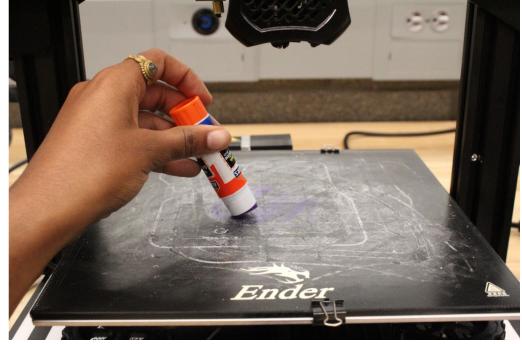


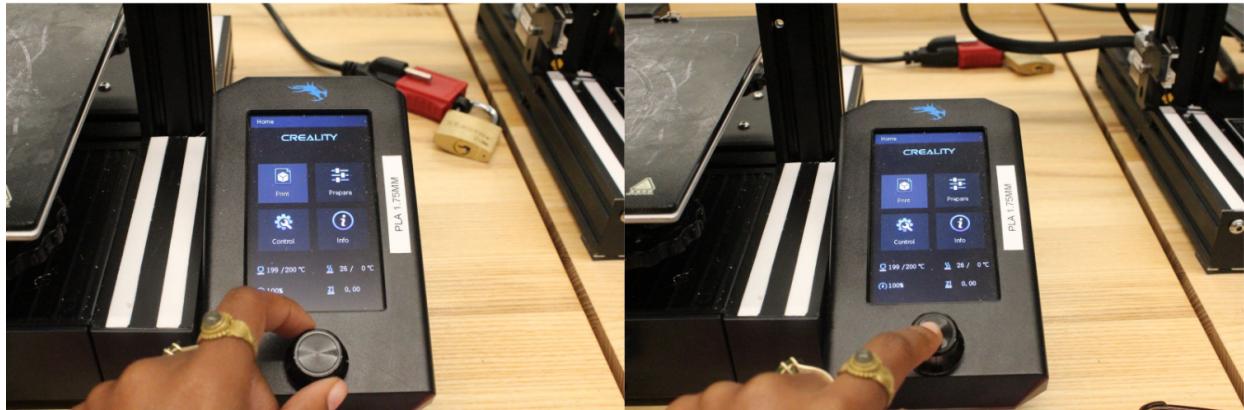
END20: 2022/08/10

#	Instructions	Key point:
20.	Having safely removed the micro SD card from your device, take the card to the the Ender and locate the port on the left side of the front of the printer  Insert the SD card into the first port.	<b>See picture above!</b>  <b>END20: 2022/08/10</b>



END21: 2022/08/10

#	Instructions	Key point:
21.	<p>If your job lacks surface area contact between the model and the print bed, you may add glue to the print bed for extra adhesive support.</p> <p>Staff can provide you with glue.</p>	 <p>END21: 2022/08/10</p>



END22: 2022/08/10

#	Instructions	Key point:
22.	<p>When using the printer interface, <b>turn</b> the dial to browse presented options, and <b>press</b> the dial to select desired option.</p> <p>Select “<b>Print</b>”</p>	<p>END22: 2022/08/10</p>



END23: 2022/08/10

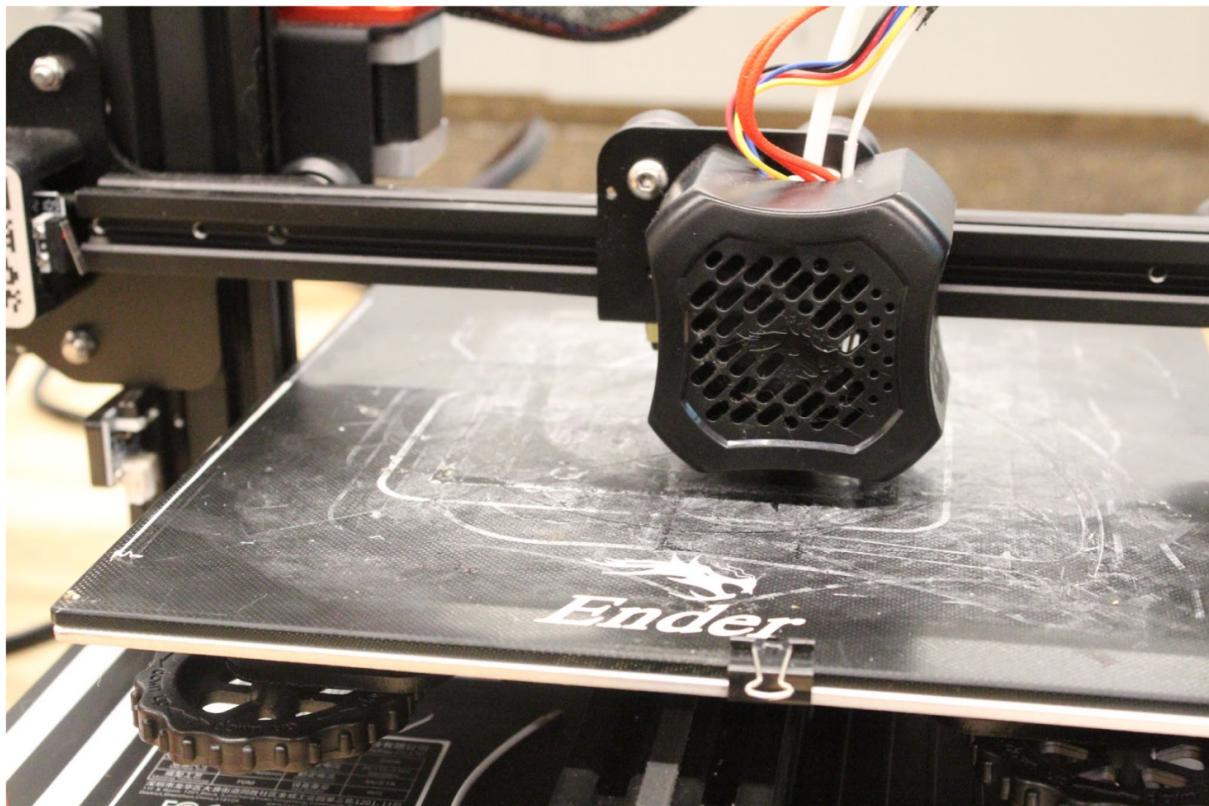
#	Instructions	Key point:
23.	Select your job from the files on the micro SD card	<p>END23: 2022/08/10</p>



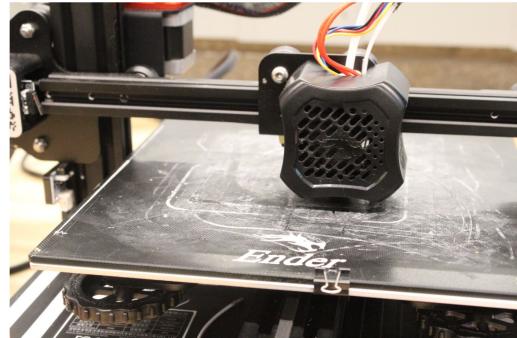
**END24: 2022/08/10**

#	Instructions	Key point:
24.	<p>This screen will show once your job has started.</p> <p>This screen gives you an estimation of your print time and the option to Pause/Stop your print if something goes wrong.</p>	

**END24: 2022/08/10**



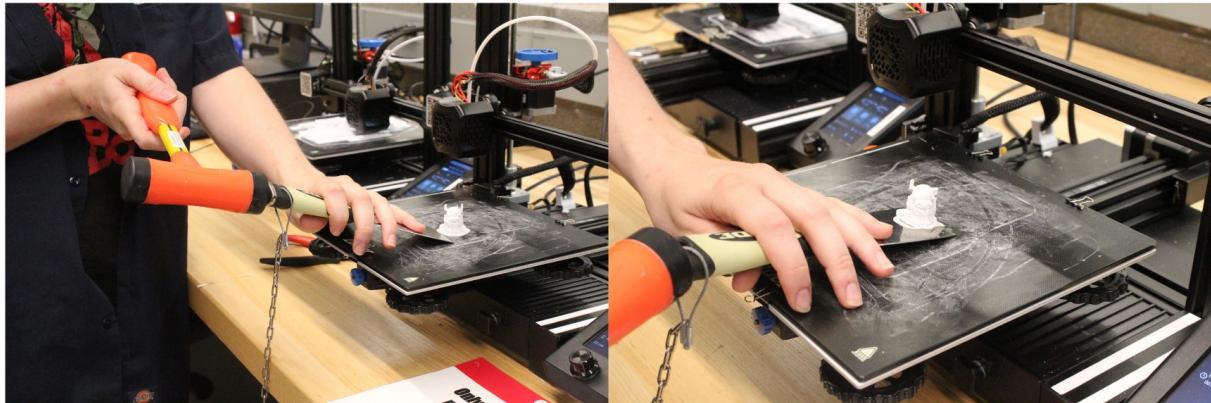
END25: 2022/08/10

#	Instructions	Key point:
25.	Stick around and watch your print for the first few layers. This gives staff/technicians an early chance of catching filament clogs and other problems.	 <p>END25: 2022/08/10</p>



END26: 2022/08/10

#	Instructions	Key point:
26.	Once your print is done, use the provided chisel and mallet to remove the print <b>and</b> its build plate adhesion from the print bed.	 END26: 2022/08/10



**END27: 2022/08/10**

#	Instructions	Key point:
27.	<p>Put the tapered edge of the chisel against the bottom corner of your part. Repeatedly, purposefully, strike the end of the chisel handle with the mallet.</p> <p>Please don't use too much force, otherwise your part will go soaring across the room.</p> <p>Finish by returning the mallet to where you found them, and throwing away all filament scraps.</p>	 <p><b>END27: 2022/08/10</b></p>