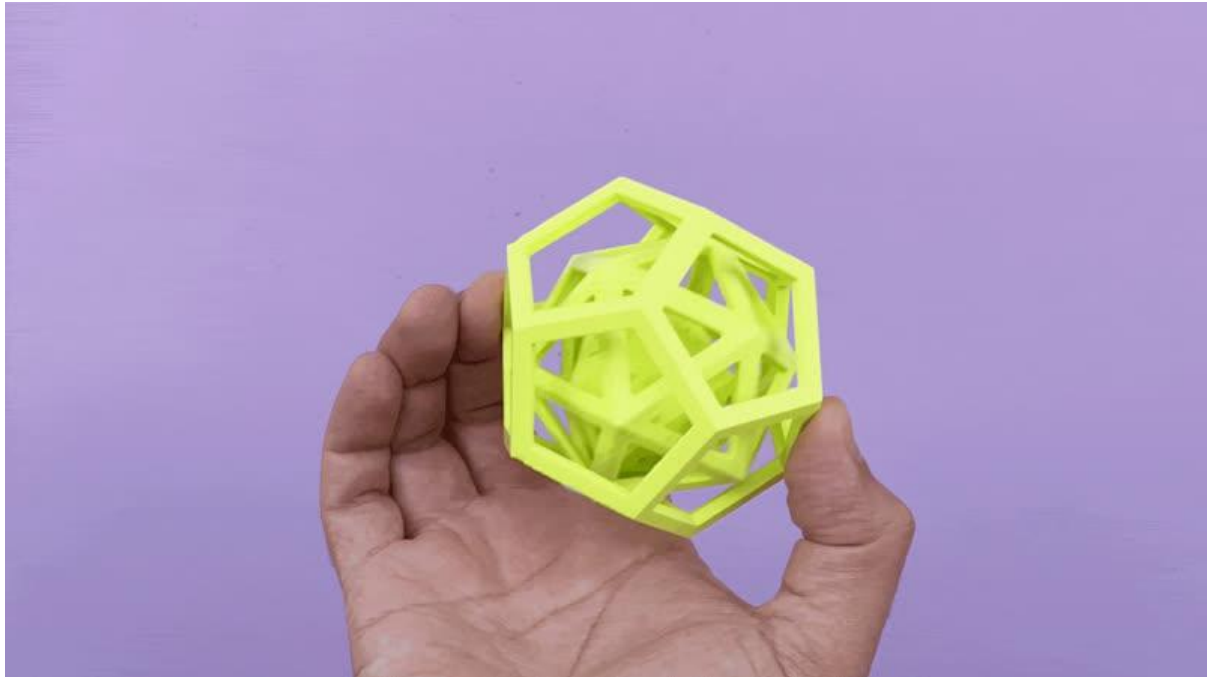




# How to Use PVA Filament

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<https://learn.adafruit.com/how-use-to-pva>

Last updated on 2022-12-01 03:12:01 PM EST

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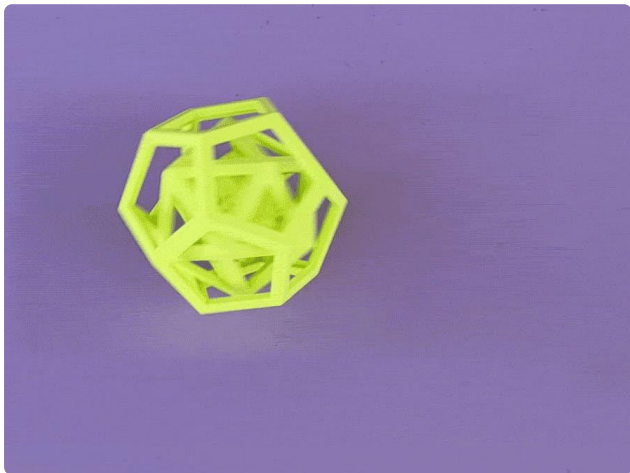
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## Overview

We present our PVA Dual Extrusion torture test!

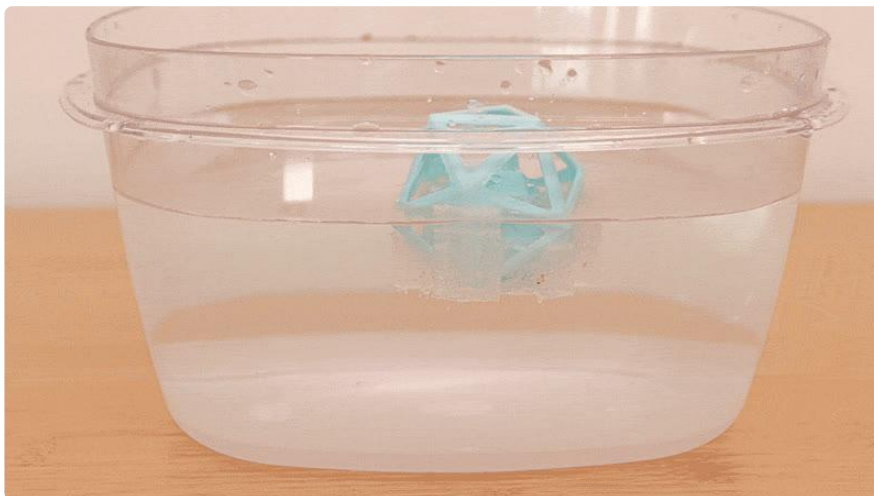


This D20 moves freely inside the frame of a larger D20. This makes it easy to roll without covering numbers up and adding additional random spins to a throw!



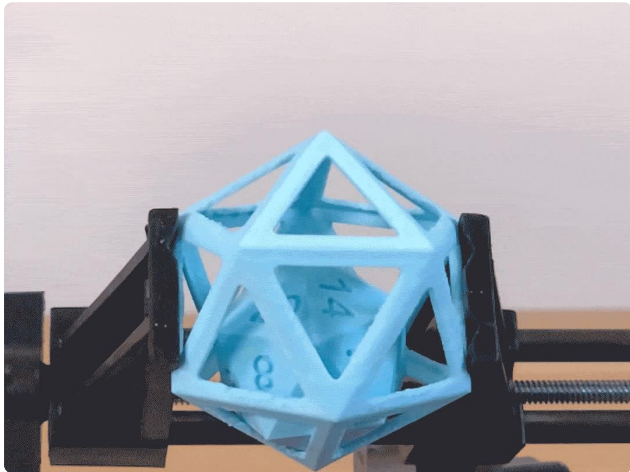
To up the torture test, we added an even smaller D20 inside a D20 frame inside a dodecahedron!

To remove the supports, we used dissolvable PVA material to act as scaffolding to hold the smaller D20 as it prints in the air!



PVA (polyvinyl alcohol) is a 3D printing material commonly used to create water-soluble support structures to achieve complex geometries. We have extensively

tested preconfigured Ultimaker Cura profiles for optimal results when printing PVA support structures in combination with PLA material.



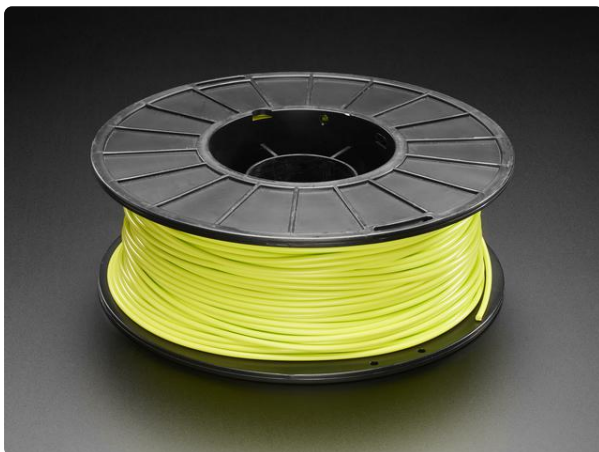
PVA is safe to print when using the recommended temperatures listed. To ensure a comfortable and healthy environment, we recommend 3D printing in a well-ventilated area.



### Ultimaker 3 - 3D Printer

The Ultimaker 3 is one of our favorite 3D printers on the market. It's a well-built open-source compact machine with an excellent UX. Every inch of the...

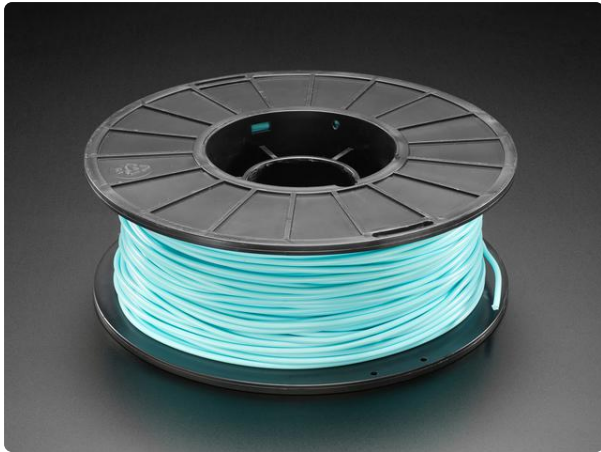
<https://www.adafruit.com/product/3300>



### PLA Filament for 3D Printers - 2.85mm Dia - Light Green - 1 Kg

Having a 3D printer without filament is sort of like having a regular printer without paper or ink. And while a lot of printers come with some filament there's a good chance...

<https://www.adafruit.com/product/3735>



### PLA Filament for 3D Printers - 2.85mm Diameter - Aqua - 1.0 Kg

Having a 3D printer without filament is sort of like having a regular printer without paper or ink. And while a lot of printers come with some filament there's a good chance...

<https://www.adafruit.com/product/3737>



### PLA Filament for 3D Printers - 2.85mm Diameter - Magenta - 1 Kg

Having a 3D printer without filament is sort of like having a regular printer without paper or ink. And while a lot of printers come with some filament there's a good chance...

<https://www.adafruit.com/product/3732>

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## 3D Printing

### PVA Print Cores



Use nozzles that are appropriate for PVA filament, The Ultimaker 3 features swappable Print Cores that are designed for PVA material. The all-in-one design contains the heater block, sensors and nozzle all in one package. This makes maintenance low and speeds up prototyping workflow. The BB 0.4mm and BB 0.8mm print core is also known as the Support Core, specifically designed for PVA.

# D20 inside D20 inside Dodecahedron

[Download STL on Thingiverse](#)

[Download on Youmagine](#)

[Download on Pinshape](#)

You can find our PVA print settings on our GitHub as well as all of the settings we used linked below:

[3D Printer Profiles on GitHub](#)

## Clean and Calibrate Nozzles



Before printing, make sure to clean both nozzles with the hot and cold pull methods. This will minimize nozzles from clogging from any material that heats away will inactive.

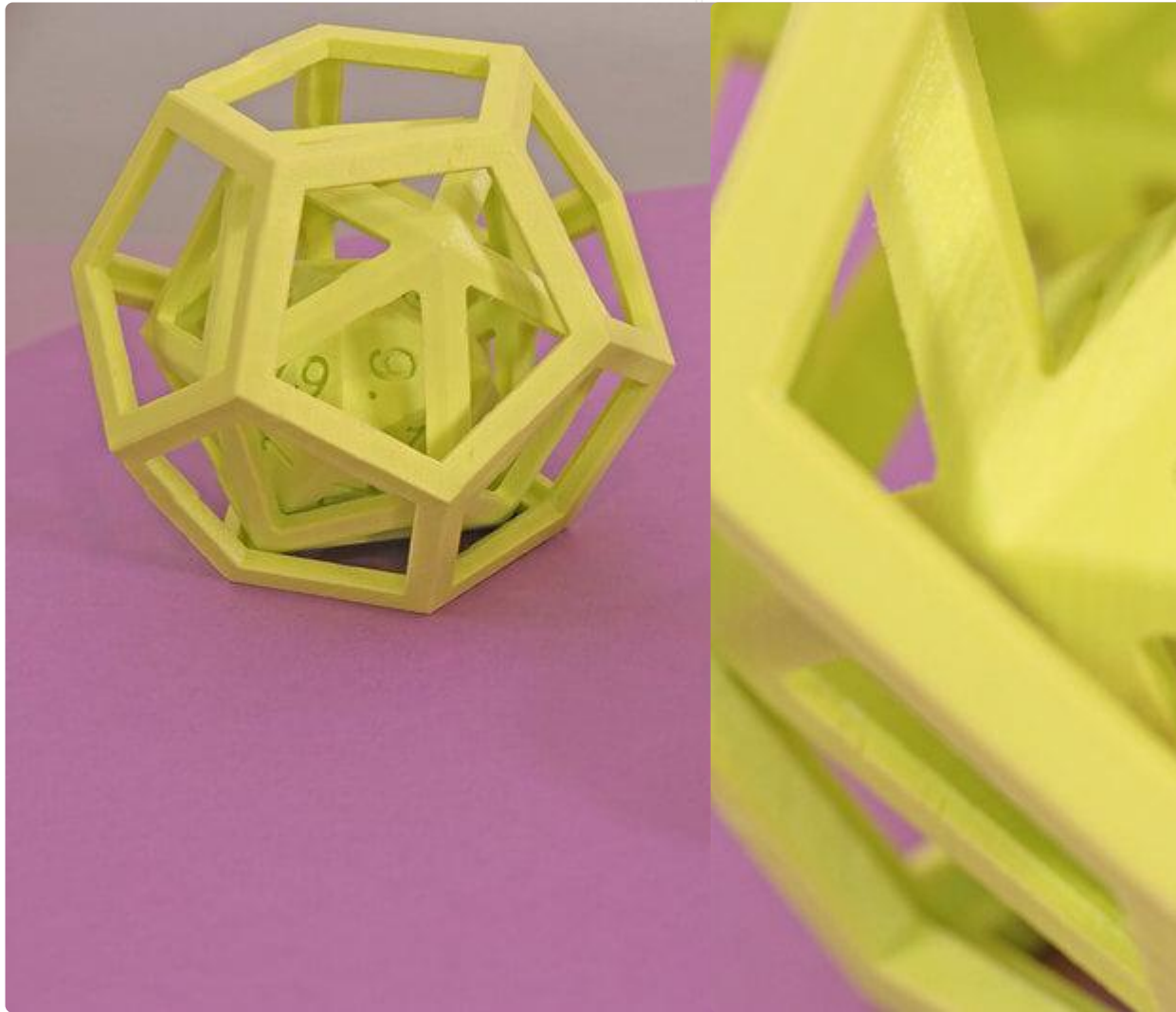
We'll also want to calibrate the nozzles to ensure the x and y offsets correctly align to each other.

Before printing, make sure to calibrated the nozzles to ensure the x and y offsets correctly align to each other.

## Details

We used .1mm layer height with the .25mm nozzle to get a pretty fine details on the numbers and frames.

To speed up print times, we modeled the parts to scale down %50 without the frame becoming too thin.



<i>Retraction Distance</i>	6	mm
<i>Retraction Speed</i>	15	mm/s
Retraction Retract Speed	15	mm/s
Retraction Prime Speed	15	mm/s
<i>Retraction Extra Prime Amount</i>	2	mm <sup>3</sup>
<i>Maximum Retraction Count</i>	10	
<i>Standby Temperature</i>	130	°C
<i>Nozzle Switch Retraction Speed</i>	15	mm/s
Nozzle Switch Retract Speed	15	mm/s
Nozzle Switch Prime Speed	15	mm/s

## Retraction

Tune down the "Maximum Retraction Count" to around 10 to decrease filament grinding.

We found that material can heat away but enabling a prime tower helped to keep the flow of filament consistent.

<i>Enable Prime Tower</i>	<input checked="" type="checkbox"/>	
Circular Prime Tower	<input checked="" type="checkbox"/>	
<i>Prime Tower Size</i>	<input type="text" value="20"/>	mm
Prime Tower Minimum Volume	<input type="text" value="8.48"/>	mm <sup>3</sup>
<i>Prime Tower Thickness</i>	<input type="text" value="2"/>	mm
Prime Tower X Position	<input type="text" value="177.8"/>	mm
<i>Prime Tower Y Position</i>	<input type="text" value="180"/>	mm
<i>Prime Tower Flow</i>	<input type="text" value="150"/>	%
<i>Wipe Inactive Nozzle on Prime Tower</i>	<input checked="" type="checkbox"/>	
Wipe Nozzle After Switch	<input checked="" type="checkbox"/>	
Prime Tower Purge Volume	<input type="text" value="1"/>	mm <sup>3</sup>

## Prime Tower

Enable Circular Prime Tower to optimize tools paths and increase the tower size to 20.

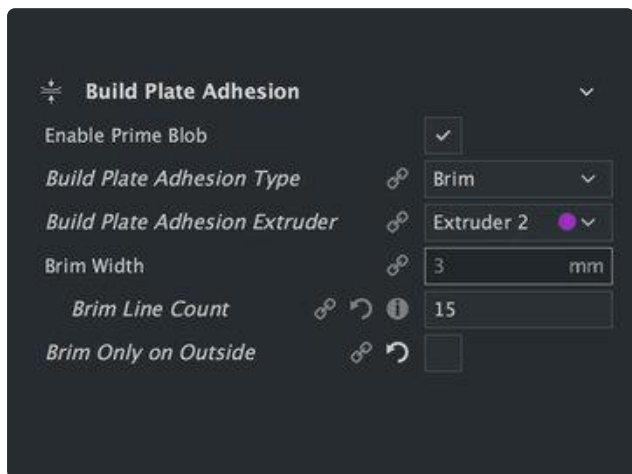
## Wipe Nozzles

We can also enable wiping nozzles on the prime tower and increasing the purge volume to 1



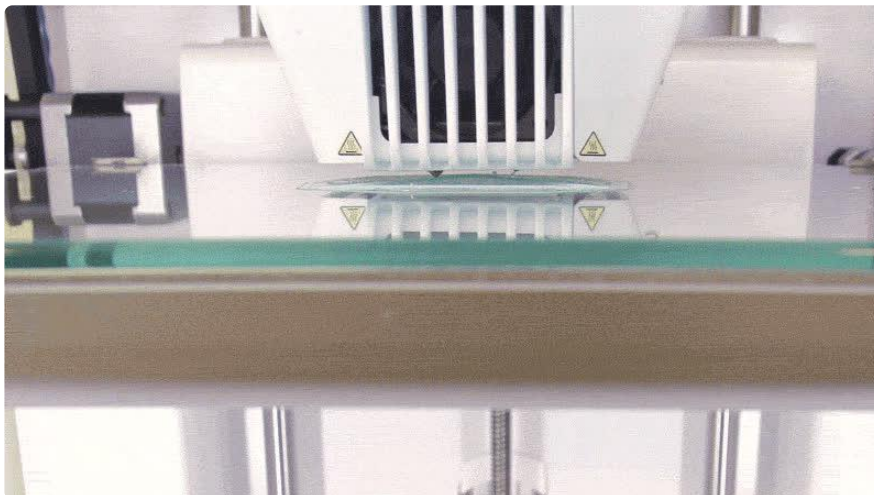
## Build Plate Adhesion

You'll want to make sure to add a brim around the prime tower to make sure it stays in place while the nozzles take turn whipping excess material between switching.



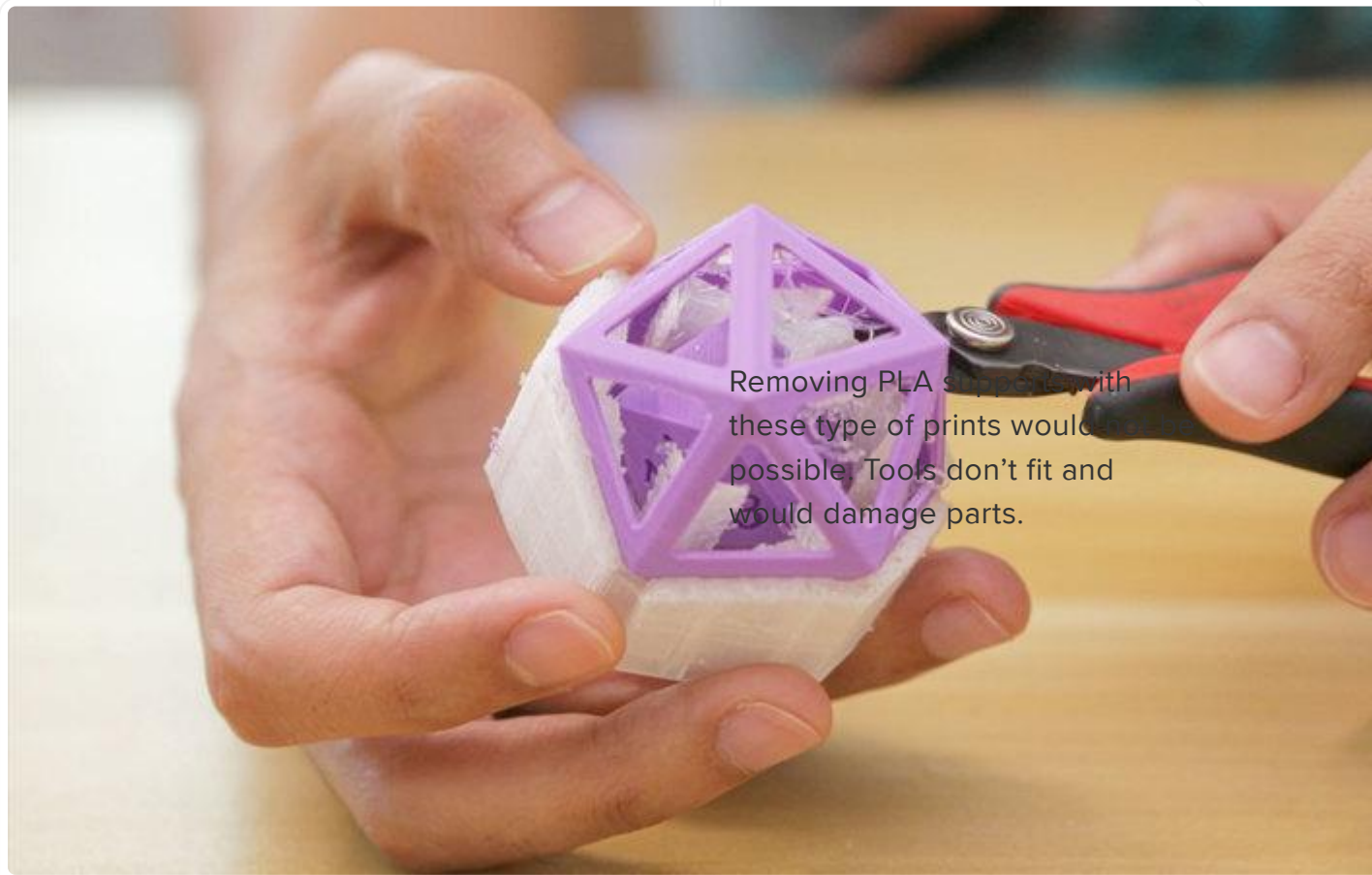
Enable Brim on inside and outside by first unchecking it from the options. Click on the cog wheel icon next to the main title for any setting.

Untick the option to enable brim on outside and inside.





## Dissolving PVA

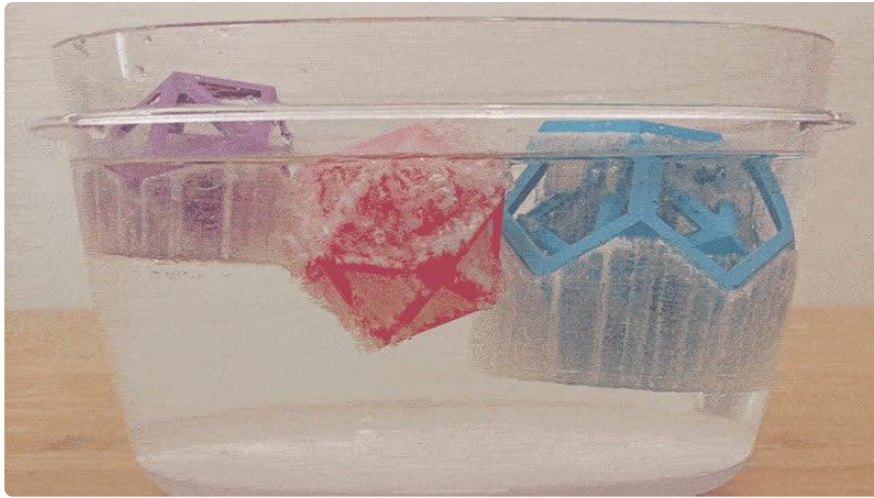




To clean the print, we'll use Luke warm water to thoroughly dissolve the supports.

### Prep Part

We can speed up dissolving time by first removing large portions prior to soaking. Agitating prints to help to lift and remove the PVA as it starts to turn into slime.



### Sonic Bath Cleaner



You can also use a Sonic Bath Cleaner to help agitate the PVA. You can print scaled version to fit inside.

Use the 2 minute cycle for about a dozen times to thoroughly clean the print. Allow the sonic cleaner to cool down between each cycle.



## Peel Sludge

Portions of the model will dissolve more slowly than others but we can help remove sludge from tight areas with the help of a spudger tool.

A spudger tool is thin enough to help scrape off excess PVA as it continues to dissolve.

## Clean Water

Changing out water will also help speed up cleaning!



Carefully remove water from your container without dumping out the PVA sludge at the bottom.

Use a paper towel to remove the heavy sludge from the bottom of your container and fill it back up with fresh warm water to continue dissolving.

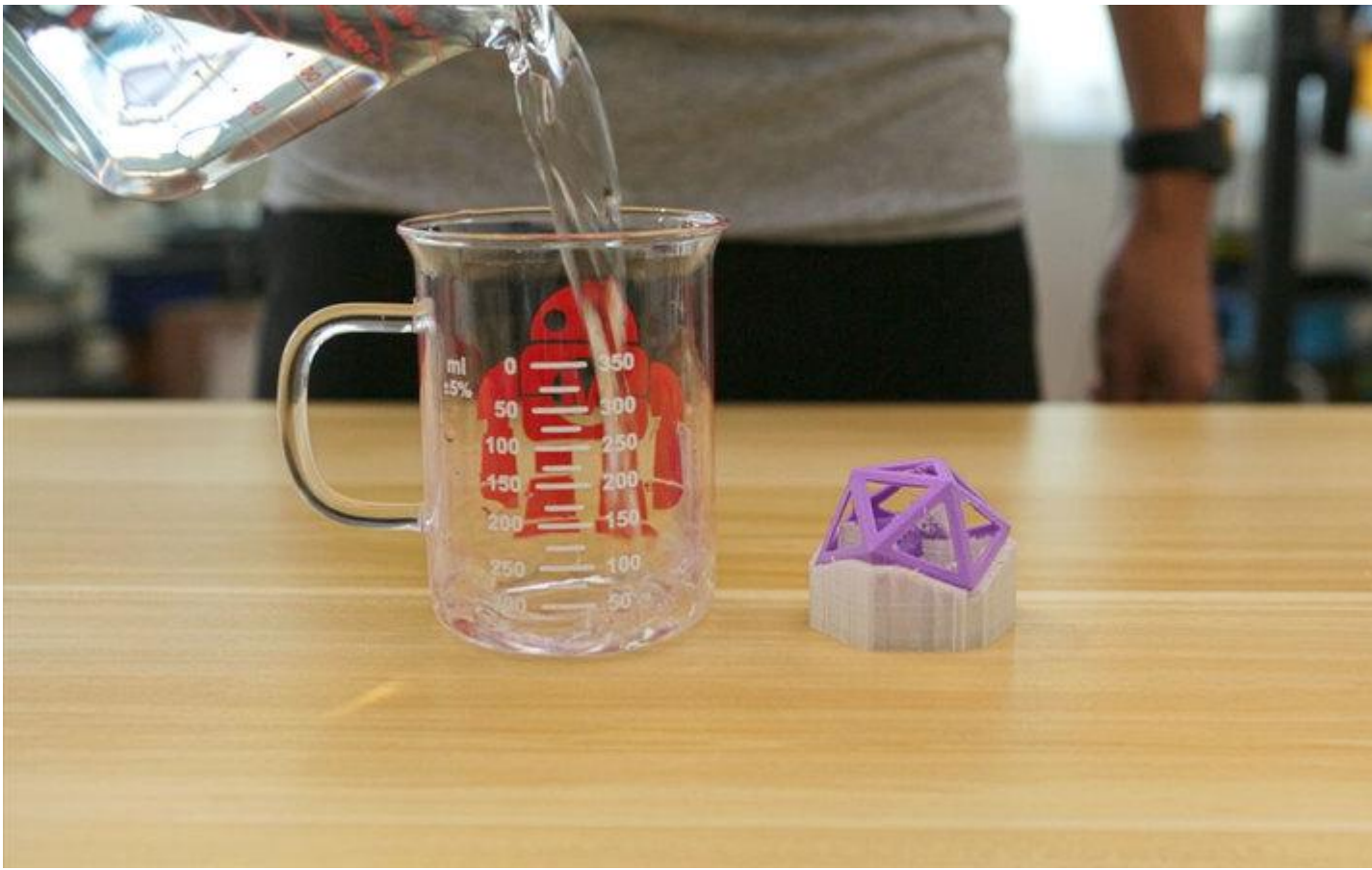
Once all the PVA has all dissolved, we can pat down the part with a paper napkin to dry it off.

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And that's it, a great way to help calibrate your slice settings for PVA supports!

Remember to save out customized settings and please share any settings you found in your results.