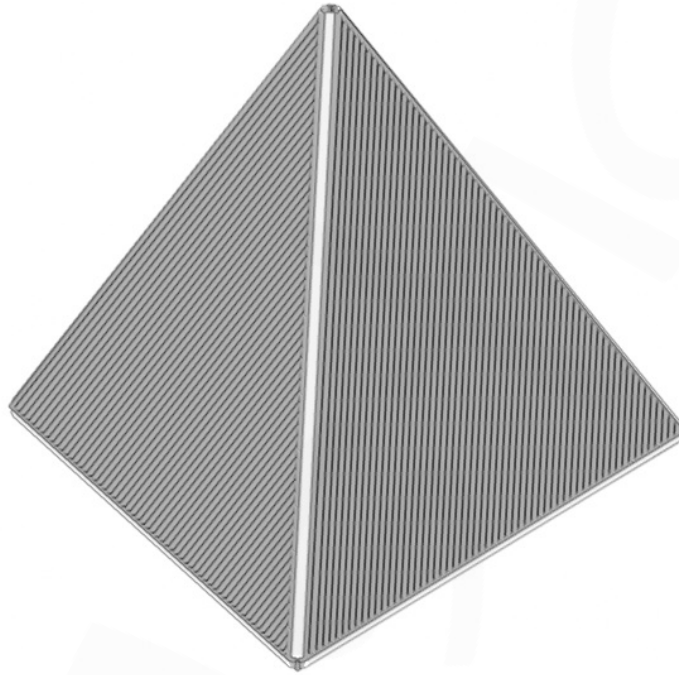


MAKE • DISCOVER • COLLECT

Three-sided pyramid

Beginners aged 10 and over, as well as teenagers and adults; assistance suited to the participant's skills and the device instructions. • About 50–80 minutes; an estimate, not a limit



Four identical filled PLA triangles form a colourful hollow tetrahedron.



Your outcome

Assemble a first closed solid from four identical faces.

Construction illustration. The instructions show the successive stages. Full-size (1:1) templates are supplied on a separate sheet.

What you need

A 3D pen, the selected filament and equipment available in your workspace. See the complete list below.

equipment

- | | | |
|--------------------------|---|-------|
| ☐ | PLA-compatible 3D pen
Set up and operate according to the device instructions. | 1 pc. |
|--------------------------|---|-------|

material

- | | | |
|--------------------------|--|--|
| ☐ | PLA in colours of your choice
Use one type of filament for the four faces and all joints. | Based on the estimated amount needed, with extra |
|--------------------------|--|--|

equipment

- | | | |
|--------------------------|---|-------|
| ☐ | Suitable work mat for PLA
Transparent and flat; clear area of at least 220 × 200 mm. | 1 pc. |
|--------------------------|---|-------|

template

- | | | |
|--------------------------|---|-----------|
| ☐ | Printout of the face template
100% scale; use the template four times in sequence. | 1 A4 copy |
|--------------------------|---|-----------|

equipment

- | | | |
|--------------------------|--|--------|
| ☐ | Ruler
For checking the 20 mm segment and laying out the areas. | 1 pc. |
| ☐ | Ordinary paper scissors
For cutting out the rectangular area of the paper template before starting. | 1 pair |

Filament — amounts include extra

- | | | |
|--------------------------|--|-----------------|
| ☐ | PLA 1.75 mm — colour shown in the illustration | 1.2 m · ≈ 3.6 g |
| ☐ | PLA 1.75 mm — colour shown in the illustration | 1.2 m · ≈ 3.6 g |
| ☐ | PLA 1.75 mm — colour shown in the illustration | 1.2 m · ≈ 3.6 g |
| ☐ | PLA 1.75 mm — colour shown in the illustration | 1.2 m · ≈ 3.6 g |
| ☐ | PLA 1.75 mm — colour shown in the illustration | 0.4 m · ≈ 1.2 g |

Total filament: 5.2 m · approximately 15.6 g

The quantities include extra filament. Grams indicate estimated net filament mass, excluding packaging.

Before you start

Colours and time

Choose your own PLA colours. About 50–80 minutes is an estimate, not a limit; you can pause once the four separate faces have cooled.

- 1 Print the template at 100% scale, with no fit-to-page scaling. Measure the check segment with a ruler: it must be exactly 20 mm. Cut out the 80 × 72 mm paper template area along its boundary; do not cut out the triangle.
- 2 Prepare a clear area of 220 × 200 mm. Mark out two rows of two 80 × 72 mm areas, with 15 mm gaps. As viewed from your position: 1 on the left near you, 2 on the right near you, 3 on the left farther away, and 4 on the right farther away. Point every template apex away from you.
- 3 You will use one paper template four times. Place it UNDER the transparent mat in area 1 and make the outline. Once the outline has cooled, slide out only the paper and place it under the next EMPTY area: 2, 3, and 4. Do not slide the template under existing PLA or overlap the areas.

The outlines stay in their areas; then fill them in one by one.
- 4 Choose the face or stripe colours from your own PLA. Set up the pen according to its instructions. During assembly, provide assistance suited to the participant's skills; hold only the cool centres of the faces, away from the nozzle and fresh seams.

A project estimate for beginners, not a physical measurement. Total pen time, including seams, is 30–50 min within the overall time. The approved phases and the option to pause after making four cool faces have been retained.

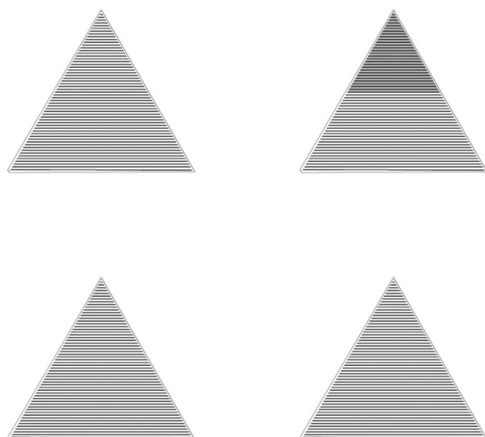


How to read the instructions

The large image shows the completed stage. Small views show the action and current parts. ×N means repeat the whole action N times, cooling and checking each time. Illustrations are not at 1:1 scale.

STAGE 01 / 08 • Work 1

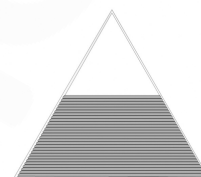
Make four filled faces



Four separate filled faces



Outline ×4 • What to repeat: Close outline 2; Close outline 3; Close outline 4



Partial fill ×4 • What to repeat: Fill the lower part of face 2; Fill the lower part of face 3; Fill the lower part of face 4

NOW Face 1 • Face 2 • Face 3 • Face 4

Blue / dark emphasis: the part used in this action. Arrows: visual guides. Illustration not to scale.

PARTS FOR THIS STAGE

1 × Face 1 • PLA | template F3-B-01-wall

1 × Face 2; 1 × Face 3; 1 × Face 4 • PLA | template follow the written method

→ T001 • Techniques — reference appendix

First close four outlines in separate template areas. Then fill each one in sequence with a single thin layer: apply strands approximately 1,1 mm wide every approximately 0,9 mm, from the bottom side towards the apex, alternating from edge to edge. Join each strand to the adjacent strand and the outline.

Choose your own colours for the faces or stripes. Let each face cool flat.



Check

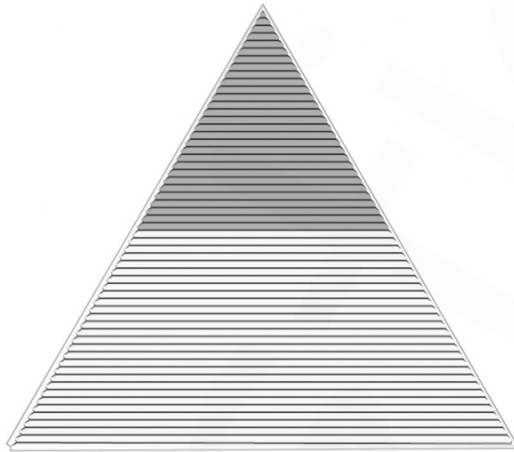
You have four identical, cool triangles with sides approximately 60 mm long and a continuous fill.

If it does not work

Cover any gaps with a thin strand on the support. Remake a curved or undersized face using the template; do not bend hardened PLA.

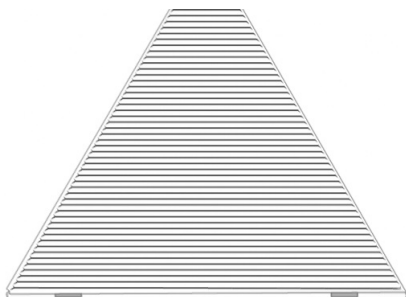
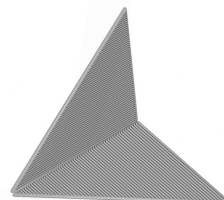
Make four filled faces — construction details

Complete fill ×4 • What to repeat: Finish face 2; Finish face 3; Finish face 4



STAGE 02 / 08 • Work 1

Tack the first two faces



Align and support

Two short tacks

NOW Face 1 · Face 2 · Seam 1–2

Blue / dark emphasis: the part used in this action. Arrows: visual guides. Illustration not to scale.

PARTS FOR THIS STAGE

1 × Seam 1–2 · PLA | template follow the written method

→ T002 • Techniques — reference appendix

Lay face 1 flat. Align one side of face 2 with it and incline that face so that its apex is approximately 49 mm above the centre of the base. Hold the cool outer centre at least 15 mm from the edges. From the outside, make two tacks approximately 4 mm long, approximately 7 mm from the ends of the joint.

After each tack, move the nozzle away and hold the parts until rigid.



Check

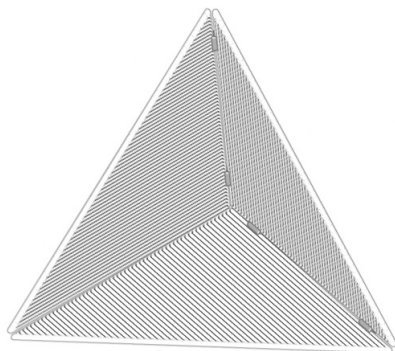
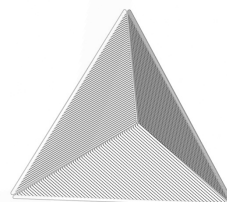
Two cooled tacks join the rims and maintain the inclination of the second face.

If it does not work

Correct the alignment before the next tack. If the joint has failed, support the parts and add PLA; do not bend the face.

STAGE 03 / 08 • Work 1

Build a corner from three faces



Align without bending

Tacks from the outside

NOW Face 3 · Seam 1–3 · Seam 2–3

Blue / dark emphasis: the part used in this action. Arrows: visual guides. Illustration not to scale.

PARTS FOR THIS STAGE

1 × Seam 1–3; 1 × Seam 2–3 · PLA | template follow the written method

→ T002 • Techniques — reference appendix

Place face 3 between base 1 and face 2. Align both shared sides and the top apex. The base remains flat. Hold the cool centre of face 3 from the outside; add two tacks to each joint, approximately 7 mm from the corners. Maintain your grip after each one until rigid.



Check

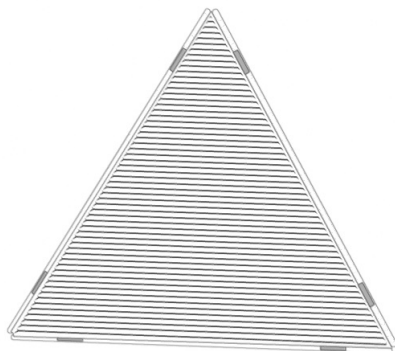
Three cool faces form a corner; a triangular opening the size of the fourth face remains.

If it does not work

If the edges do not align, remove the still-loose face and check its size and position. Do not force the gap closed or bend the PLA.

STAGE 04 / 08 • Work 1

Close with the fourth face



Align without bending

Tacks from the outside

NOW Face 4 · Seam 1–4 · Seam 2–4 · Seam 3–4

Blue / dark emphasis: the part used in this action. Arrows: visual guides. Illustration not to scale.

PARTS FOR THIS STAGE

1 × Seam 1–4; 1 × Seam 2–4; 1 × Seam 3–4 · PLA | template follow the written method

→ T002 • Techniques — reference appendix

Hold the cool centre of face 4 from the outside, at least 15 mm from the edges. Place it against the opening from the outside: align the bottom side with the base, then align the other two sides. Do not put your fingers inside or press the face in. Make two tacks from the outside on each of the three joints. Hold until cool.

✓ Check

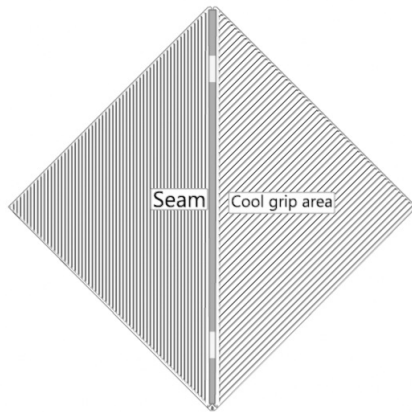
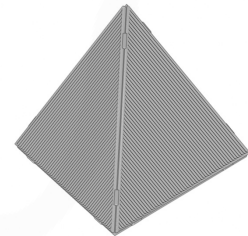
The fourth face covers the entire opening, and six cool tacks join its three sides to the other faces.

If it does not work

If the edges do not align, remove the still-loose face and check its size and position. Do not force the gap closed or bend the PLA.

STAGE 05 / 08 • Work 1

Complete seam 1–2



Support the solid for seam 1–2

Complete seam 1–2

NOW Complete model — all previously made parts

Blue / dark emphasis: the part used in this action. Arrows: visual guides. Illustration not to scale.

Once the tacks have cooled completely, hold the solid by the centres of the cool faces. Lift and rotate the entire assembly; lay it flat on face 3. Joint 1–2 is now accessible above the support. On the supported solid, join the tacks with fresh PLA from the outside. Fill the sections between them and up to both corners, covering both rims.

Hold the cool centre of the face at least 15 mm from the weld; move the nozzle away and let it cool before the next rotation.



Check

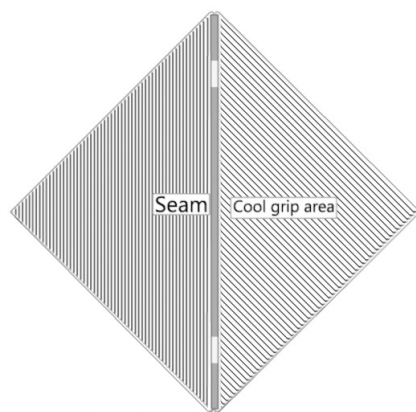
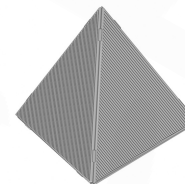
The edge has a continuous seam from corner to corner, joining both faces.

If it does not work

Fill the gap at the supported joint. Do not rest the model on a hot seam.

STAGE 06 / 08 • Work 1

Complete seam 1–3 / Complete seam 1–4



Support the solid for seam 1–3



Complete seam 1–3

Complete seam 1–4

NOW Complete model — all previously made parts

Blue / dark emphasis: the part used in this action. Arrows: visual guides. Illustration not to scale.

Once the tacks have cooled completely, hold the solid by the centres of the cool faces. Lift and rotate the entire assembly; lay it flat on face 2. Joint 1–3 is now accessible above the support. On the supported solid, join the tacks with fresh PLA from the outside. Fill the sections between them and up to both corners, covering both rims.

Hold the cool centre of the face at least 15 mm from the weld; move the nozzle away and let it cool before the next rotation. Once the tacks have cooled completely, hold the solid by the centres of the cool faces. Lift and rotate the entire assembly; lay it flat on face 2. Joint 1–4 is now accessible above the support.

On the supported solid, join the tacks with fresh PLA from the outside. Fill the sections between them and up to both corners, covering both rims. Hold the cool centre of the face at least 15 mm from the weld; move the nozzle away and let it cool before the next rotation.



Check

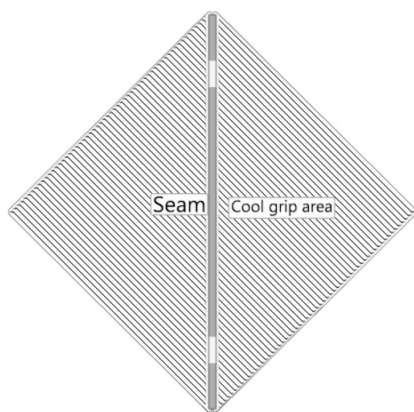
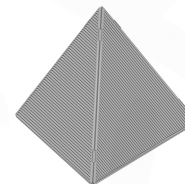
The edge has a continuous seam from corner to corner, joining both faces.

If it does not work

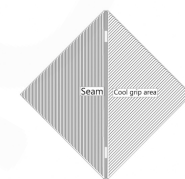
Fill the gap at the supported joint. Do not rest the model on a hot seam.

STAGE 07 / 08 • Work 1

Join with complete seams — 2/2



Support the solid for seam 2–3



Seam 2–3; support 1

Complete seam 3–4

NOW Complete model — all previously made parts

Blue / dark emphasis: the part used in this action. Arrows: visual guides. Illustration not to scale.

Begin only after all the tacks have cooled. Position the solid for each seam as follows: 2–3 on face 1; 2–4 on face 1; 3–4 on face 1. Lift and rotate the entire cool assembly. Hold the cool centre of a face at least 15 mm from the edge.

From the outside, fill the sections between the tacks and up to the corners with a strand of PLA, joining both rims. Let each seam cool before rotating.



Check

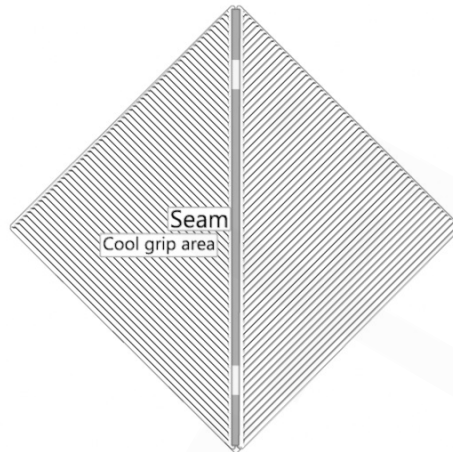
The three shown edges have continuous, cool seams from corner to corner.

If it does not work

Fill any gap or detached area while supporting the joint. If a tack has failed, repair the alignment before completing the weld.

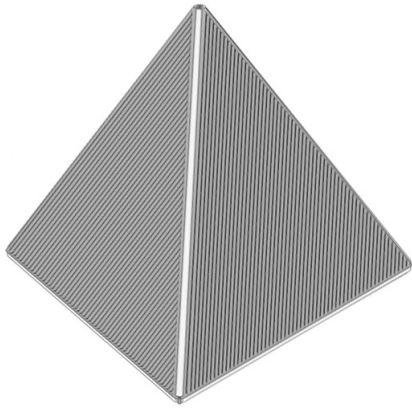
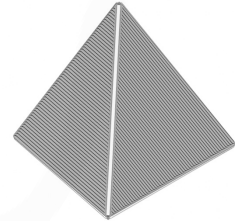
Join with complete seams — 2/2 — construction details

Seam 2–4; support 1



STAGE 08 / 08 • Work 1

Check four orientations



Support on face 1 • What to repeat:
Check support on face 2; Check
support on face 3

Test on face 4

NOW Face 1 • Face 2 • Face 3 • Face 4

Blue / dark emphasis: the part used in this action. Arrows: visual guides. Illustration not to scale.

Once completely cool, examine all six seams and four corners against the light. Stand the solid on faces 1, 2, 3, and 4 in turn; in each orientation, gently touch the top and release it. Check that it is closed and stable. Choose the orientation that best displays your colours.

✓ Check

Four filled faces enclose a hollow interior. The model rests stably on every face; nothing comes apart.

If it does not work

Fill the gap at the supported joint and repeat the test once cool. Do not bend a warped face; it must be remade.

Finished — check the outcome



Check

Four faces enclose the solid, and the model rests stably on each one.



Check

Four identical, thinly filled faces; a hollow interior and six continuous seams.



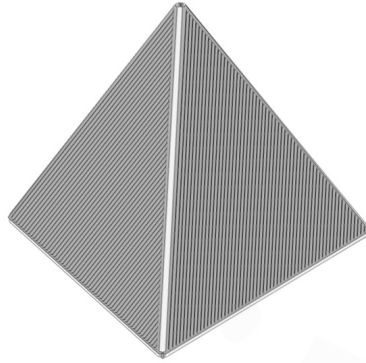
Check

The participant's own colour composition has a chosen display orientation.

Storage

Store the model in a cool place away from sunlight and heat. Repair it on a suitable 3D-pen work surface using the same material as the part.

View 1



Techniques — reference appendix

T001 • Stage 1

1 × Face 1 · PLA | template F3-B-01-wall

1 × Face 2; 1 × Face 3; 1 × Face 4 · PLA | template follow the written method

Close the outline with 60 mm sides. On a flat support, fill it with one thin layer of strands approximately 1,1 mm wide, spaced every 0,9 mm; join each one to the outline and the adjacent strand. Let it cool flat. Finished cross-section [mm]: 1.1 × 1.1. Number of layers: 1.

Support: The entire face is supported flat on a suitable surface for PLA. Strand direction: Make the outline, then adjacent strands from the bottom side towards the apex, alternating from edge to edge. Cooling: Let it cool flat until completely cool and rigid; do not bend a hot face.

Tip access: From above, over a clear area; the nozzle does not pass over your hand.

T002 • Stage 2 · Stage 3 · Stage 4

1 × Seam 1–2 · PLA | template follow the written method

1 × Seam 1–3; 1 × Seam 2–3 · PLA | template follow the written method

1 × Seam 1–4; 1 × Seam 2–4; 1 × Seam 3–4 · PLA | template follow the written method

After aligning the cool faces, make two 4 mm tacks, approximately 7 mm from the ends. Only on the closed, cooled solid should you complete the entire edge from the outside. Finished cross-section [mm]: 1.36 × 1.36. Support: Two aligned rims, a cool base face, and a grip at the centre of the face being added.

Strand direction: Two tacks: 7–11 and 49–53 mm from the corner; then the 0–7, 11–49, and 53–60 mm sections join the tacks into a single seam. Cooling: Hold after each tack until rigid. Wait until completely cool before changing the support. Tip access: From the outside, along the bisector of the angle between the rims.

For the complete weld, place the solid on the specified cool face.