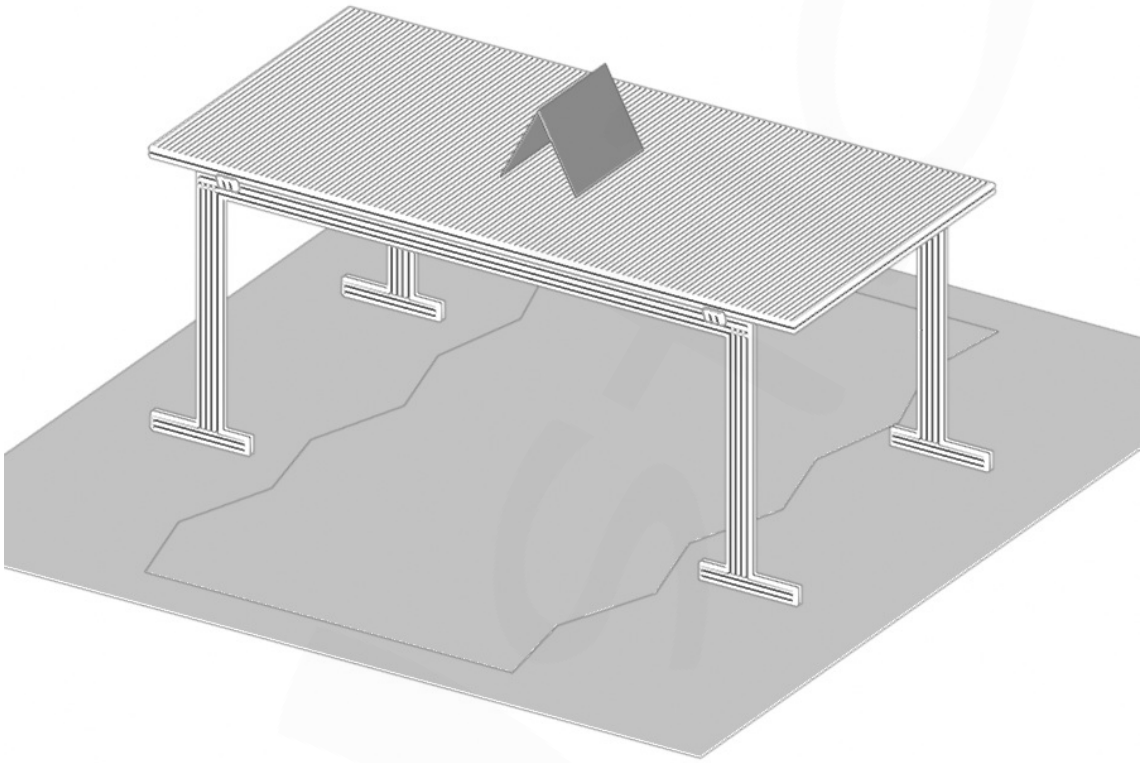
MAKE • DISCOVER • COLLECT

Bridge over a small obstacle

Beginners aged 10 and up, young people and adults • Approximately 50–80 min, including 30–50 min with the pen



Build a three-dimensional bridge from two identical frames and a filled deck. Choose your own PLA colours, join the supported parts and invent a crossing for a lightweight paper character over a drawn river.

Your outcome

Join three parts into a useful three-dimensional object for play.

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

What you need

Additional items are needed. Prepare the complete list below before starting.

Tools

☐ 3D pen and PLA Your own colours; settings in accordance with the instructions for your pen.	**1 pen; enough PLA for three parts and four joints**

Workspace

☐ Transparent surface suitable for PLA	**1, 330 × 220 mm area**

Paper

☐ Printed 1:1 templates	**3 pages, one template per page**

Preparation

☐ Ruler, pencil and ordinary paper scissors	**1 set**

Paper

☐ Plain lightweight paper	**1 sheet for the river and a 30 × 20 mm scrap for the figure**

Filament — amounts include extra

☐ PLA 1.75 mm — colour shown in the illustration	**2.8 m · ≈ 8.4 g**
☐ PLA 1.75 mm — colour shown in the illustration	**10.4 m · ≈ 31.3 g**
☐ PLA 1.75 mm — colour shown in the illustration	**0.1 m · ≈ 0.3 g**

Total filament: 13.3 m · approximately 40.0 g

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

Before you start

Your own colours

Choose the PLA colours yourself; keep the outlines and joint locations unchanged.

Assembly assistance

A helper holds the cool feet. Follow the pen instructions; keep hands out of the path of the hot nozzle. Move parts only after they have cooled.

1. Print the three templates at 100% scale, without fitting them to the page. Measure the 20 mm control line. Use scissors to trim the paper template areas; do not cut out the PLA paths.
2. Prepare a 330 × 220 mm area: 150 × 220 mm on the left for the three templates and a clear 150 × 90 mm area on the right for assembly, with a 20 mm gap.
3. Place the areas under the transparent surface without overlapping them. Measure from the bottom-left corner of the left area: deck 130 × 70 mm at (10,10) mm; frame B 130 × 58 mm at (10,85) mm; frame A 130 × 58 mm at (10,145) mm. Point the feet of both frames downwards. Do not move the templates while drawing.
4. Choose your own PLA colours. Set aside the paper for the river and figure until the bridge has cooled. You will need someone to help hold the cool feet during assembly.

An estimate from the brief for home or workshop use; it depends on the feed speed, cooling and assistance. It is neither a limit nor the result of a physical test.

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 • Session praca-domowa

Two identical frames

Second frame completed

Close the outline • What to repeat: Frame B outline

Fill and repeat for B

NOW Frame A · Frame B

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

PARTS FOR THIS STAGE

1 × Frame A · PLA for your pen | template 1

Outline, adjacent strands in the legs, beam and wide feet; a second identical layer on the first. Cool flat. Finished cross-section [mm]: 1.2 × 2.2. Support: The entire outline and first layer lie on a surface suitable for PLA; the second layer lies on the first.

Strand direction: Close the outline, fill the feet and legs lengthwise and the beam crosswise; repeat on top. Cooling: Allow it to cool completely before removing and standing up the frame. Tip access: Work from above on a flat template.

1 × Frame B · PLA for your pen | template 2

Outline, adjacent strands in the legs, beam and wide feet; a second identical layer on the first. Cool flat. Finished cross-section [mm]: 1.2 × 2.2. Support: The entire outline and first layer lie on a surface suitable for PLA; the second layer lies on the first.

Strand direction: Close the outline, fill the feet and legs lengthwise and the beam crosswise; repeat on top. Cooling: Allow it to cool completely before removing and standing up the frame. Tip access: Work from above on a flat template.

After laying out the templates, close outline A with its feet. Fill the feet, legs and beam with strands; add a second layer. Cool flat. Repeat the outline and fill for B.

✓ **Check**

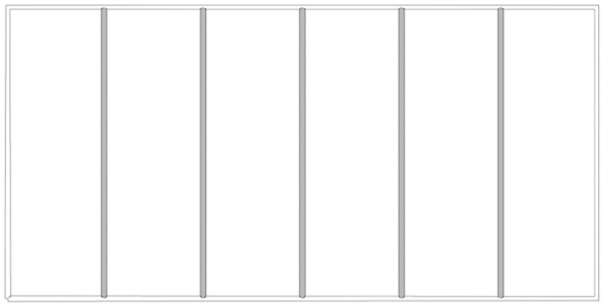
Both cool frames have identical feet and the same top-beam height.

If it does not work

Fill gaps on the template; do not bend a warped cool frame.

STAGE 02 / 08 • Session praca-domowa

Deck outline and ribs



Outline first

Then five ribs

NOW Deck

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

PARTS FOR THIS STAGE

1 × Deck · PLA for your pen | template 3

120 × 60 mm outline, five short ribs, adjacent fill strands from the left end, second full layer. Finished cross-section [mm]: 1.2 × 2.2. Support: First layer on a flat surface suitable for PLA; the strands reach the outline, ribs and neighbouring strands. The second layer lies on the first.

Strand direction: Outline, ribs running across, fill with successive strands from the left end; then a second layer. Cooling: Cool flat without lifting the warm corners. Tip access: From above, without bridging in mid-air.

On the third template, close the rectangular outline. Add five ribs across it, each running from one long edge to the other.

✓ **Check**

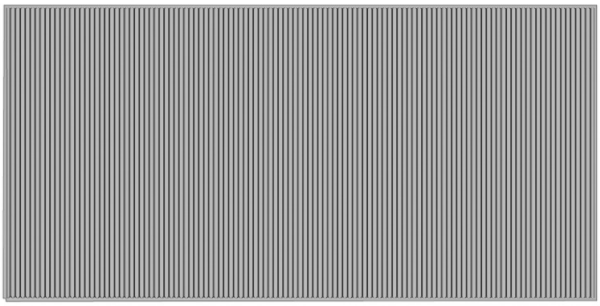
The outline is closed; all ribs touch both edges.

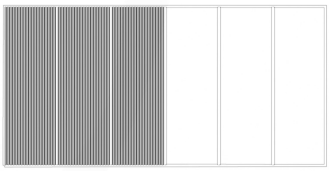
If it does not work

Join a loose end with a short bead on the flat surface.

STAGE 03 / 08 • Session praca-domowa

Fill the entire deck





First half

Entire surface and second layer

NOW Deck

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

Starting at the left end, lay adjacent strands up to halfway. Fill the rest, joining the strands to the outline and ribs. Add a second full layer. Cool flat.

Check

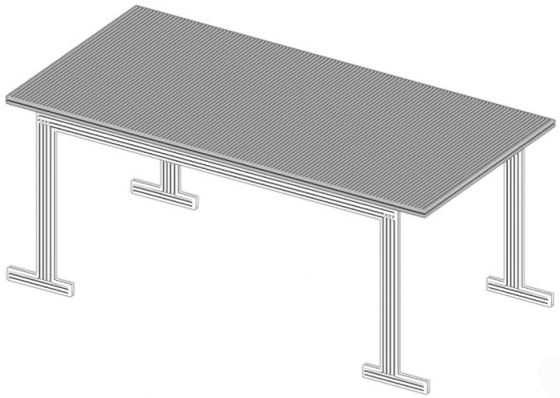
The deck has a fully filled surface and flat corners.

If it does not work

Fill any gaps; remake a warped cool deck flat.

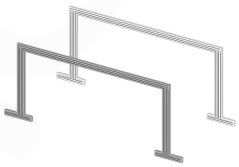
STAGE 04 / 08 • Session praca-domowa

Test-fit the three cool parts



Cool deck on the beams

First frame



Both frames

NOW Frame A · Frame B · Deck

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

Stand A and then B parallel in the clear area. A helper holds the cool feet. Lower the deck onto both beams; its sides should cover them, and its ends should project equally.

✓ **Check**

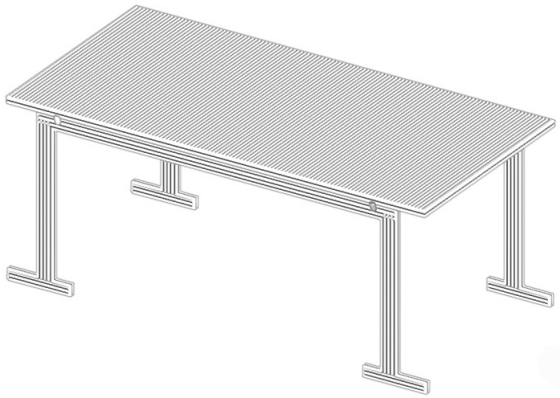
Both beams support the deck, including at the four joint locations.

If it does not work

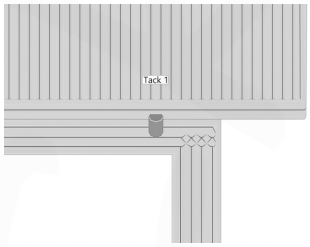
Remove the deck and adjust the spacing between the frames. Do not force it into place or bend the PLA.

STAGE 05 / 08 • Session praca-domowa

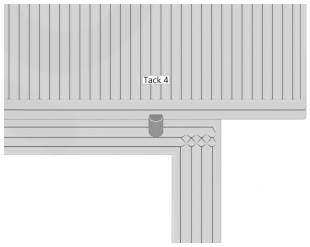
Four supported tacks



Four tacks after cooling



Tack: the same technique in four locations • What to repeat: Tack 2; Tack 3



Fourth tack

NOW Tack and reinforcement 1 · Tack and reinforcement 2 · Tack and reinforcement 3 · Tack and reinforcement 4

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

PARTS FOR THIS STAGE

1 × Tack and reinforcement 1; 1 × Tack and reinforcement 2; 1 × Tack and reinforcement 3; 1 × Tack and reinforcement 4 · PLA for your pen | template follow the written method

Tack the supported joint and allow it to cool; later, add two adjacent reinforcement beads. Finished cross-section [mm]: 1.4 × 3.8. Support: The deck rests on both beams; the helper holds the cool feet on the side opposite the nozzle. Strand direction: From the outer face of the beam to the edge of the deck, a short distance upwards.

Cooling: After each tack and reinforcement, hold it still until the PLA stiffens and cools. Tip access: From the outside of the frame, diagonally from above; keep the hand at the cool foot, out of the nozzle's path.

A helper holds the cool feet out of the nozzle's path. From the outside, tack the two ends of frame A and then the two ends of B. Join each joint with one short bead from the beam to the deck; hold it until it cools.

✓ **Check**

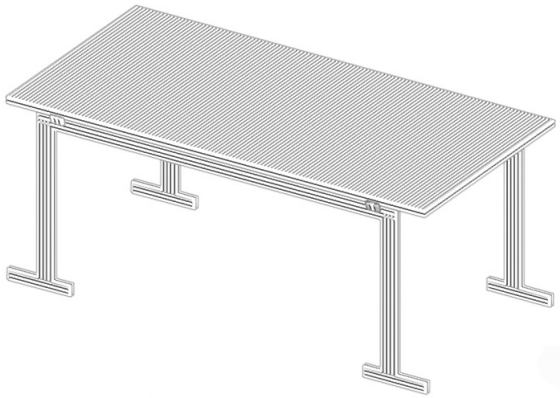
There are four cool tacks, and the deck still lies flat on both beams.

If it does not work

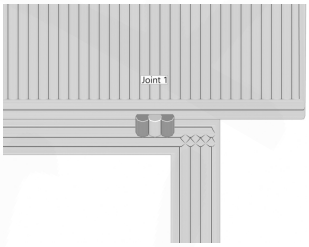
Cool a separating joint, correct its position and make the tack again before reinforcing it.

STAGE 06 / 08 • Session praca-domowa

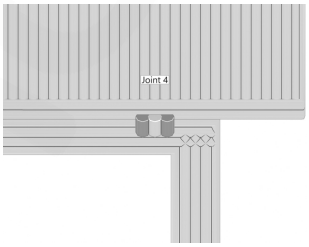
Reinforce the four joints



All joints reinforced



Two strands next to the tack • What to repeat: Reinforce joint 2; Reinforce joint 3



Final reinforcement

NOW Tack and reinforcement 1 · Tack and reinforcement 2 · Tack and reinforcement 3 · Tack and reinforcement 4

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

After all the tacks have cooled, add two short strands next to each one. Work from the outside: the ends of A, then B. A helper supports the cool feet; allow each joint to cool before moving to the next.

Check

Each bead joins the beam to the deck; the parts have not changed position.

If it does not work

If a joint moves, stop and let it cool. Correct the position and that joint before continuing.

STAGE 07 / 08 • Session praca-domowa

River and paper character

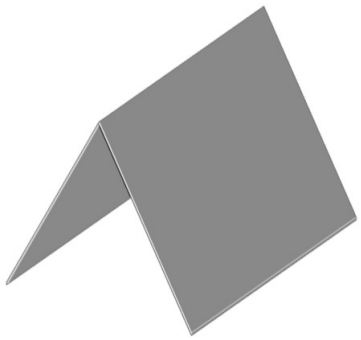
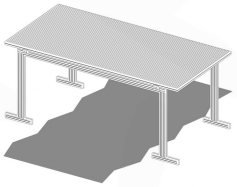


Figure as a tent shape



River between the feet

Scrap with the character

NOW Paper sheet with the drawn river · Paper river · Lightweight paper figure

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

Release the completely cool bridge. Draw a river up to 70 mm wide on paper and slide it between the feet. Draw a character on a 30 × 20 mm scrap; fold it in half to form a small tent shape.

Check

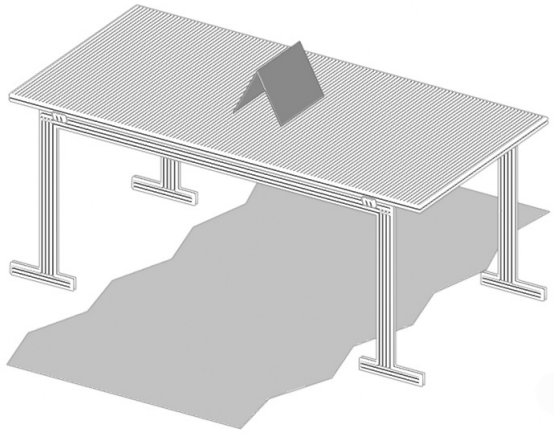
The bridge stands unsupported, and the lightweight paper figure has two even bottom edges.

If it does not work

Adjust the river's position or the paper fold. If the bridge wobbles, check the feet and joints.

STAGE 08 / 08 • Session praca-domowa

Your crossing



Completed scene

NOW Lightweight paper figure

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

Place one lightweight paper figure in the centre of the deck. Name the river and invent a journey for the character. Move the bridge only when it is cool.

Check

The bridge stands unsupported and spans the river, and the figure remains on the deck. This is for play, not a load-bearing test.

If it does not work

Remove the figure if anything wobbles. Check the position of the feet and repair a separating joint before continuing to play.

Finished — check the outcome

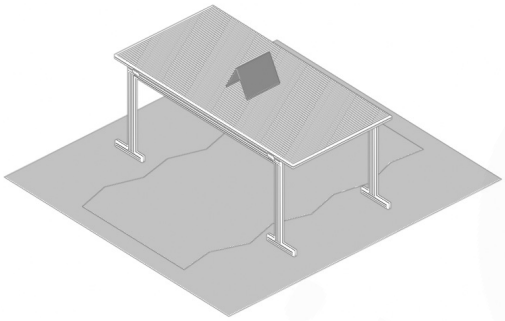
Check

Two frames and a deck form a three-dimensional bridge; the four joints are connected.

Check

The cool bridge stands unsupported over the paper river, and one lightweight paper figure can remain on the deck. This is for play, not a load-bearing test.

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