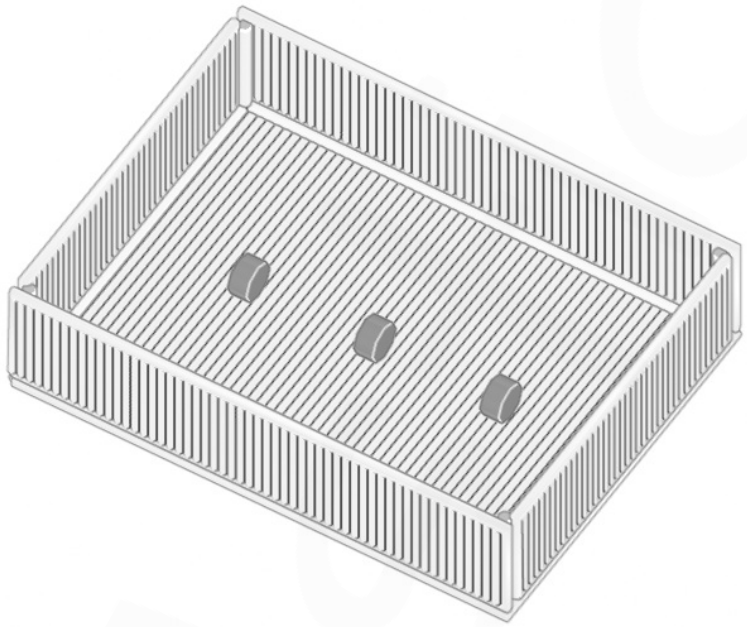
MAKE • DISCOVER • COLLECT

A Small Tray for Three Treasures

Beginners aged 10 and over, young people and adults • About 50–80 min, including 30–50 min of work with the pen.



Build an open tray in your own colours from five flat, filled PLA panels. Test its use with three of your own small dry items.

Your outcome

Make an open solid and test its everyday use.

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.

Basic set

☐	3D pen and PLA The participant chooses the colours.	**1 set**
☐	Transparent work surface for PLA Clear area of 180 × 150 mm.	**1**

Preparation

☐	1:1 paper templates 1 base, 2 long walls and 2 short walls; print at 100%.	**5 patterns**
☐	Printer, paper scissors and ruler Checking 20 mm and cutting out the paper rectangles.	**1 set**

Testing

☐	Small dry items Your own items that fit inside the tray.	**3**

Filament — amounts include extra

☐	PLA 1.75 mm — colour shown in the illustration	**6.8 m · ≈ 20.4 g**
☐	PLA 1.75 mm — colour shown in the illustration	**4.2 m · ≈ 12.6 g**
☐	PLA 1.75 mm — colour shown in the illustration	**3.0 m · ≈ 9.0 g**
☐	PLA 1.75 mm — colour shown in the illustration	**0.5 m · ≈ 1.5 g**

Total filament: 14.5 m · approximately 43.5 g

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

Before you start

1. Print all patterns at 100% scale, without fitting them to the page. Use a ruler to check that the control line measures exactly 20 mm. If you get a different result, correct the settings and print again.
2. Use ordinary scissors to cut out five paper rectangles, leaving 5 mm around the outline: a 90 × 70 mm base, two 90 × 28 mm long walls and two 65,2 × 28 mm short walls. Keep the drawing lines intact.
3. Prepare a clear rectangle measuring 180 × 150 mm. The positions below indicate the top-left corner of the paper, measured from the top-left corner of this area. Place the base at (45, 40) mm; the long patterns at (45, 11) and (45, 111) mm; rotate the short ones by 90° and place them at (11, 42,4) and (141, 42,4) mm.

   All five patterns fit side by side without overlapping.
4. Cover all five patterns together with the transparent work surface for PLA. Do not move the paper while tracing. If there is no clear area of 180 × 150 mm, prepare a larger workspace before you start.
5. Choose your own PLA colours, including colours for the fill strands. Set the pen according to its instructions for PLA. Prepare three small dry items that will fit side by side inside the tray.

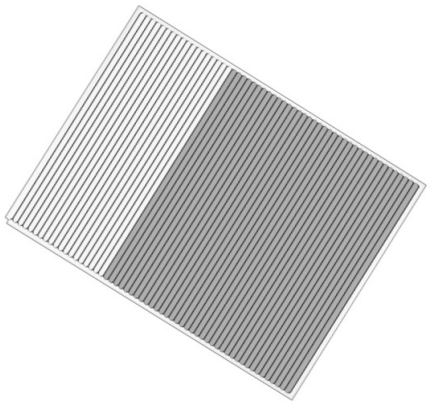
Estimate for a home or workshop activity, with no time limit. The pace depends on filling and cooling speed. Cooling is included in the drawing and assembly stages; after each tack, wait until the shape has set.

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 1

1. Make a solid base



Solid base

Outline

Partly filled

NOW Base

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

PARTS FOR THIS STAGE

1 × Base · PLA in your chosen colours | template bottom

flat_supported_trace. Finished cross-section [mm]: 2. Support: Flat on the surface used for working with PLA, over your own pattern. Strand direction: Close the outline, then fill it with short adjacent strands from left to right. Cooling: Leave it flat until it has cooled completely and retains its shape.

After preparing the five patterns (print at 100%, check 20 mm), trace the base. Fill it with short strands that touch adjacent strands and the outline. Complete the entire interior and cool it flat. Choose the colour or stripes yourself.

Check

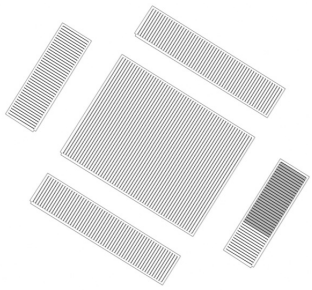
The base measures 80 × 60 mm and is flat, solid and free of gaps.

If it does not work

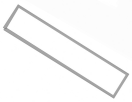
Fill any gaps. Remake a bent base; do not straighten cooled PLA.

STAGE 02 / 08 • Session 1

2. Prepare four walls



Stage outcome



Closed outline • What to repeat: Long B: outline; Short A: outline; Short B: outline

First strands • What to repeat: Long B: strands; Short A: strands; Short B: strands

NOW Long wall A · Long wall B · Short wall A · Short wall B

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

PARTS FOR THIS STAGE

1 × Long wall A · PLA in your chosen colours | template long_n

flat_supported_trace. Finished cross-section [mm]: 2. Support: Flat on the surface used for working with PLA, over your own pattern. Strand direction: Close the outline, then fill it with short adjacent strands from left to right. Cooling: Leave it flat until it has cooled completely and retains its shape.

1 × Long wall B · PLA in your chosen colours | template long_s

flat_supported_trace. Finished cross-section [mm]: 2. Support: Flat on the surface used for working with PLA, over your own pattern. Strand direction: Close the outline, then fill it with short adjacent strands from left to right. Cooling: Leave it flat until it has cooled completely and retains its shape.

1 × Short wall A · PLA in your chosen colours | template short_w

flat_supported_trace. Finished cross-section [mm]: 2. Support: Flat on the surface used for working with PLA, over your own pattern. Strand direction: Close the outline, then fill it with short adjacent strands from left to right. Cooling: Leave it flat until it has cooled completely and retains its shape.

1 × Short wall B · PLA in your chosen colours | template short_e

flat_supported_trace. Finished cross-section [mm]: 2. Support: Flat on the surface used for working with PLA, over your own pattern. Strand direction: Close the outline, then fill it with short adjacent strands from left to right. Cooling: Leave it flat until it has cooled completely and retains its shape.

Make two long walls measuring 80 × 18 mm and two short walls measuring 55,2 × 18 mm. Close the outline on each pattern and add touching strands until the interior is filled. Choose colours or stripes. Cool them flat.

✓ **Check**

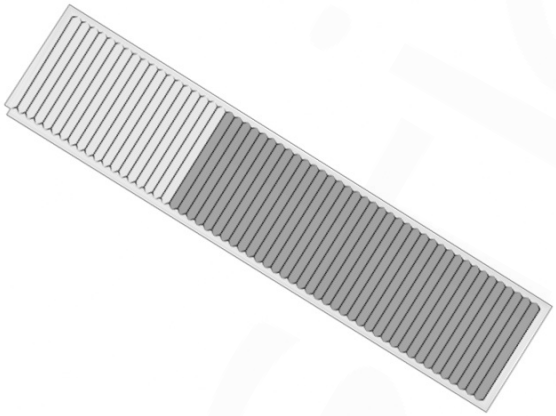
Four solid, flat panels form two matching pairs; thickness about 2 mm.

If it does not work

Fill any gaps. Remake any panel that does not match the pattern.

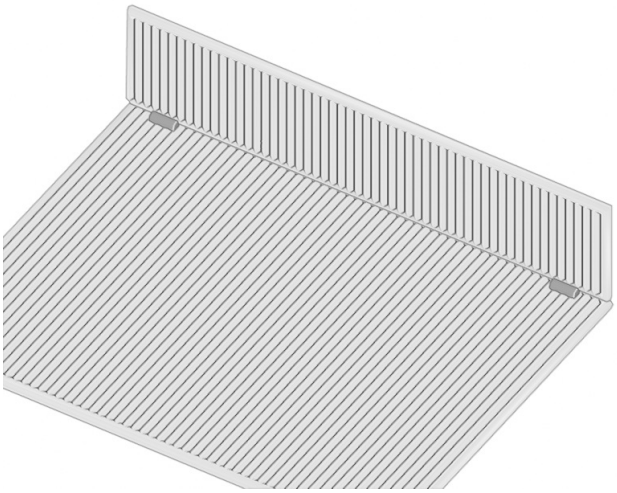
2. Prepare four walls — construction details

Solid wall • What to repeat: Long B: full; Short A: full; Short B: full

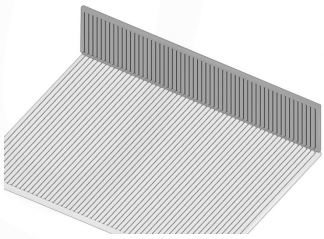


STAGE 03 / 08 • Session 1

3. Position the first long wall



Then tack



Fit first

NOW Long wall A · Base-to-long-wall N seam

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

PARTS FOR THIS STAGE

1 × Base-to-long-wall N seam · PLA in your chosen colours | template follow the written method

supported_process_deposit. Finished cross-section [mm]: 1.7. Support: The base lies flat. Two cooled panels support the fresh PLA; while making a tack, hold the cooled top edge with your fingers away from the nozzle. Strand direction: Make short tacks first; once they have cooled, fill the gaps along the joint.

Work up the corners from bottom to top. Cooling: Cool each tack before releasing your grip. After welding, let the entire piece cool on a flat surface. Tip access: Work from the open interior; the low wall lets you reach the base. Rotate the tray on the work surface to reach the next joint comfortably.

Stand the cooled long wall on the edge of the base: the bottom edge rests on the base and the outer surfaces are flush. While holding the cooled top, add two short tacks at the base from the inside. Cool the tacks before letting go. Keep the base flat throughout.

✓ **Check**

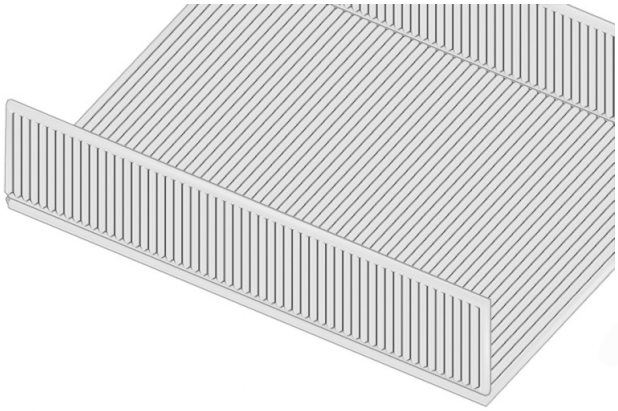
The wall is straight, its bottom edge rests on the base and its ends align with the ends of the base. The wall stands on its own after you let go.

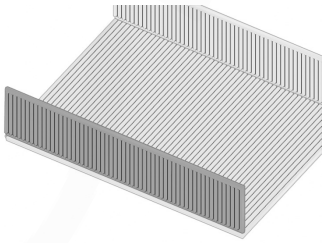
If it does not work

Before welding, remake any panel that does not fit. Reinforce a weak tack while supporting the wall, then let it cool.

STAGE 04 / 08 • Session 1

4. Add the second long wall





Fit first

Then tack

NOW Long wall B · Base-to-long-wall S seam

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

PARTS FOR THIS STAGE

1 × Base-to-long-wall S seam · PLA in your chosen colours | template follow the written method

supported_process_deposit. Finished cross-section [mm]: 1.7. Support: The base lies flat. Two cooled panels support the fresh PLA; while making a tack, hold the cooled top edge with your fingers away from the nozzle. Strand direction: Make short tacks first; once they have cooled, fill the gaps along the joint.

Work up the corners from bottom to top. Cooling: Cool each tack before releasing your grip. After welding, let the entire piece cool on a flat surface. Tip access: Work from the open interior; the low wall lets you reach the base. Rotate the tray on the work surface to reach the next joint comfortably.

Stand the cooled long wall on the edge of the base: the bottom edge rests on the base and the outer surfaces are flush. While holding the cooled top, add two short tacks at the base from the inside. Cool the tacks before letting go. Keep the base flat throughout.

✓ **Check**

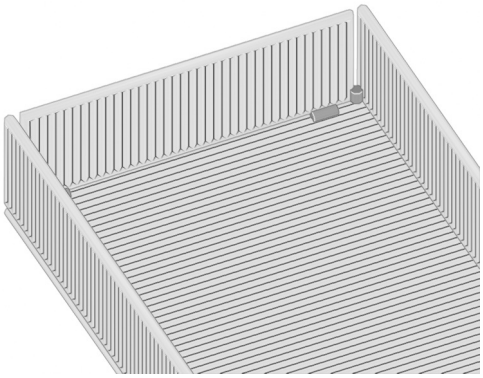
The wall is straight, its bottom edge rests on the base and its ends align with the ends of the base. The wall stands on its own after you let go.

If it does not work

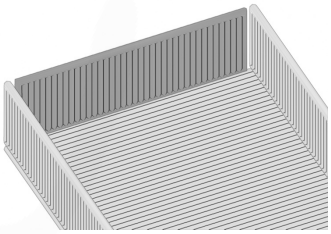
Before welding, remake any panel that does not fit. Reinforce a weak tack while supporting the wall, then let it cool.

STAGE 05 / 08 • Session 1

5. Fit the first short wall



Then tack



Fit first

NOW Short wall A · Base-to-short-wall W seam · WN corner seam · WS corner seam

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

PARTS FOR THIS STAGE

1 × Base-to-short-wall W seam · PLA in your chosen colours | template follow the written method

supported_process_deposit. Finished cross-section [mm]: 1.7. Support: The base lies flat. Two cooled panels support the fresh PLA; while making a tack, hold the cooled top edge with your fingers away from the nozzle. Strand direction: Make short tacks first; once they have cooled, fill the gaps along the joint.

Work up the corners from bottom to top. Cooling: Cool each tack before releasing your grip. After welding, let the entire piece cool on a flat surface. Tip access: Work from the open interior; the low wall lets you reach the base. Rotate the tray on the work surface to reach the next joint comfortably.

1 × WN corner seam; 1 × WS corner seam · PLA in your chosen colours | template follow the written method

supported_process_deposit. Finished cross-section [mm]: 2. Support: The base lies flat. Two cooled panels support the fresh PLA; while making a tack, hold the cooled top edge with your fingers away from the nozzle. Strand direction: Make short tacks first; once they have cooled, fill the gaps along the joint.

Work up the corners from bottom to top. Cooling: Cool each tack before releasing your grip. After welding, let the entire piece cool on a flat surface. Tip access: Work from the open interior; the low wall lets you reach the base. Rotate the tray on the work surface to reach the next joint comfortably.

Stand the cooled short wall on the free edge of the base, between the two long walls. Centre it: there is a gap of about 0,4 mm at each end. While holding the cooled top, add two short tacks at the base from the inside. Also join the lower sections of both corners. Cool the tacks before letting go. Keep the base flat throughout.

✓ **Check**

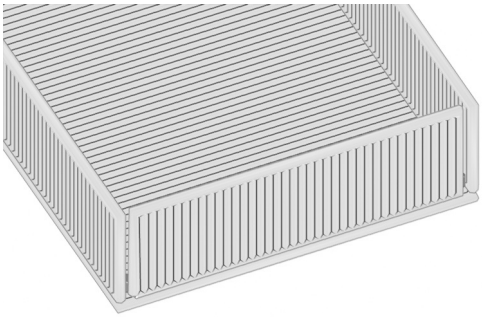
The short wall fits without forcing, stands on the base and does not overlap the long walls. The wall stands on its own after you let go.

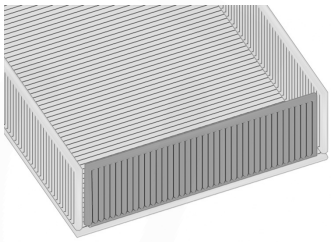
If it does not work

Before welding, remake any panel that does not fit. Reinforce a weak tack while supporting the wall, then let it cool.

STAGE 06 / 08 • Session 1

6. Close the perimeter with the fourth wall





Fit first

Then tack

NOW Short wall B · Base-to-short-wall E seam · EN corner seam · ES corner seam

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

PARTS FOR THIS STAGE

1 × Base-to-short-wall E seam · PLA in your chosen colours | template follow the written method

supported_process_deposit. Finished cross-section [mm]: 1.7. Support: The base lies flat. Two cooled panels support the fresh PLA; while making a tack, hold the cooled top edge with your fingers away from the nozzle. Strand direction: Make short tacks first; once they have cooled, fill the gaps along the joint.

Work up the corners from bottom to top. Cooling: Cool each tack before releasing your grip. After welding, let the entire piece cool on a flat surface. Tip access: Work from the open interior; the low wall lets you reach the base. Rotate the tray on the work surface to reach the next joint comfortably.

1 × EN corner seam; 1 × ES corner seam · PLA in your chosen colours | template follow the written method

supported_process_deposit. Finished cross-section [mm]: 2. Support: The base lies flat. Two cooled panels support the fresh PLA; while making a tack, hold the cooled top edge with your fingers away from the nozzle. Strand direction: Make short tacks first; once they have cooled, fill the gaps along the joint.

Work up the corners from bottom to top. Cooling: Cool each tack before releasing your grip. After welding, let the entire piece cool on a flat surface. Tip access: Work from the open interior; the low wall lets you reach the base. Rotate the tray on the work surface to reach the next joint comfortably.

Stand the cooled short wall on the free edge of the base, between the two long walls. Centre it: there is a gap of about 0,4 mm at each end. While holding the cooled top, add two short tacks at the base from the inside. Also join the lower sections of both corners. Cool the tacks before letting go. Keep the base flat throughout.

✓ **Check**

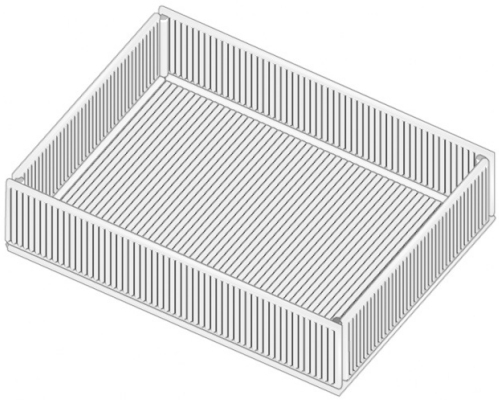
The short wall fits without forcing, stands on the base and does not overlap the long walls. The wall stands on its own after you let go.

If it does not work

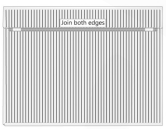
Before welding, remake any panel that does not fit. Reinforce a weak tack while supporting the wall, then let it cool.

STAGE 07 / 08 • Session 1

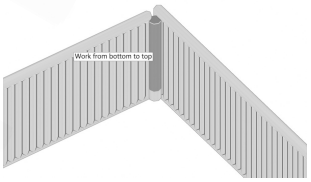
7. Join all the joints



Entire tray



Four base joints • What to repeat: Base-to-long-wall S seam: completion; Base-to-short-wall W seam: completion; Base-to-short-wall E seam: completion



Four corners • What to repeat: WS corner seam: completion; EN corner seam: completion; ES corner seam: completion

NOW Base-to-long-wall N seam · Base-to-long-wall S seam · Base-to-short-wall W seam · Base-to-short-wall E seam · WN corner seam · WS corner seam · EN corner seam · ES corner seam

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

Complete the four base seams from the inside: both long seams, then both short seams. Next, complete the four corners from the bottom tacks to the top. The fresh PLA must touch both edges. Rotate the tray on the work surface to reach each successive joint. Cool the entire piece flat.

✓ **Check**

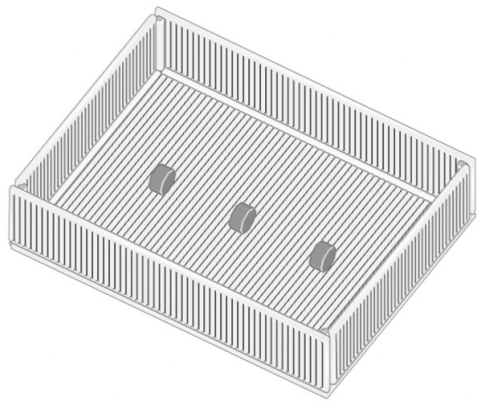
All four joints at the base and all four corners are joined; the panel does not move when a cooled edge is touched lightly.

If it does not work

Fill any visible gaps from the inside, joining both panels. Cool the tray and inspect it again.

STAGE 08 / 08 • Session 1

8. Test the space for three treasures



Test your own small items

NOW Small dry item 1 — example · Small dry item 2 — example · Small dry item 3 — example

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

Place three of your own small dry items in the cooled tray. Check that they cannot fall through any gaps and that the tray stands flat. Hold it with both hands at the base and carefully lift it with its contents, keeping it low above the work surface. Decide where you will use it. The illustration shows example items.

✓ **Check**

The three selected items remain inside, the tray stands flat and the joints hold during careful lifting.

If it does not work

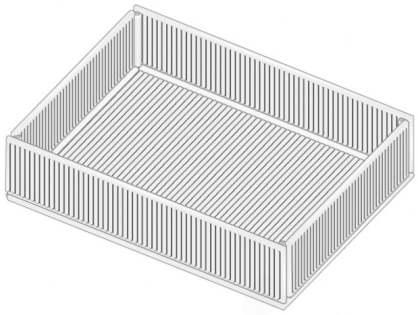
Remove the items. Fill any gaps and reinforce weak joints, let the tray cool and test it again. Do not bend cooled PLA that has warped; remake the defective panel.

Finished — check the outcome

Check
A base and four straight, low walls form an open tray measuring about 80 × 60 × 20 mm.

Check
The cooled panels fit before welding; the seams join them to the base and at the four corners.

Check
The three selected dry items remain in the tray, with no gaps through which they could fall; the tray stands flat and can be lifted carefully with its contents.

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