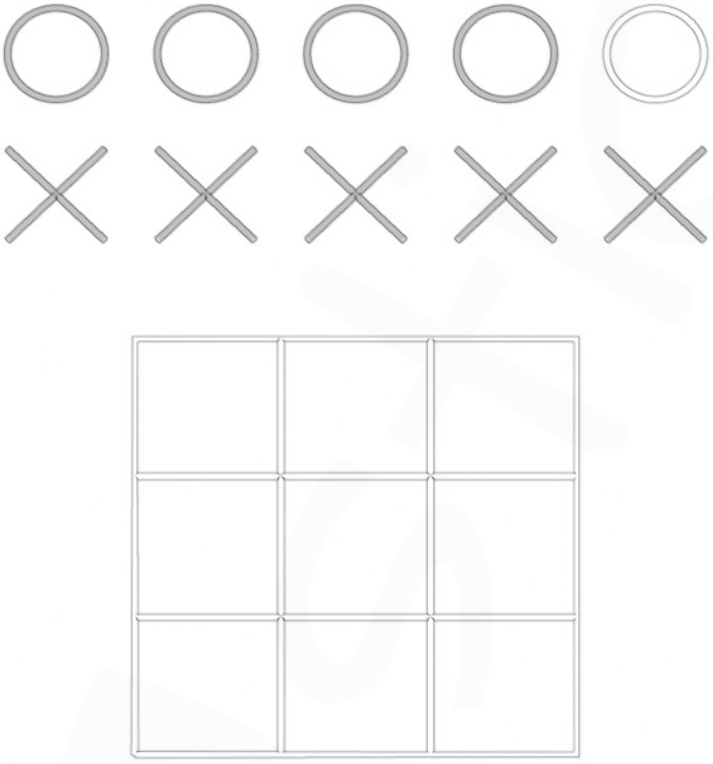
MAKE • DISCOVER • COLLECT

Pocket Tic-Tac-Toe

Beginners of various ages; assistance tailored to the user's skills and the device instructions. • 35–55 min of pen work; 50–80 min total



Complete pocket-sized game: a flat 120 × 120 mm board, five separate X pieces and five separate O pieces. X goes first.

Your outcome

Create a complete small game for two players.

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

☐	3D pen for PLA With its own power supply and a safe place to set it down in accordance with the instructions.	**1**
☐	Pen work mat A flexible, flat, heat-resistant, transparent mat compatible with the device; it accommodates the 12 × 12 cm pattern and can be bent when removing cooled PLA.	**1**

Templates

☐	Printout of the templates from the package Plan: 1 A4 page for the selected language, at 100% / 1:1 scale. This is an aid included in the package, not additional construction material.	**1**

Equipment

☐	Ruler with millimeter markings To check the 20 mm calibration segment and the dimensions of the board and pieces.	**1**

Filament — amounts include extra

☐	PLA 1.75 mm — blue	**1.9 m · ≈ 5.7 g**
☐	PLA 1.75 mm — orange	**0.8 m · ≈ 2.4 g**
☐	PLA 1.75 mm — green	**0.8 m · ≈ 2.4 g**

Total filament: 3.5 m · approximately 10.5 g

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

Before you start

Hot nozzle

Set the PLA according to the pen and filament instructions. Do not touch the nozzle or the fresh strand; tailor assistance to the user.

Visible template

Print without fitting to the page; the scale must preserve the 20 mm segment. In the described method, do not replace the transparent mat with an opaque one.

1. Prepare a flat workstation, a safe place to set down the pen and space for cooling parts.
2. Print one page of templates in the selected language at 1:1 scale; check the scale of the 20 mm segment when preparing the print.
3. Place the template under a suitable transparent mat; the board, X and O must be visible and must not move during the work.
4. Prepare compatible PLA and set the device according to its instructions; read the new / complete / remaining repetitions labels.

Design estimate, without physical timing. Board: 15-23 min; five X pieces: 10-16 min; five O pieces: 8-12 min; corrections: 2-4 min. Other activities: 15-25 min. Breaks may be taken after any part has cooled.

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 / 06 • Session 1

Prepare the worksheet and make the frame

First closed frame traced from the worksheet

NOW 120 × 120 mm board

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

PARTS FOR THIS STAGE

1 × 120 × 120 mm board · PLA | template W01

One layer of 2 mm-diameter strands. Close the frame first, then make two vertical and two horizontal dividers. The fresh strands will bond every joint on the mat; no base.

Print the templates at 100% scale and check the 20 mm segment. Place the template under a transparent, heat-resistant mat. Set the pen for PLA according to its instructions. Leave room for cooling and setting parts aside. Then make the frame along the outline on the worksheet. Run a 2 mm strand along the outline on the mat.

Join the end to the beginning with fresh PLA. The outside dimensions are 120 × 120 mm.

✓ **Check**

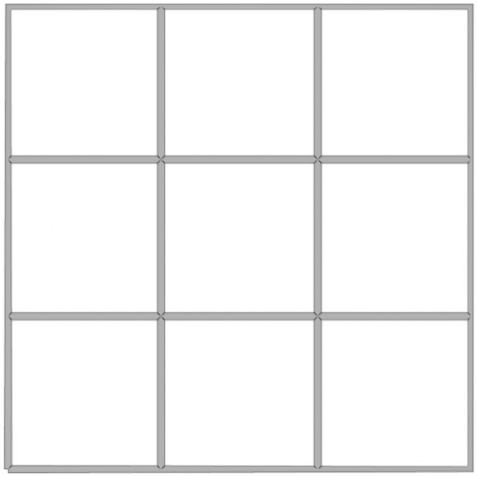
The template is clearly visible; the mat lies flat. The four sides form a closed frame.

If it does not work

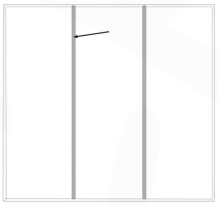
If the template is not visible, use the specified transparent mat; do not draw from memory. Repair a gap on the mat with a short PLA bridge; let it cool.

STAGE 02 / 06 • Session 1

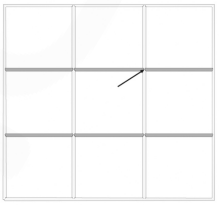
Add the board dividers



The board is separate and lies flat.



The first two dividers



Two crosswise dividers

NOW 120 × 120 mm board

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

Add two vertical dividers, then two horizontal dividers. Fuse the ends and intersections into the existing strands. One layer with a 2 mm strand diameter; do not add a bottom. Put the pen down safely. Leave the entire board flat on the mat until completely cool.

✓ **Check**

A closed frame, 9 cells and bonded nodes.

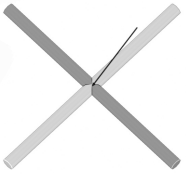
If it does not work

Lay a disconnected joint flat and bond it with a short PLA strand. Let it cool again.

STAGE 03 / 06 • Session 1

Make five separate X pieces

First line • What to repeat: First diagonal of X2; First diagonal of X3; First diagonal of X4; First diagonal of X5



New diagonal and center • What to repeat: Bond the center of X2; Bond the center of X3; Bond the center of X4; Bond the center of X5

There are 5 separate X pieces.

NOW X piece X1 · X piece X2 · X piece X3 · X piece X4 · X piece X5

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

PARTS FOR THIS STAGE

1 × X piece X1; 1 × X piece X2; 1 × X piece X3; 1 × X piece X4; 1 × X piece X5 · PLA | template W02

One layer, 2 mm strand. Bond the two diagonals together at the center with fresh PLA; no separate overlay.

Make X1: the first diagonal, then the second fused at the center. Repeat exactly 4 times for X2-X5, making 5 X pieces in total. Move the template under a free area of the mat. One layer, 2 mm strand. Do not connect the pieces to one another. Leave each piece flat on the mat until completely cool. Put the pen on its stand.

✓ **Check**

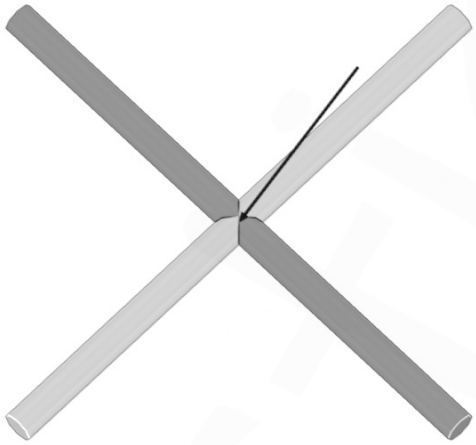
Each piece has a 28 mm outline and its own bonded center or closure.

If it does not work

Repair a disconnected joint on the mat. Remake an oversized piece using the template; set the defective one aside outside the complete set.

Make five separate X pieces — construction details

Bond the center of X5



STAGE 04 / 06 • Session 1

Make five separate O pieces

There are 5 separate O pieces.

Outline before closure • What to repeat: Open outline of O2; Open outline of O3; Open outline of O4; Open perimeter of O5

Closing the outline • What to repeat: Close the outline of O2; Close the outline of O3; Close the outline of O4; Close the perimeter of O5

NOW O piece O1 · O piece O2 · O piece O3 · O piece O4 · O piece O5

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

PARTS FOR THIS STAGE

1 × O piece O1; 1 × O piece O2; 1 × O piece O3; 1 × O piece O4 · PLA | template W03

One layer, 2 mm strand. Close the 26 mm centerline-diameter outline with fresh PLA at the starting point.

1 × O piece O5 · PLA | template W03

One layer, 2 mm strand. Close the 26 mm centerline-diameter perimeter at the starting point with fresh PLA.

Make O1: an open perimeter, then close it at the starting point. Repeat exactly 4 times for O2-O5, making 5 O pieces in total. Move the template under a free area of the mat. One layer, 2 mm strand. Do not connect the pieces to one another. Leave the pieces flat on the mat briefly until they cool. Put the pen on its stand.

✓ **Check**

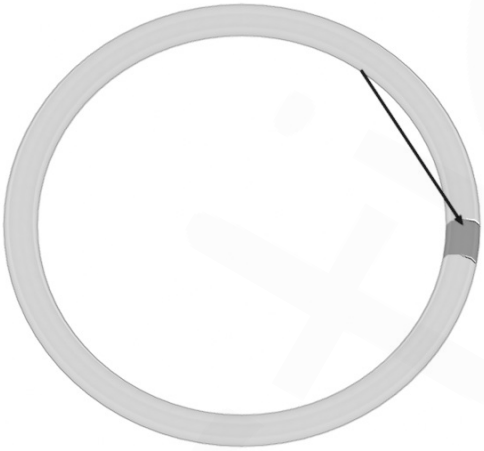
Each piece has a 28 mm outline and its own bonded center or closure.

If it does not work

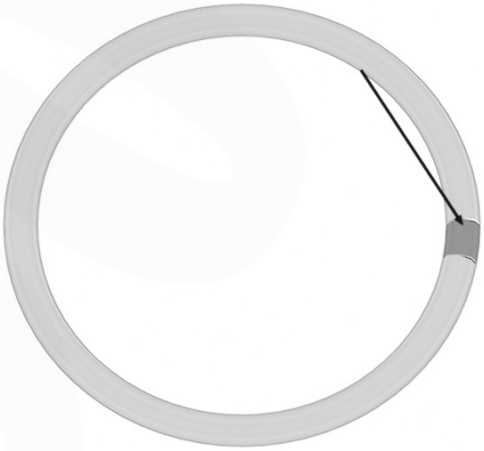
Repair a disconnected joint on the mat. Remake an oversized piece using the template; set the defective one aside outside the complete set.

Make five separate O pieces — construction details

Close the outline of O4

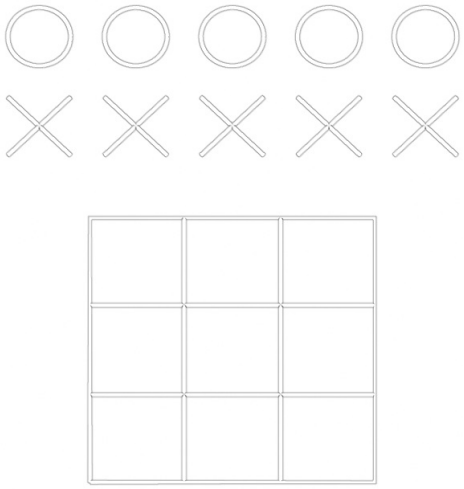


Close the perimeter of O5



STAGE 05 / 06 • Session 1

Count and check the fit



Complete set: 1 + 5 + 5

NOW Check the complete model

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

Put the mat aside. Count: 1 board + 5 X + 5 O = 11 parts. Once cool, insert each piece in turn into every cell: 10 × 9 = 90 test fits. Lift each piece over the dividers; never push it sideways. Return to the arrangement beside the board.

✓ **Check**

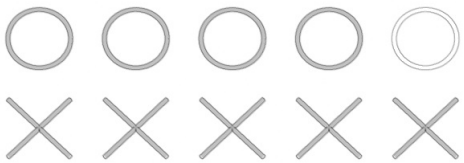
Each piece rests loosely without being forced in or catching; the edges are not joined to the board.

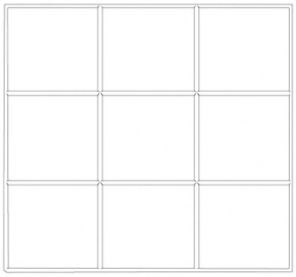
If it does not work

Repair a defective piece away from the board or replace it using the template. Keep exactly 5 X pieces and 5 O pieces.

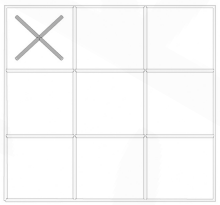
STAGE 06 / 06 • Session 1

Play and collect the complete set

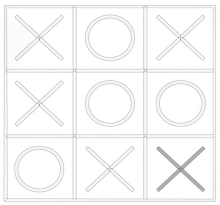




After the game: 5 X pieces and 5 O pieces again



X starts; repeat the placement technique • What to repeat: Move 2: O1; Move 3: X2; Move 4: O2; Move 5: X3; Move 6: O3; Move 7: X4; Move 8: O4



Draw: 5 X pieces and 4 O pieces on the board; O5 beside it

NOW X piece X1 · O piece O1 · X piece X2 · O piece O2 · X piece X3 · O piece O3 · X piece X4 · O piece O4 · X piece X5

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

X goes first. Take turns placing one mark in an empty cell. Three of your marks in a row, column, or diagonal wins. A full board with no line is a draw. A draw after 9 moves is shown: 5 X pieces and 4 O pieces on the board, with O5 beside it. After the game, gather the complete set: 5 X pieces and 5 O pieces.

✓ **Check**

All 9 cells can be filled without making additional pieces, after which the complete set can be recovered.

If it does not work

Do not weld the symbols to the board; lift them above the dividers.

Finished — check the outcome

Check
The set contains exactly 11 physical parts: 1 board, 5 X pieces, and 5 O pieces.

Check
The board measures 12 × 12 cm and has nine cells; the frame, dividers and their joints form an integral whole after cooling.

Check
Each X has a bonded center and each O has a closed outline; the pieces remain separate integral components.

Check
Every symbol fits freely in every cell without being forced in, bent or caught on the dividers.

Check
Two players play a game from X's first move to a win or a draw without making any additional pieces.

Check
After the game, the complete set is still available for the next game.

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.