



Staunton Travel Chess Set



WhatWouldAnEngineerDo

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Summary

An elegant miniature chess set in the style of the classic Staunton set, with pegged pieces and a close-fitting top.

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Tags: [chessset](#)

NOTE: I may be biased, but I think this set would make an excellent project for students of 3D printing.

- The design relies on the accurate printing of close-fitting pieces, which can require particular attention to the physical behaviour of the printer and a certain degree of finesse with slicer settings.
- The board pieces also make for a good beginner's project in a CAD modeling program like Fusion 360 (see the examples uploaded here), as would these or alternative chess pieces.
- The overall design concept of pieces with holes in their base and a board with pegs has notable pros and cons. How could the objective of safely transporting games in progress have been achieved better?
- How could this entire set have been implemented with parameterized models, such that the set could have been scaled up or down without losing critical fit dimensions?

This elegant set was remixed - by scaling down and converting to work with a pegged board - from [this 4d Stauton full-size chess set](#) on Thingiverse.

The board was inspired by [this chessboard](#) on Thingiverse, which I have redrawn in Fusion360 to improve on the fit tolerances at this scale. I have also added short pegs to hold the chess pieces in-place, when the game is traveling.

[NOTE: After early feedback on the original post, I have modified the board pieces to be thicker, with chamfered tabs, tapered posts, and 0.1mm spacing between squares. I also narrowed the border pieces by 0.19mm, so that they fit into the bottom without tension. The result is the “v6” board parts now uploaded [here](#).]

I designed the box to hold the board, the lid to fit over the board and the feet to fit onto the top of the lid, each with a close fit.

It takes several hours to print each of the box parts. You may want to print the corresponding test piece first, to be sure that your setup is capable of printing each box piece so that they all fit together comfortably.

- The box bottom test piece should hold a complete board border with minimal clearance. Assemble one end of the board, with at least 2 rows of squares, to test the fit.
- The box top test piece should be a good friction-fit over the box bottom.
- The box feet test piece should be a good friction-fit over the top of the box lid.

The design concept is to use the box lid as a small table to hold the box bottom, when playing. The “feet” stop the box from sliding off the top.

Recommended order of print and assembly:

1. Print any one chess piece and the chess board piece with the 3.1mm diameter peg.
2. Test fit the chess piece to the peg on the board piece.
 - If the piece fits on the peg, note how the fit varies from first time to the third or fourth time you install and then remove it. Verify that it becomes a light friction-fit.
 - OR
 - If the piece is too tight on the 3.1mm peg, try the piece with the 3.0mm peg.
 - If the piece is too loose on the 3.1mm peg, try the piece with the 3.2mm peg.

- If the piece fits none of the pegs, the .f3d file is posted here, to allow further customization.
 - OR
 - If you are using Cura to slice your prints, you may find it helpful to experiment with the Horizontal Hole Expansion factor and/or the Small Hole Max Size, to adjust the printed size of the hole in the chess pieces, until they friction-fit the pegs to your taste. (I use +0.1 to print mine) Use only 2 walls to print the piece.
 - If you are using a different slicer, look for the equivalent settings that improve small hole size accuracy.
3. Print a border piece and a second board piece. Verify they fit together well.
 4. Print a total of 32 of the chessboard pieces that fit your chess pieces, and 4 border pieces, in each of the two colours. (I have bundled the correct mix of tab and slot border pieces into the Half-board files)
 5. Print 8 pawns, two each of the Rook, Bishop and Knight pieces, and one King, one Queen, in each of the two colours.
 6. Optionally, print the box bottom test piece. Verify that two border pieces fit inside the test piece, end to end.
 7. Print the box bottom in black.
 8. Dry-fit the board together inside the box bottom, to confirm it all fits together, before gluing. (The assembled board should lie flat inside the box. It should not pop up under tension when released.
 9. [Optionally*] Glue the border and board pieces into the box bottom, starting with two of the black border pieces with pegs flush to the front right corner. Remember that a White colour square should be the first square installed, in the front-right corner. Position the squares with their tabs pointing toward the white end and toward the left side. Install one row at a time. Install the border pieces on the left side last.
[NOTE: It is best to use a glue that gives you enough working time to slide the pieces after inserting all but the last border part(s), just in case...] *I did not need to glue my board, when I used these v6 pieces. They fit precisely into the box bottom, without bowing-up under tension.
 10. Optionally, print the box lid test piece. Verify that lid is a good friction-fit over the box bottom.
 11. Print the box lid in white. Verify how well the lid fits over the box bottom. Ideally, you should be able to lift the box by the lid, without the lid falling off, and yet still be able to ease the lid off the box without too much effort. It helps to have the lid level as you slip it on. A canted lid may not push on. (NOTE: Once the feet are glued on, getting the lid off will be easier.)
 12. Optionally, print the box feet test piece. Verify that feet are a good fit over the box lid.

13. Print the box feet in white. Verify how well the feet fit over the top of the box lid. Ideally, the box feet will slide a little bit, but not much.
14. Glue the box feet to the bottom of the box bottom, such that the bottom is centered on the feet and the box will nest over the top of the box lid.
15. Assemble the chess pieces onto the board.
16. You may find that some pieces are a tight fit. If the printer has not drawn the 3.6mm holes or the pegs with precision, you may want to ream the hole a little bit. Carefully and slowly, though. Ream the fit too loose and you will need to print a replacement piece...
17. [Optionally] Verify the effectiveness of your final assembly by turning the board & pieces upside-down. (Nothing should fall out!)
18. Put the lid on the box, until you are ready to play.

PRINTING TIPS:

1. When slicing the squares:
 - Orient the squares so that the seam appears on the point between the two tabs, so that the first layer is less likely to fail while drawing the small features.
 - Use only 2 walls so that the point between the two sockets is included in the initial outline of the piece and not started as an isolated island. Otherwise, the print is more likely to fail and the parts are less likely to be dimensionally precise enough to connect properly.
2. When slicing the border pieces:
 - Orient the pieces so that the seam appears on a sharp corner like the point, not on the tabs or in the sockets.
 - Ensure that the tabs lie flat on the bed and the sockets are on the top of the sockets border pieces.
 - Ensure that you have the right combination of border pieces in each colour. If you have edited and printed your own customized border pieces from the .f3d files, you note the particular combination of pieces in the pre-packaged half-border files, [here](#). [The references to "Type1 and Type2 refer to whether the piece points left or right, when installed.]
3. The board pieces do not need dense infill. I used 50%, to keep the distance between infill lines small, for a cleaner top finish.
4. When slicing the chess pieces:
 - Use 100% infill, to minimize the risk of snapping one if pulling a piece up off an overly-tight peg.
 - Print with 2 walls
 - Print with a random seam placement, since most of the pieces are cylindrical and all are small. If the seam aligns top to bottom in one vertical line up the piece, it draws the eye and spoils the "look."

- Consider configuring your slicer to compensate for horizontal expansion and/or printing small features. The small hole in the base will be a bit too tight, or too loose, if the hole is not dimensionally correct.

CAUTIONS:

1. My apologies to early adopters - the original board pieces, which I had scaled down for this application, proved to be an excessively tight fit, at this small scale. I have now replaced those parts with new ones that I modeled in Fusion 360 and validated on my CR6-SE in PLA. I have provided both .3mf and .f3d versions of those models, to allow you to either find a .3mf set that works for you or to customize the models and print your own.
2. You will probably need to glue* the assembled board into the box bottom, with a weight on the board overnight. (*Use a gel form of the glue, to add thickness, but only a small amount, to avoid glue coming up between the squares. **Make sure you have enough working time to slide the pieces around when you come to glue the final border pieces in!**)
3. Initially, the chess pieces are likely to be a tight fit, on the board pegs. This can happen if there are spurious zits or blobs of filament deposited as the head draws the hole walls, or if the printer/filament combination is not well-tuned. I recommend that you install/remove/install/remove/etc.. a chess piece onto the peg of each board piece in turn, to see whether fitting and removing the pieces becomes “easy” enough after a few cycles. The idea of the peg/hole fit is that you be able to tip the board without the pieces falling out, so that a game can be transported “in progress”. It should not be so tight that you have to use two hands to pull them apart.
4. I have posted three versions of the chessboard piece, each with a slightly different diameter of peg. I expect that the 3.1mm diameter peg will be the best fit to the 3.6mm sized hole of the pieces, but your printer/slicer performance may vary.

Model files



Chess Pieces

6 files



travelchesspawn_36mmholeinbase.3mf



travelchessking_36mmholeinbase.3mf



travelchessqueen_36mmholeinbase.3mf



travelchessbishop_36mmhole.3mf



travelchessknight_36mmhole.3mf



travelchessrook_36mmhole.3mf



Box Pieces

6 files



boxbottom_testpiece.3mf



boxbottom.3mf



boxtop_testpiece.3mf



boxtop.3mf



boxfeet_testpiece.3mf



boxfeet.3mf



Board Pieces

5 files



v6travelchesssquare_31mm_-2deg_tapered-post.3mf

☐ START WITH THIS SQUARE to test-fit your pieces.



v6travelchesssquare_32mm_-2deg_tapered-post-v1.3mf

☐ TRY THIS if 3.1mm is much too loose



v6travelchesssquare_3mm_-2deg_tapered-post.3mf

☐ TRY THIS IF 3.1 is much too tight



border_half_white_forv6squares.3mf



border_half_black_forv6squares.3mf



Fusion360 Files for Board Pieces

3 files



slots-border-piecetypes-12-for-v6-squares-with-02.f3d



travelchessboard_bordertypes12withtabs-v4.f3d



v6travelchesssquare_31mm_-2deg_tapered-post-v1.f3d

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