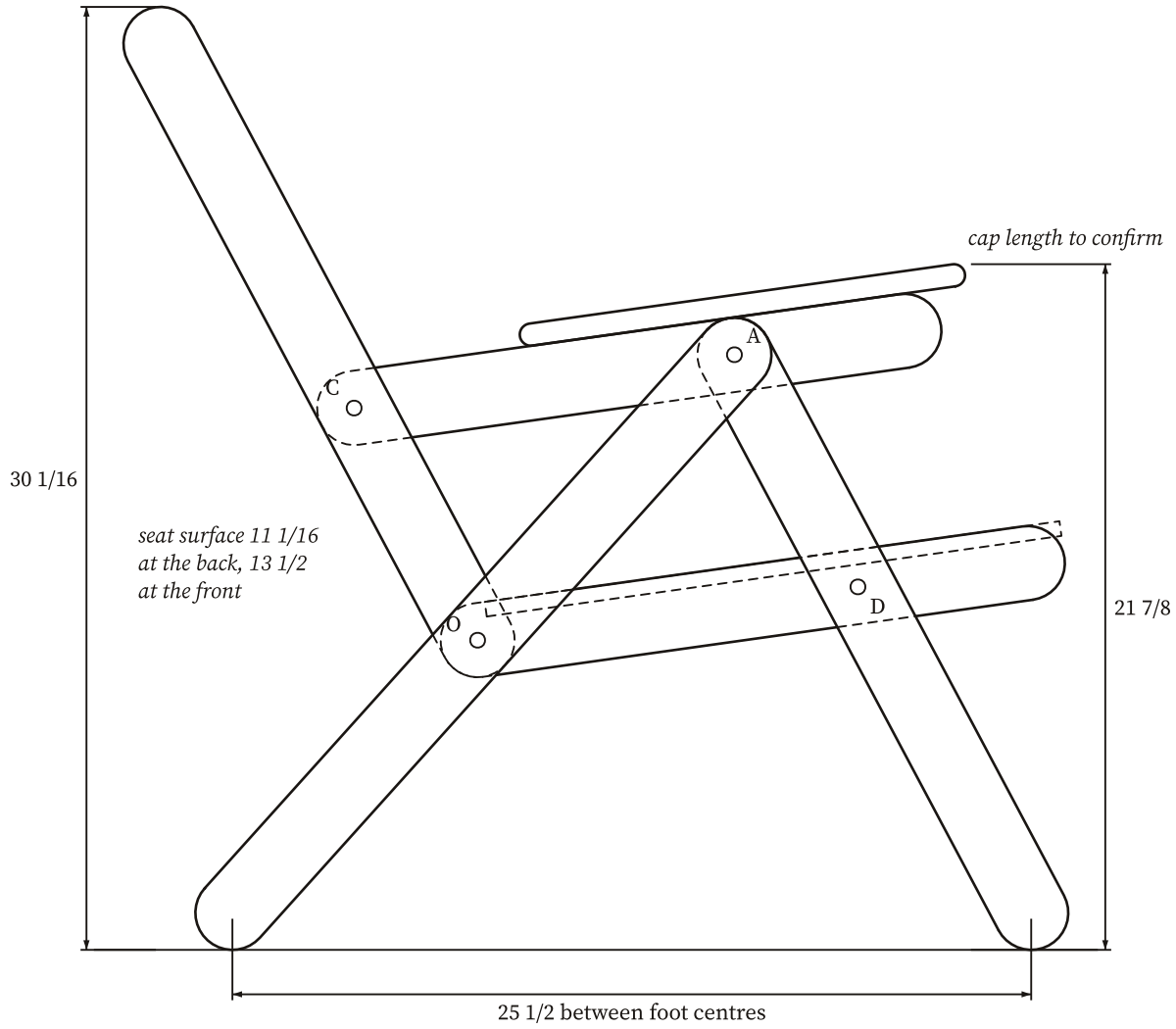
Keel Truss Lounge Chair

The same two triangles with the apex moved from the seat to the arm: ten sticks, pinned, no notches and no glue.



Side elevation at 1:6. The keel is the outside layer, the back and front leg the middle, the arm and seat inside; hidden edges are dashed, and the recessed seat panel lies behind the seat stick. O, A, C and D are the four pins.

Plan of 2 October 2026, in inches, printed for US Letter paper. Every drawing is placed at its stated scale; check one dimension with a rule before cutting from a printout.

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A record of the third build (4 September 2026) more than a settled pattern. The arm cap length is a placeholder, and whether the keel goes from 18 to 25 mm is an open upgrade.

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The chair

This is the second chair built to the Keel pattern, and the one that kept a promise the project made at the start and had stopped keeping: that the chair could come out of the scrap pile. The Keel Panel wants a 400 mm panel. The widest piece in this one is 143.

The topology is the Keel Panel's. Two congruent triangles share a keel, and the keel is the only member that belongs to both. What moved is the apex: in the Keel Panel it is where the seat meets the back, and here it is where the arm meets the back. That relocation turns four panels into ten sticks and every notch into a pin. Set the seat-to-back angle to 90 degrees plus half the apex and the keel's pin spacing equals the arm and seat spacing, which is why ten sticks need only four cut lengths and two drill settings.

Cut list

Part	*Name*	*Qty*	*Length*	*Pin to pin*	*Note*
K	keel	2	26 5/16	12 1/4	pins at A and O; foot at the far end
XB	back	2	23 7/8	8 3/8	pins at O and C
Y	seat and arm	4	20 1/16	12 1/4	seat: O and D; arm: C and A; alternate C at 13/16
XF	front leg	2	22 1/2	8 3/8	pins at A and D; foot at the far end
	arm cap	2	to confirm		2 3/8 wide, 23/32 thick, R1 3/16
	seat strip	3	17 11/16		5 5/8 wide, 15/32 ply
	back panel	1	19 1/8		11 13/16 wide, 15/32 ply
	back panel	1	19 1/8		5 5/8 wide, 15/32 ply

The sticks stay 18 mm plywood (23/32 for the eye) and the panels 12 mm. The pin spacings are the design's whole millimeters converted to the nearest sixteenth, so they differ from the millimeter plan by less than 0.4 mm.

Hardware. Eight barrel bolts (sex bolts): four long for the three-layer stacks, four short for the two-layer stacks. Small screws for the panels and cleats. Size the holes to the bolt and drill them square.

Drawings

The side view is on the first page.

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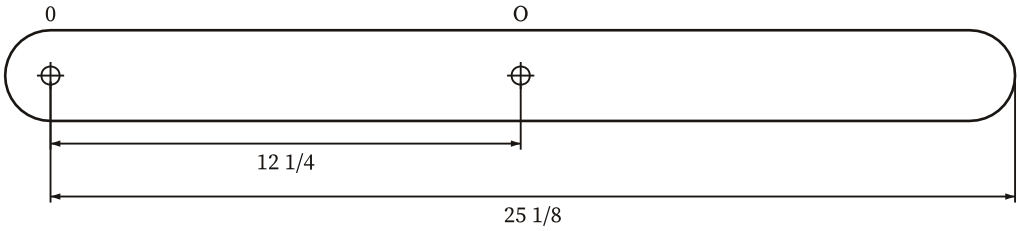
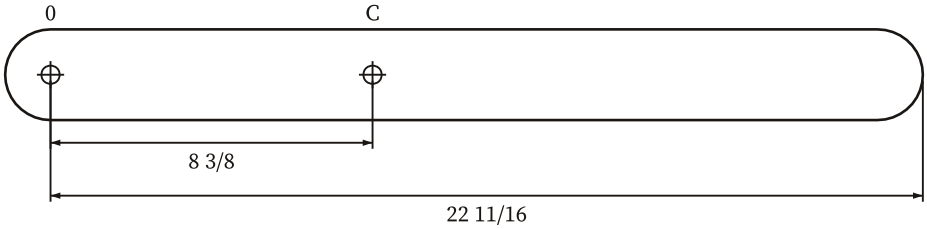
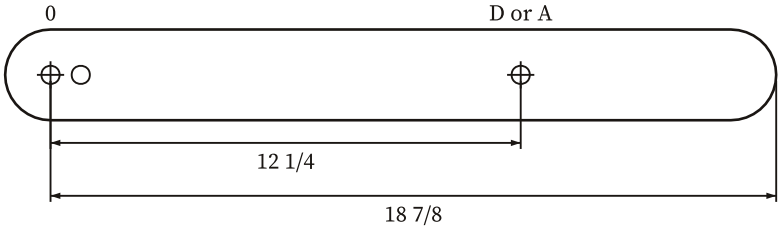
K keel ×2 26 5/16 long



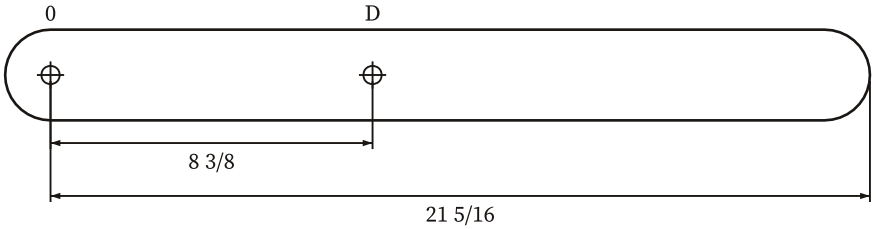
XB back ×2 23 7/8 long



Y seat and arm ×4 20 1/16 long



XF front leg ×2 22 1/2 long



Every stick 2 3/8 wide, ends full radius 1 3/16 centred on the end pin;
every dimension struck from the pin marked 0; 23/32 plywood throughout.
The small ring on Y is the alternate C, 13/16 along: seat to back 110° becomes 104.4°.

The ten sticks at 1:5, each dimensioned from the pin at one end. Four cut lengths, two drill settings.

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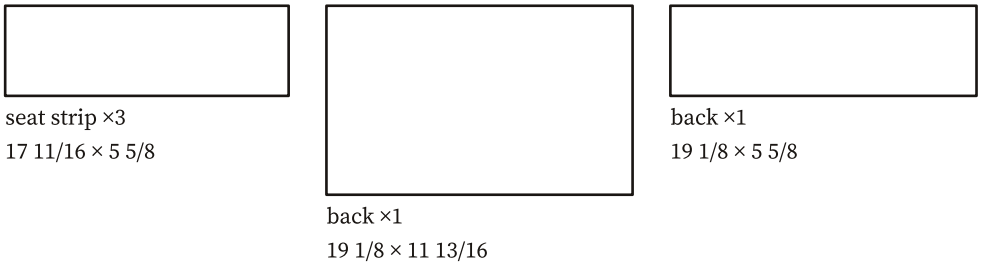
panels, 15/32 plywood, recessed between the sticks on cleats (1:12)



seat strip ×3
17 11/16 × 5 5/8

back ×1
19 1/8 × 11 13/16

back ×1
19 1/8 × 5 5/8

arm cap ×2, 23/32 thick (1:5)

2 3/8 wide, R1 3/16; overhangs the arm end 1 length to confirm

The panels at 1:12, recessed between the sticks on cleats, and the arm cap at 1:5, whose length is still to be confirmed.

Building it

1. Cut ten sticks from 23/32 plywood strips 2 3/8 wide: two keels, two backs, four seat-and-arm sticks and two front legs. This is what the scrap bin is for; the widest piece in the chair is a 5 5/8 panel strip.
2. Round every end to a full 1 3/16 radius centred on its pin. A printed router guide with a small hold-down hole at the radius centre does this in one pass per end and puts the pin centre where it belongs.
3. Drill the pins. Every stick is dimensioned from the pin at one end, marked 0 on the parts sheet. Two settings do the whole chair: 12 1/4 on the keels and all four seat-and-arm sticks, 8 3/8 on the backs and front legs. A third, 13/16, is the optional alternate C on the four Y sticks. Make a drill template; holes laid out by hand let the joints wobble.
4. Lay up each side in three layers: the keel outside, the back and front leg in the middle, the arm and seat inside. Pin O takes keel, back and seat; pin A takes keel, front leg and arm; pin C takes back and arm; pin D takes seat and front leg. The two triangles share the keel and nothing else.
5. Use barrel bolts, eight in all: four long through the three-layer stacks at O and A, four short through the two-layer stacks at C and D. The first build used plain M6 bolts in 6 mm holes.
6. Screw hardwood cleats to the inside faces of the seat and back sticks. Drop the panels between the sticks, flush with their top faces: three seat strips 5 5/8 × 17 11/16, and back panels 19 1/8 × 11 13/16 and 19 1/8 × 5 5/8. Screw down through each panel into its cleat, one screw size, one inset, evenly spaced.
7. Pin on the arms last. They do not fold with the rest of the frame, so they ship loose. Each carries a cap 2 3/8 wide and 23/32 thick, overhanging the arm end by 1.
8. To fold the chair, pull the keel pin at the apex: the remaining parallelogram lies down flat.

Open and estimated

- The arm cap length is not settled; the drawing marks it.
- Panels on top of the sticks rather than recessed between them would raise the seat 12 mm; the frame, sticks and pins are identical either way.

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- A 25 mm keel is a stiffness upgrade over 18 (flex roughly halves), and only the long bolt changes.
- The pin joints in plywood have a little play when the holes are drilled by hand; bushings or a drill template are the cures under consideration.

Credits and license

Designed by Karl T. Ulrich. The drawings are generated from tools/make_k3_popsicle_v3.py, the same geometry the sticks were cut from.

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