

# Becoming Creative

RStudio::conf 2022

Alice Walsh



@sciencealice



I am not  
creative



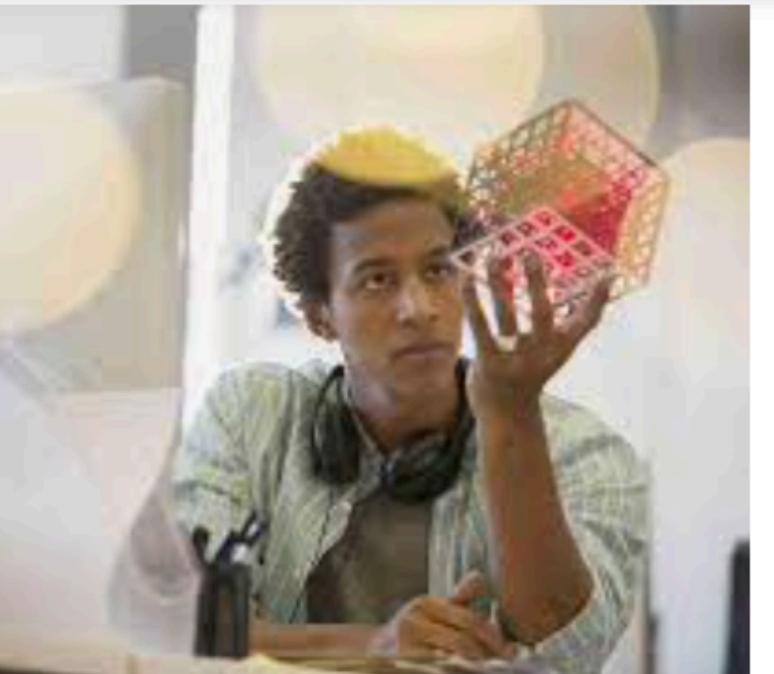
Eight Ways to Identify Creative People ...  
radcomservices.com



Become A More Creative Pe...  
newswatchtv.com



How to Be The Most Creative Person in ...  
wedu.com



10 Signs of a Creative Mind  
verywellmind.com



More Creative Person  
selecthealth.org



creative, successful person ...  
wtop.com



highly creative people ...  
thesecoundprinciple.com



How to Be a Creative Person – Turner ...  
turnerstories.com



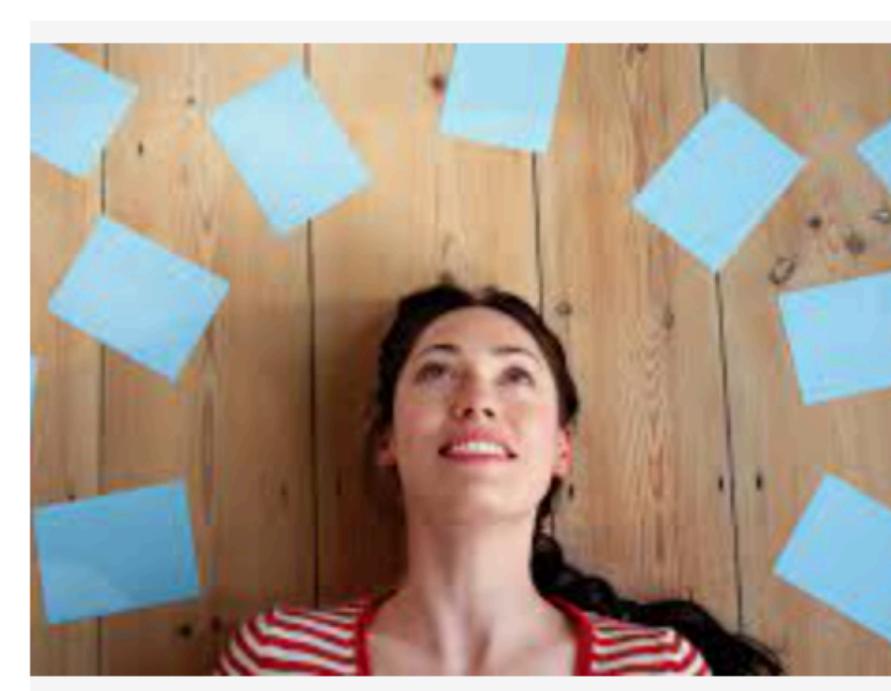
How to Focus the Hyper Creative Mind ...  
lifehack.org



Signs That a Person Is Creative - 15 ...  
15-ideas.com



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Best seller Rollback

The Pioneer Woman

**The Pioneer Woman Floral Patch Quilt,  
Full/Queen, Multi**

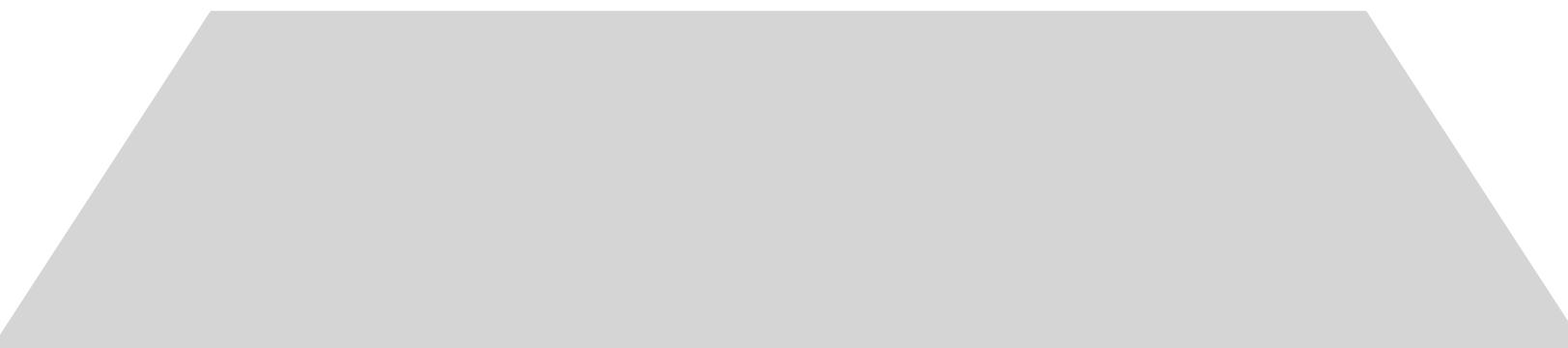
**★★★★☆ (4.2) 39 reviews**

**\$44.67** \$55.00 ⓘ \$44.67/ea

**Add to cart**



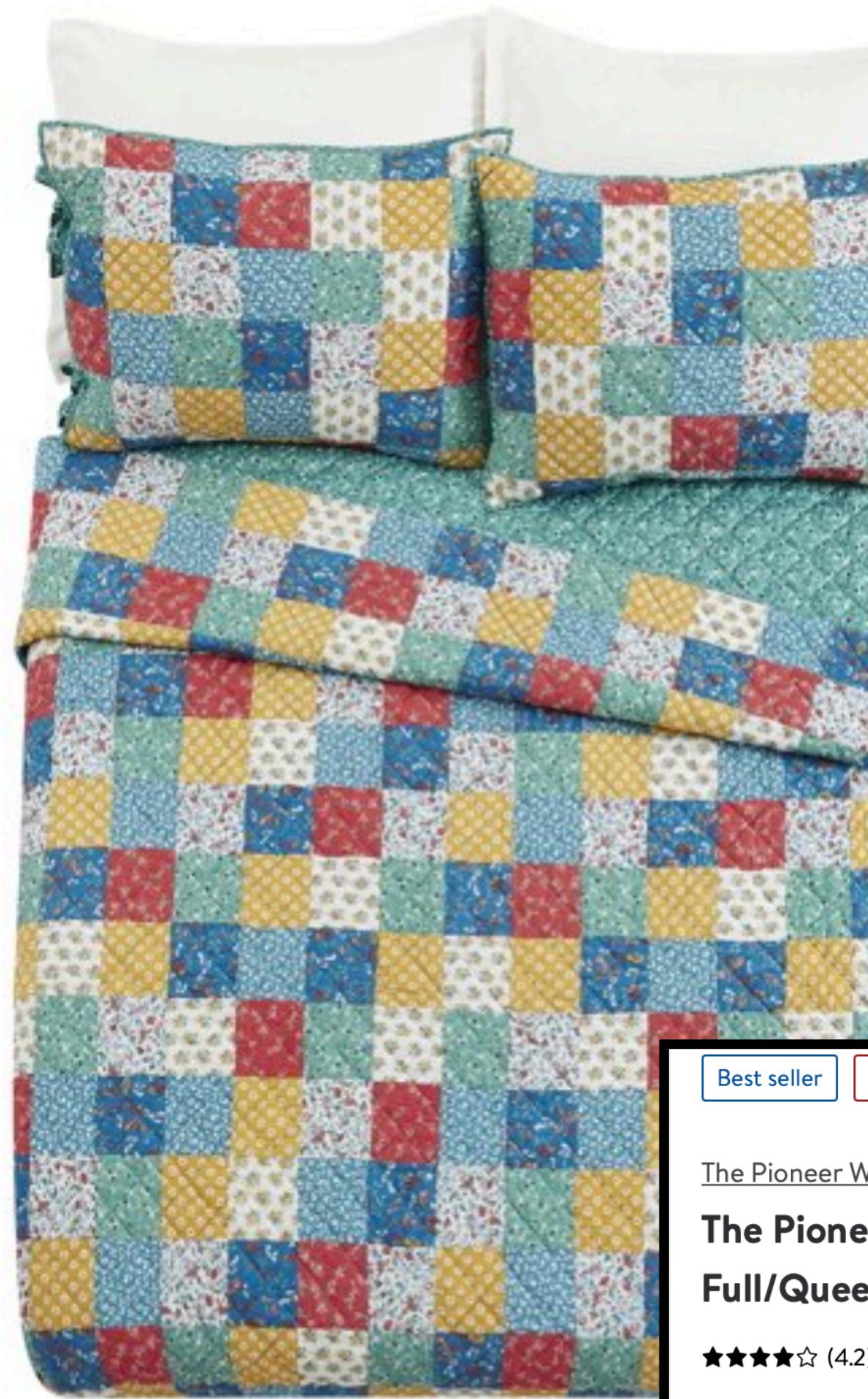
Top



Batting



Back



Best seller

Rollback

The Pioneer Woman

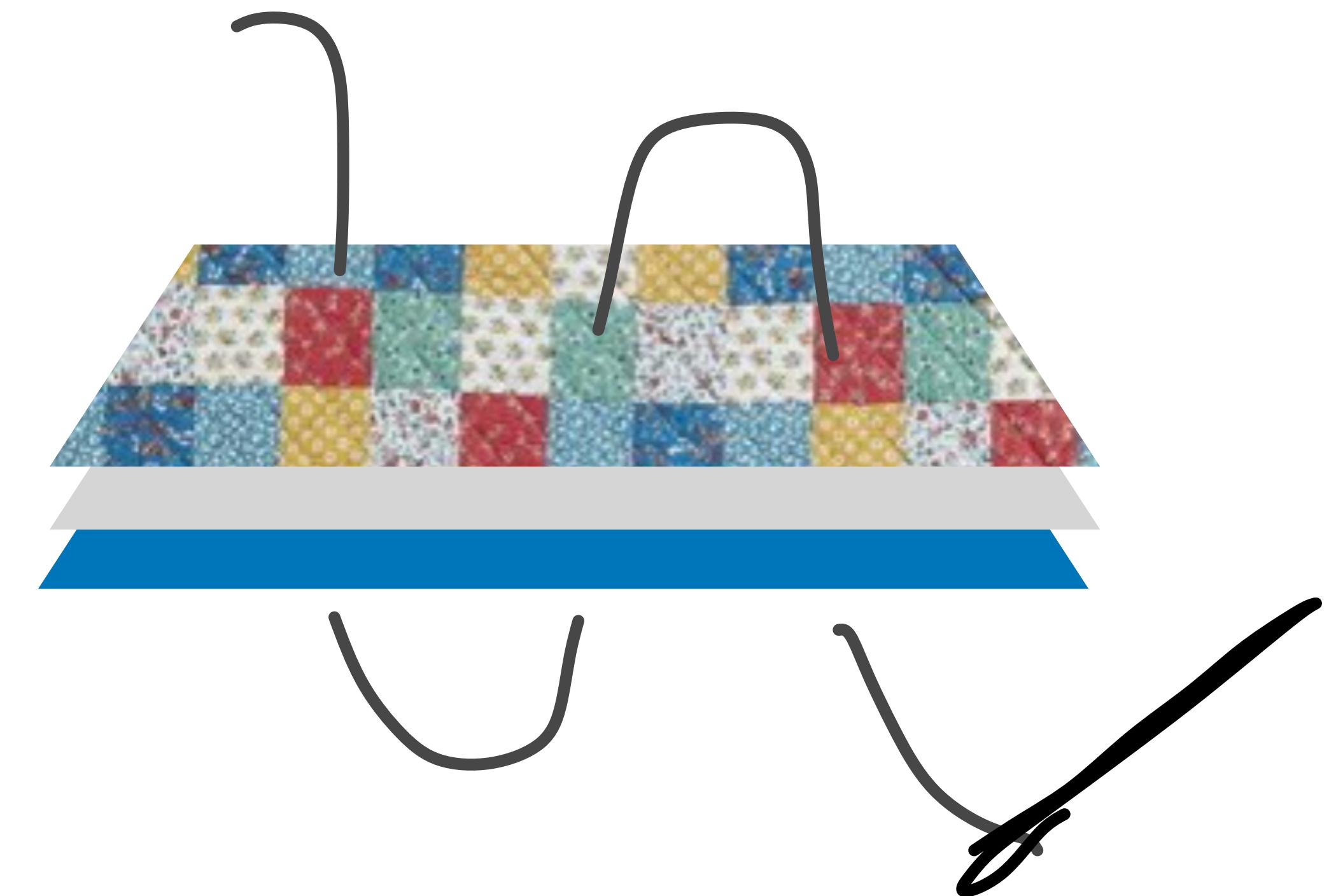
**The Pioneer Woman Floral Patch Quilt,  
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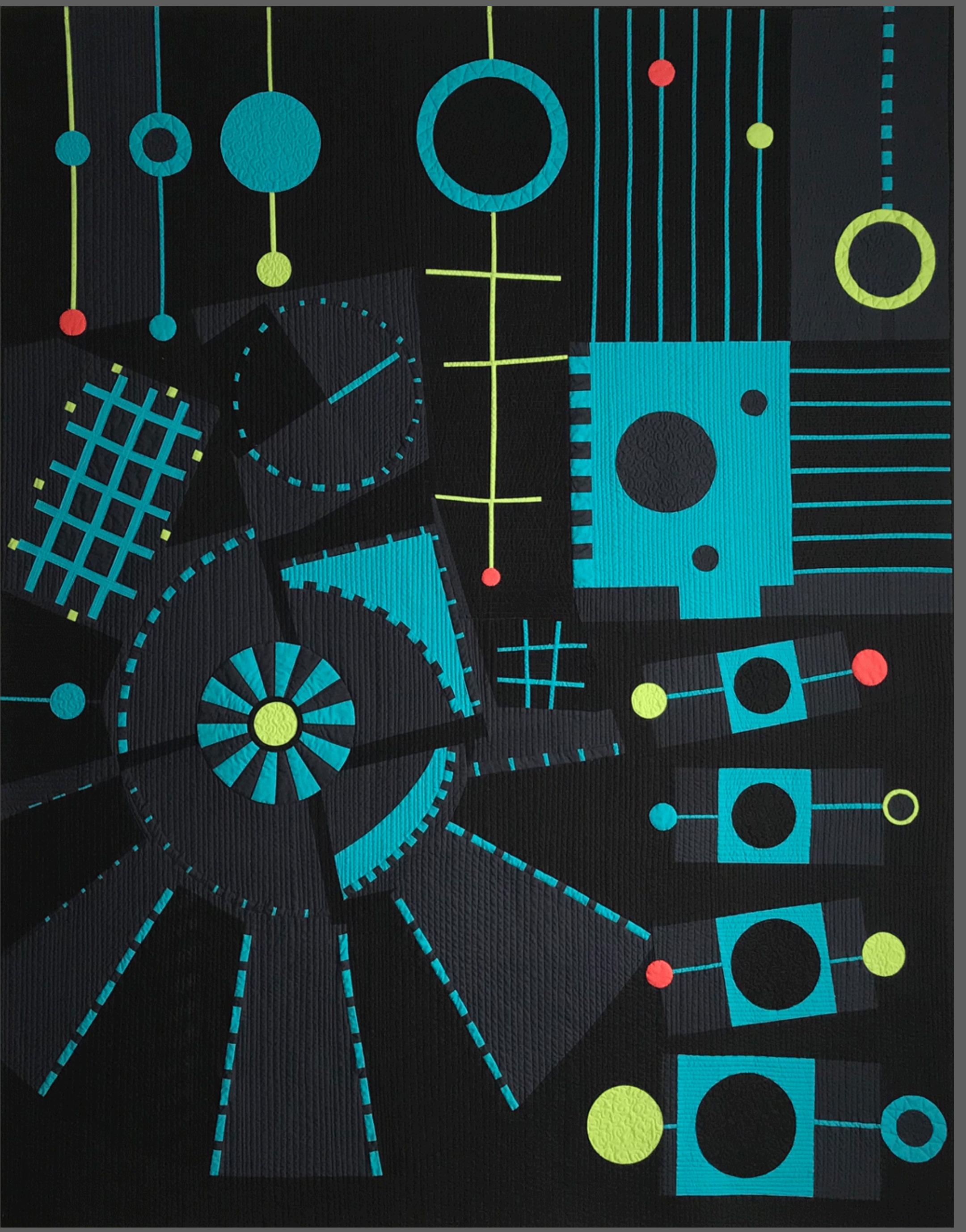
Quilting



```
fabric %>%  
  cut() %>%  
  sew() %>%  
  sandwich(battting, back) %>%  
  quilt()
```



Blooming by Emilie Trahan



Broken Clock  
by Annie Hudnut



Watercolor Study No. 6  
by Audrey Esarey



still not  
by Chawne Kimber



Pride and Joy  
by Veruschka Zarate

The prerequisite for  
doing **exciting** work  
is to be **excited** about it  
yourself

Kurt Andersen (writer, host of Studio 360)

# Step 1

Come up with too many ideas

quitting again

HYPERGRAPHS  
represented as hypergraph - data structure?

- pluck any 1 edge
- check for cycles  
→ if yes → ERROR
- if ~~acyclic~~ (acyclic)
- then remove low order nodes until all gone
- reverse order and form that is the quitting order!

any (one shared) edge

Label all the areas (holes)

Label the edges (hyperedges)

x y color

→ find area based on corners?

→ smallest area w/o any other lines?

→ need segments and not just points?

→ can find touching based on the point maxnum.  
+ intersections.

→ use labels for the sections?

→ overlap lines straight?

- ① use area labeled
- ② each line to edge
- ③ Create members grid
- ④ test for cycles

#	id	y	value
1	1	$y_1$	1
1	2	$y_2$	1
1	3	$y_3$	1
1	4	$y_4$	1

→ ① CROP

if  $y > y_{max}$ ,  $y < y_{min}$   
 $y > y_{max}, y_{max}$   
 $y < y_{min}, y_{min}$

→ ② reduce → only things in the area

↓ intersect?  
→ find if two shapes overlap.  
→ need code to crop to section of any shape  
→ hold "BORDER" object for each?

→ intersect border lines w/ all lines

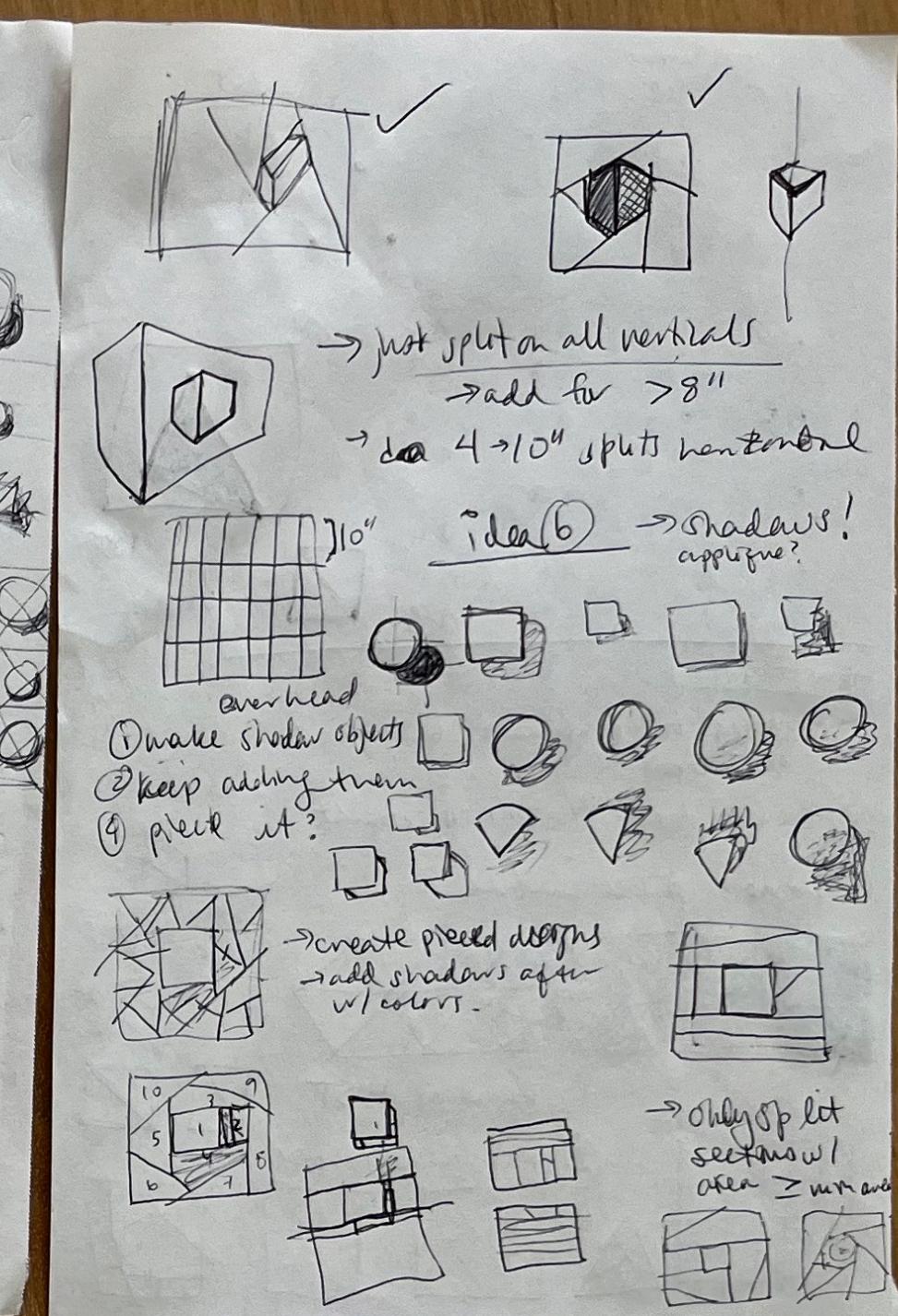
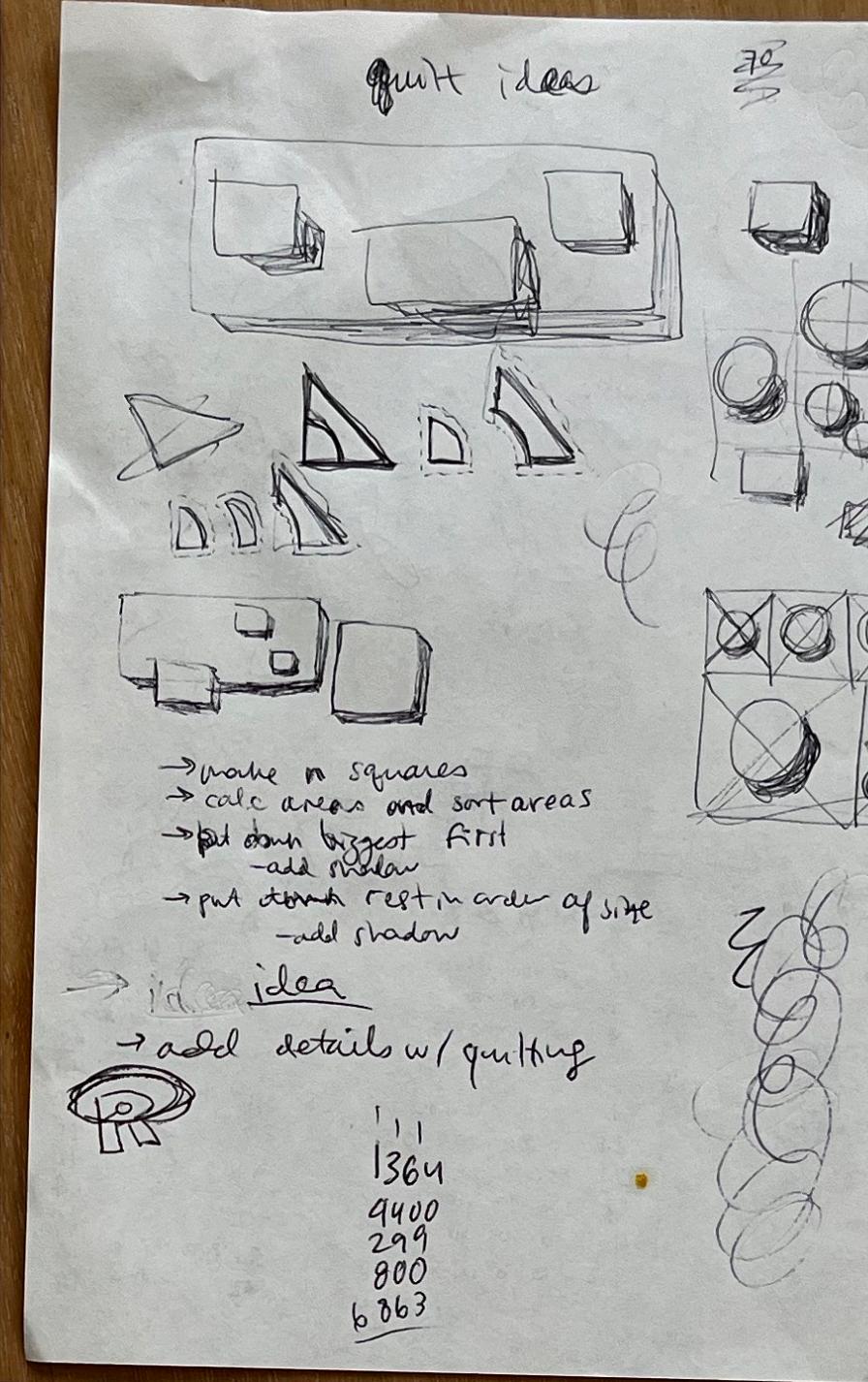
line id	x <sub>1</sub>	y <sub>1</sub>	x <sub>2</sub>	y <sub>2</sub>
1	1	$x_1 \rightarrow y_2$	2	$x_2 \rightarrow y_3$
1	2	$x_1 \rightarrow y_2$	3	$x_3 \rightarrow y_4$
1	3	$x_3 \rightarrow y_4$	4	$x_4 \rightarrow y_1$
1	4	$x_4 \rightarrow y_1$		

→ crop this just between  
if nothing → do each line in raw section one at a time

→ ③ IDEA

→ add details w/ quitting

11  
1364  
9400  
299  
800  
10863



- has to be convex

rules for finding preceable block?

dark

#9C3B21  
#BD4327  
#F6AC9C  
#F2D0BF

light

#303E58  
#415462  
#B8C2BA  
#E4E6D8

white  
gray -

IDEA generate a FPP random

borders are a special class of line  
draws edges 1 section

- ① add a line to a section to plot
  - A P(1,2) lines to connect
  - B) pick an x/y on each line
  - c) check if new line exists
- ② new line intersects other lines  
remove
- ③ Create new sections → (base side of new line)  
test if cycles in graph  
- if yes → remove line
- ④ min area??. remove if too small.

old section edge becomes 2 sections

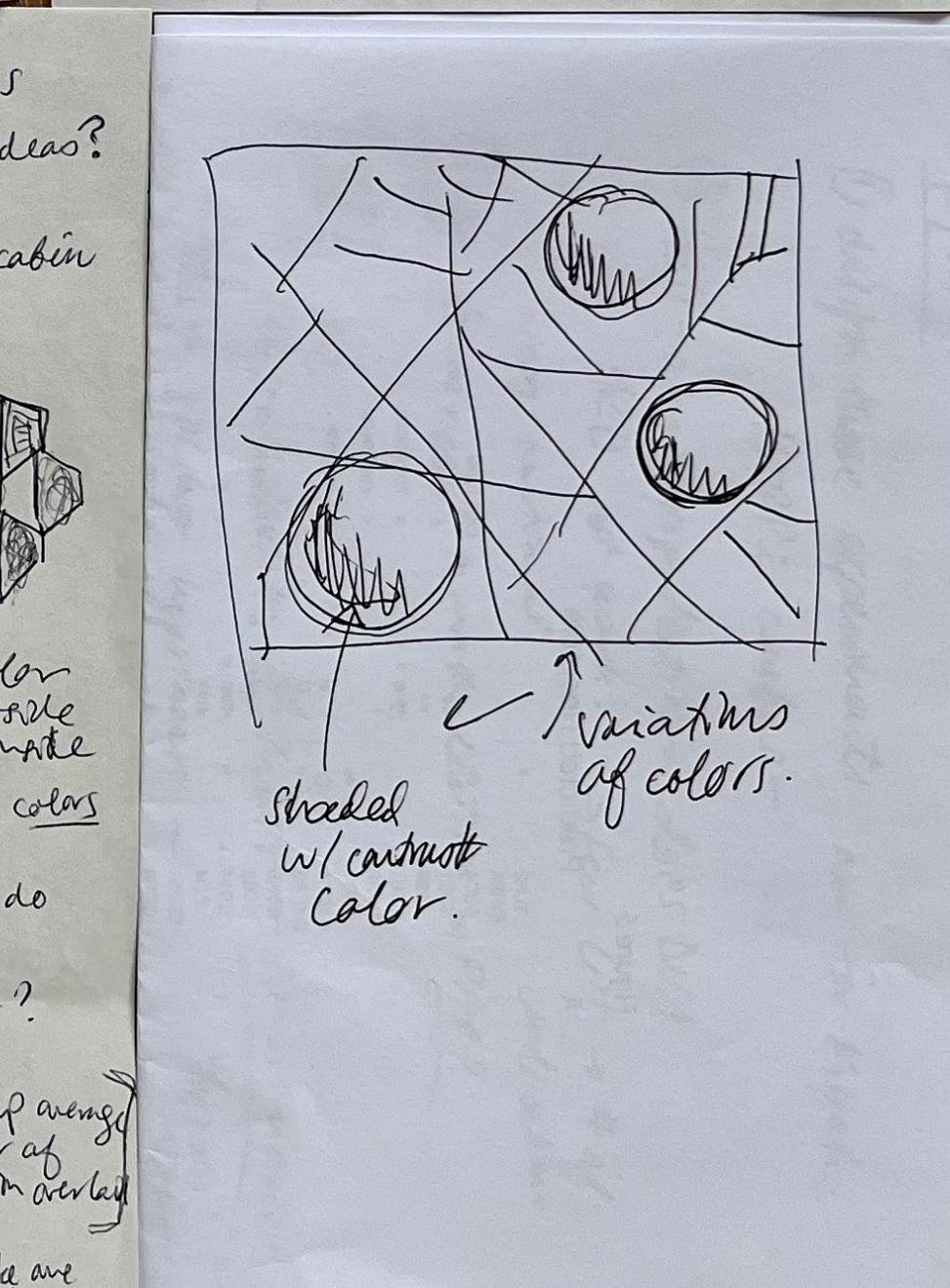
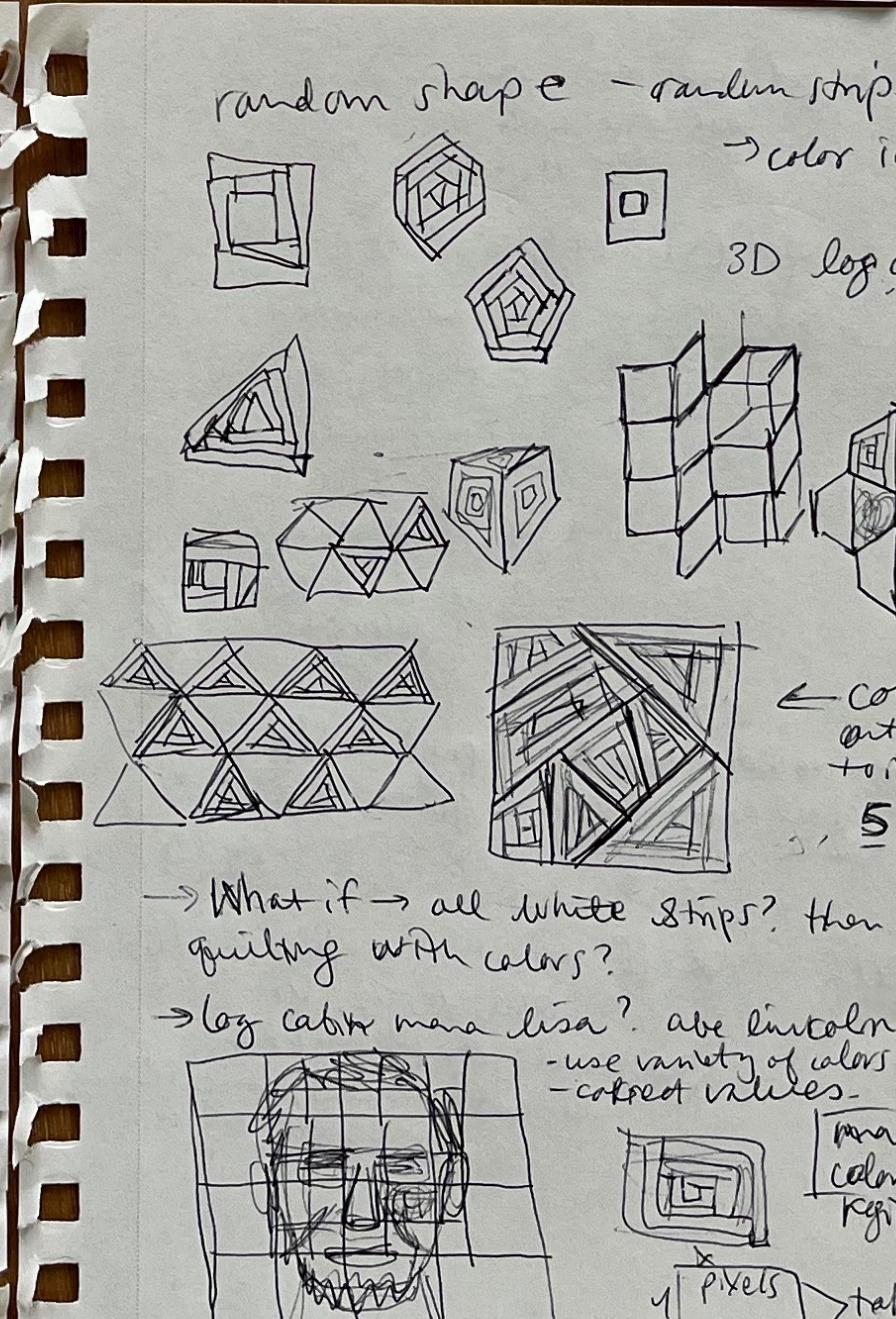
A	1	2
B	1	1
C	1	1

→ What if → all white strips? then do quilting with colors?

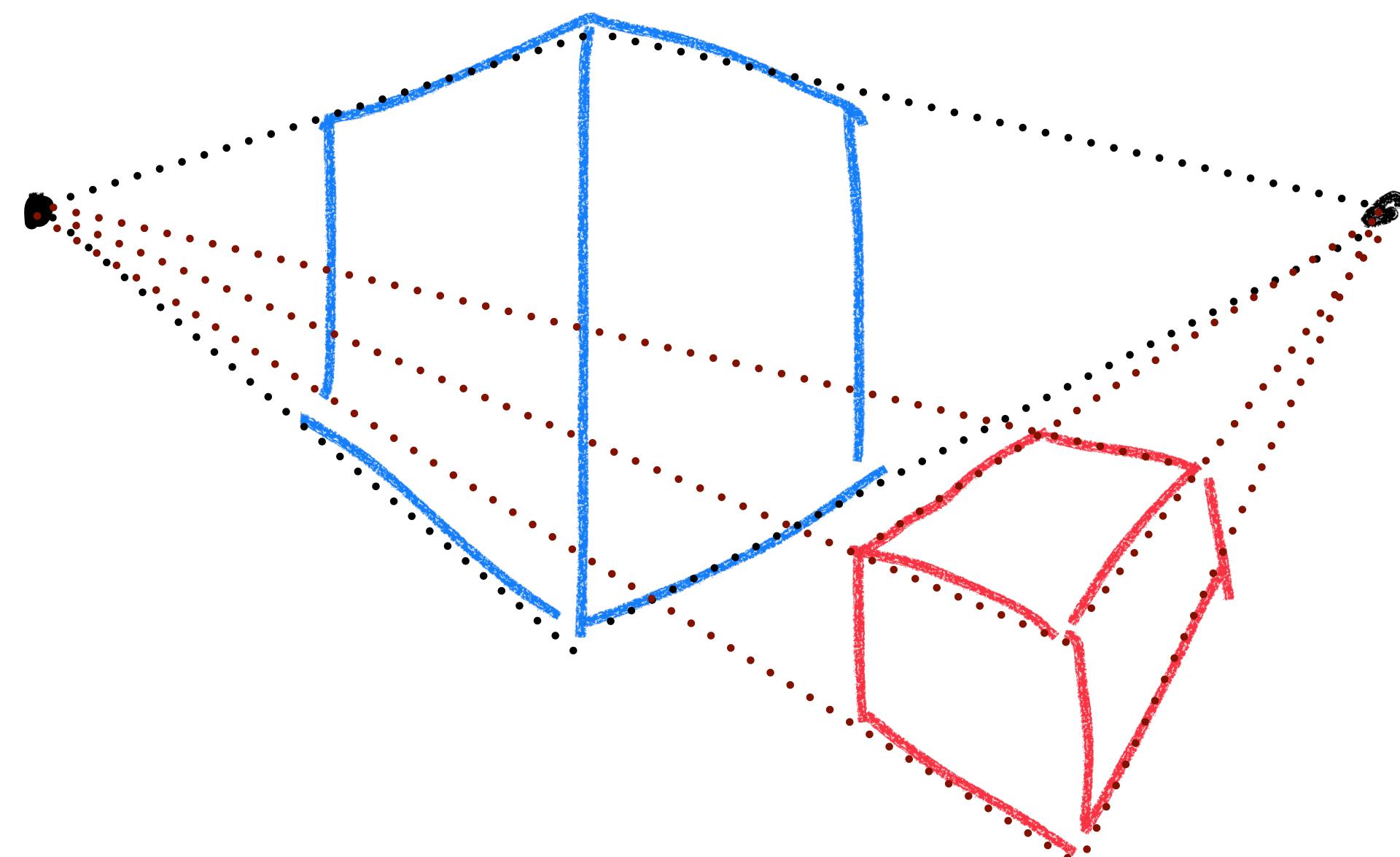
→ log cabin man elisa? abe lincoln?  
use variety of colors  
correct values  
map average color of region overlay

1 pixels

take avg color in shape



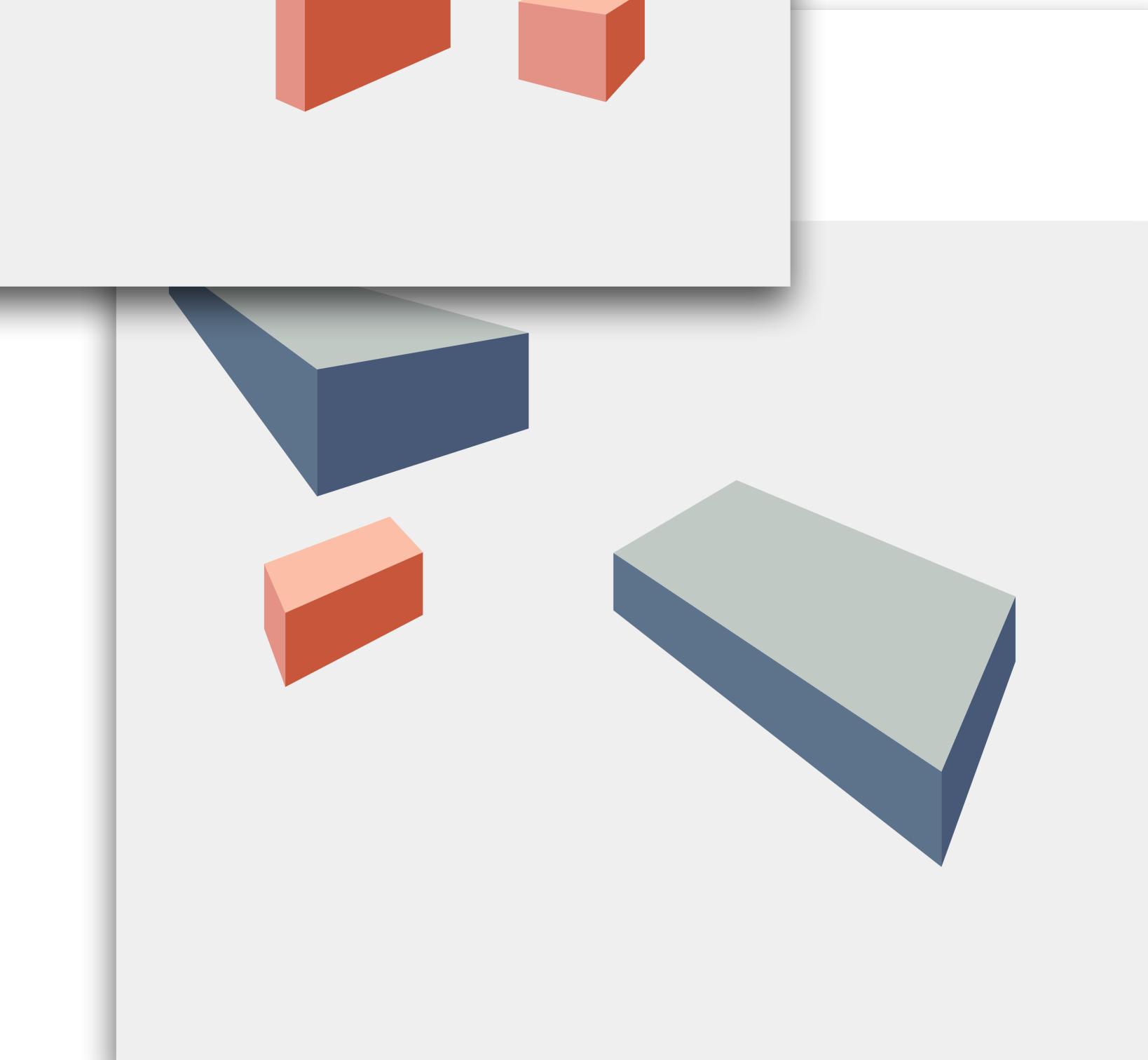
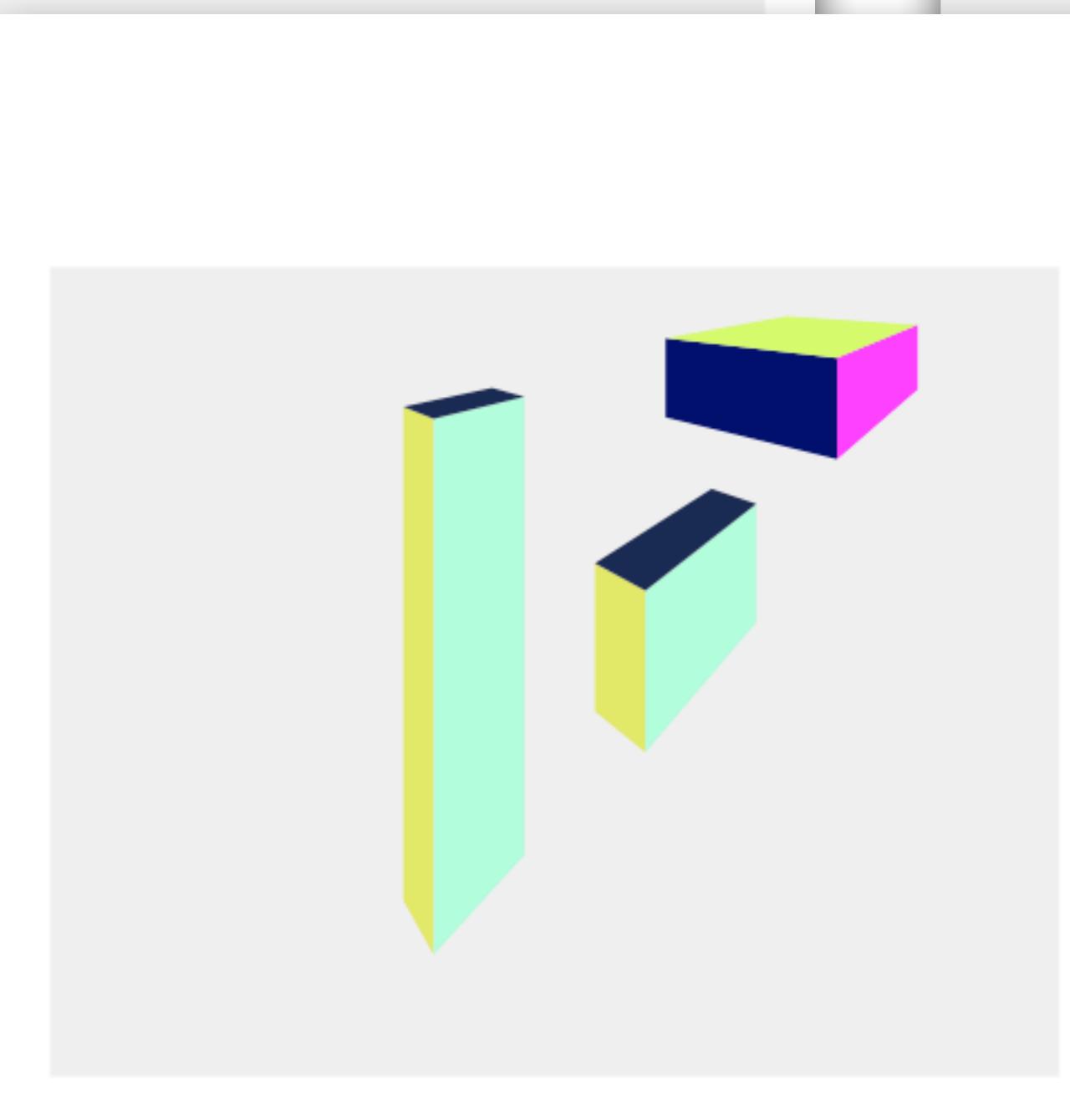
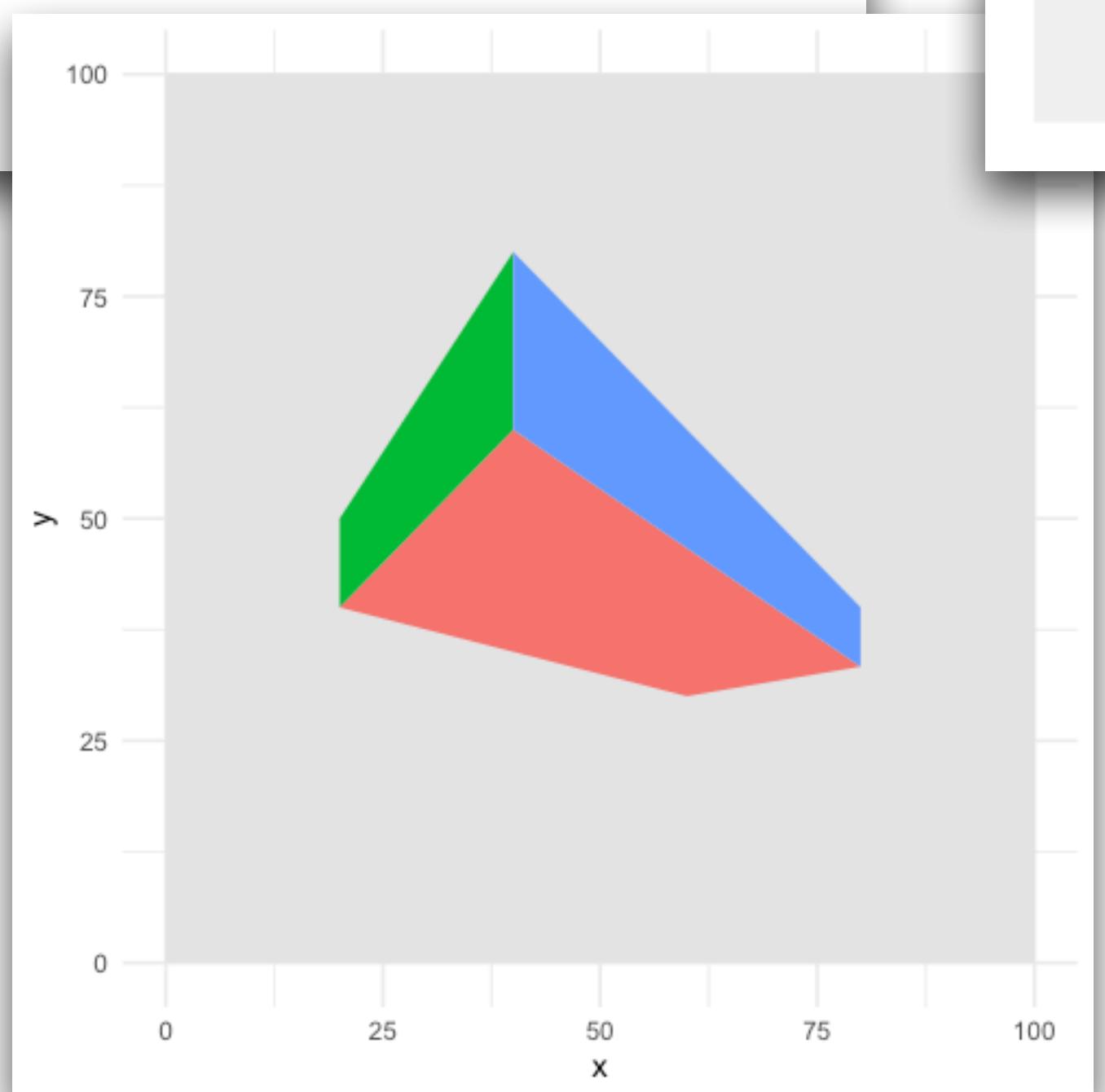
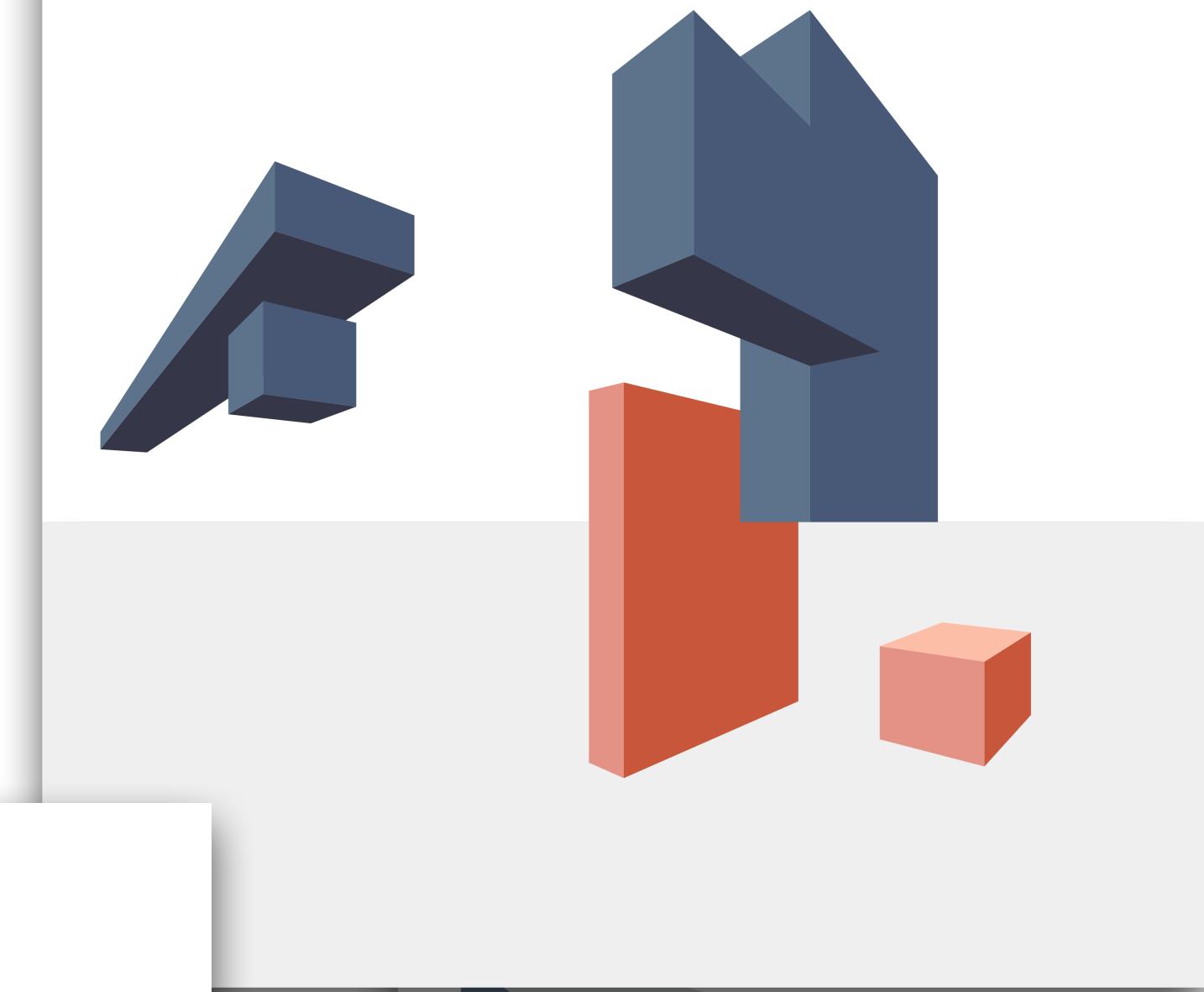
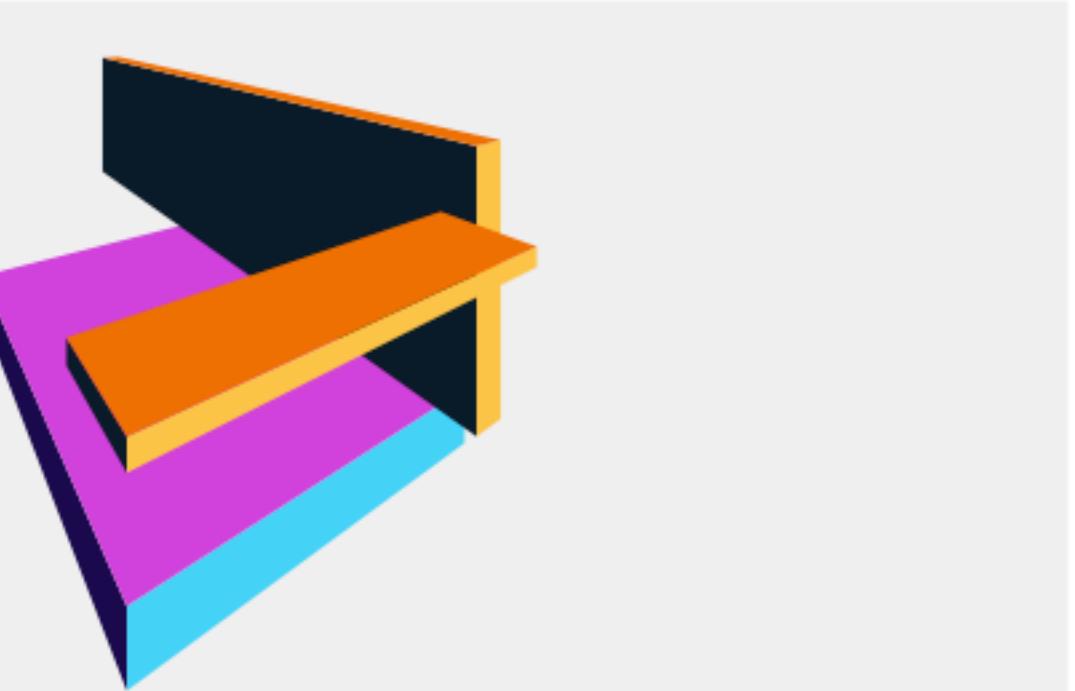
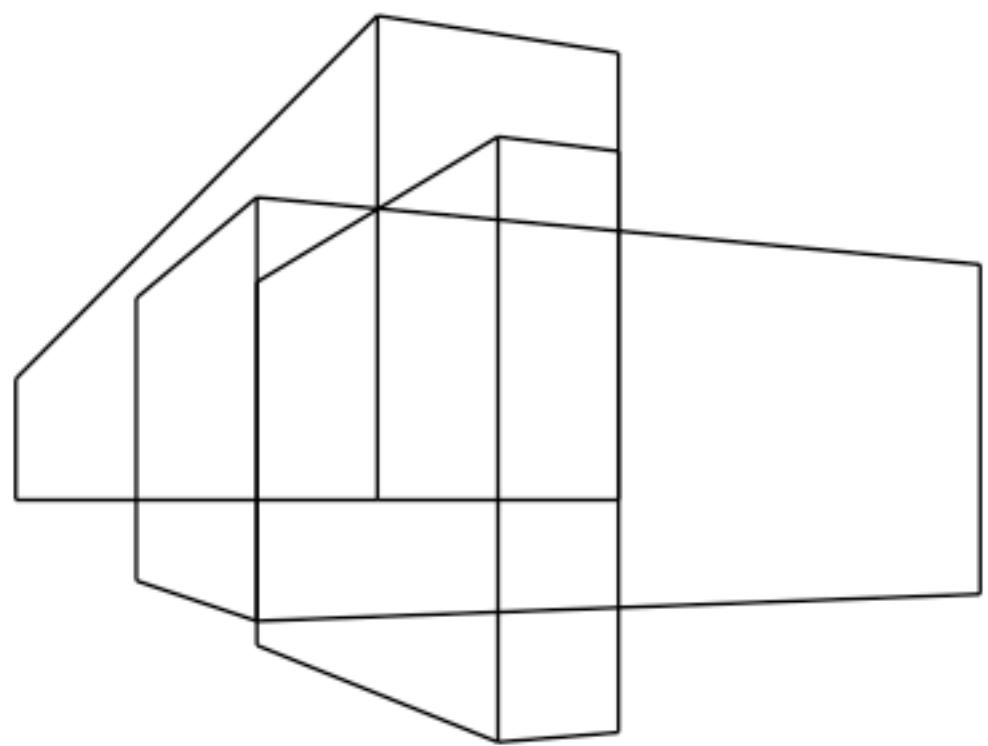
# Fuse two domains



```
poly %>%
  ggplot() +
  geom_polygon(aes(x = x, y = y,
                    group = id, fill = value),
               alpha = 1) +
  theme_void() +
  theme(legend.position = "none")
```

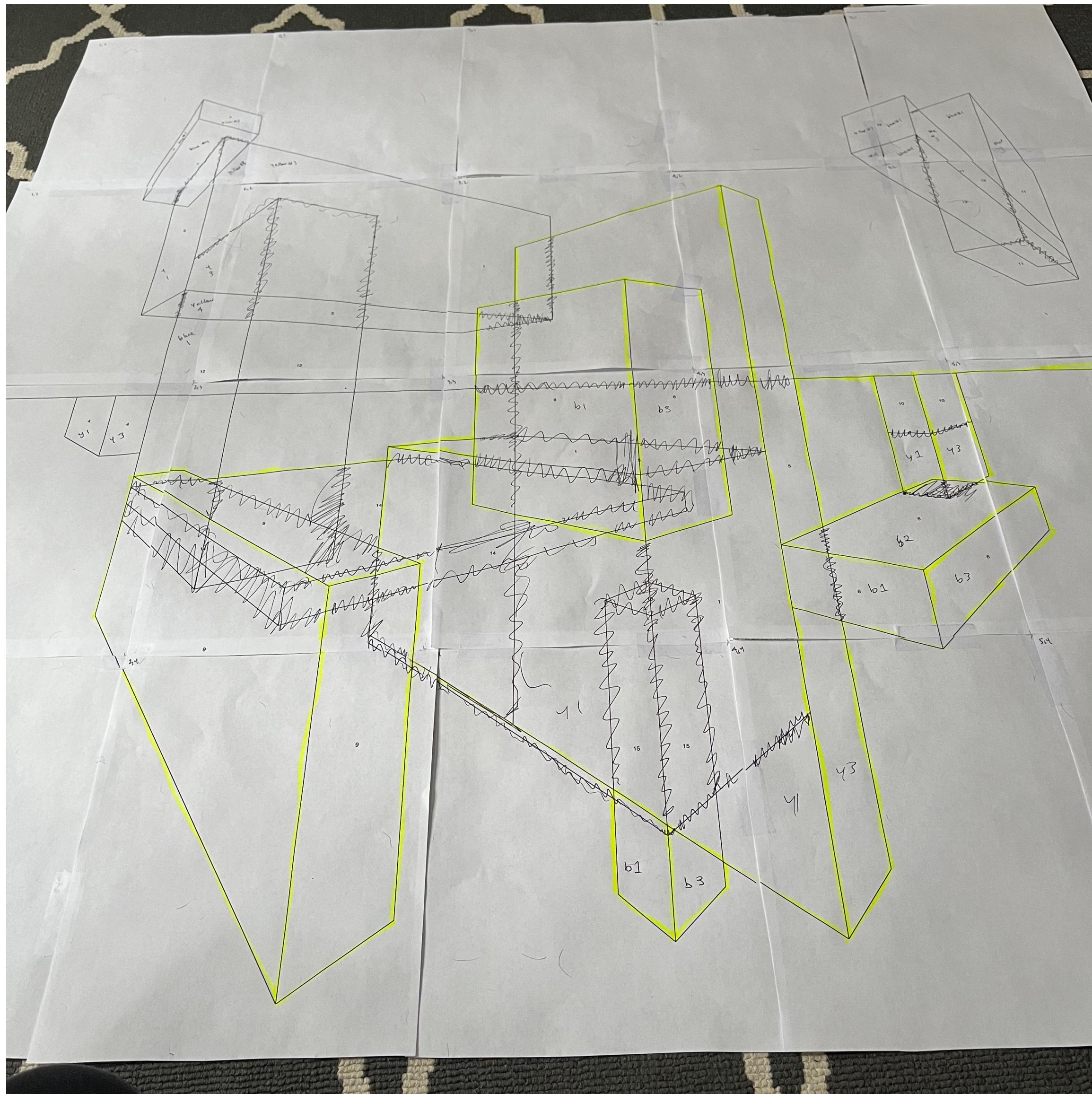
Step 2

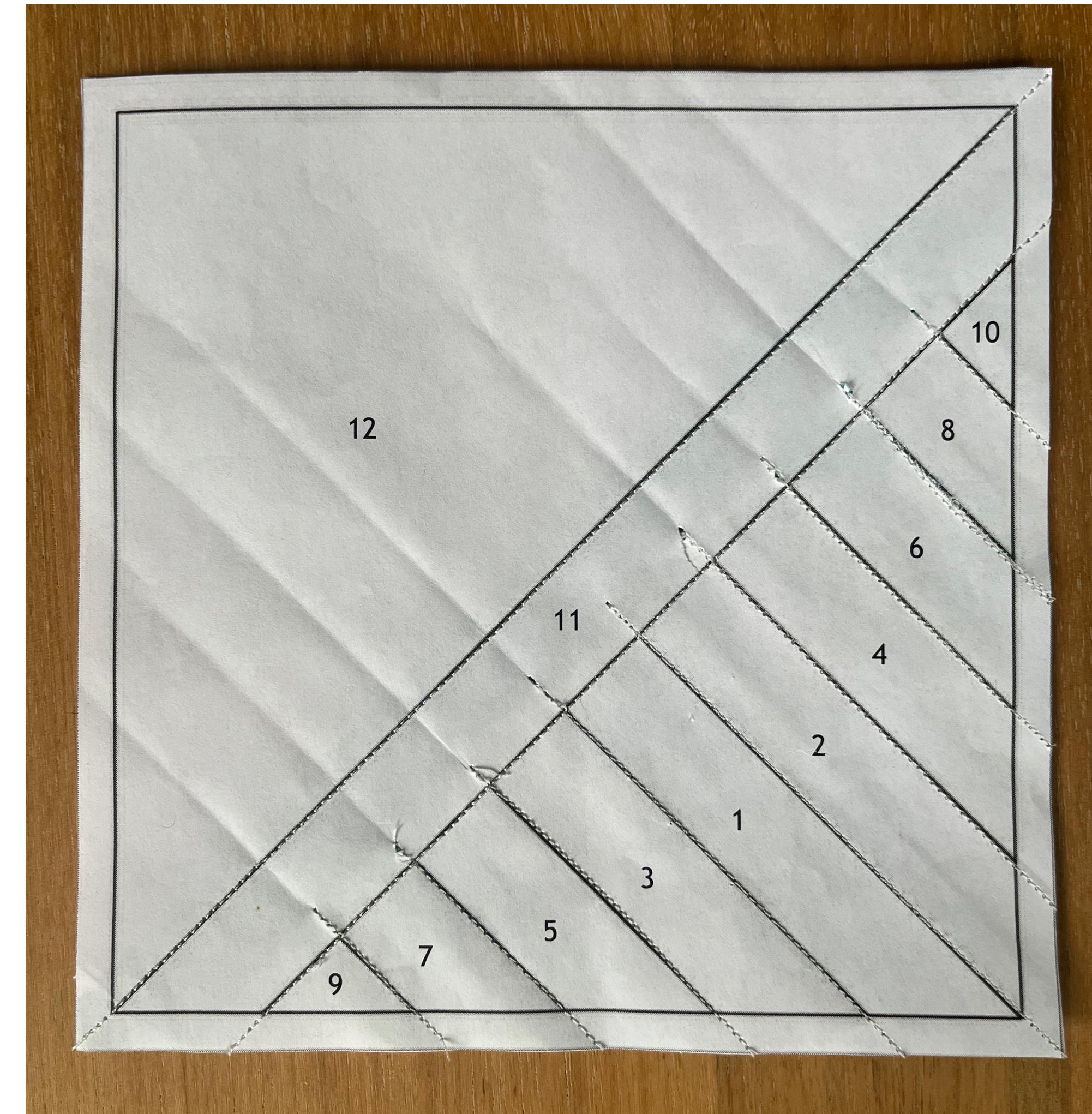
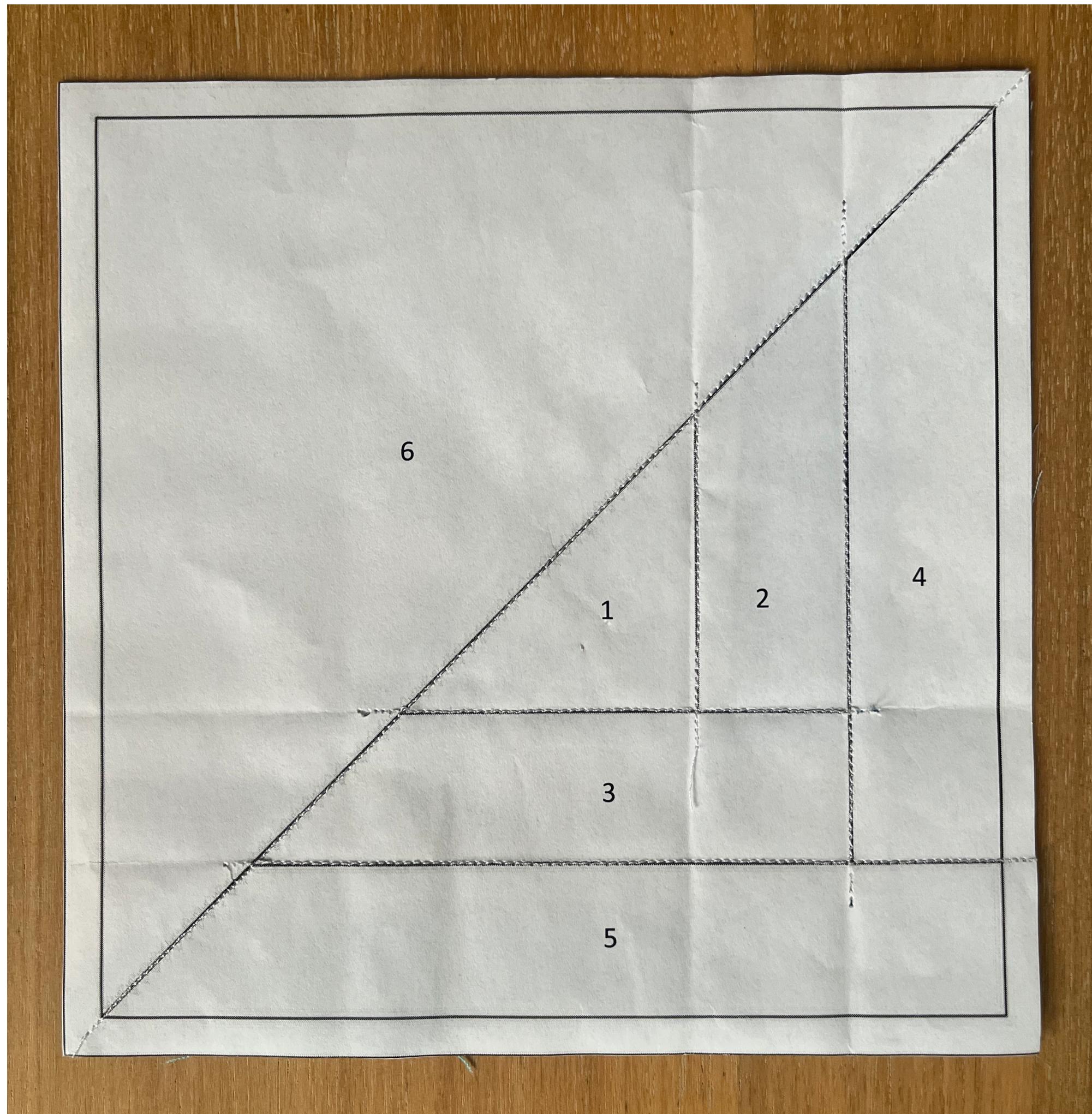
Improvise

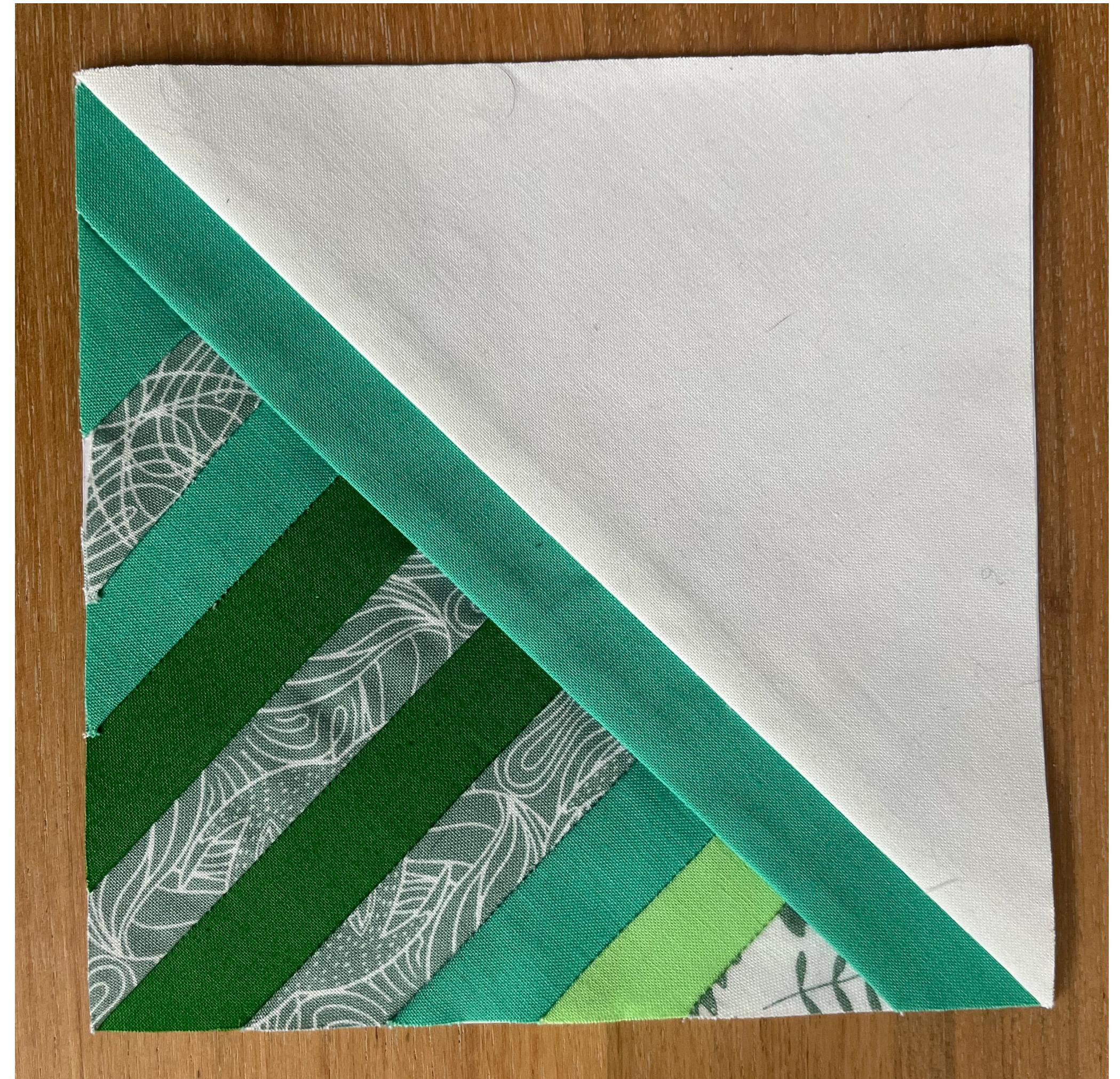


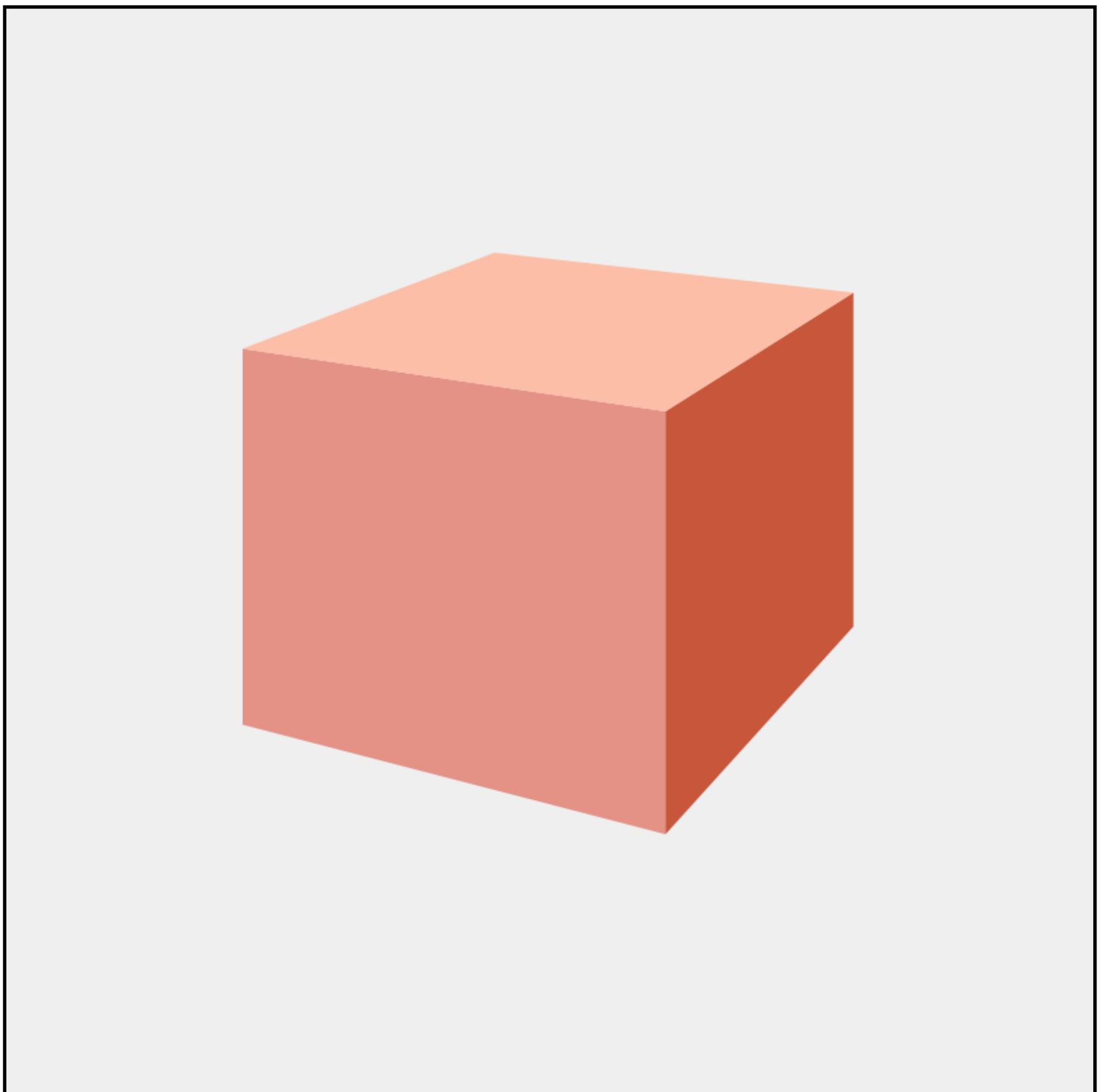
Step 3

Research

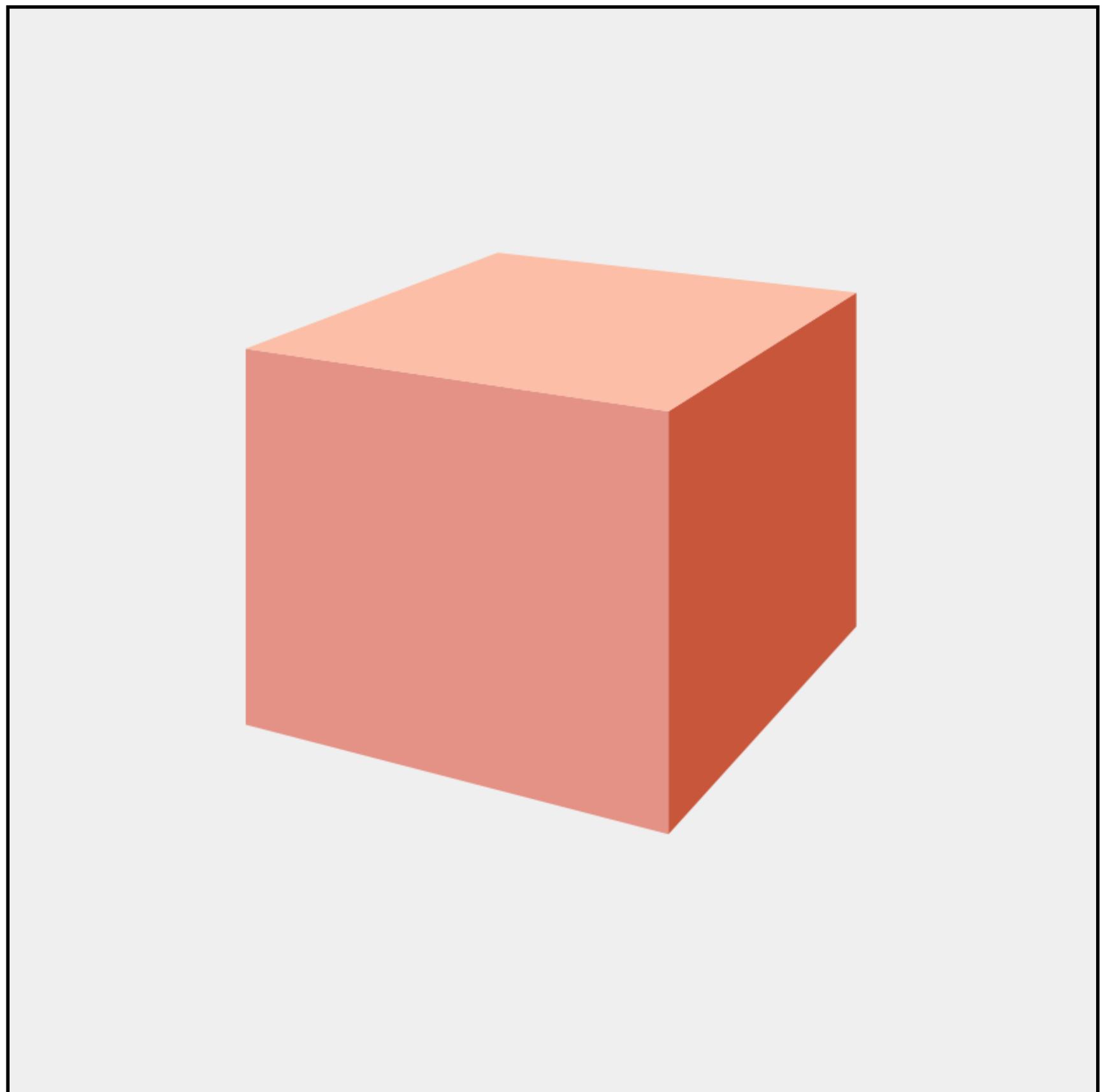




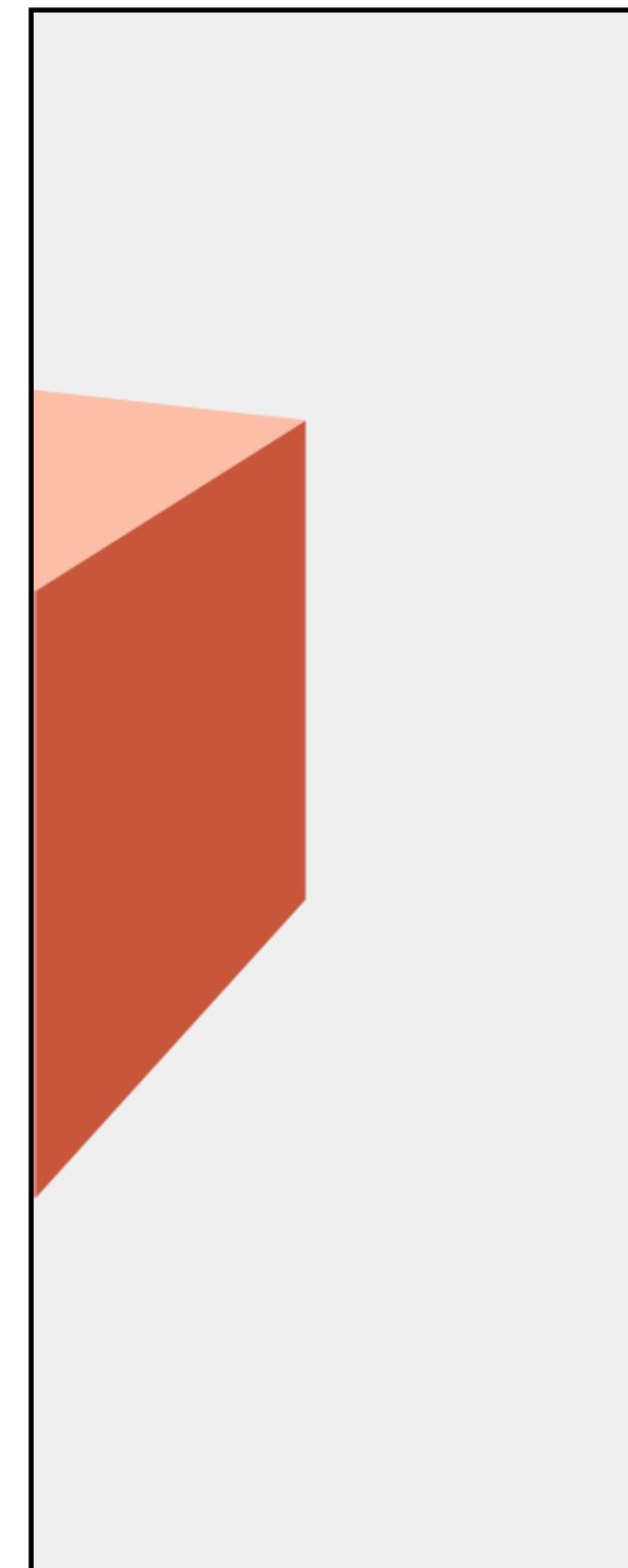
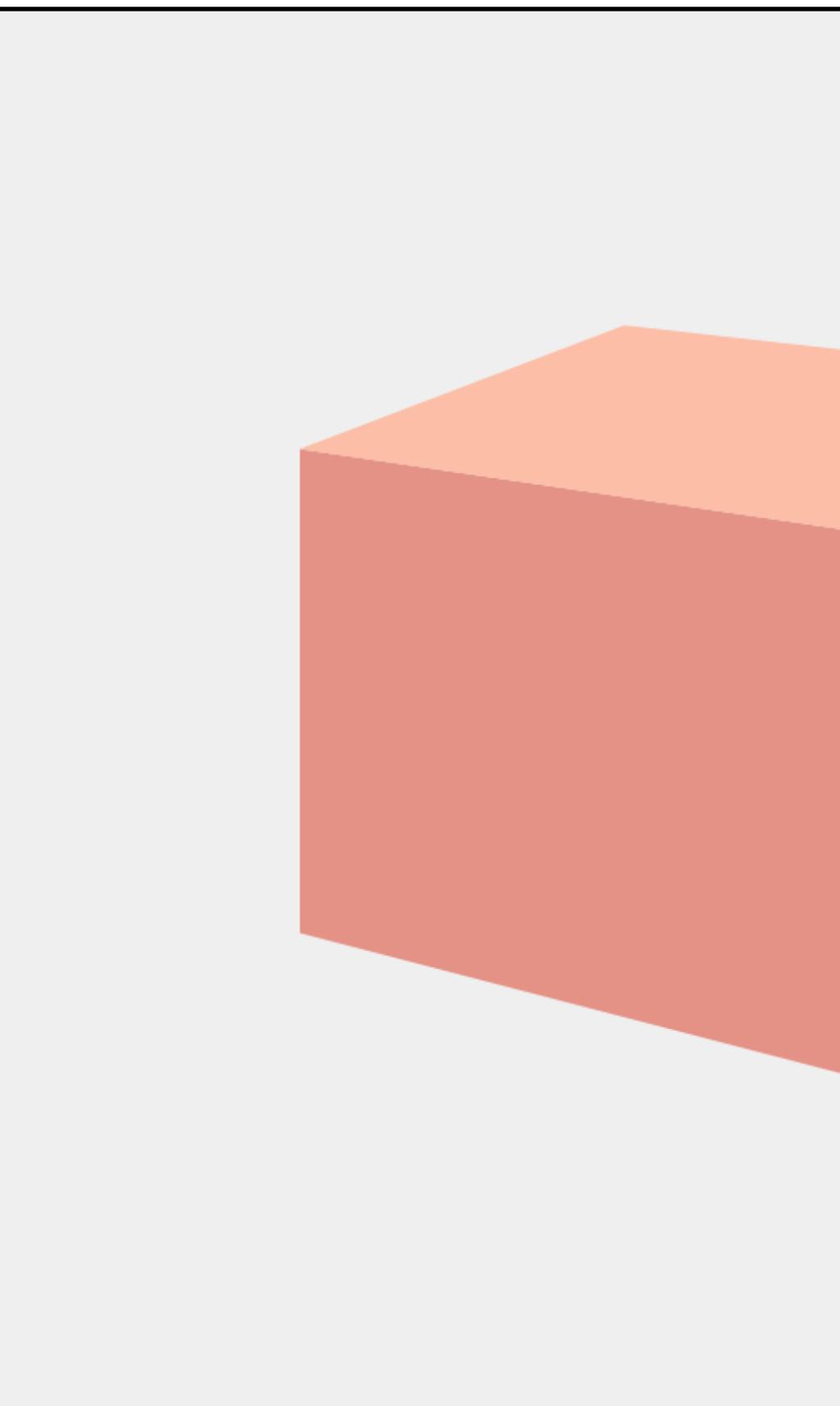




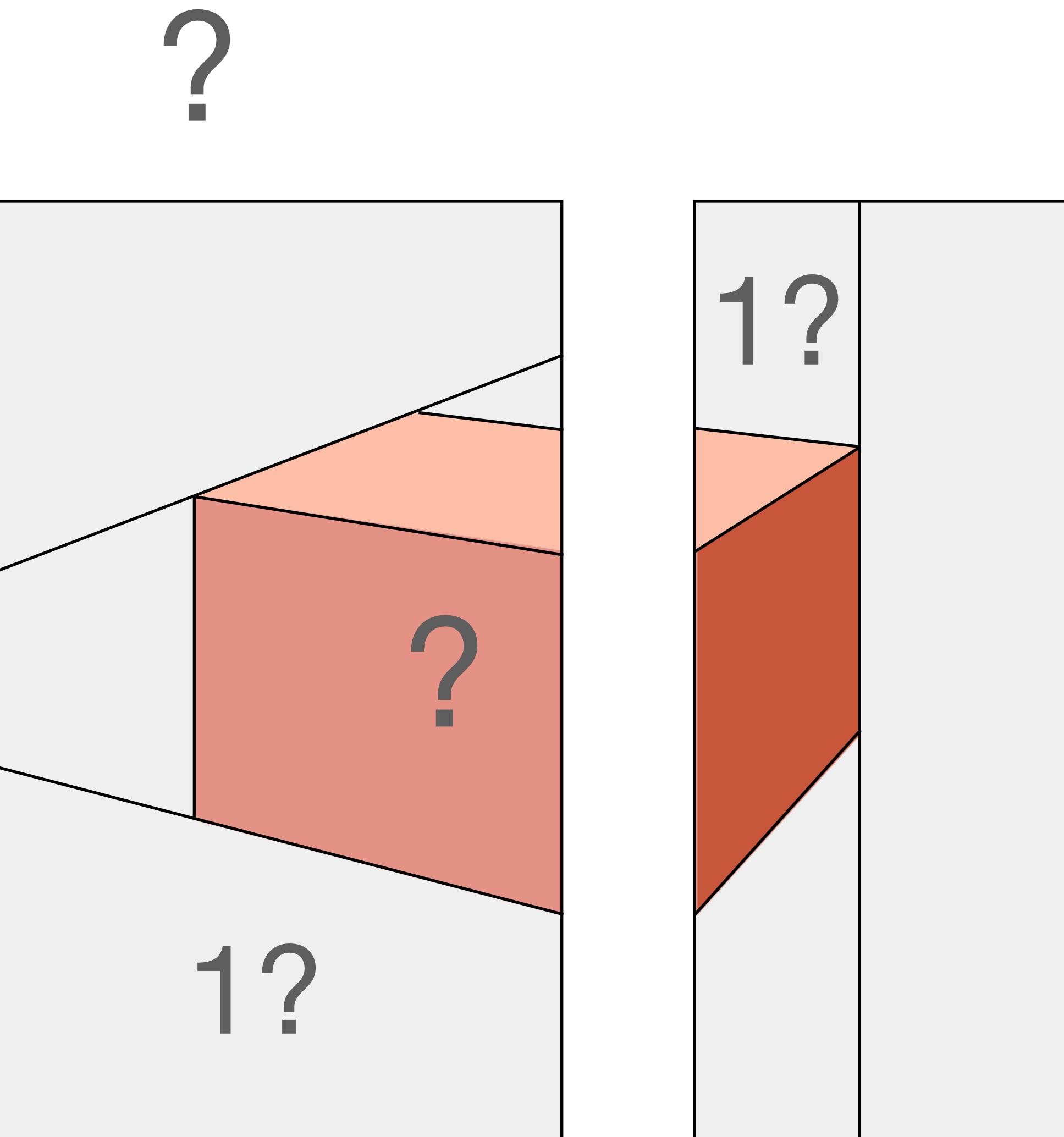
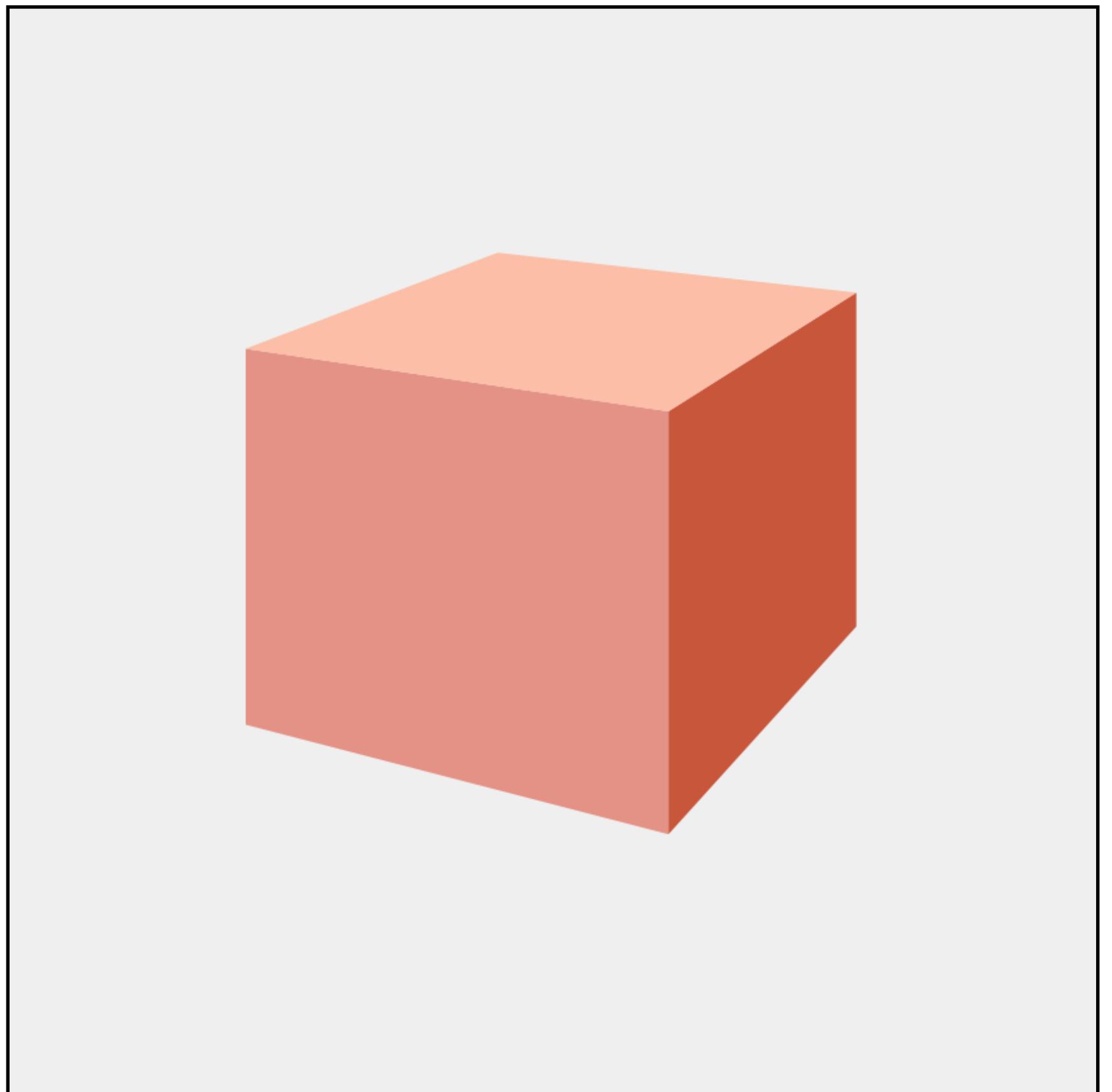
?



?



?



?

# A Mathematical Foundation for Foundation Paper Pieceable Quilts

MACKENZIE LEAKE, Stanford University, USA

GILBERT BERNSTEIN, UC Berkeley, USA

ABE DAVIS, Cornell University, USA

MANEESH AGRAWALA, Stanford University, USA

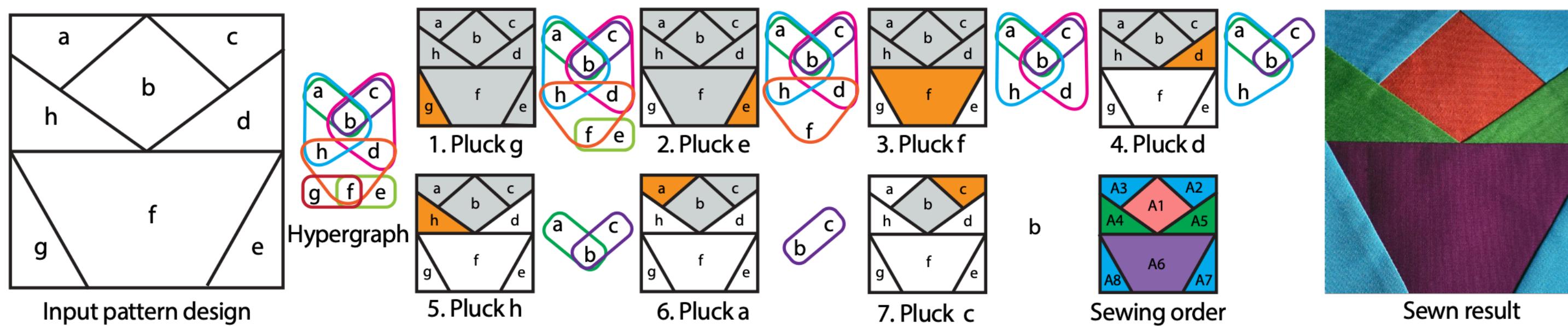
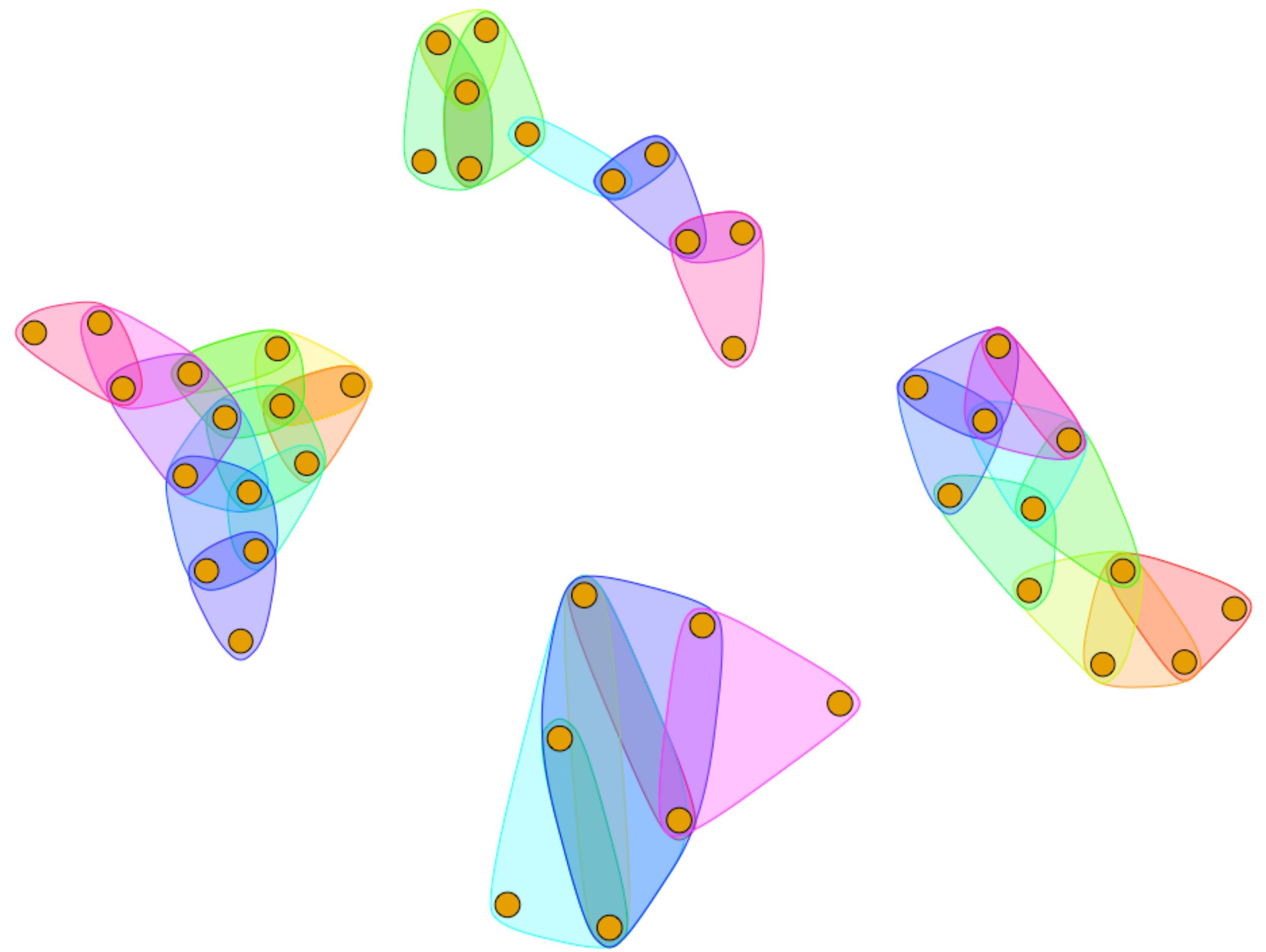
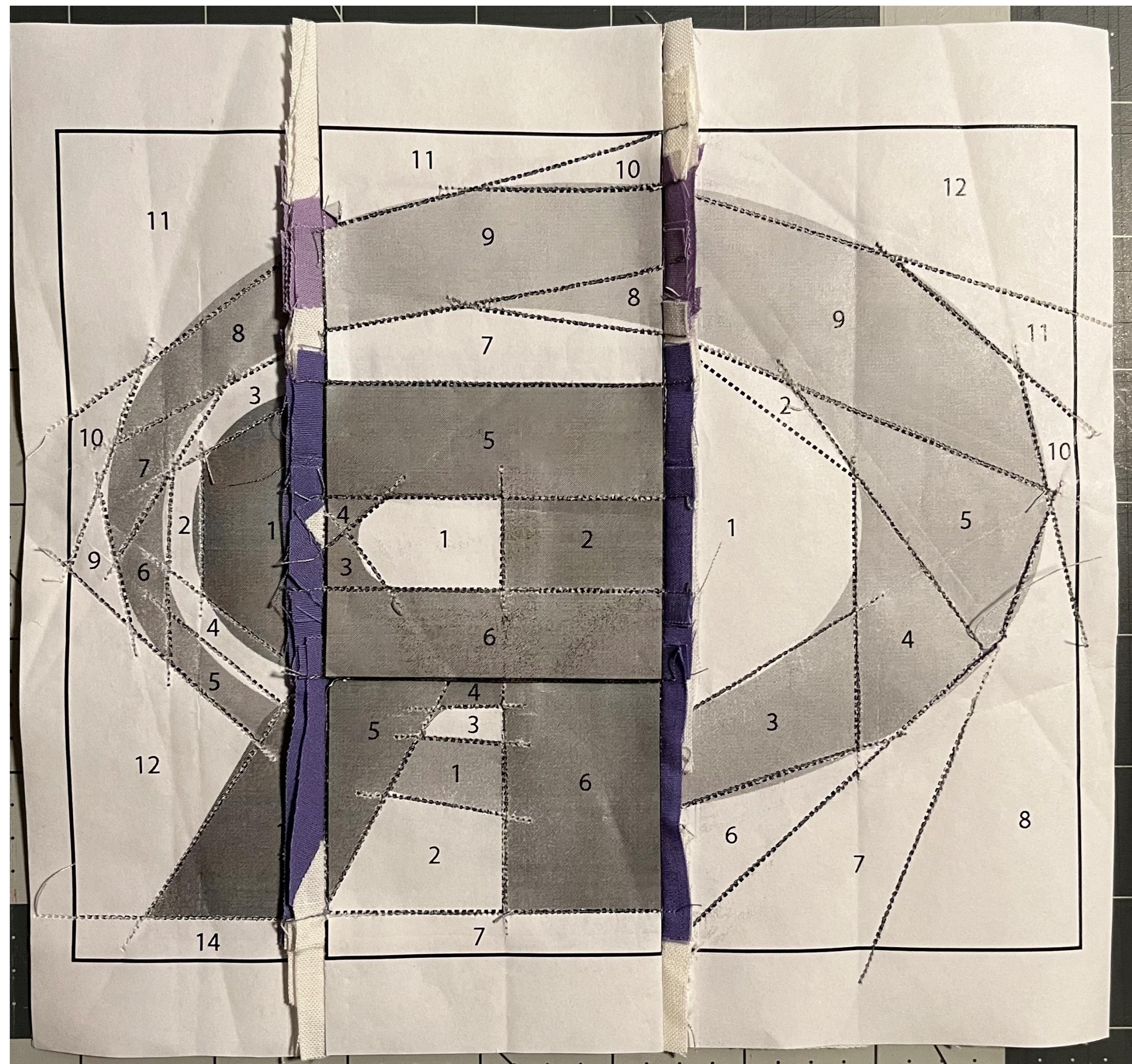


Fig. 1. Given an input pattern design we encode the geometry as a *dual hypergraph*, where nodes represent faces and hyperedges represent *seams* connecting two or more faces. We visualize the hyperedges with colored boundaries (left). In this work we prove that if this hypergraph is acyclic, the pattern design is foundation paper pieceable, and we present a *leaf-plucking* algorithm that iteratively removes leaf hyperedges, where a node is only contained in that hyperedge, to generate a sewing order for the design, which is the reverse of the order in which we plucked the nodes (center). Our quilt design tool shows the resulting sewing order by numbering the faces (center, Sewing order) and lets users color the faces to visualize the design. Quilters can use foundation paper piecing to sew the quilt by attaching fabric pieces one at a time in the sewing order and precisely construct the quilt top (right).

Foundation paper piecing is a popular technique for constructing fabric patchwork quilts using printed paper patterns. But, the construction process imposes constraints on the geometry of the pattern and the order in which the fabric pieces are attached to the quilt. Manually designing foundation paper pieceable patterns that meet all of these constraints is challenging. In

## ACM Reference Format:

Mackenzie Leake, Gilbert Bernstein, Abe Davis, and Maneesh Agrawala.  
2021. A Mathematical Foundation for Foundation Paper Pieceable Quilts.  
*ACM Trans. Graph.* 40, 4, Article 65 (August 2021), 14 pages. <https://doi.org/10.1145/3450626.3459853>

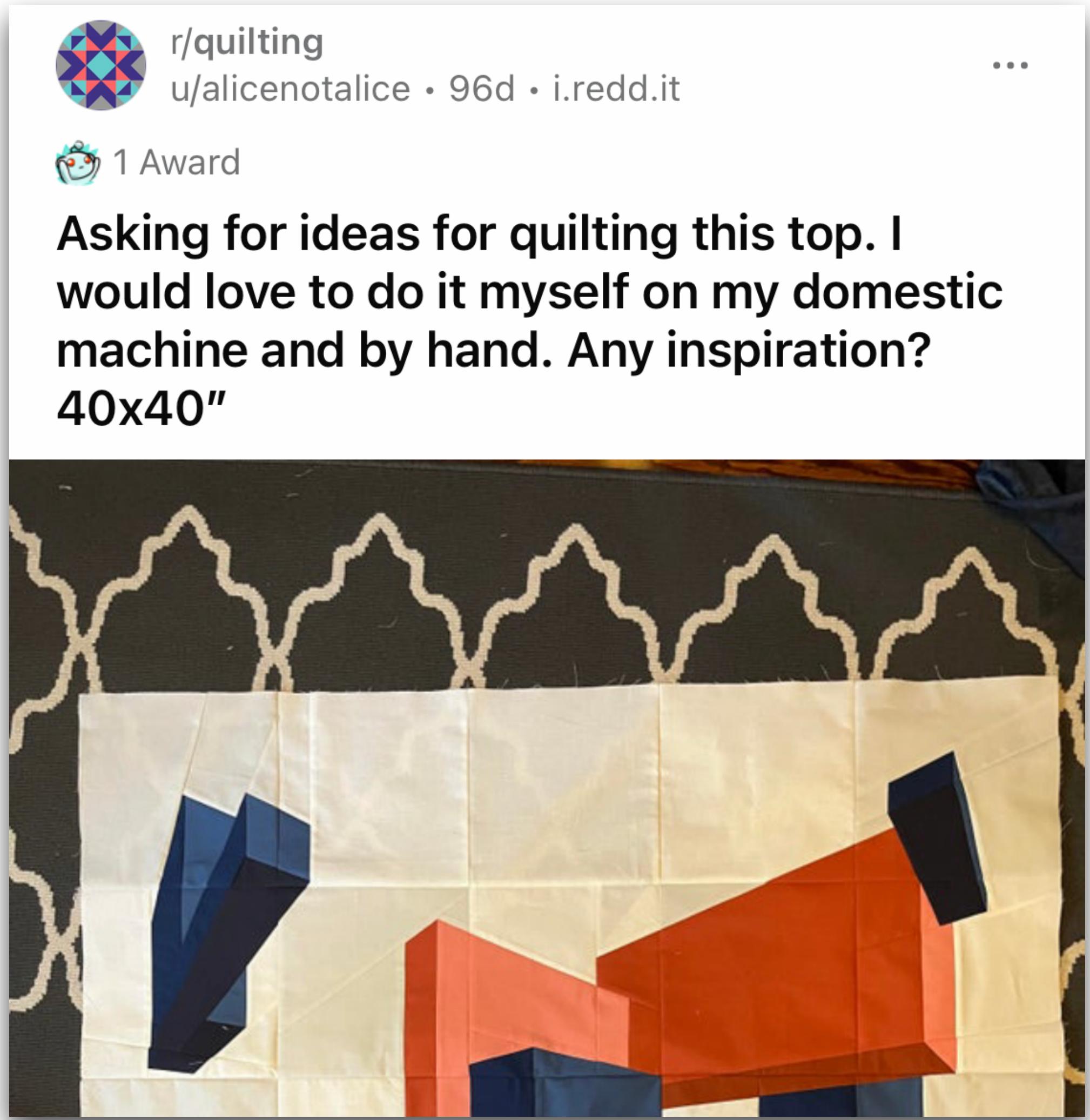


Step 4

Execute



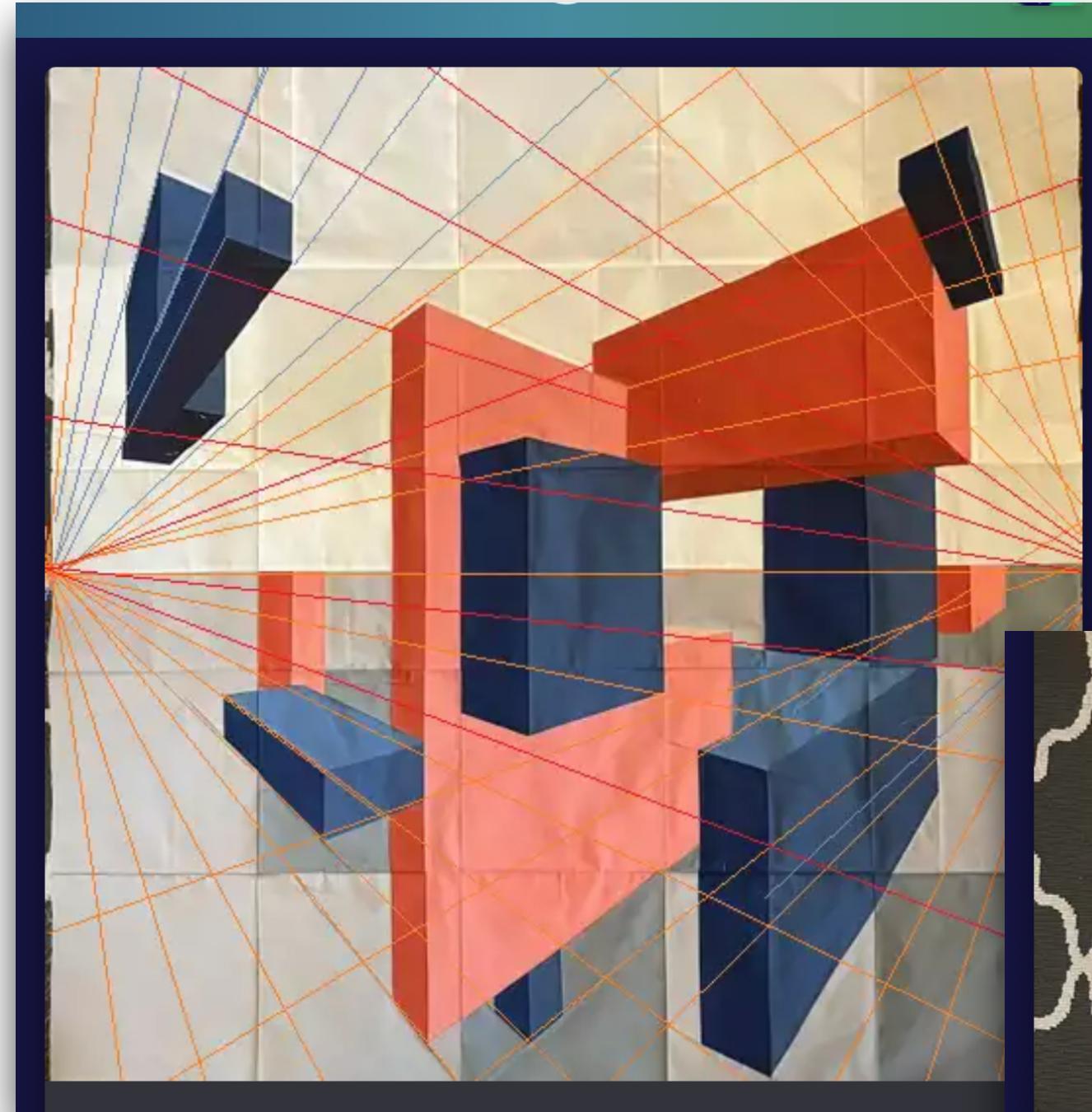
# Seek Collaboration



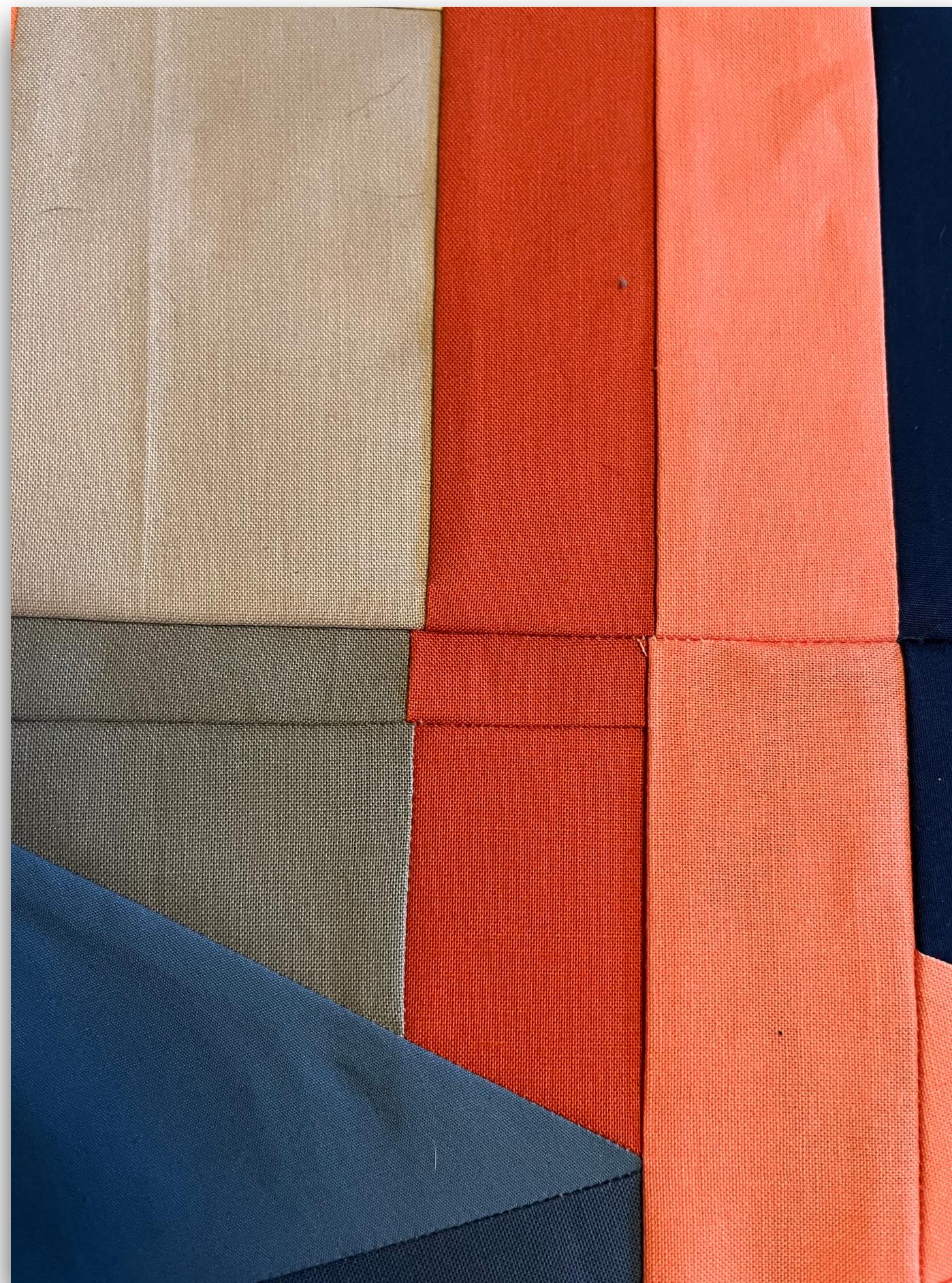
r/quilting  
u/alicenotalice • 96d • i.redd.it

1 Award

Asking for ideas for quilting this top. I would love to do it myself on my domestic machine and by hand. Any inspiration?  
40x40"



# Mistakes are necessary

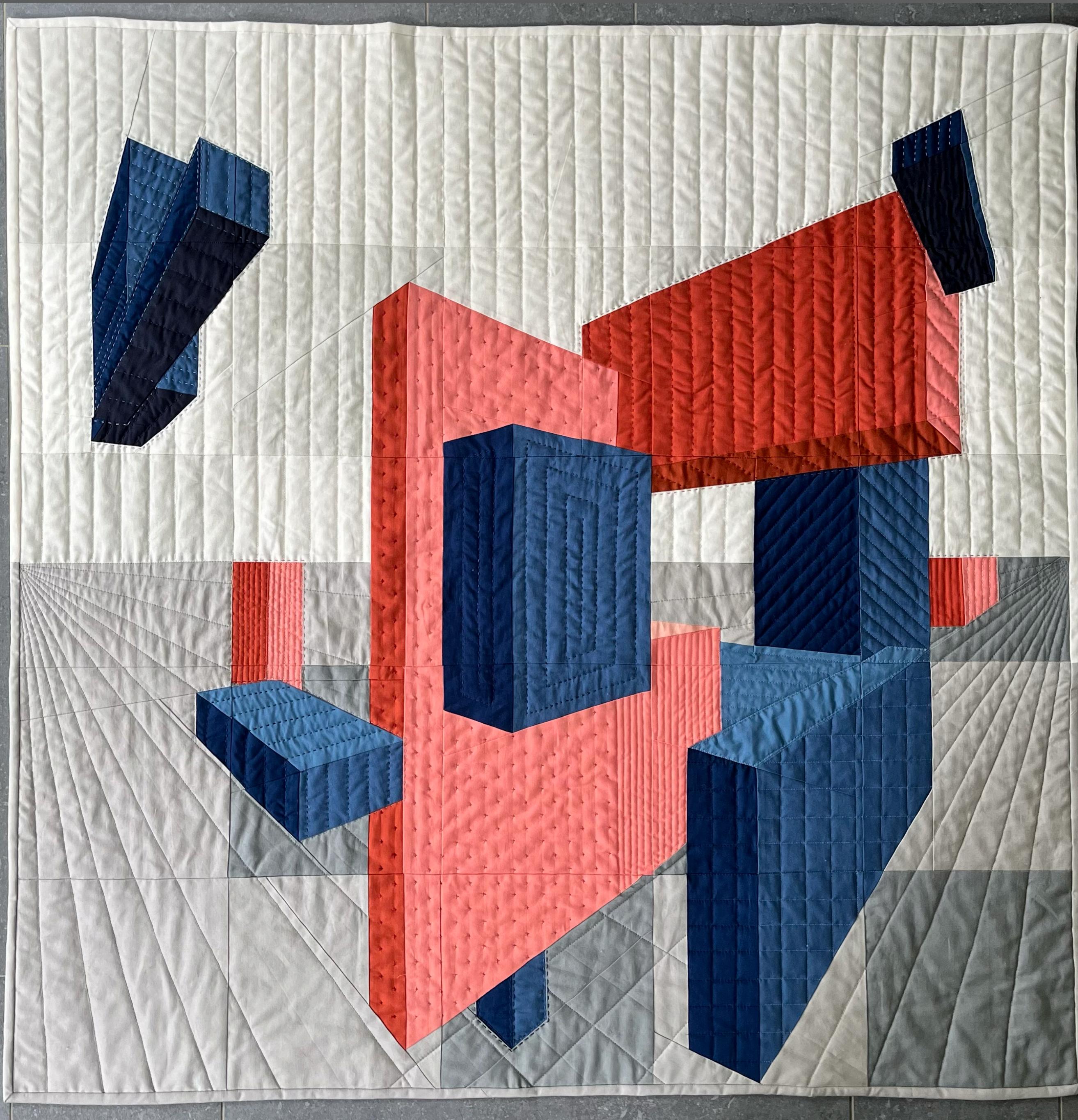


main ▾

- Commits on Jun 12, 2022
  - need to refactor and fix area calc**  
 awalsh17 committed 6 days ago
  - new ideas for photo to fpp. big mess to clean up**  
 awalsh17 committed 6 days ago
- Commits on May 22, 2022

Step 5

Share!



Landscape no. 1  
by Alice Walsh

## Step 6

Discover the real problem



Designing foundation paper blocks

Choosing fabric

Determining how much fabric



code-generated block pattern



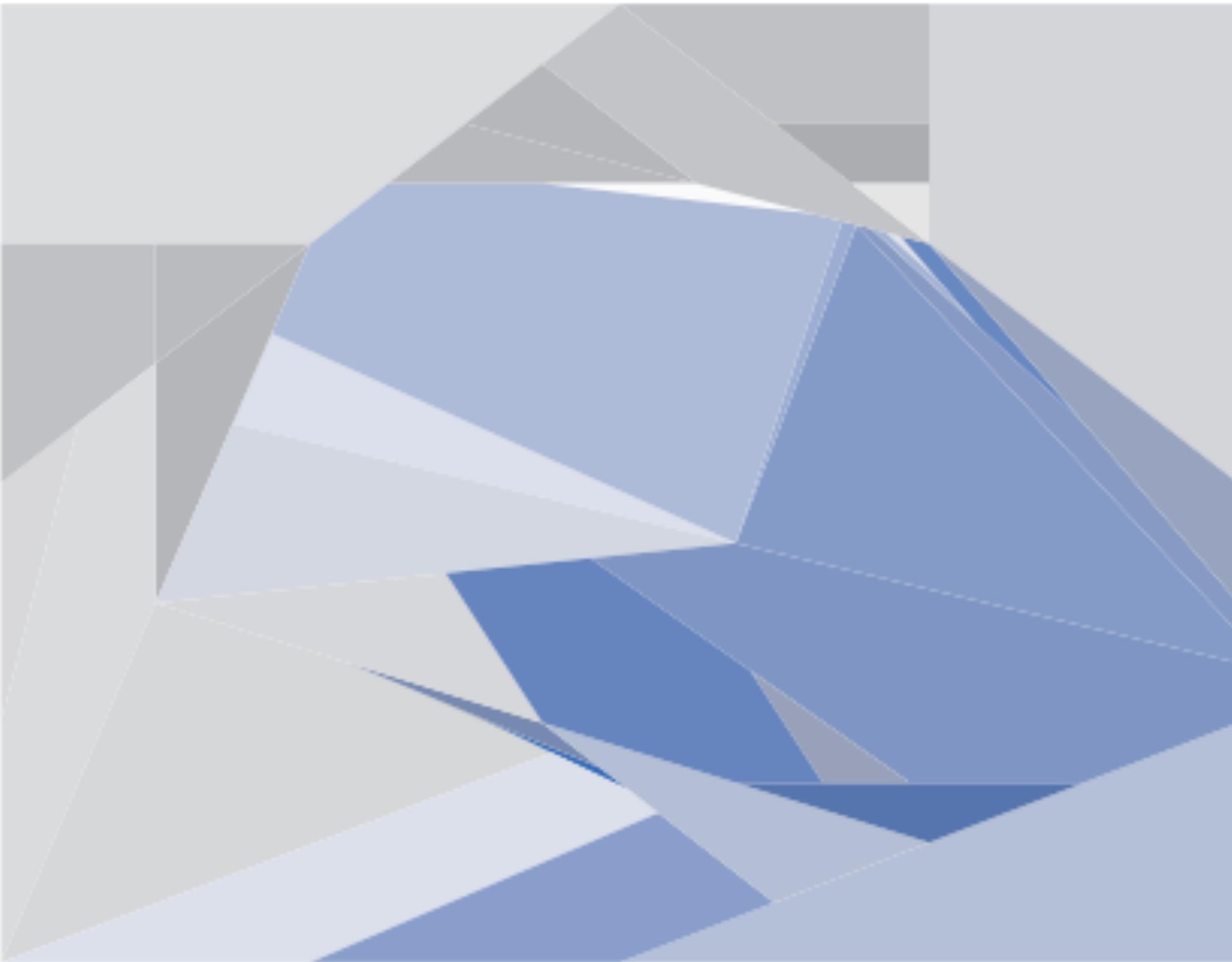


hand-generated FPP pattern

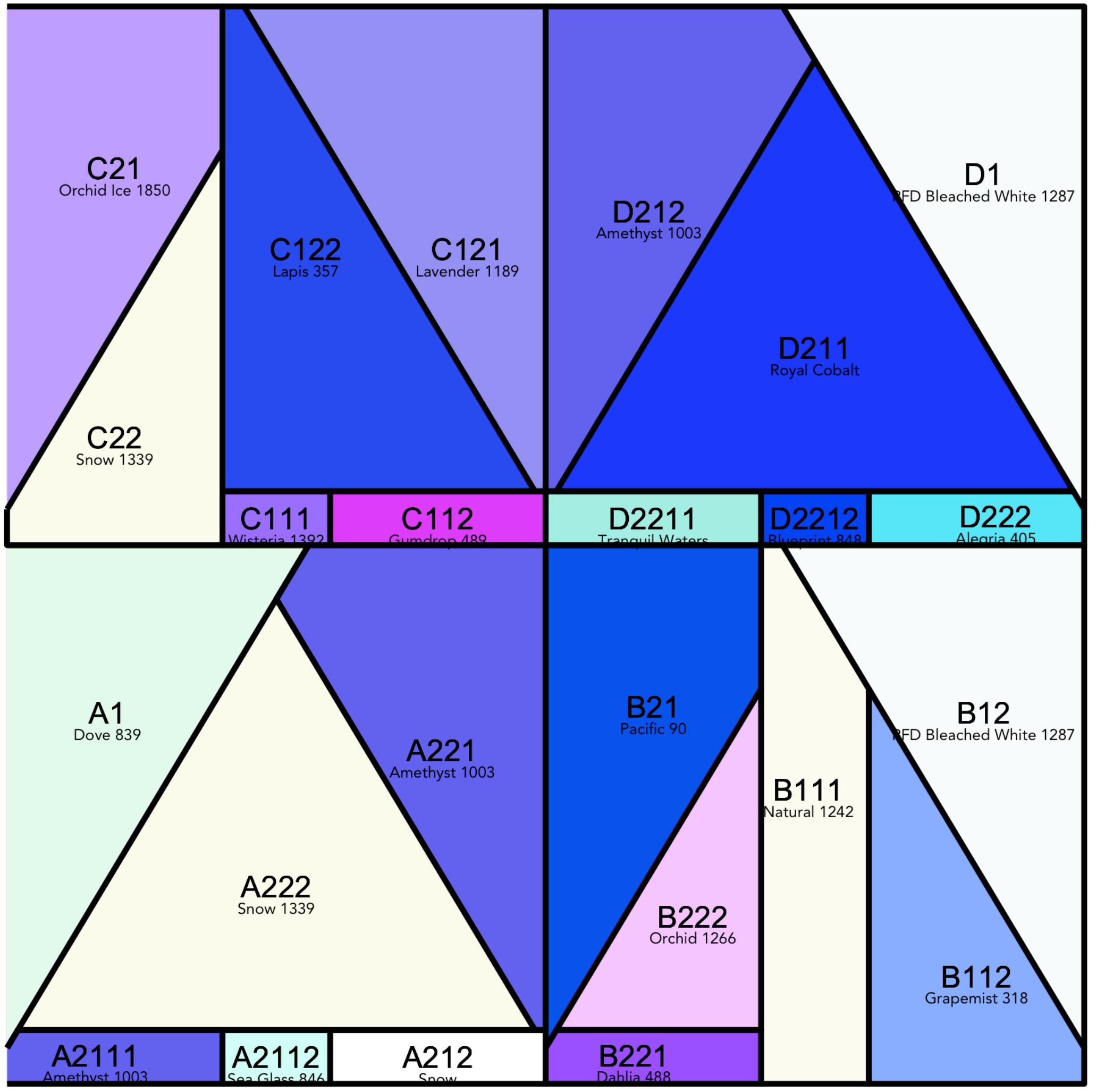




code-generated FPP pattern



code-generated FPP pattern with  
fabric choices



code-generated FPP self-portrait



1

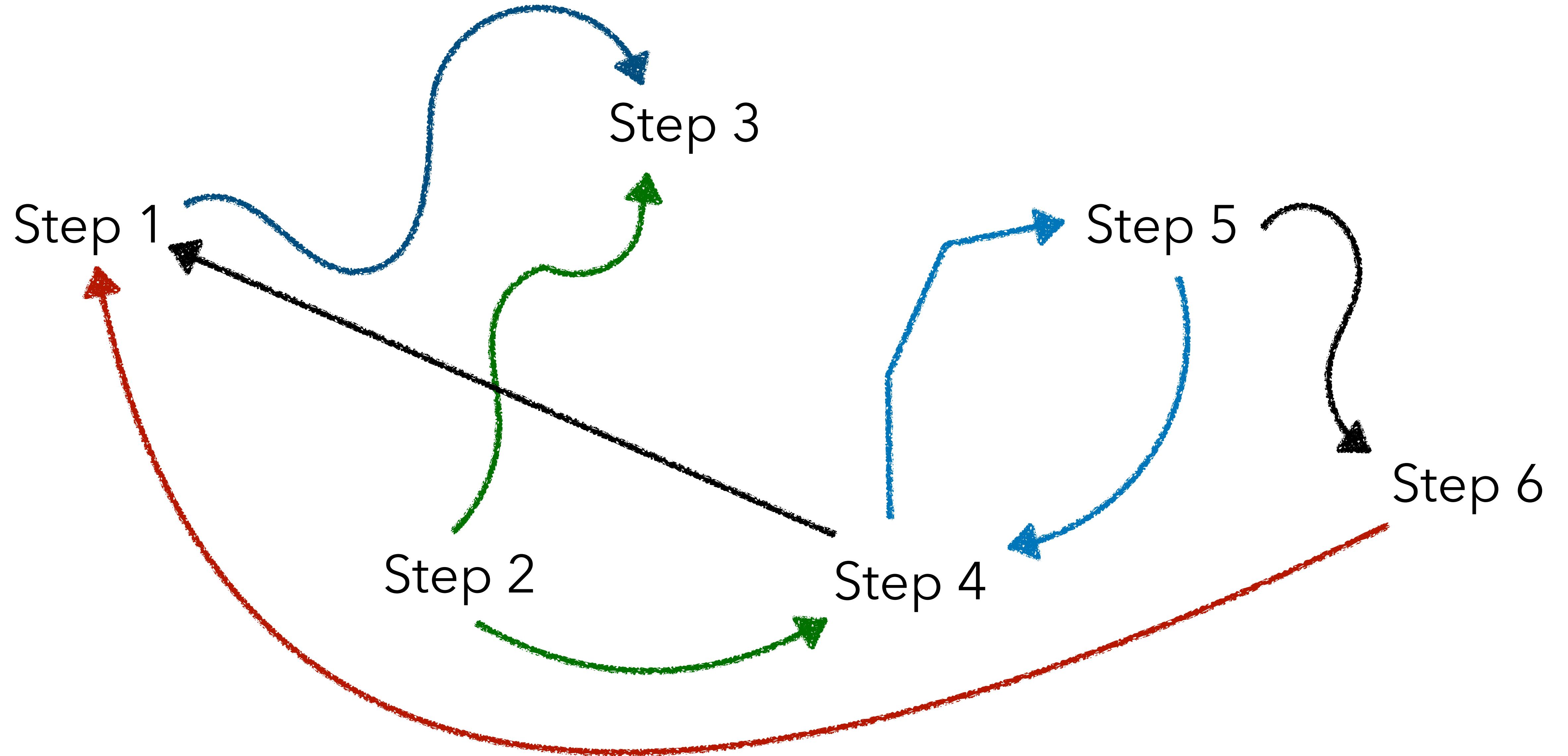
2

3

4

5

6



How to be  
more creative

Would you rather be  
a pizza delivery person?  
or  
a plumber?





Would you rather be  
a detective?  
or  
a criminal?



For the **detective** the crime is given,  
the **problem formulated...**

*Einstein and Infeld, The Evolution of Physics*

The **scientist** must  
[...] **commit his own**  
**crime**, as well as  
carry out the  
investigation



*Einstein and Infeld, The Evolution of Physics*

# How to be more creative

- Be a plumber
- Commit some (science) crimes
- Get exposure to new ideas
- Celebrate mistakes

# Sources and Inspiration

- *Explaining Creativity: The Science of Human Innovation* by Keith Sawyer
- *Zig Zag* by Keith Sawyer
- *Spark: How Creativity Works* by Julie Burnstein
- Stiny, George, and James Gips. "Shape grammars and the generative specification of painting and sculpture." *IFIP congress (2)*. Vol. 2. No. 3. 1971.
- Leake, Mackenzie, et al. "A mathematical foundation for foundation paper pieceable quilts." *ACM Trans. Graph.* 40.4 (2021): 65-1.
- Joe Szustakowski (pizza versus plumber metaphor)
- PAFA Continuing Education instructors: Fred Kaplan, Charles Muldowney, and Al Gury



Slides & code are available at [github.com/awalsh17/quiltR/](https://github.com/awalsh17/quiltR/)