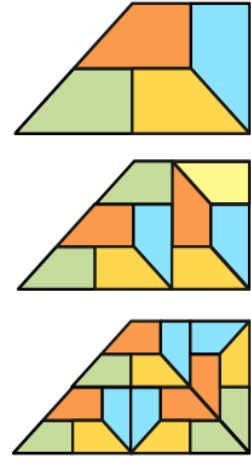


Reptiles

In the geometry field, a rep-tile or reptile is a (tessellating) shape that can be dissected into smaller copies of the same shape. The term was coined as a pun on animal reptiles by the American mathematician Solomon W. Golomb, who used it to describe self-replicating tilings. This subject has several areas that can be investigated;



Geometric shapes / colours

Some of the simpler forms can be folded very easily. Where your aim is primarily to investigate the shapes, this allows the required folding skills to be minimal. The folded shapes could be cut out to create single layer versions. You can control which colours are used and look at the different possible arrangements. The arrangements of units can produce many variations, the students could try and sketch the more interesting ones. Through trigonometry, you also can study at the angles and length of sides involved in each shape. Since the shape can be replicated using more “units”, students could see if there was a way to predict how many units are needed for each iteration?

Folding at a basic level

Depending on the folding ability of the students, you can create more “finished” models, where the “raw” edges of the paper are folding inwards to create a smooth edge and where the layers interlock to produce a “solid” result. The models could be taught, or handed out / displayed as instructions; The students should have access to a reference sheet explaining the symbols that are used.

Some of the shapes (#1 square, #2 a 2x1 rectangle) are too simple to provide a real challenge to most students. For #3, creating an angle of 45 degrees is simple – fold a corner in half. Two methods of folding this are shown, one slightly harder than the other. Many other methods can be found. One aim might be to make the largest possible shape from a given square, then comparing how “satisfying” each one is and why? The shapes can be arranged to produce many different patterns. If you slot them into each other, you can make a star (use glue).

More advanced folding

Student should be show one example of the many possible way to fold a given shape. Then they can be asked to create an alternative solution, individually or in (small) groups. Groups should be chosen and monitored to ensure that no one student dominates the creative process.

#4 and #5 require 60 degree geometry, which is quite easy to locate using origami using the technique shown. A further challenge would be to create a reptile from scratch, For this I recommend reptile #6. The student will hopefully identify that the shape is half that of #5 and so a (thicker) solution can be found quite quickly. #7 requires more advanced folding skills, unless you use two sheets of paper, for example, two 2x1 rectangles tucked into one another. #5 can also be folded into 3D shapes by adding the two “missing” creases.

A rep-tile dissection using different sizes of the original shape is called an irregular rep-tile or irreptile. Rep-tiles can be used to create fractals, or shapes that are self-similar at smaller and smaller scales. A rep-tile fractal is formed by subdividing the rep-tile, removing one or more copies of the subdivided shape, and then continuing recursively. More about this and further reference can be found here <https://en.wikipedia.org/wiki/Rep-tile>

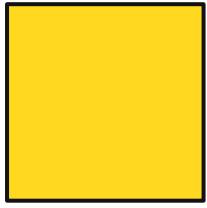
Nick Robinson

nick@12testing.net
www.origami.me.uk

Prepared for the Folding Diadactics Conference in Freiburg, October 2017

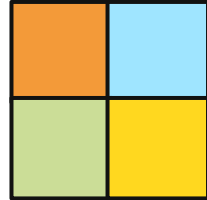
Reptile examples

Too easy?

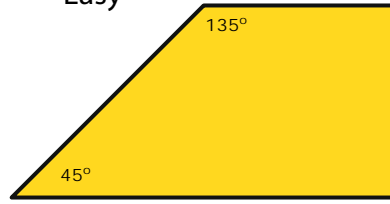


#1

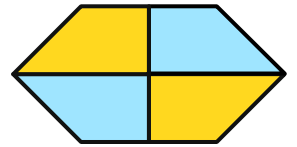
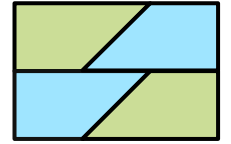
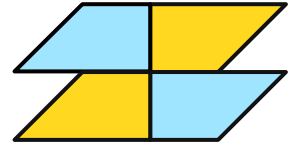
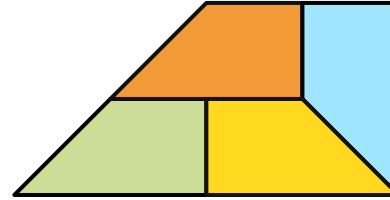
#2



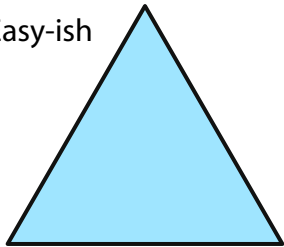
Easy



#3



Easy-ish

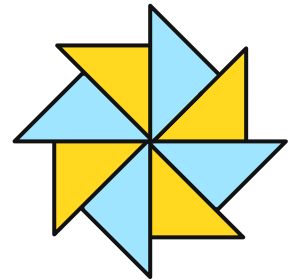
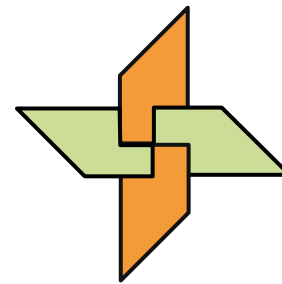
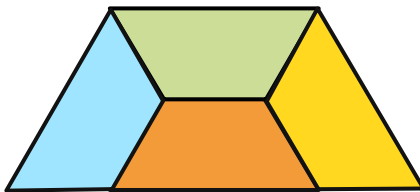
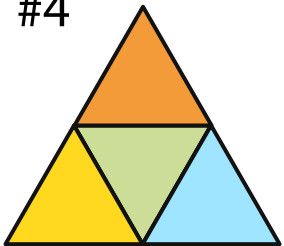


Harder

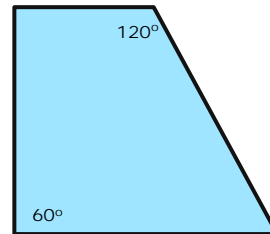


#4

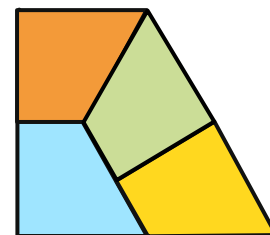
#5



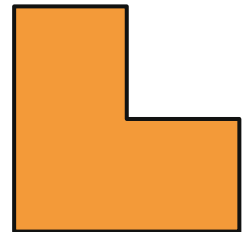
Tricky!



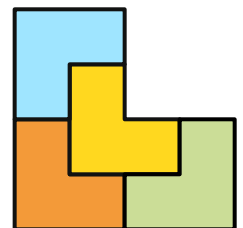
#6



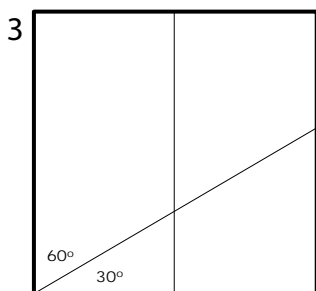
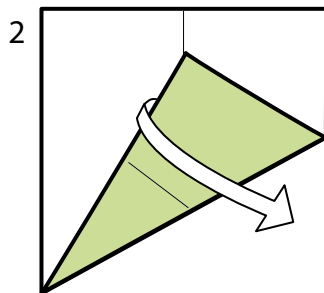
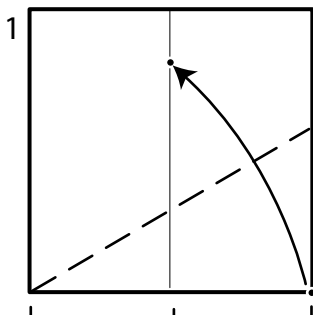
Very tricky!



#7



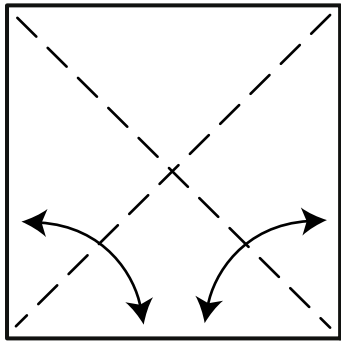
Finding 60 degrees



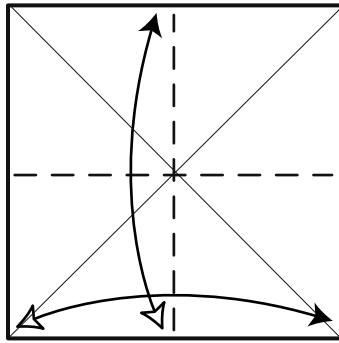
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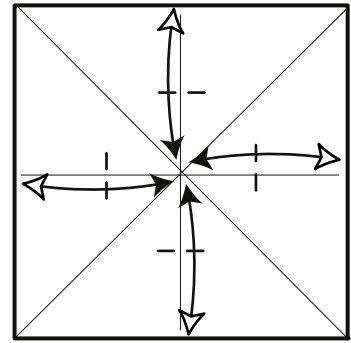
1.5 square Reptile # 1



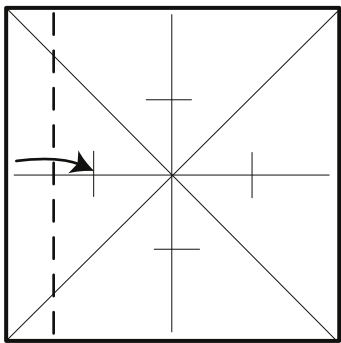
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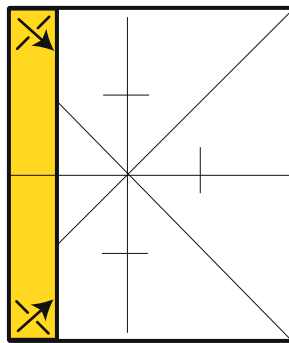
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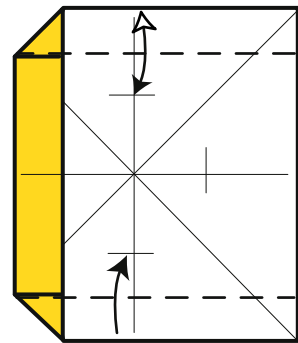
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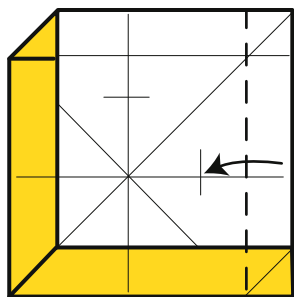
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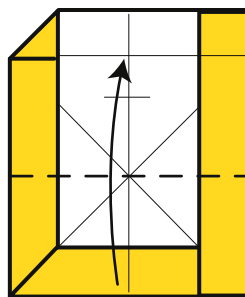
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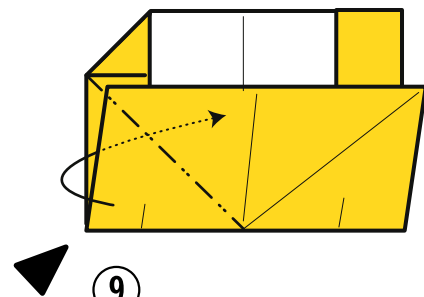
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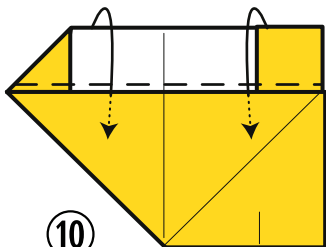
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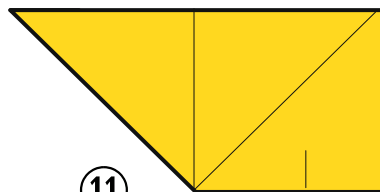
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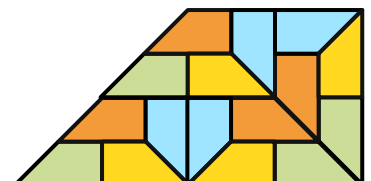
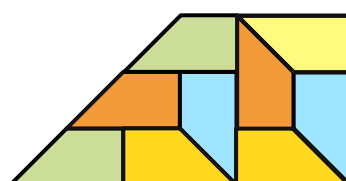
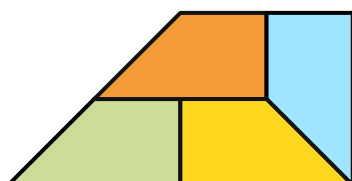
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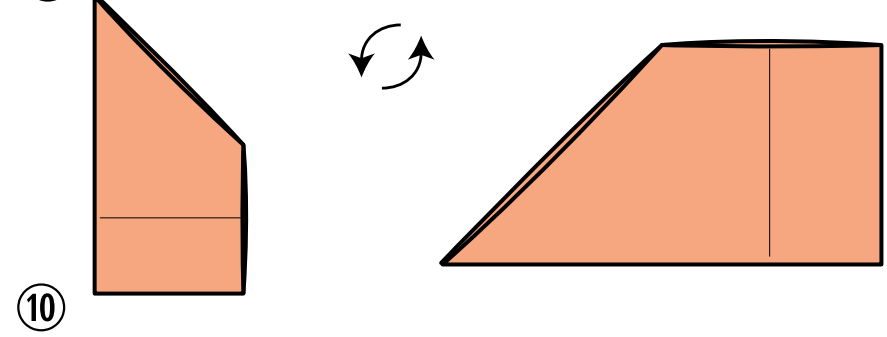
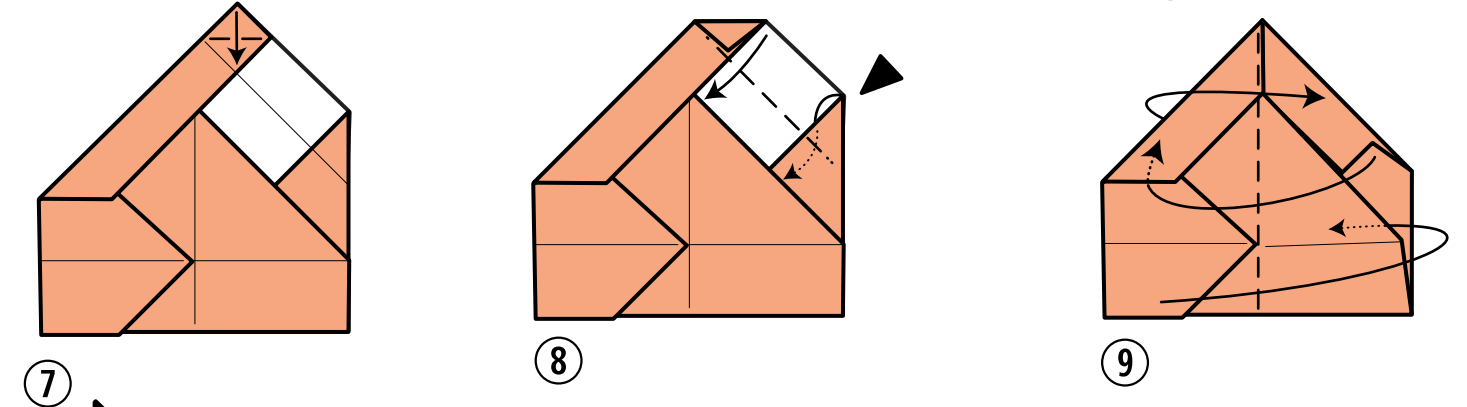
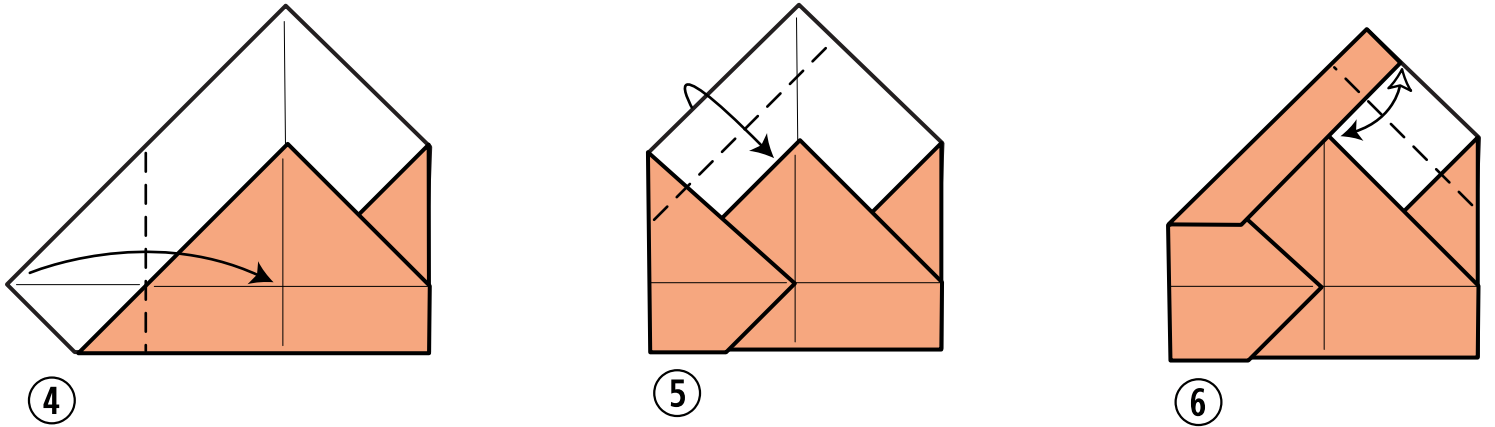
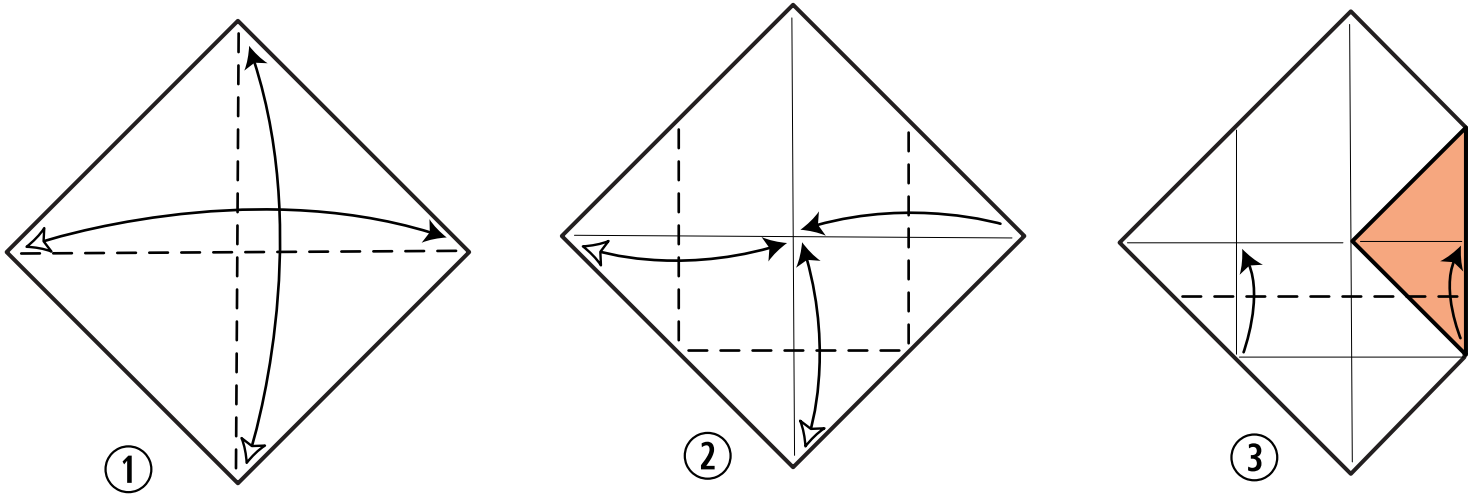
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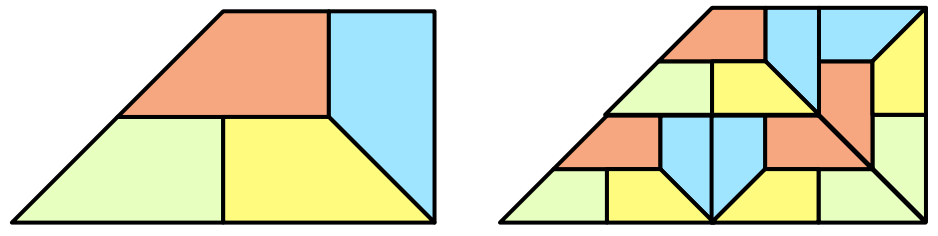
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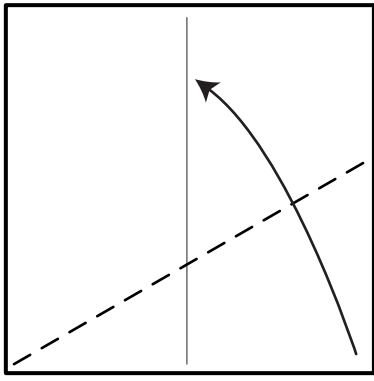
1.5 square Reptile #2



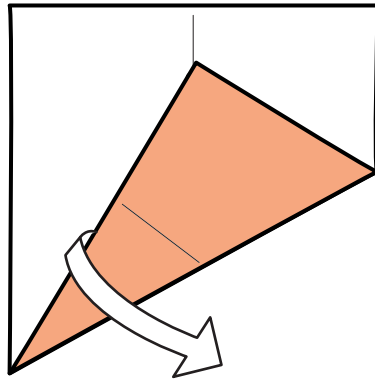
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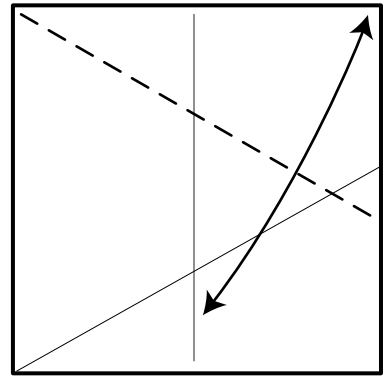
half-hexagon reptile



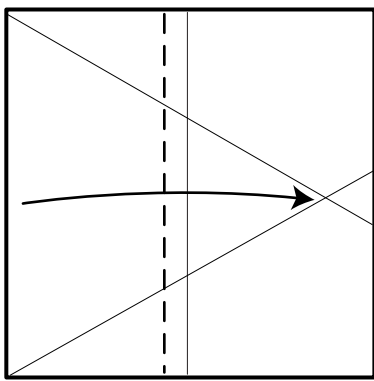
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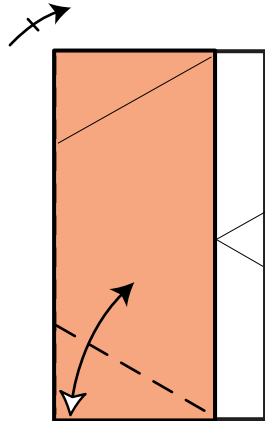
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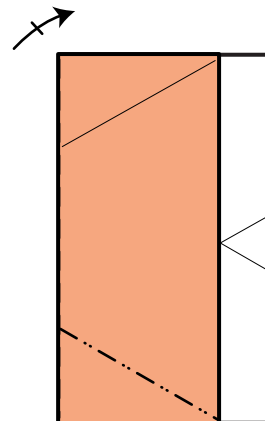
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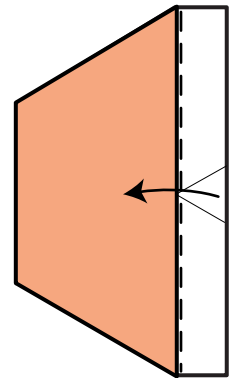
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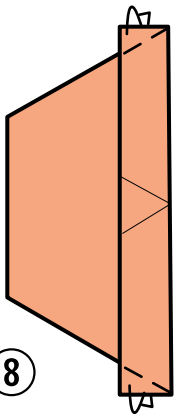
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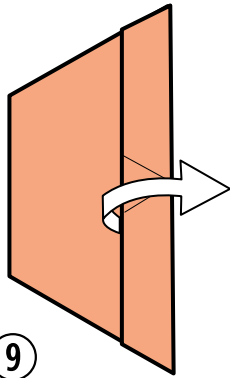
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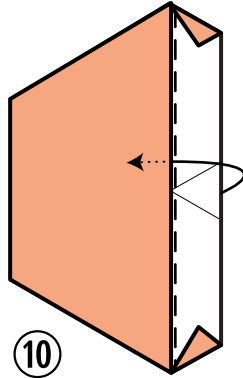
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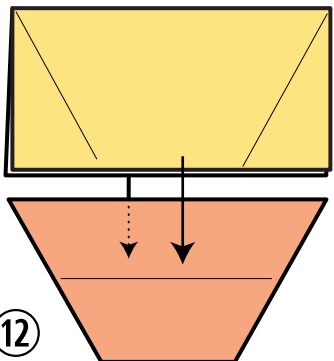
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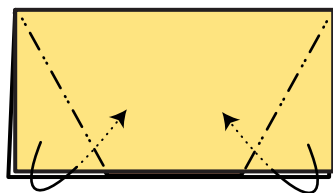
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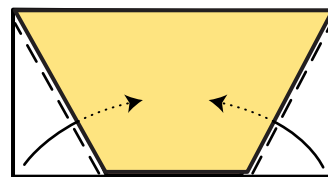
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⑬



⑭

