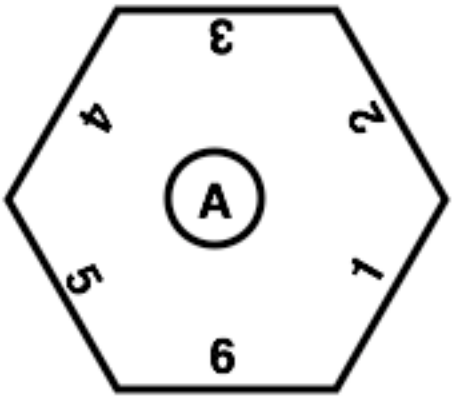
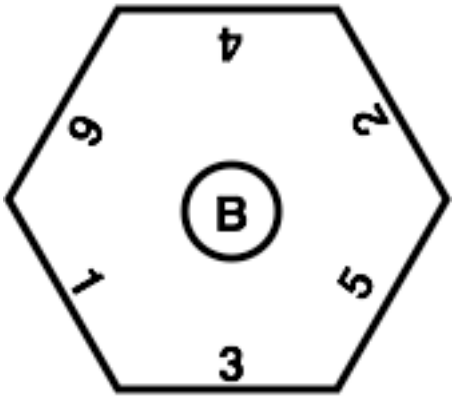
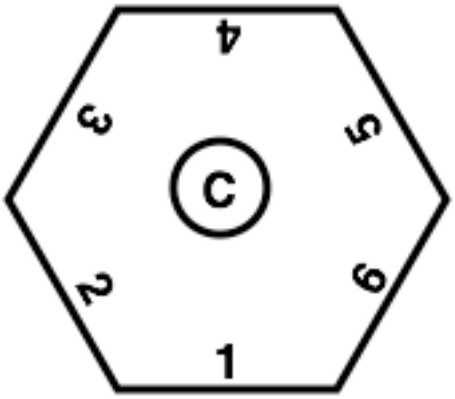
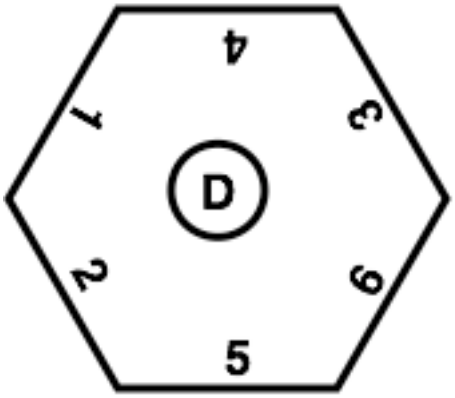
The Hexagon Puzzle

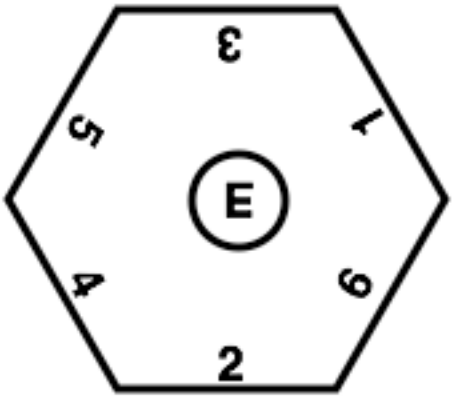
Cut Out the 7 hexagons below

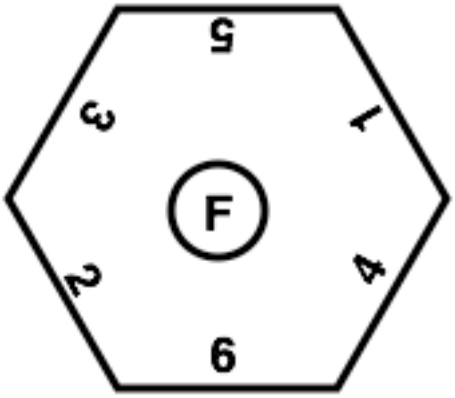


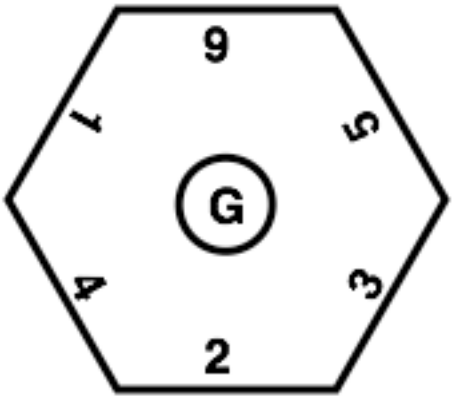




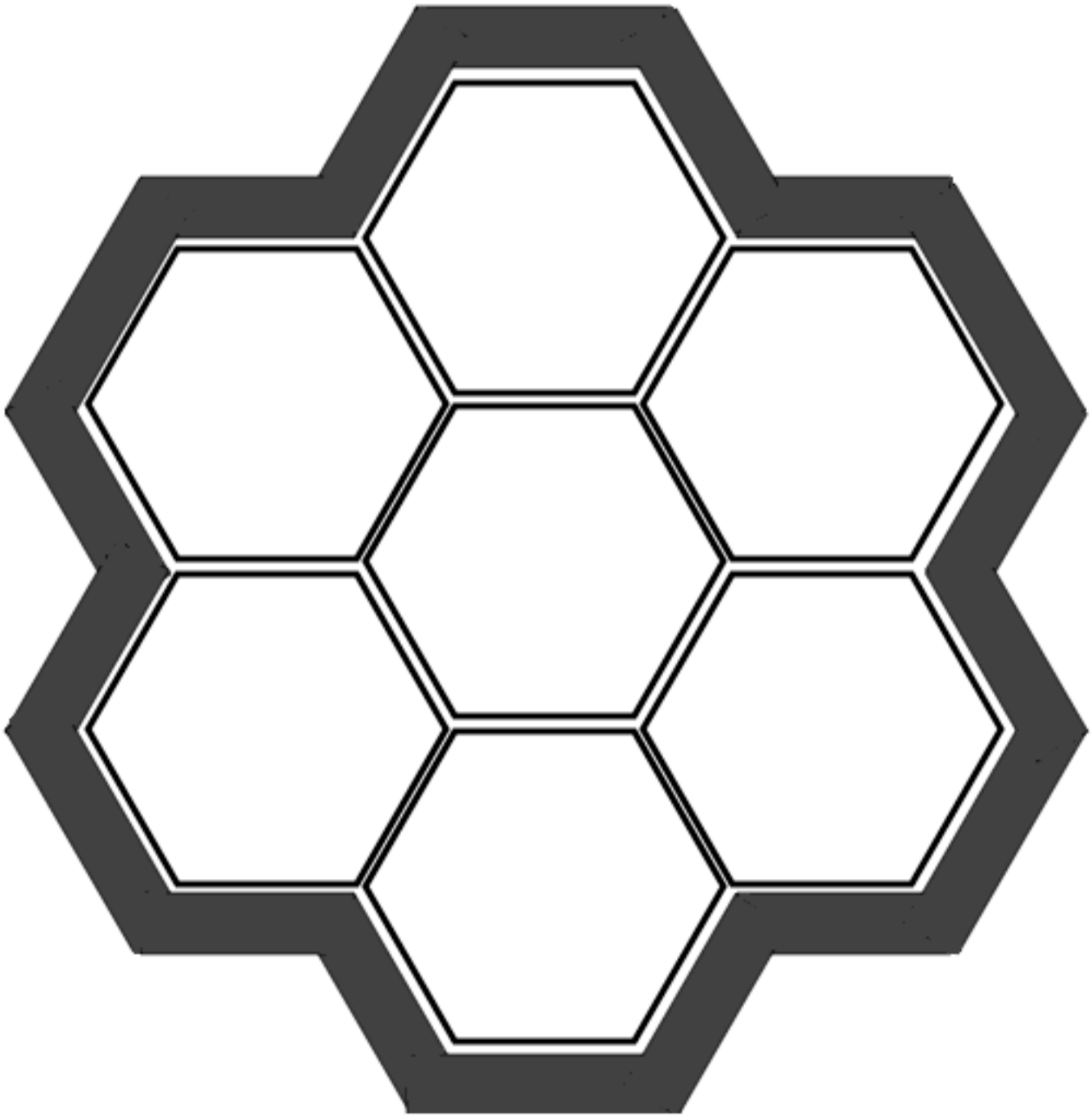






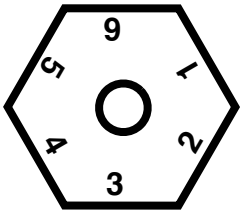


Cut out around the outside of the frame below

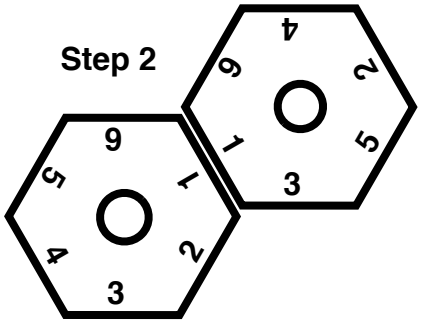


The Hexagon Puzzle

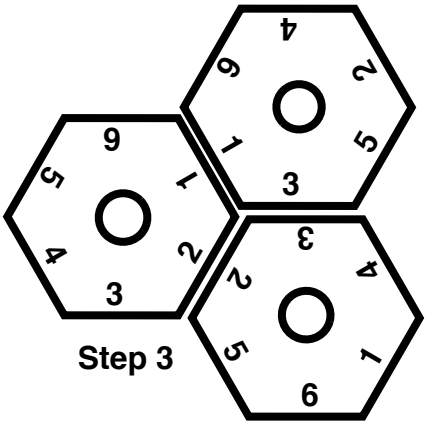
The puzzle consists of 7 hexagons with the numbers 1-6 on the edges of each hexagon. Cut out the 7 hexagon pieces. Place one the seven hexagons in the center. Place the other 6 hexagons around the center hexagon so that the numbers on the edges of the outside hexagons match the numbers on the edges of the adjoining hexagons. That is, if one edge of a hexagon has a 4 the edge of the adjoining hexagon also has a 4. The picture below shows an example of the required steps.



1. Pick one hexagon to be in the center.



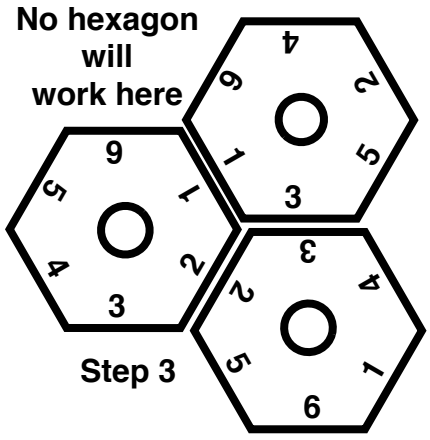
2. Place a second hexagon so the numbers on the edges where the 2 hexagons meet have matching numbers. The 1's match.



3. Place a 3rd hexagon so the numbers on the edges where the 3 hexagons meet have matching numbers. on the The 2's match and the 3's match

4. Keep adding hexagon on the outsides until all 6 hexagons have been placed and all the edges where the hexagons touch have matching numbers.

If you cannot find a hexagon that works then you must start over and try again. Use different tiles with the same center or start with a different center



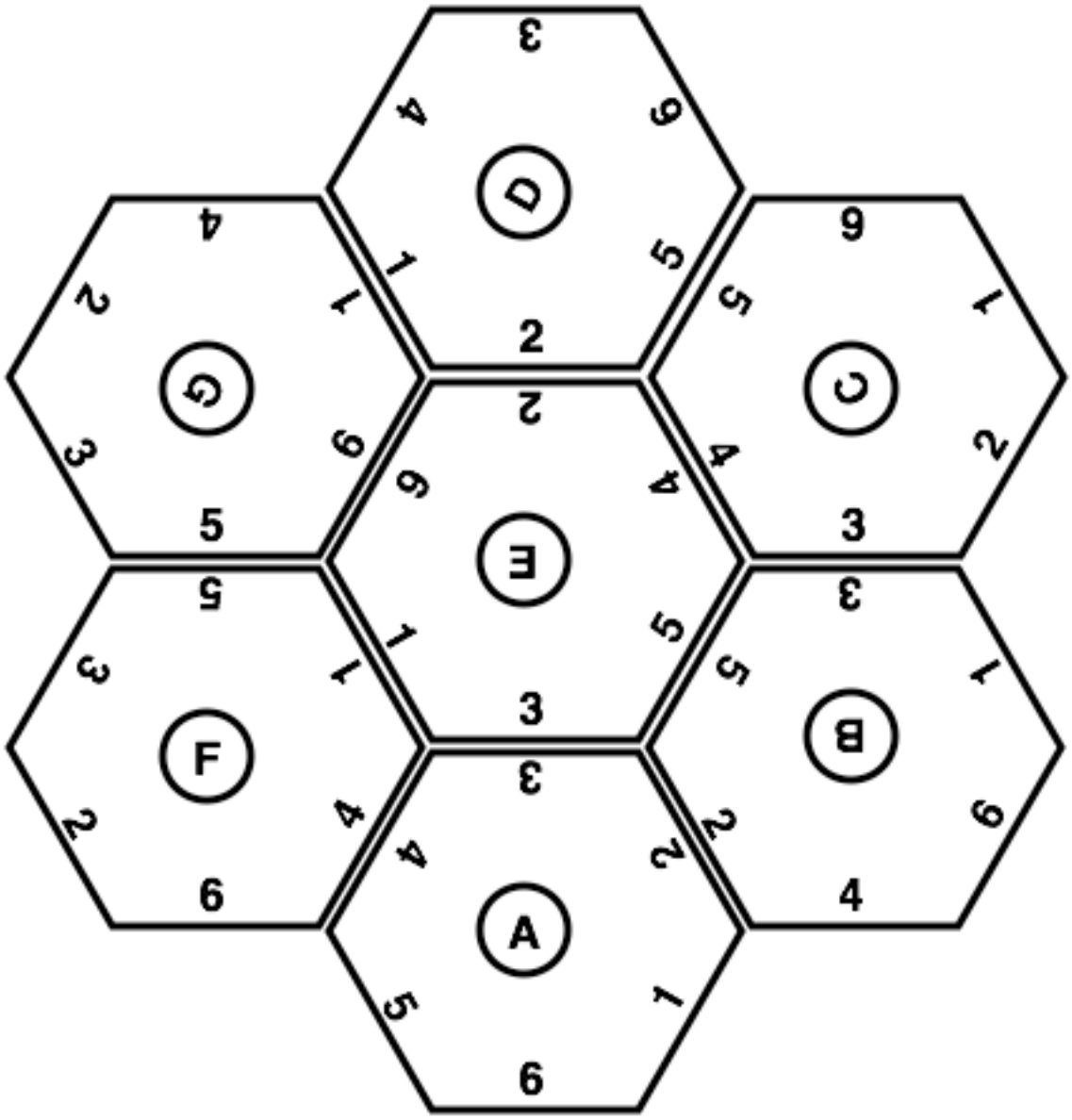
There is only 1 hexagon that will work in the center. The position of the 6 remaining hexagons are fixed when you put the correct hexagon in the center. There are 6 positions the correct center hexagon can be placed in so there are 6 solutions that are rotations of each other.

Hexagon Solution

There is only 1 hexagon that will work in the center. The position of the 6 remaining hexagons are fixed when you put the correct hexagon in the center. There are 6 positions the correct center hexagon can be placed in so there are 6 solutions that are rotations of each other.

The solution below has the center hexagon E placed with the 2 edge at the top. This fixes the other 6 in the position shown. If you placed the E hexagon with a different number at the top the solution would be a rotation of the solution shown.

Hexagon Solution



The puzzle consists of 7 hexagons and all the pieces must be aligned so that each number is adjacent to the same number on the next piece. The puzzle has ~1.4G non-unique **possible solutions:**

The following python code generates these **possible solutions:**

```
def rotations(p):
    for i in range(len(p)):
        yield p[i:] + p[:i]
def permutations(l):
    if len(l)<=1:
        yield l
    else:
        for perm in permutations(l[1:]):
            for i in range(len(perm)+1):
                yield perm[:i] + l[0:1] + perm[i:]
def constructs(l):
    for p in permutations(l):
        for c in product(*(rotations(x) for x in p)):
            yield c
```

However, note that the puzzle has only ~0.2G unique possible solutions, as you must divide the total number of possibilities by 6 since each possible solution is equivalent to 5 other solutions (simply rotate the entire puzzle by 1/6 a turn).

Is there a better way to generate only the unique possibilities for this puzzle?

We have seven choices for the centre piece. Then we have 6 choices for the piece above that but its orientation is fixed, as its bottom edge must match the top edge of the centre piece, and similarly whenever we choose a piece to go in a slot, the orientation is fixed.

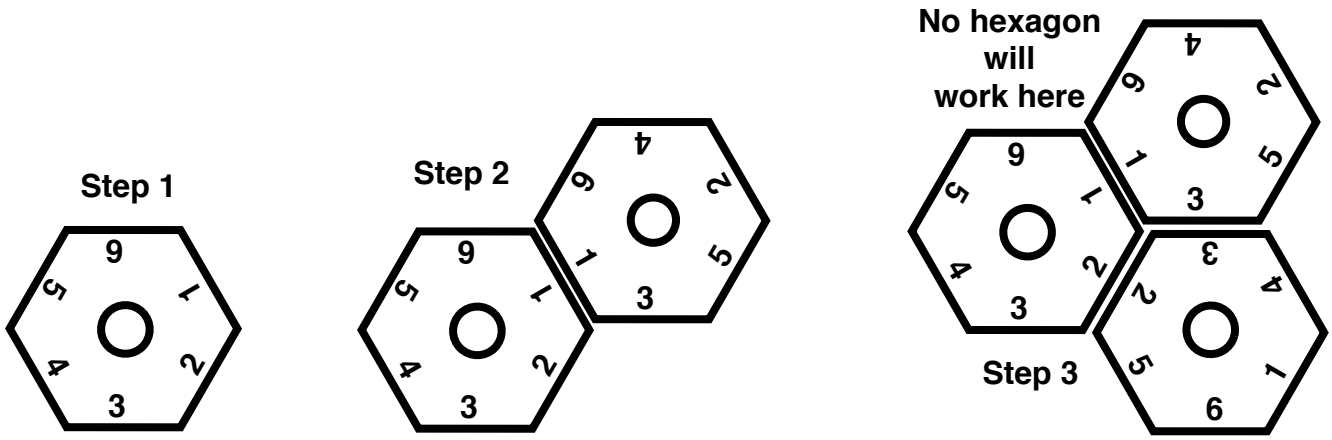
There are fewer choices for the remaining pieces. Suppose for example we had chosen the centre piece and top piece as in the picture; then the top right piece must have (clockwise) consecutive edges (5,3) to match the pieces in place, and only three of the pieces have such a pair of edges (and in fact we've already chosen one of them as the centre piece).

One could first build a table with a list of pieces for each edge pair, and then for each of the 42 choices of centre and top proceed clockwise, choosing only among the pieces that have the required pair of edges (to match the centre piece and the previously placed piece) and backtracking if there are no such piece.

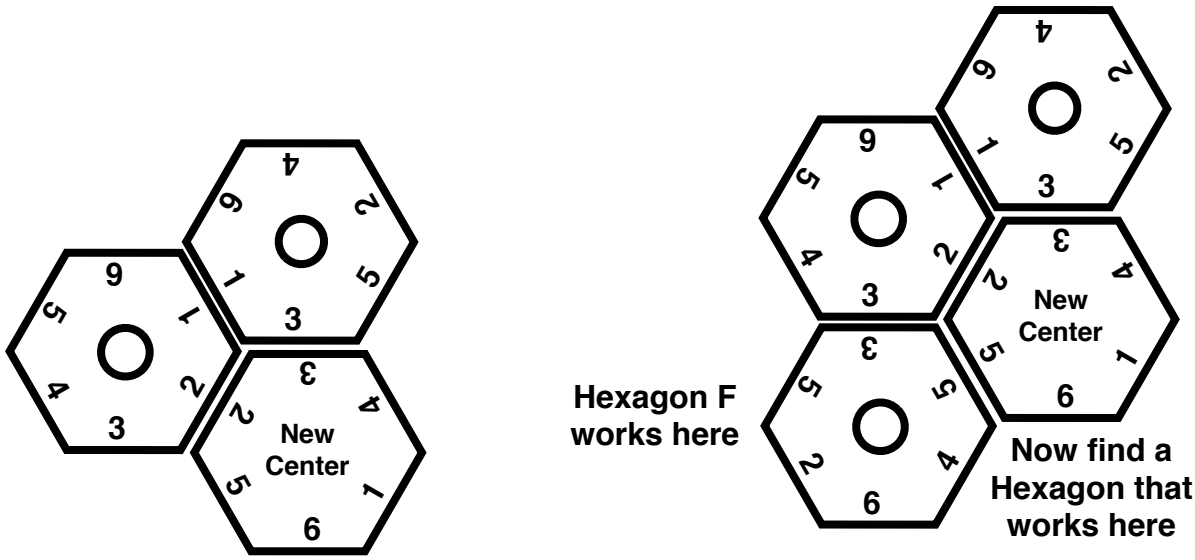
The most common pair of edges is (1,6) which occurs on 4 pieces, two other edge pairs ((6,5) and (5,3)) occur on 3 pieces, there are 9 edge pairs that occur on two pieces, 14 that occur on 1 piece and 4 that don't occur at all. So a very pessimistic estimate of the number of choices we must make is 7*6*4*3*3*2 or 3024.

Work the puzzle without the frame if you can.

The frame can make it harder to find the solution. In the picture below the center was selected. After adding 2 hexagons the next hexagon to add would need two 6's on the edge of a single hexagon. There is no hexagon that meets this requirement. You must try another arraignment.



If the frame is not used then you can just call the lower hexagon the new center and try to find a hexagon with a 3 and 5 that would fit to the left of the new center. You find one with a 5 and 3 and place it in the lower left opening.

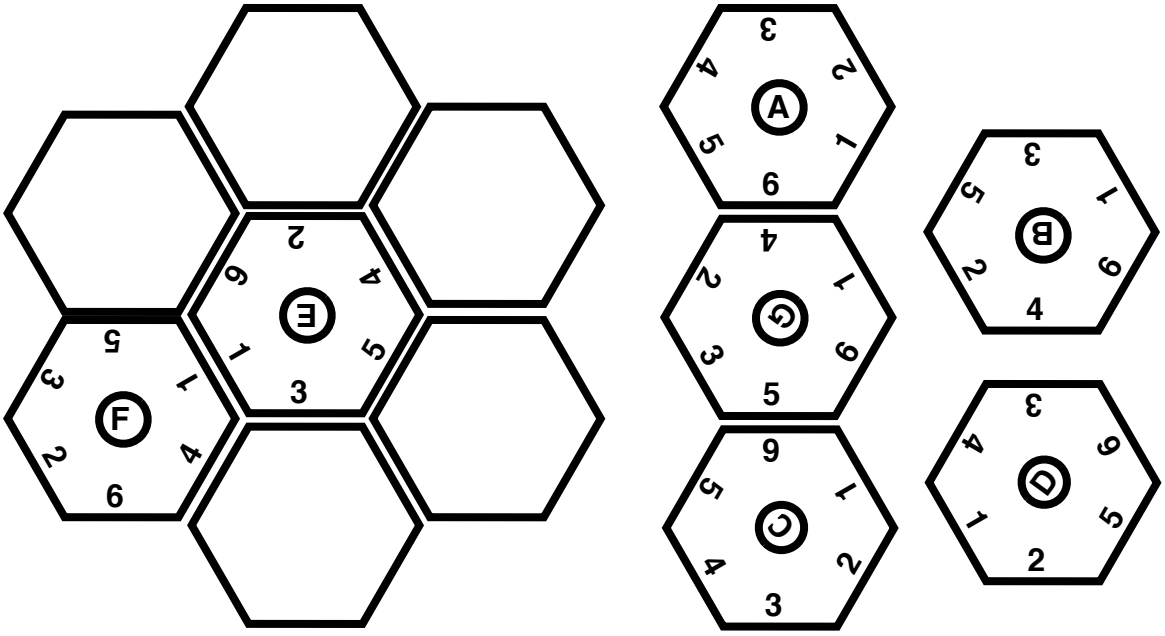


Now look for a hexagon with a 4 and 6 that will fit in the lower space below the center. When you find that there are no hexagons that will complete the puzzle you must start over with a new center hexagon or a different arraignment of hexagons around the center hexagon you are using.

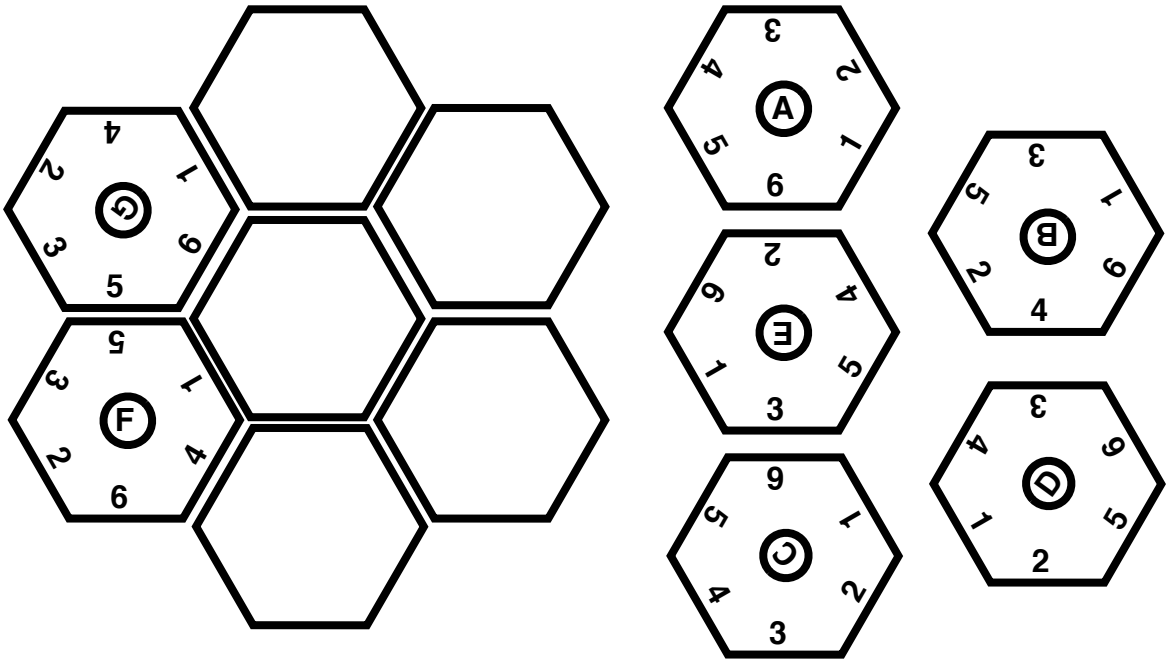
How to make this a puzzle you students can do.

It is clear that this a very difficult puzzle to solve. Almost every student will not be able to solve it and stop trying. This is too bad, as many skills can be gained if you just help the students with a hint at the beginning.

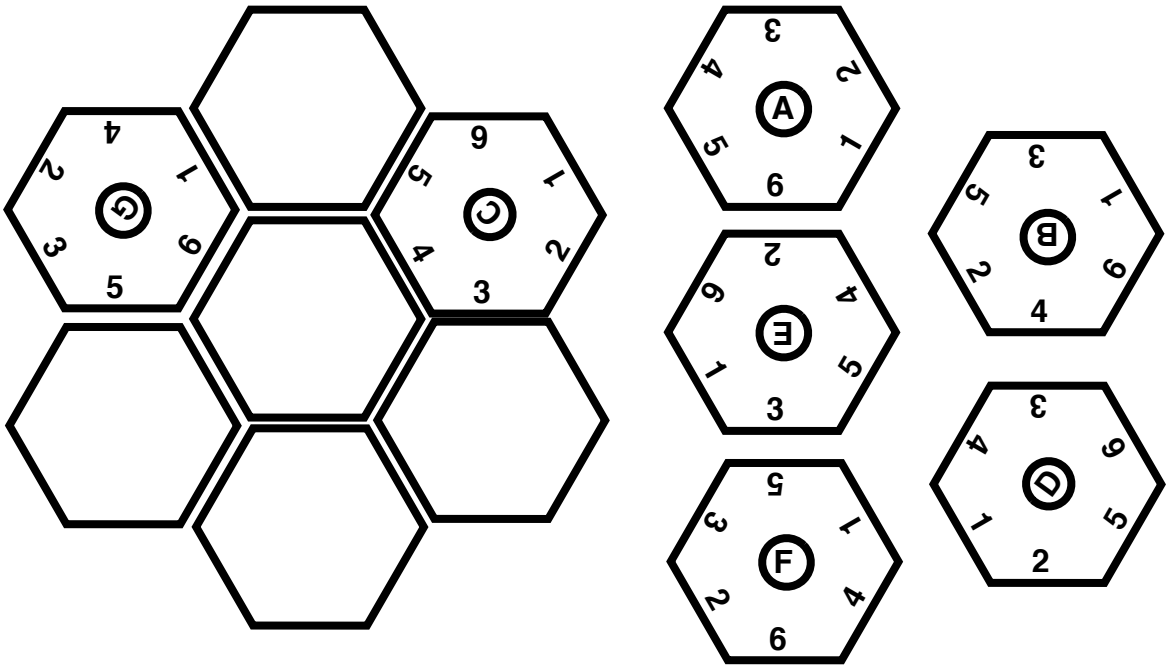
1. Use the solution provided and fix the **center piece E** and and 1 additional piece for them. The student must find the locations of the other 5 hexagons. **Easy Solution**



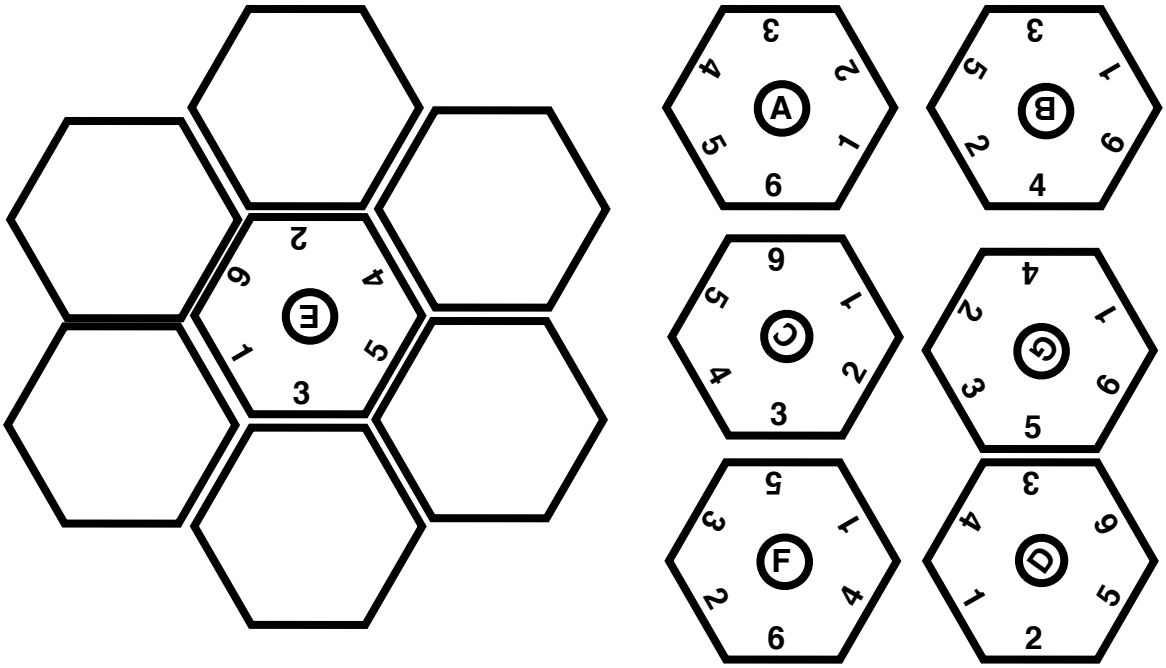
2. Use the solution provided and fix any 2 adjacent hexagon that are on the outside ring. The student must find the locations of the other 5 hexagons. **Easy Solution**



4. Use the solution provided and fix any 2 hexagon on the outside ring that are NOT adjacent piece. The student must find the locations of the other 5 hexagons. **Easy Solution**

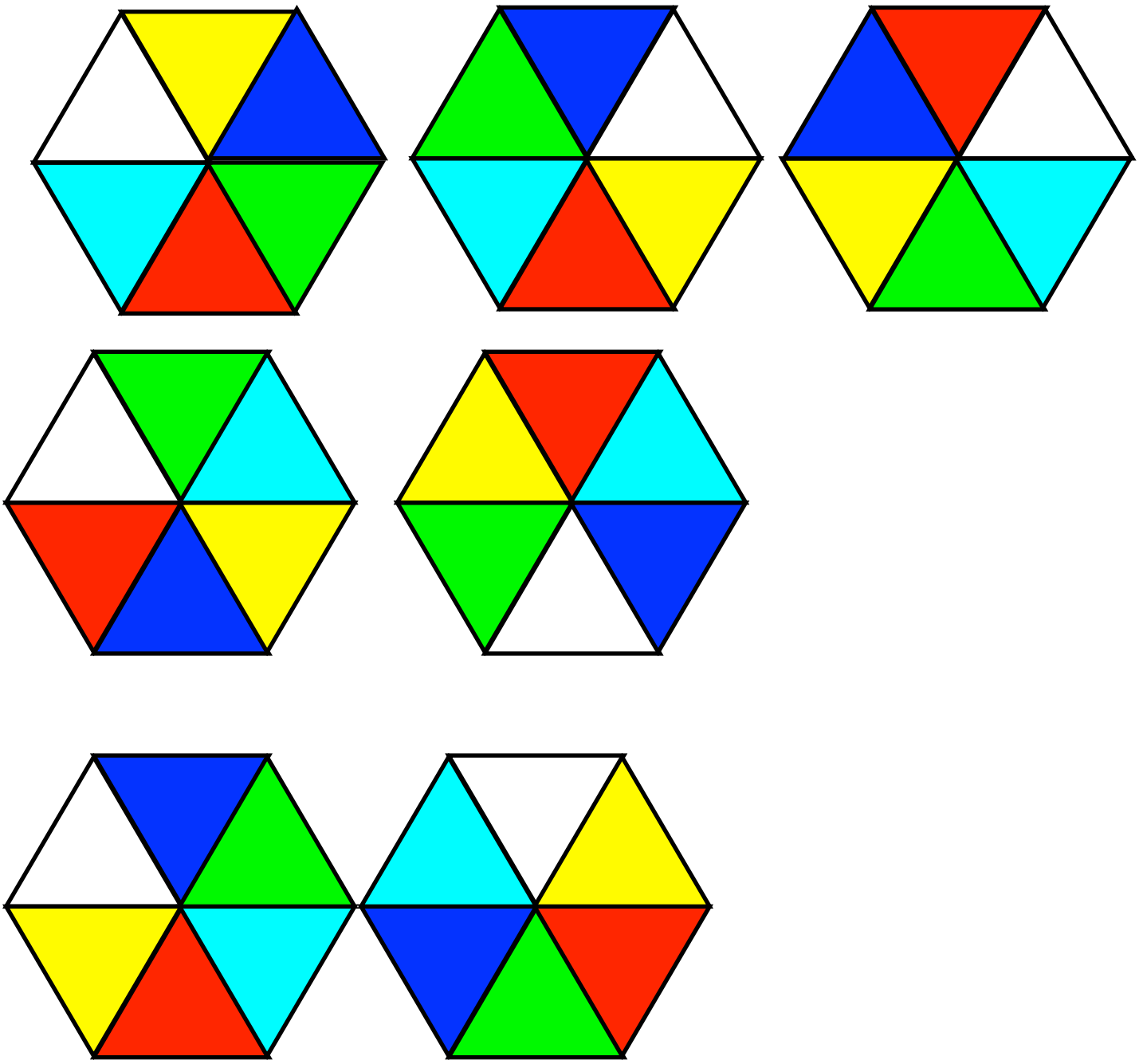


5. Fix the center piece E. The student must find the locations of the other 6 hexagons. **Harder Solution**.

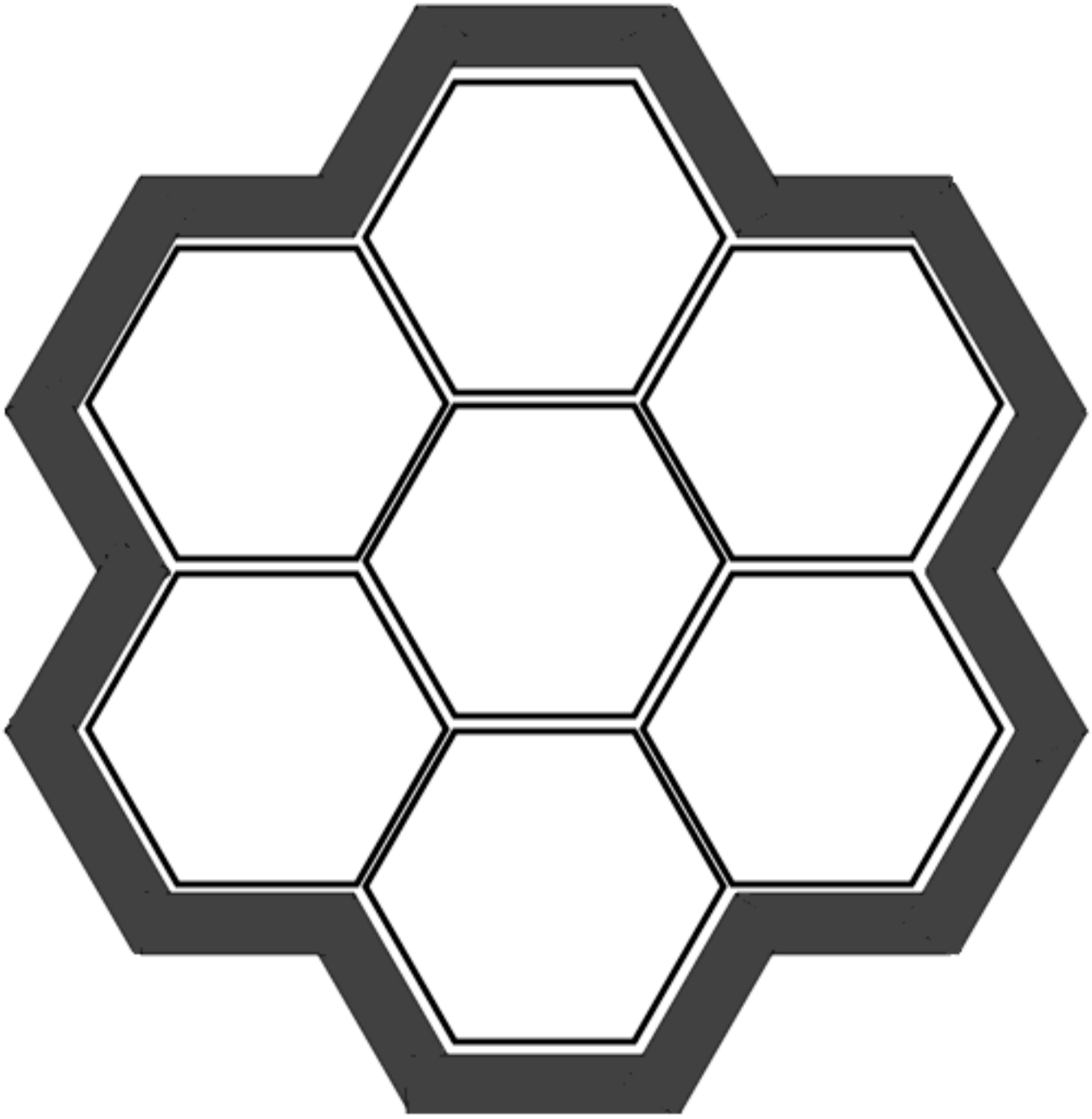


The Hexagon Puzzle

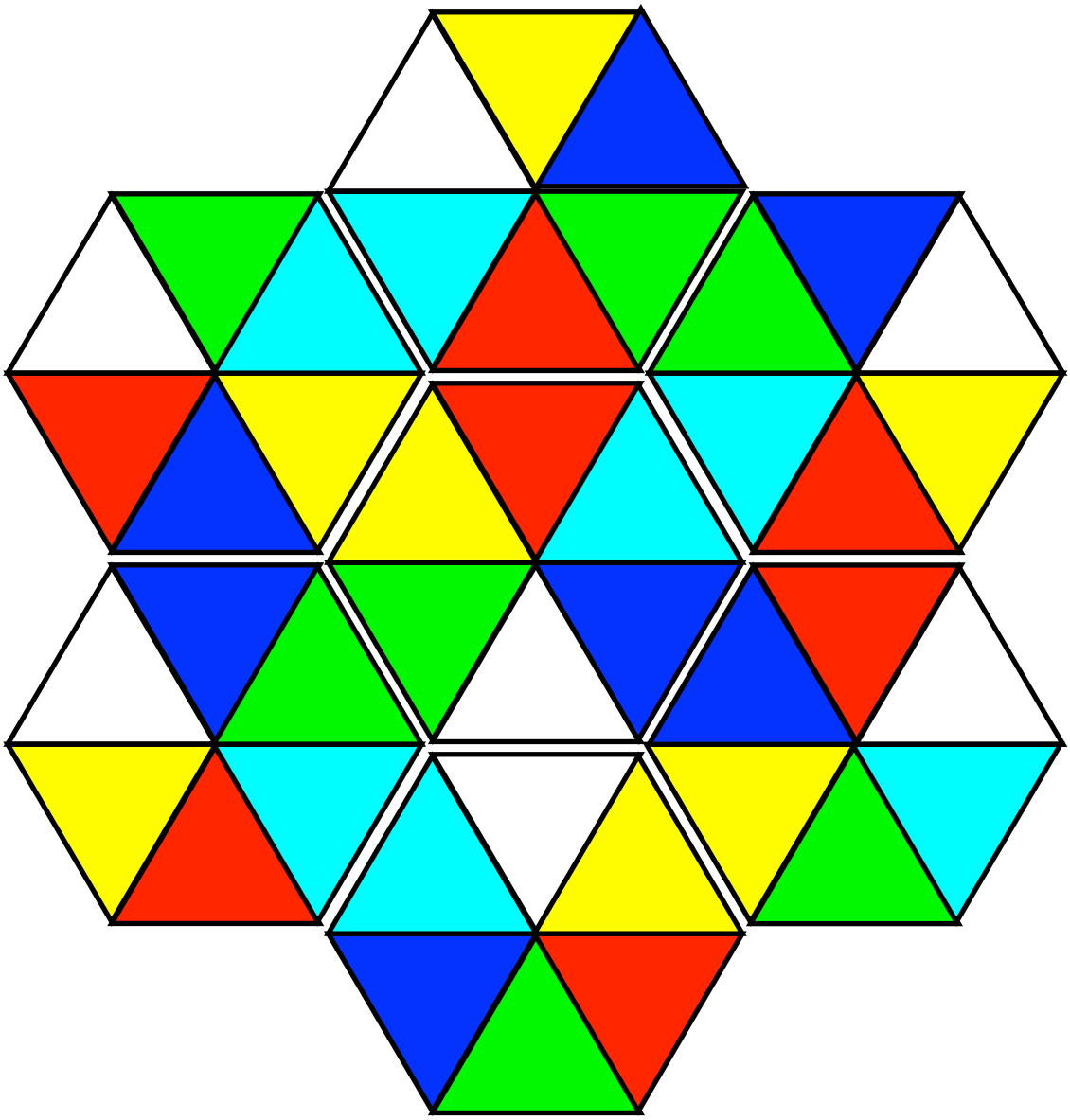
Cut Out the 7 hexagons below



Cut out Around the outside of the frame below



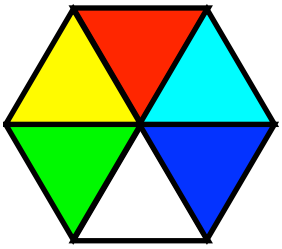
Hexagon Solution



The Hexagon Puzzle

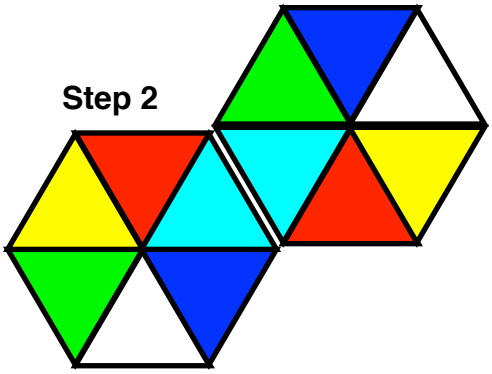
The puzzle consists of 7 hexagons. Each hexagon a 6 colored triangles inside. The 6 outside edges of each hexagon are colored white, yellow, dark blue, red or light blue. Cut out the 7 hexagon pieces. Place one the seven hexagons in the center. Place the other 6 hexagons around the center hexagon so that the colors on the edges of the outside hexagons match the colors on the edges of the adjoining hexagons. That is, if one edge of a hexagon is red then the edge of the adjoining hexagon must also be red. The picture below shows an example of the required steps.

Step 1

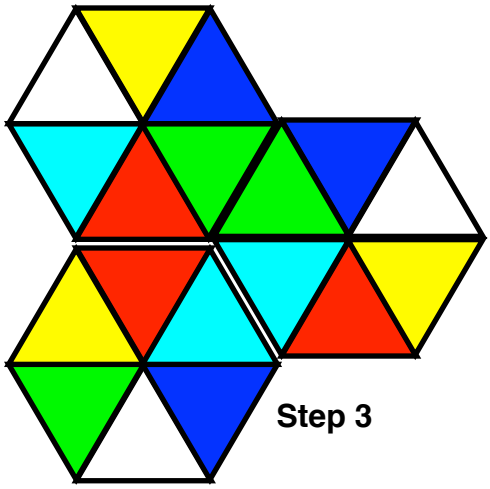


Pick one hexagon to be in the center.

Step 2



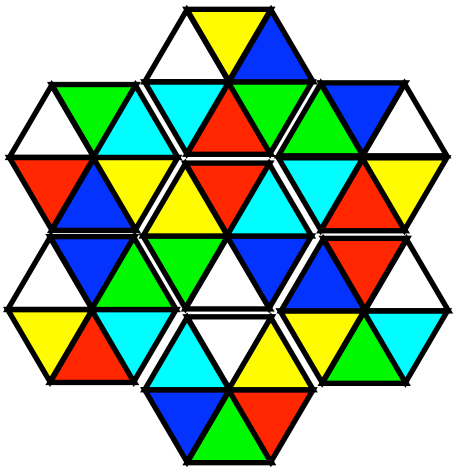
Place a second hexagon so the colors on the edges where the 2 hexagons meet have matching colors. The light blue's match.



Step 3

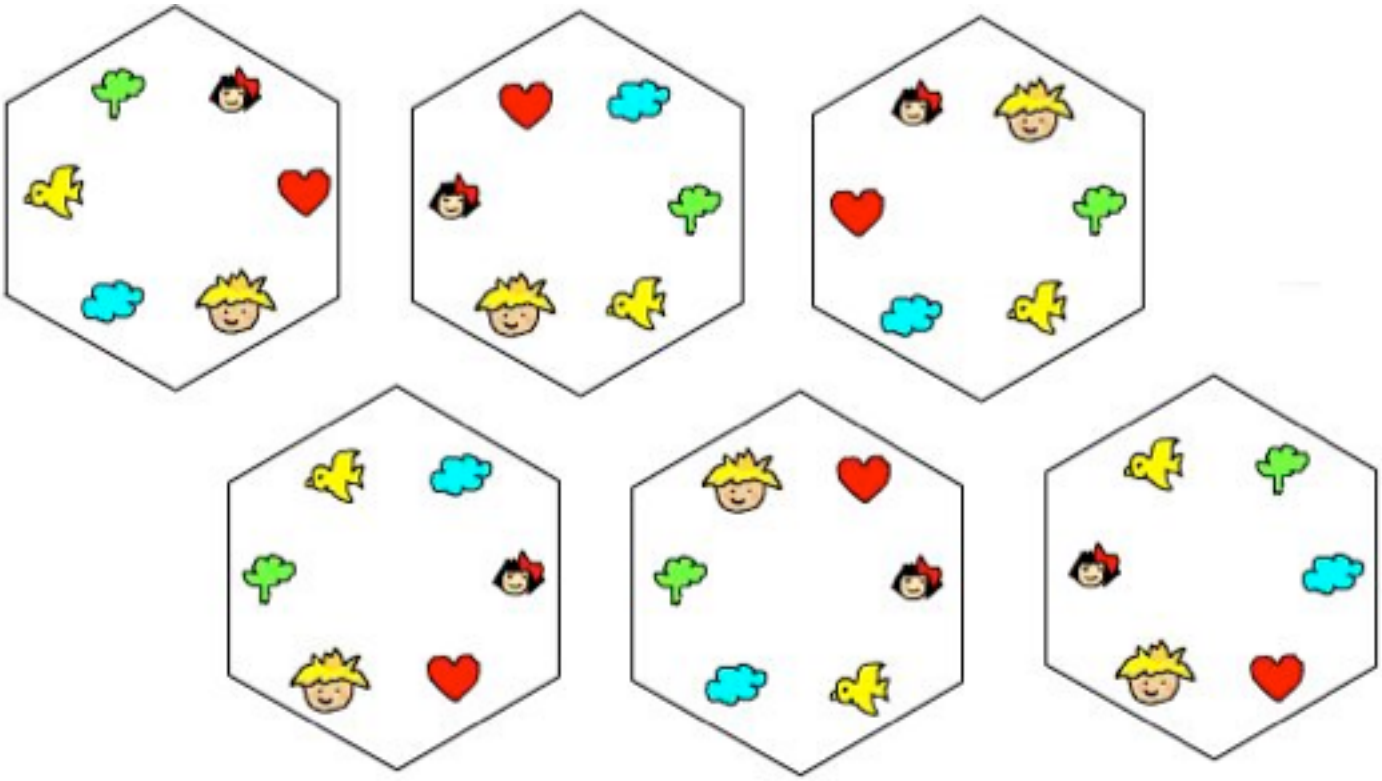
Place a 3rd hexagon so the colors on the edges where the 3 hexagons meet have matching colors. The light blues match and the greens match.

4. Keep adding hexagon on the outsides until all 6 hexagons have been placed and all the edges where the hexagons touch have matching numbers.

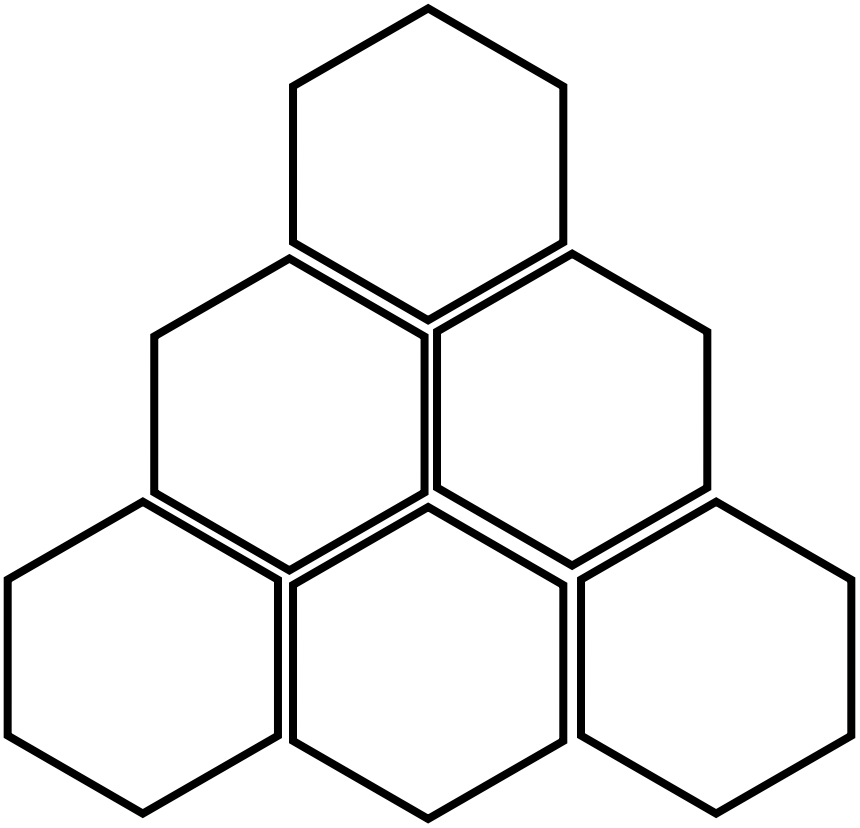


There is only 1 hexagon that will work in the center. The position of the 6 remaining hexagons are fixed when you put the correct hexagon in the center. There are 6 positions the correct center hexagon can be placed in so there are 6 solutions that are rotations of each other.

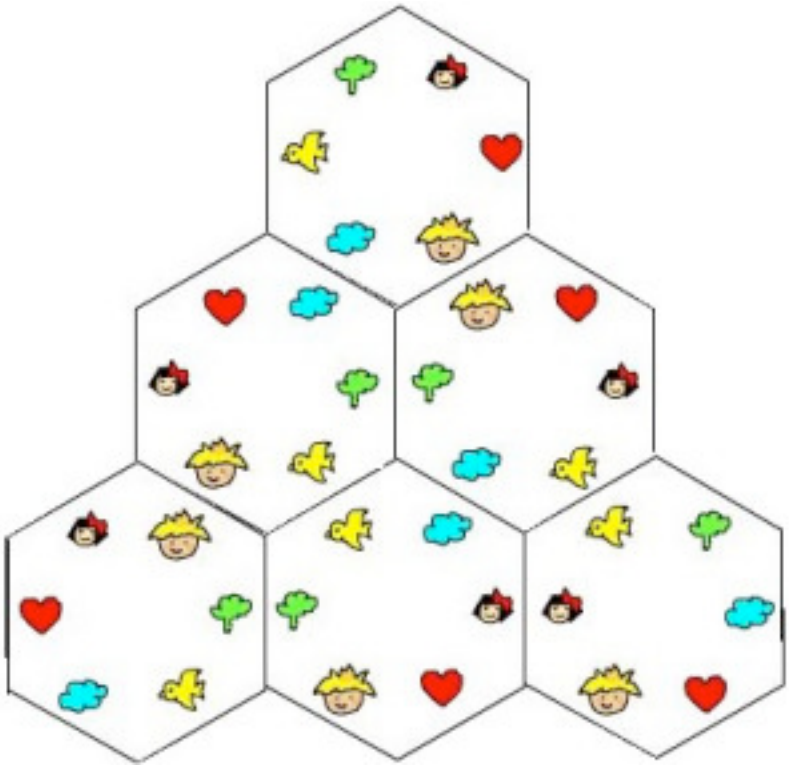
The Hexagon Puzzle



Cut out the 6 hexagons above. Place the 6 hexagons on the grid below so that the figures on the edges match. Boy matches with boy, bird matches with bird etc.



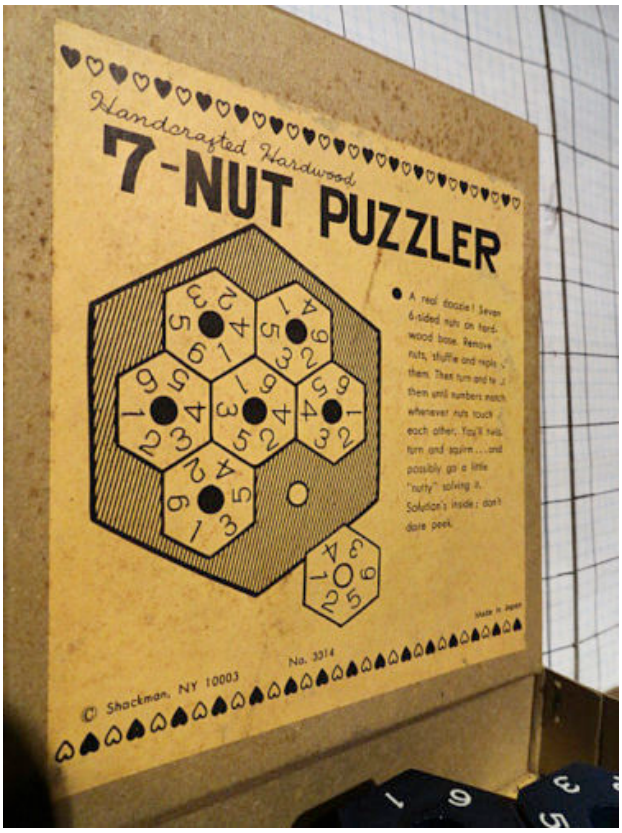
Solution



Examples of commercial versions of the puzzle

The wording on the box states that you should look before you scramble the pieces. THIS MIGHT BE THE LAST TIME YOU SEE THE PUZZLE PUT TOGETHER CORRECTLY !


DRIVE YA NUTS


Handcrafted Hardwood
7-NUT PUZZLER
A real doozie! Seven 6-sided nuts on hard wood base. Remove nuts, shuffle and replace them. Then turn and twist them until numbers match whenever nuts touch each other. You'll twist, turn and squirm . . . and possibly go a little "nutty" solving it. Solution's inside; don't dare peek.
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Made in Japan


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NO.10
PROFESSOR PUZZLE
The
HEXAGON STANDOFF
CAN YOU ARRANGE THE 7 HEXAGONAL TILES SO THAT ALL OF THE SYMBOLS MATCH?