Puzzle #1: House of Mirrors

Resource: Math Pickle
https://mathpickle.com/project/house-of-mirrors-symmetry-patterns-composite-numbers/

Curricular Connections

- Geometry (symmetry), patterning, logical thinking

Instructions for Puzzle

(taken directly from Math Pickle)
A House of Mirrors can be a dangerous place to live. Bump a wall and the whole house can fall around you - sharp shards everything. That's why there are rules for anyone planning on building a House of Mirrors.

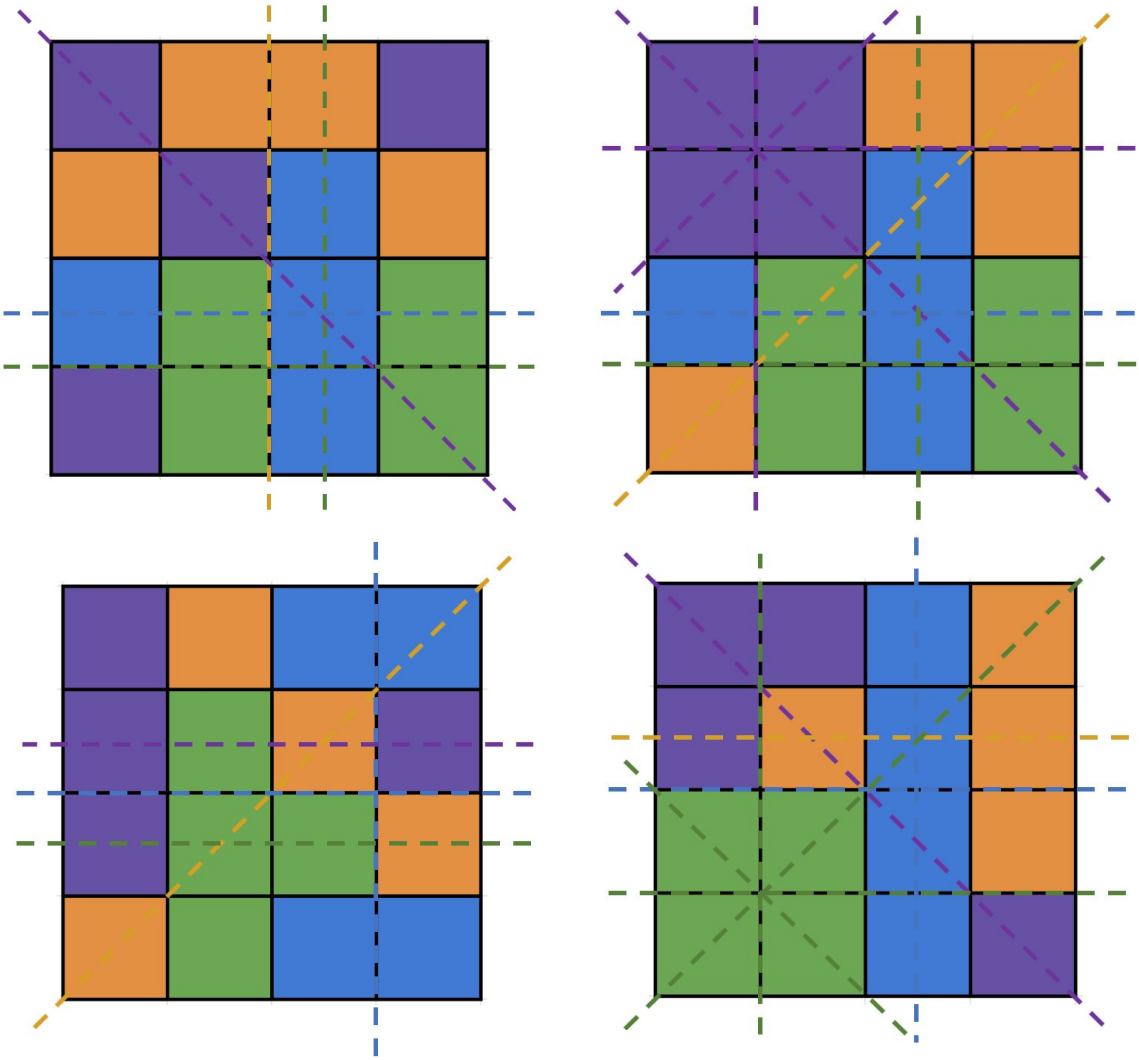
Rule 1: Equal numbers of each colour
Rule 2: All the colours must be different shapes
Rule 3: All the colours must have mirror symmetry
Rule 4: All the colours must have different lines of symmetry

Using square tiles build a House of Mirrors that is 4x4 using 4 different colours - you will need 16 square tiles, 4 of each colour. Or if your group would like a challenge, you can create a larger House of Mirrors using more colours (e.g. a 5x5 using 5 different colours or a 6x6 using 4 different colours). You must find a different House of Mirrors than other groups. Once your House of Mirrors is complete and approved by the teacher, colour it in into the chart below and hand it in. You may not need to use all of the squares - depending on the size of your house.

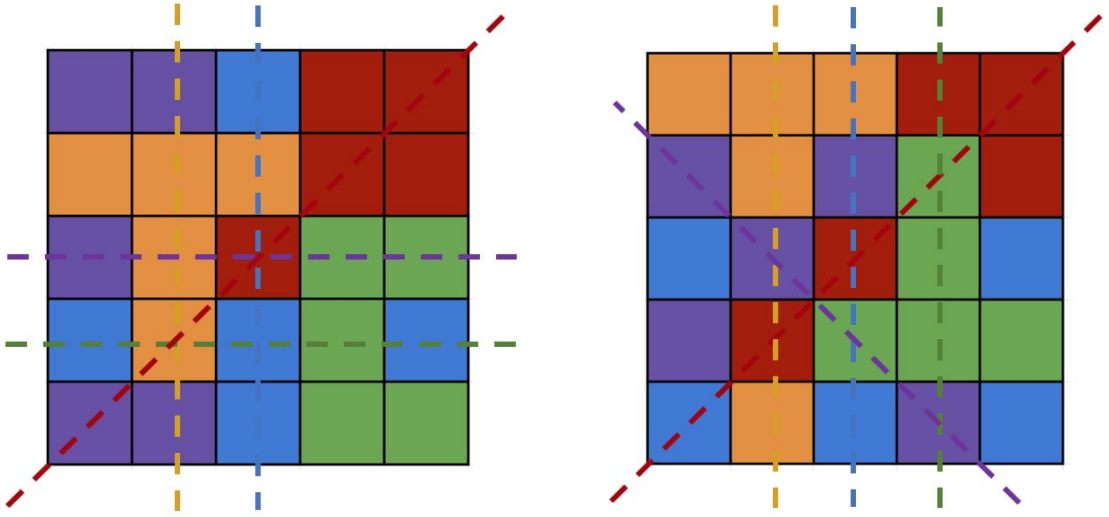
Teaching Notes

- Use the example House of Mirrors on the Math Pickle site during the instructions - as you go through the rules have students identify why each picture does not meet the particular rule you are discussing.
- You can work together as a class to create the 3x3 puzzle (in the Student Package) to help students see how it is done. Use this puzzle to do a check of all the rules to ensure understanding.
- If you have enough square tiles give each student their own set to work with; this can increase participation. Students can also create their own squares with coloured paper.
- If you find that all groups are struggling, you can remove rule #4, that each shape must have a different line of symmetry.
- Each group should find a different House of Mirrors so that if a finished group splits up and joins them to share strategies, they can not use the same House of Mirrors to complete the puzzle.
- Two puzzles are considered the same puzzle if you change the colours of one puzzle and get the other and/or if you rotate one puzzle and get the other.

Possible 4x4 House of Mirrors with 4 colours



Possible 5x5 House of Mirrors with 5 colours



Puzzle #2: Squaring the Square Puzzles

Resource: Math Pickle
https://mathpickle.com/project/squaring-the-square/

Curricular Connections

- geometry (perimeter), patterning, numbers, addition, subtraction, logical thinking

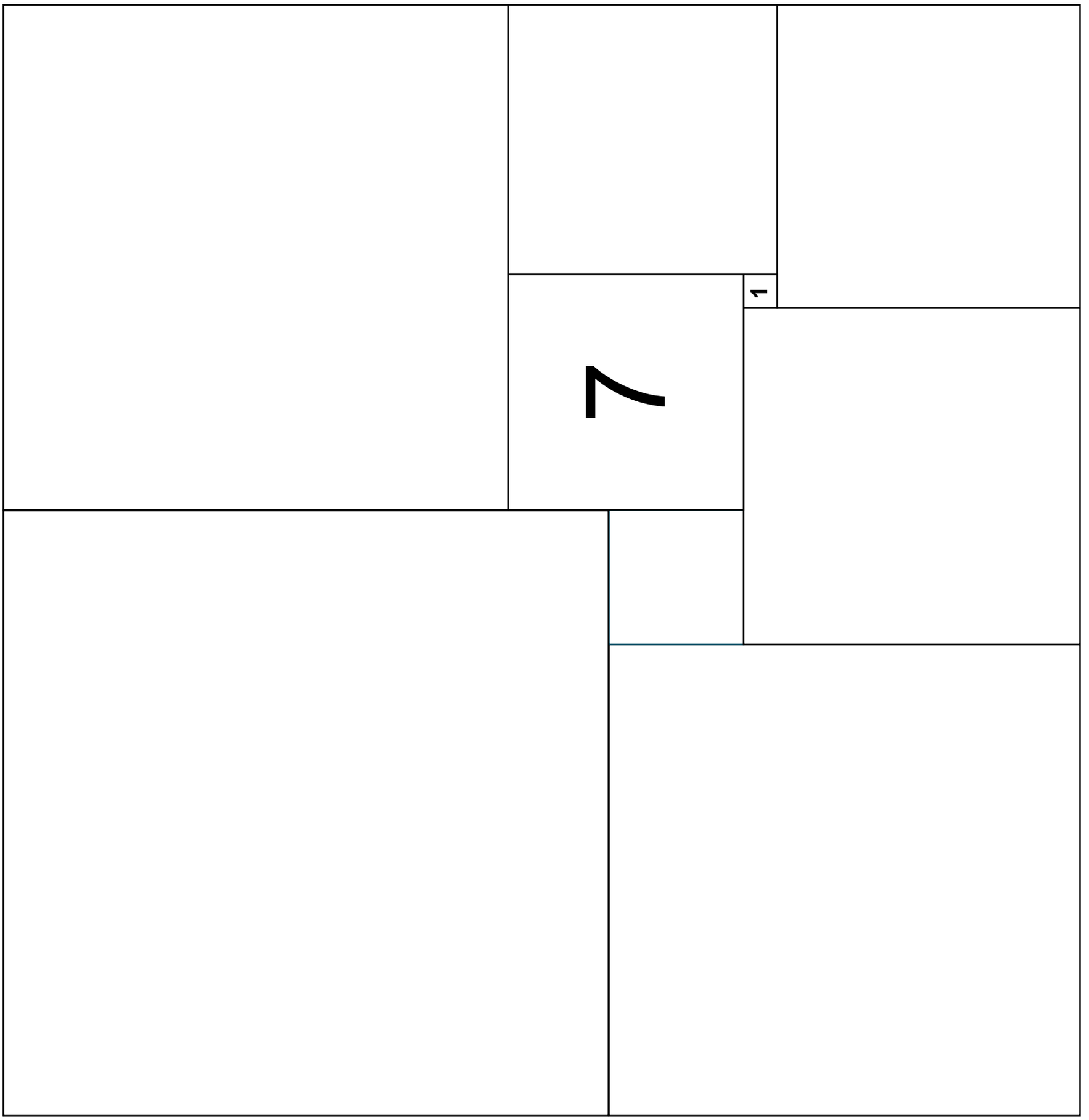
Instructions for Puzzle

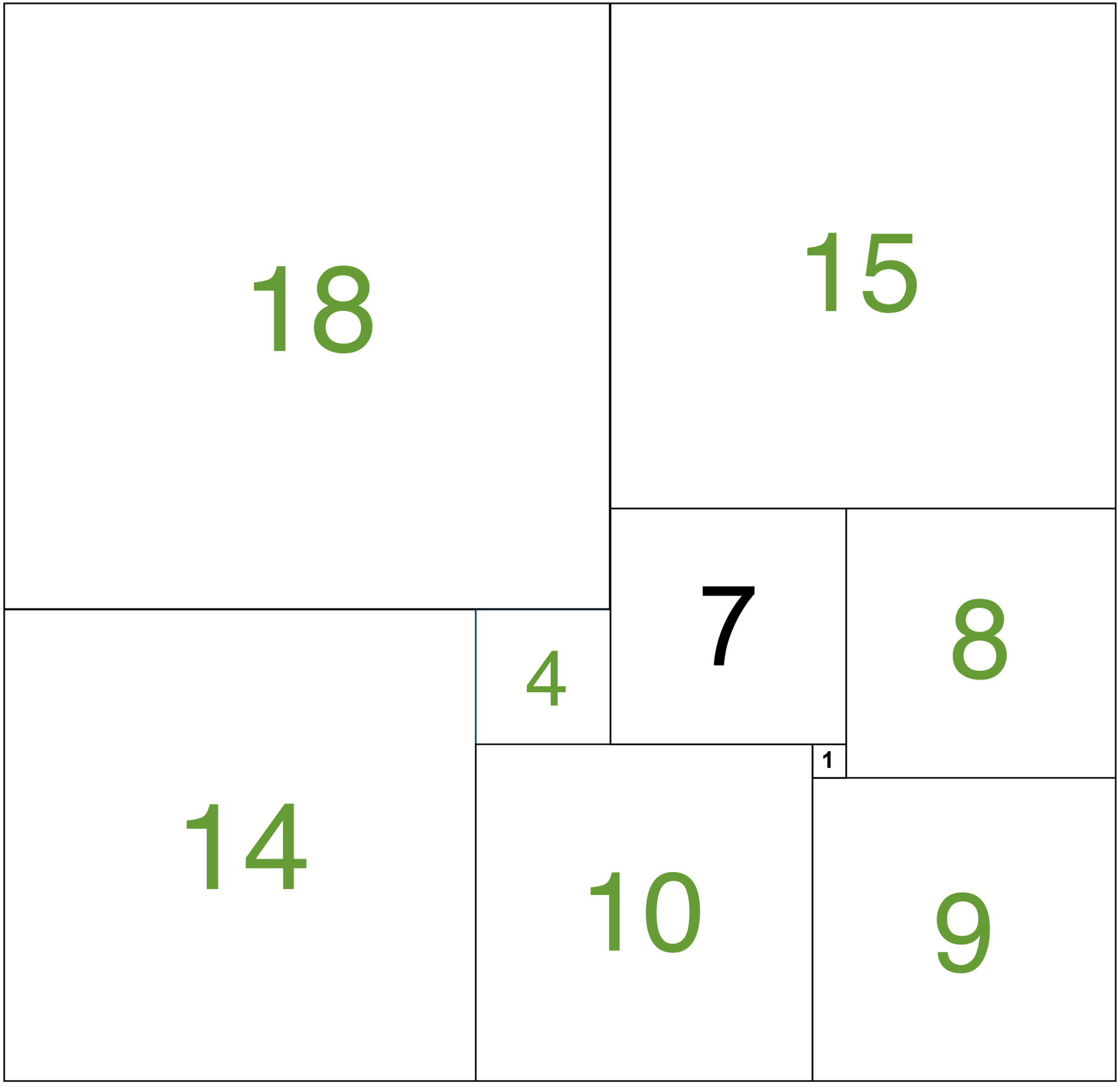
Find the side lengths of all squares in the rectangle so that the edge length of each square is the same as equivalent lengths made up of other squares' edge lengths. Use your knowledge of addition, subtraction, and perimeter to help you (measurement tools will not help you).

Teaching Notes

- Note that there is an excellent video explaining these puzzles on the website to review prior to introducing this activity to your students.
- Introduce this puzzle by doing the puzzle attached - found below marked "Use as class example" - with the whole class.
  - Explain that the 7 square is a measurement length of 7 (the units could be anything, they don't matter for the purposes of this puzzle) - or each side of the square equals a length of 7. The 1 square is the same concept - each side of that square equals a length of 1.
  - In order to find the number of an adjacent square, say the one to the right of the 7 and 1 squares, we need to see if we have enough information from other squares to determine the length of one side of this empty square. In this case, it is 7 + 1 = 8 ⟶ so this new square is an 8 square.
  - Continue on in this way, asking the class to participate in logically thinking through this puzzle, using strategies of addition and subtraction. Some students may come up with other strategies; test them out to see if they work.
- Ask if students have any questions about how to do the puzzles.
- Suggest to students to start with the "hint" numbers and move outwards from those squares.
- You can not use any measurement tool to figure these puzzles out - the goal is to use logical and numbers to solve them.
- Some students may want to guess or estimate squares by visual comparison (ie: if this is a 1 square then it looks like it would fit into this other square over here as a 3) - you can let them try this strategy without interfering - they may be correct. However, if they continue to use this strategy they will eventually run into a situation where they are not correct, and the later squares will not match up (ie: you might get a square that has a 5 and 7 along its side - adding to 12 - but another two squares along another side add up to 18). Students will have to backtrack when they encounter errors such as these - you can encourage them to find the errors.
- Puzzles for students (with answers for you) are attached at the end of this document where later puzzles are generally harder. Each group should get a different puzzle.

Use as class example

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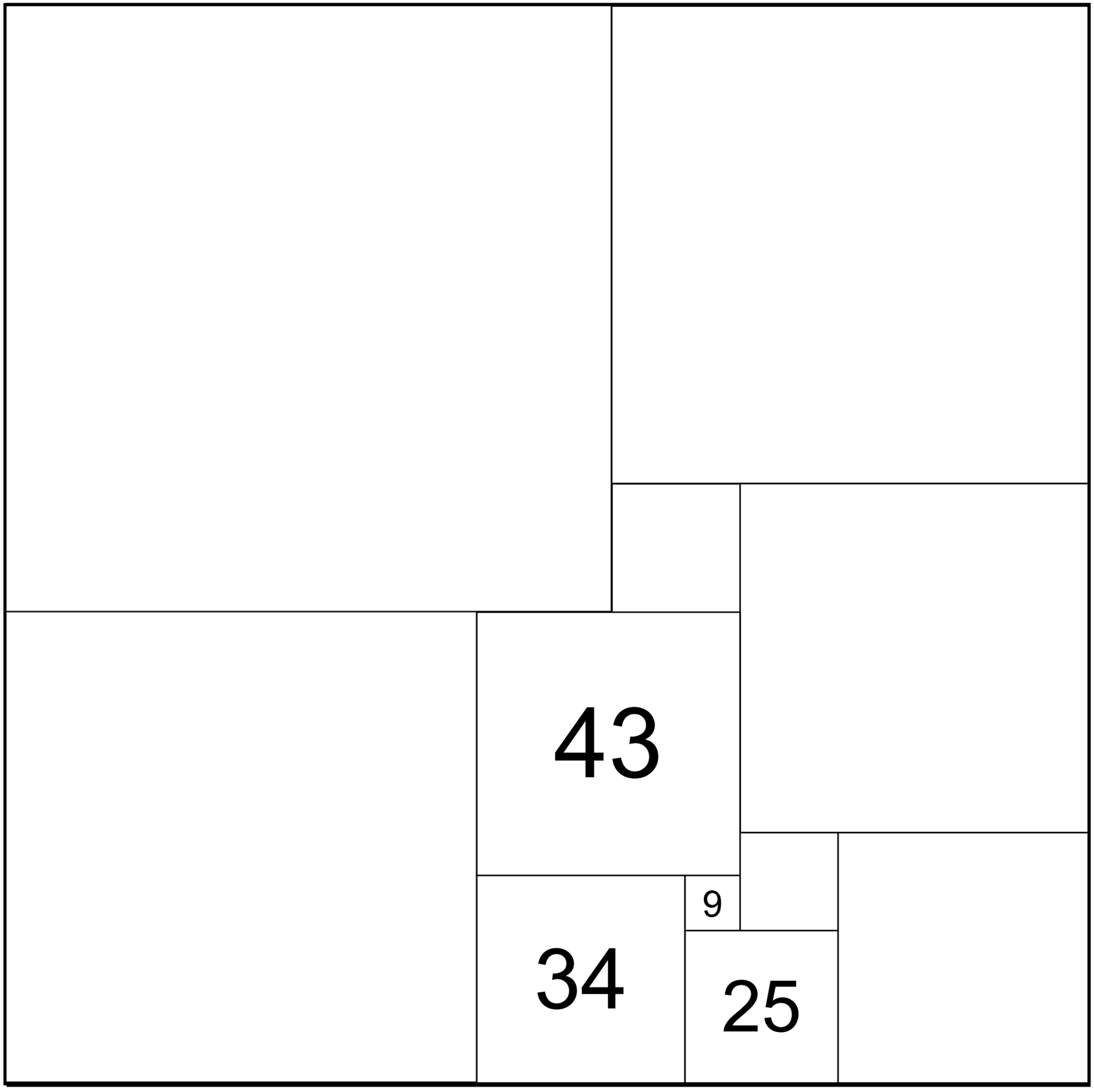
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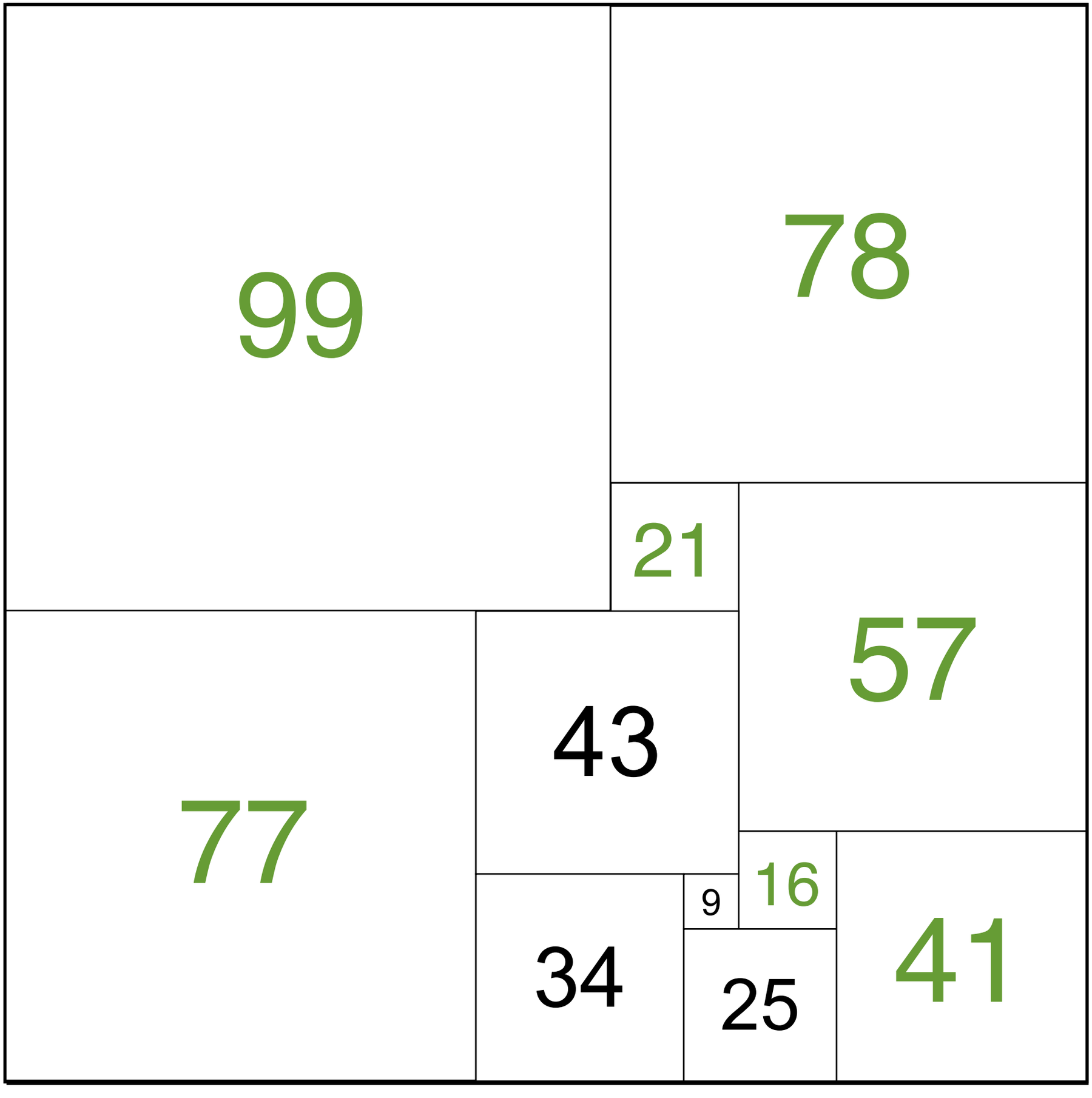
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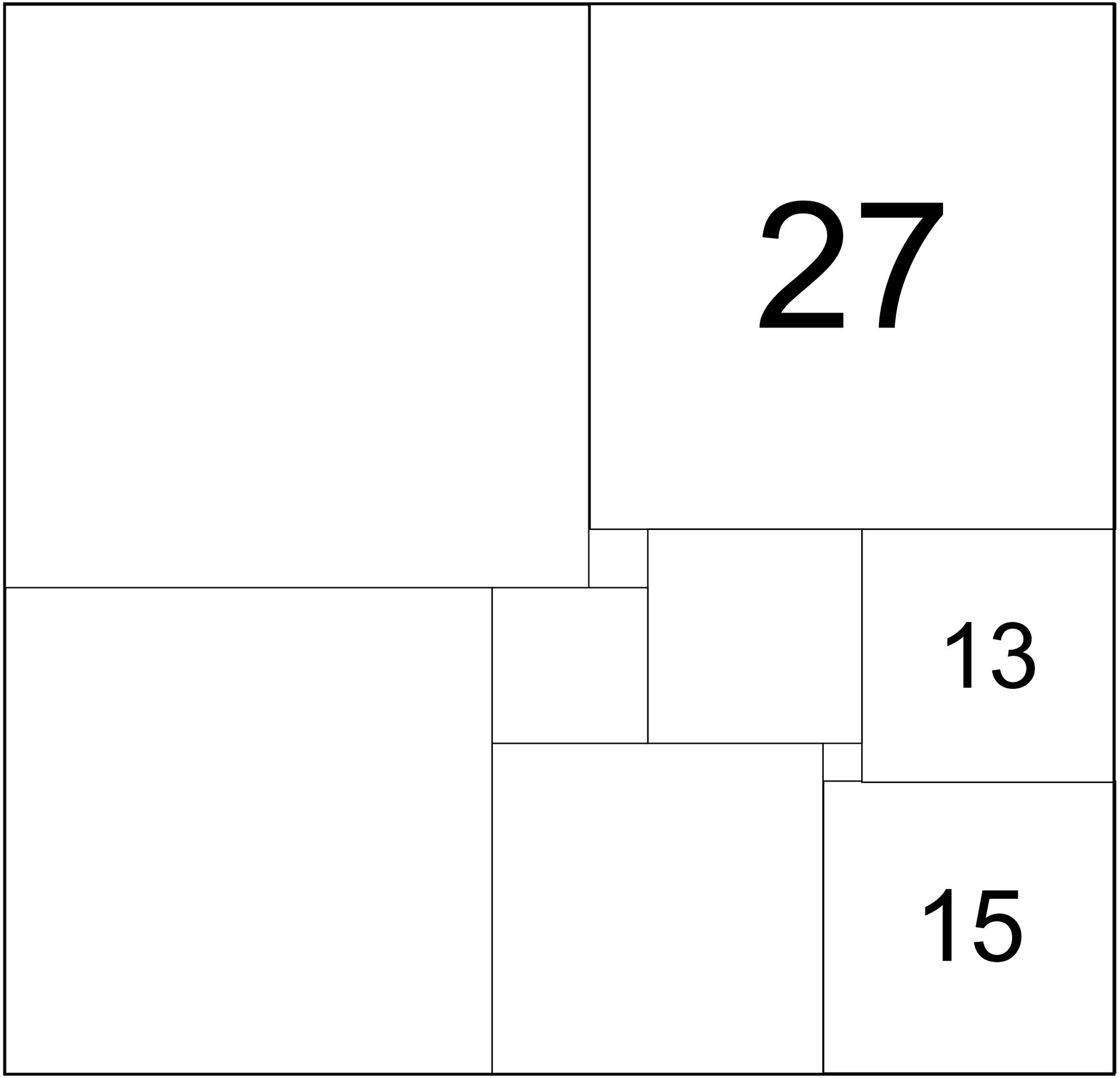

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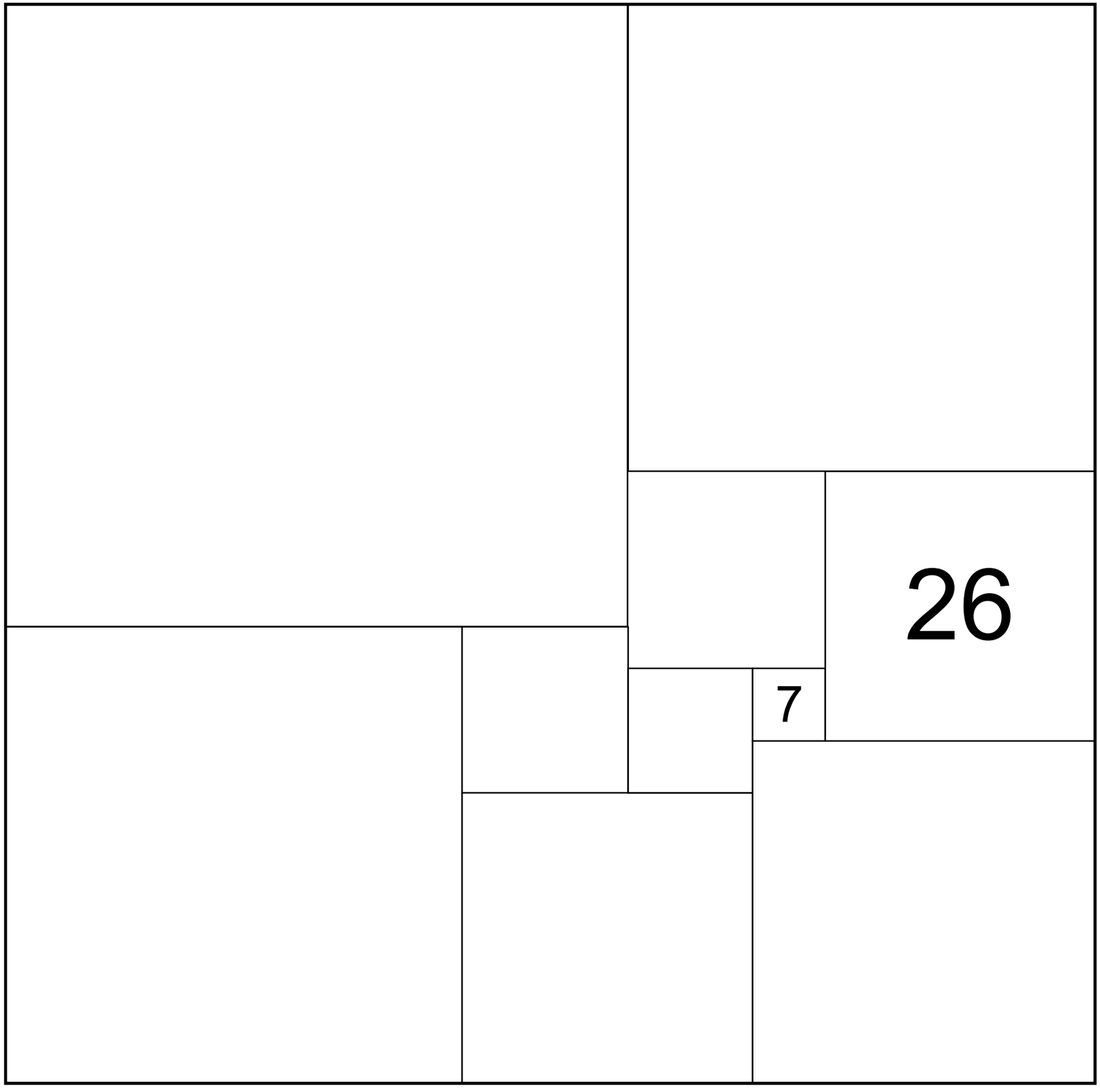

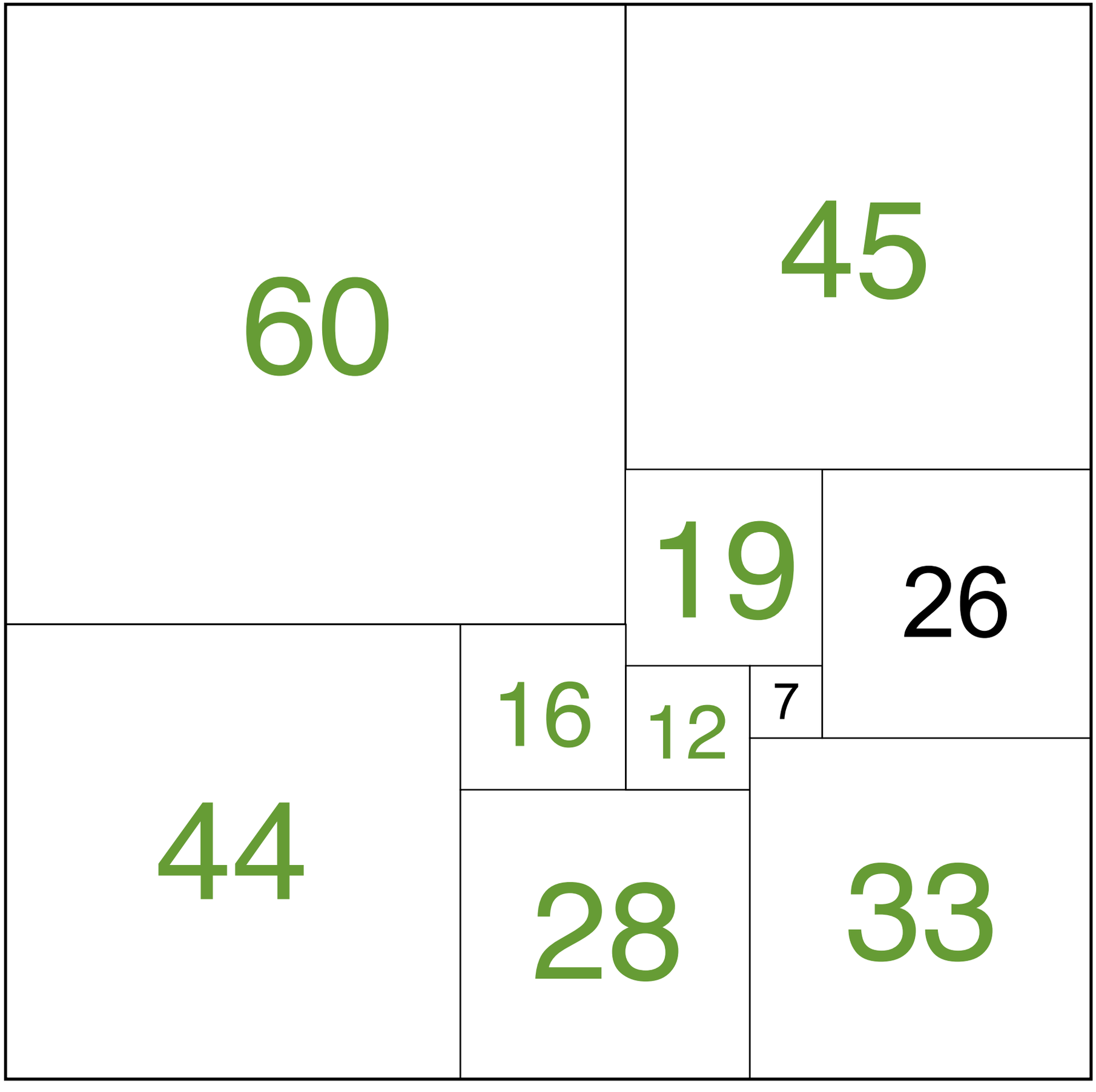

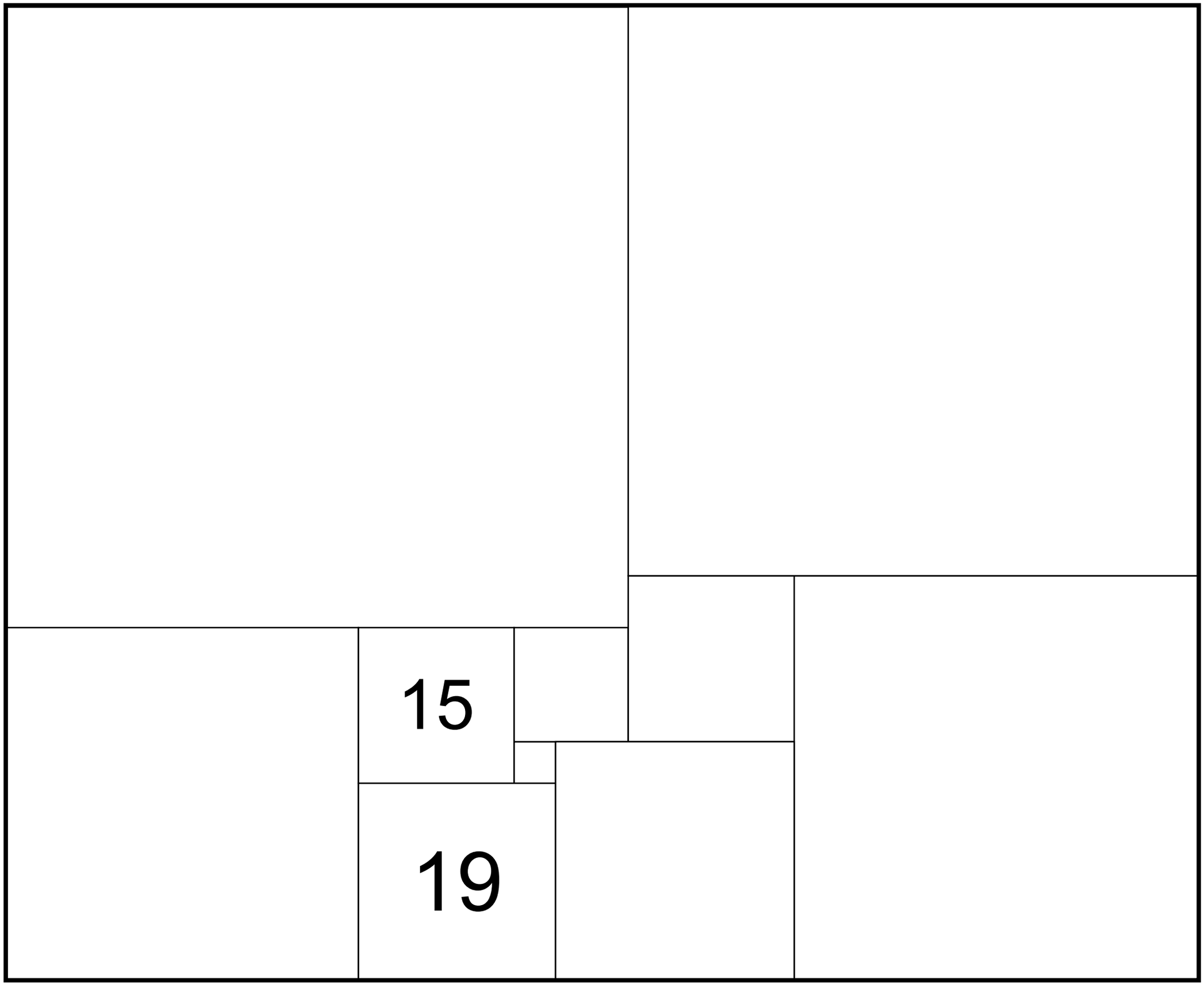
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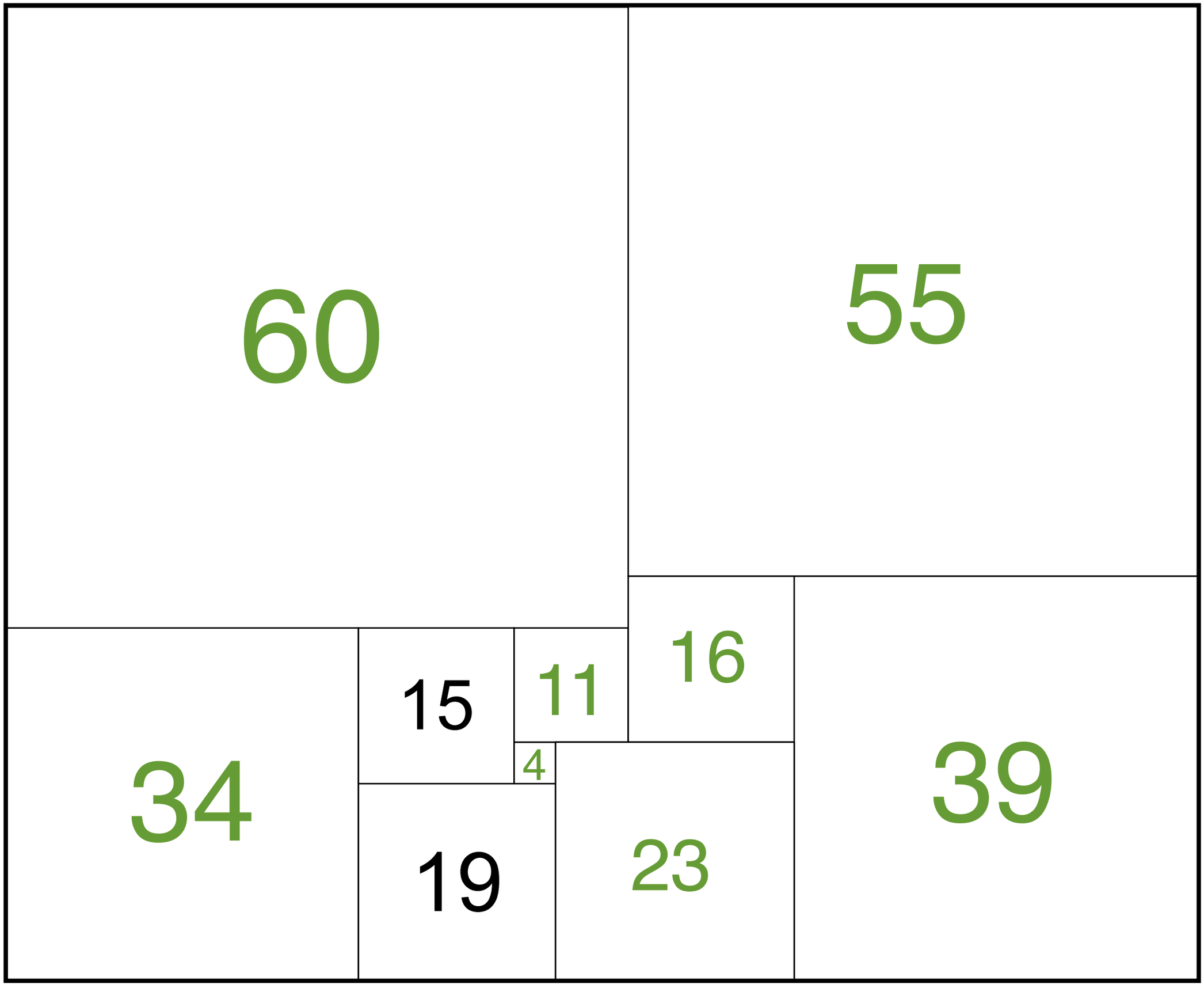
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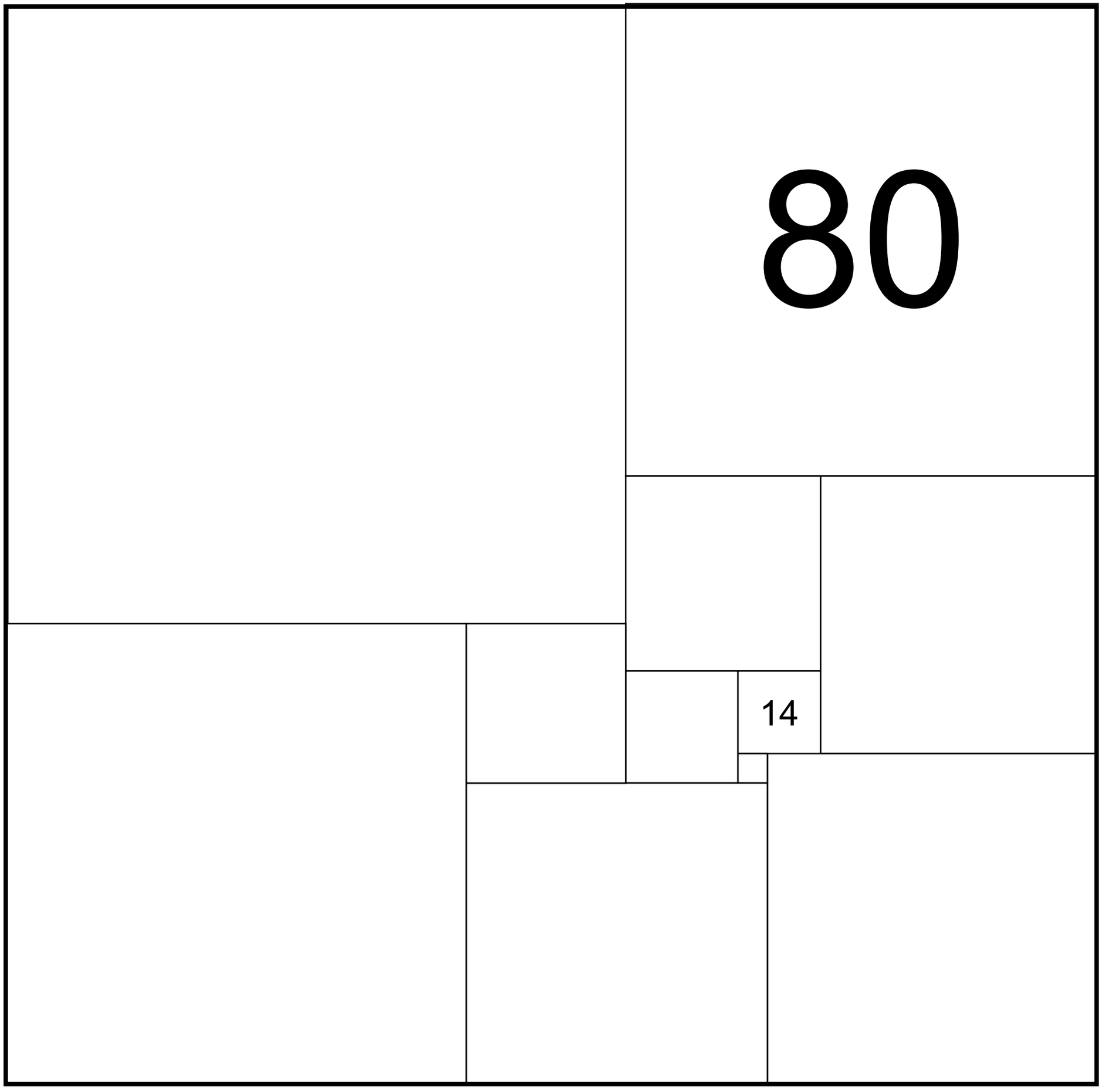
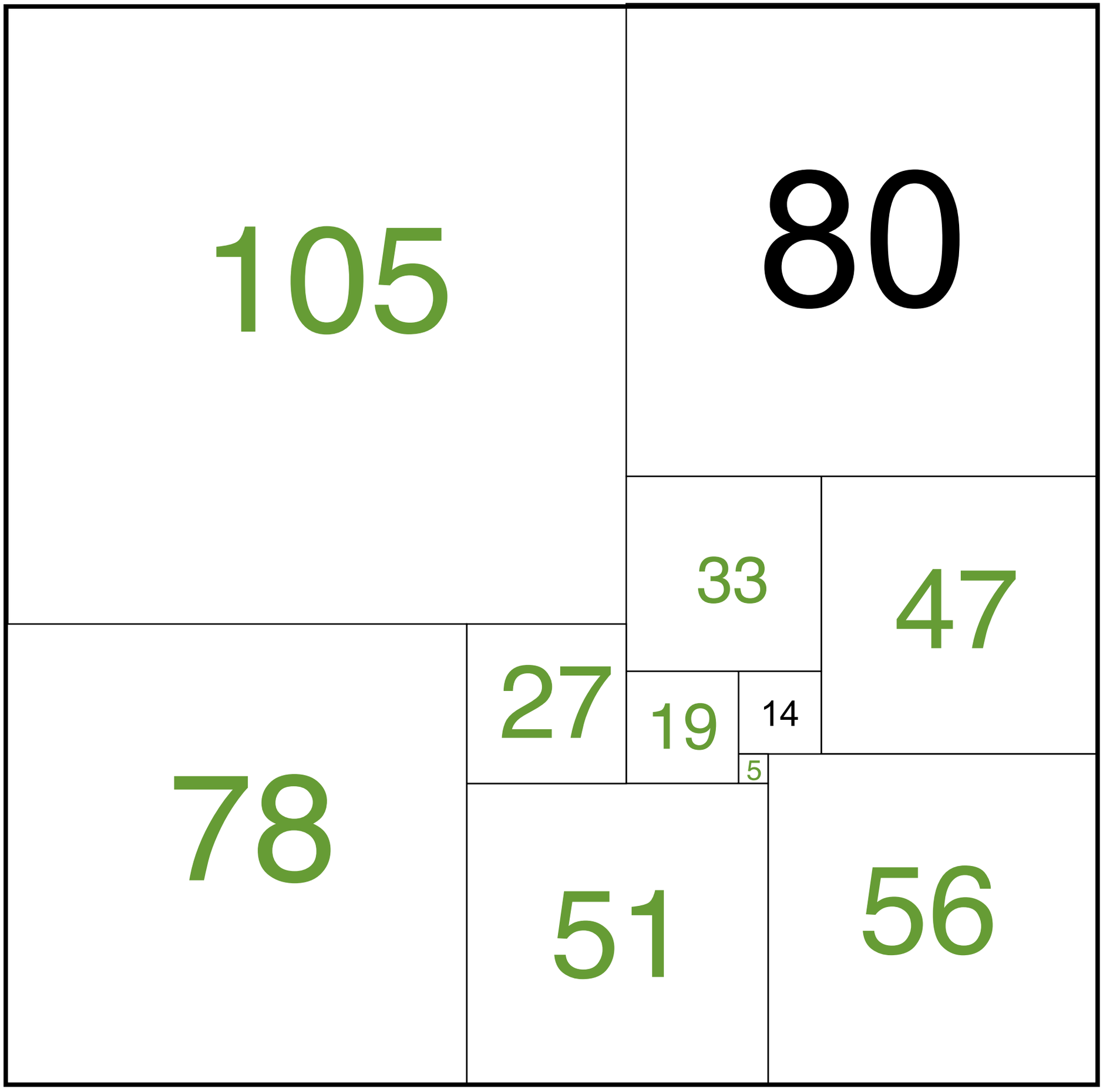
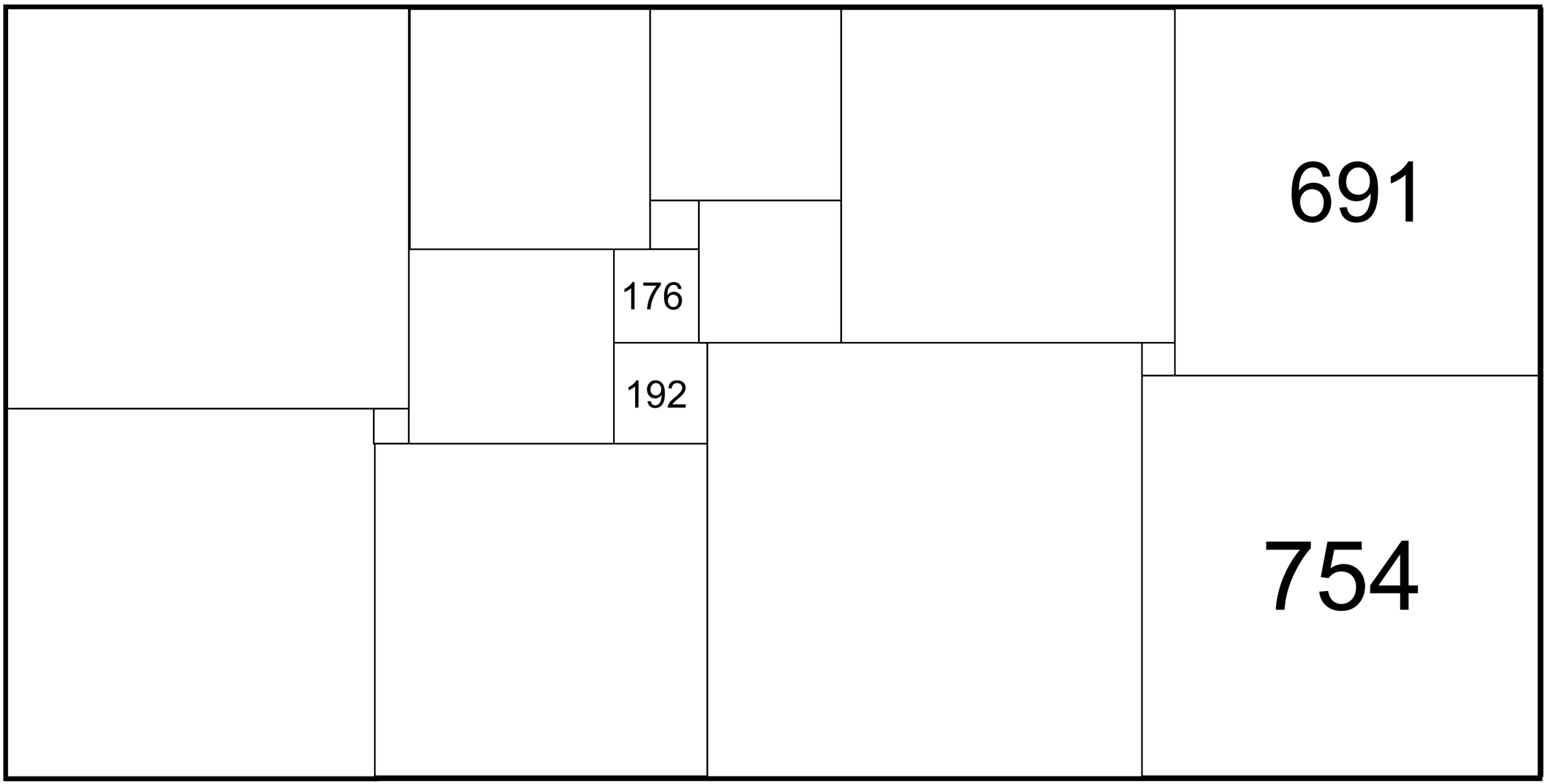




This one is tricky, requires skills beyond addition and subtraction.



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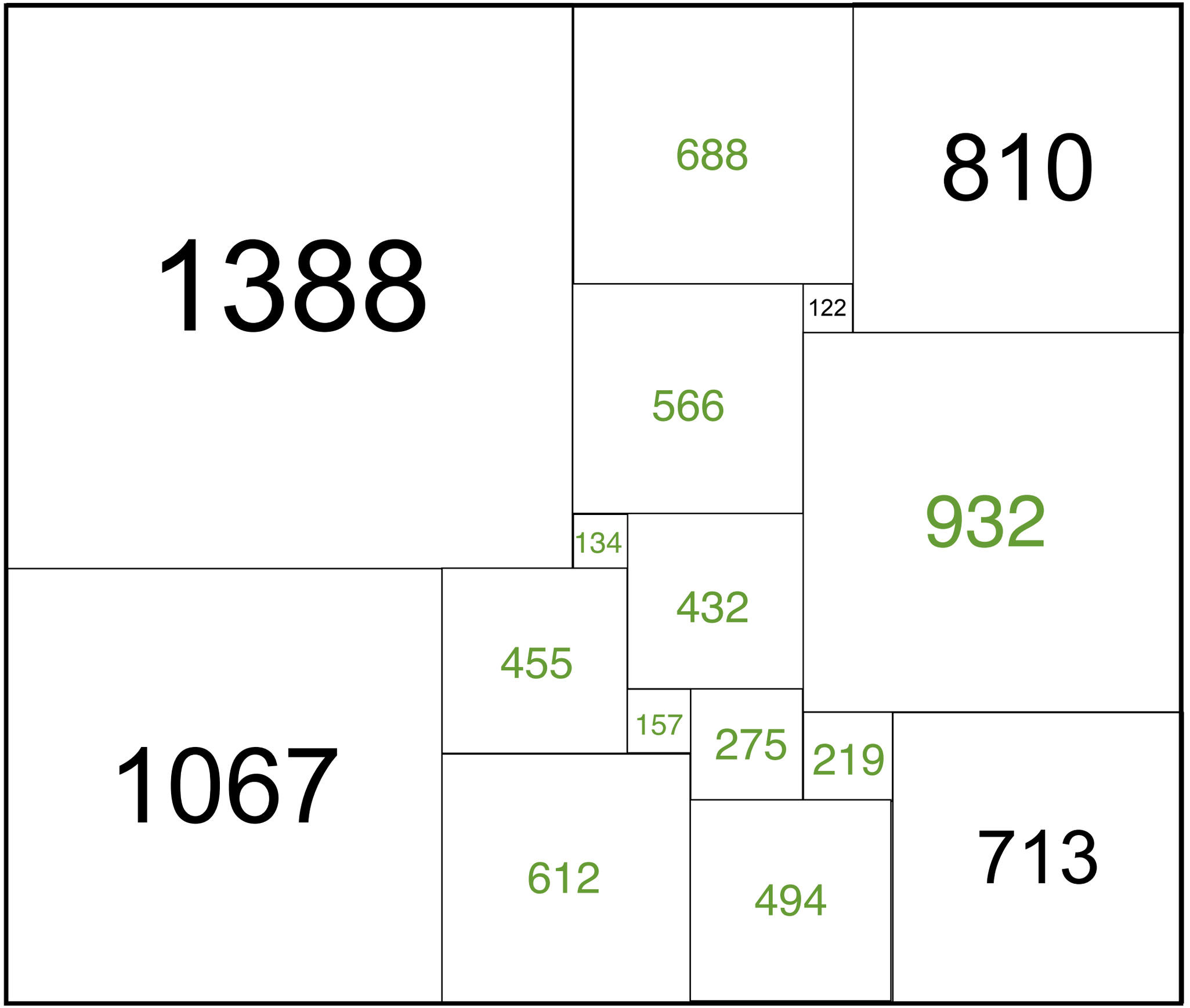

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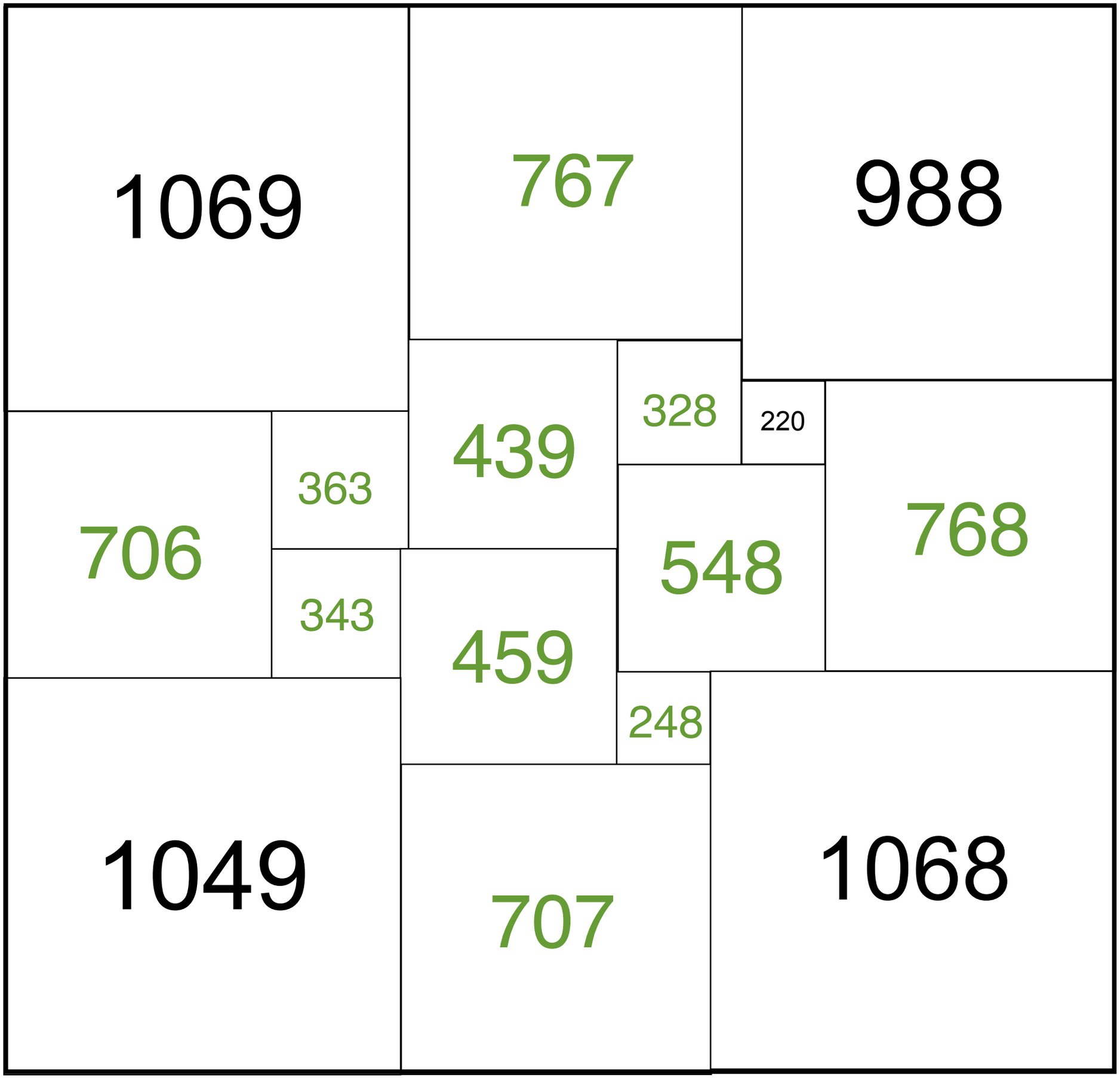

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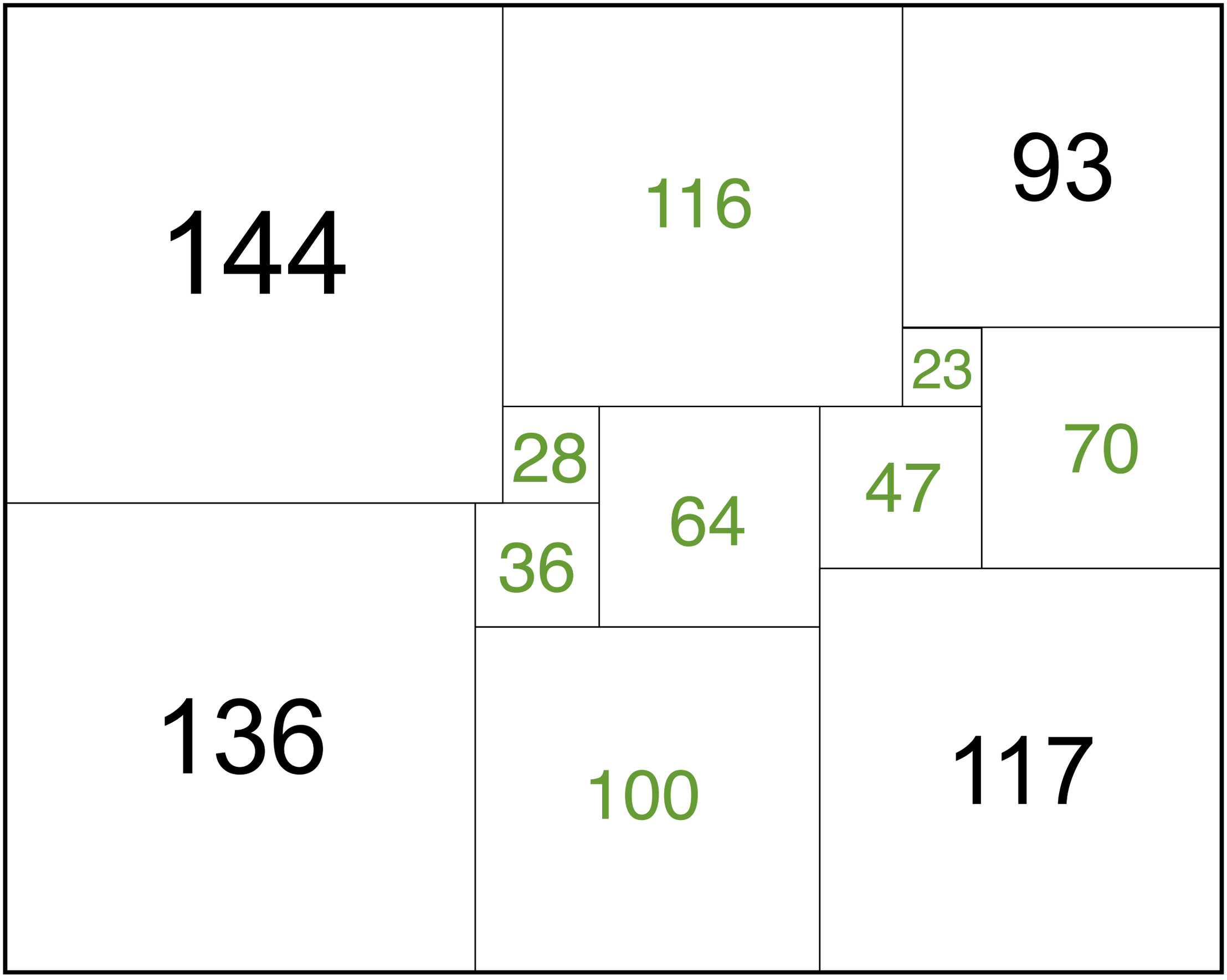
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225

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1017

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Puzzle #3: Venn Puzzler

Resource: Math Pickle
https://mathpickle.com/project/venn-puzzler/

Curricular Connections

- logically thinking, reasoning, venn diagrams, cross-curricular

Instructions for Puzzle

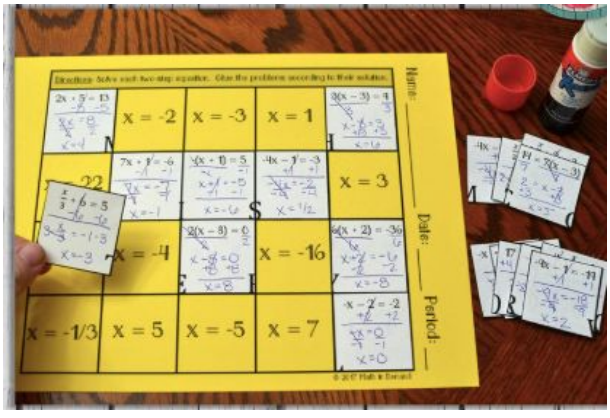
Match each list of three descriptors to the corresponding venn diagram so that the diagram explains the relationship between the three descriptors. Each list of descriptors fits only one diagram (a one-to-one correspondence).

Teaching Notes

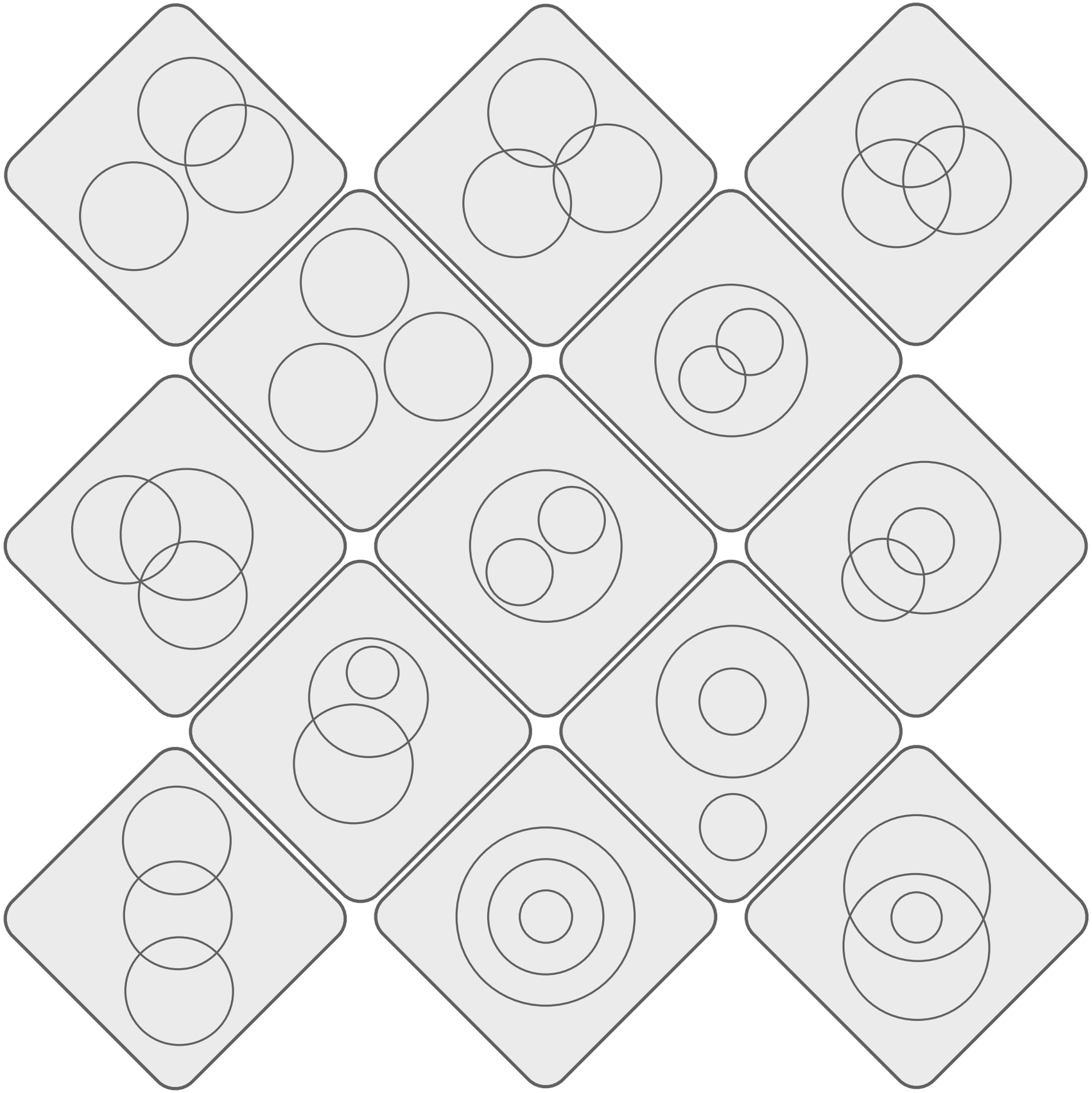
- When explaining the instructions to this puzzle, use the Venn Puzzler example on Math Pickle showing the wrong explanation. Make sure students understand why it is wrong and work through it together to correct it. There is a fully explained relationship in the student package.
- There is an example Venn Puzzler attached below (with the answer). You can use any descriptors from content the class is covering in other subjects. Ideally, you will create five versions of this puzzle that all relate to content in other subjects that students are fairly comfortable with so that students are able to figure out the math component and complete the puzzle.
- Encourage students to explain/convince their teammates that the descriptor and diagram match. If they get a match wrong, it may mess them up later on as they narrow the selection. This would support collaboration and discussion - peers teaching peers.

Final Whole Class Puzzle

Once each group completes one of the above puzzles, they will receive a one-step algebraic equation containing one variable on a square piece of paper that they will need to solve. They then match their square to the corresponding solution place on the whole class puzzle. Each group will receive three equations altogether. After the class puzzle is complete, a message of some sort will appear since each square contains part of a letter (as illustrated below). Examples of messages could include a reveal of an upcoming exciting field trip location, the answer to some big question the class has asked of the teacher, or other whole class related exciting information. It could also be the secret password to the story in the Student Package.



Example of the final whole class puzzle.



1) Mosquito, Insect, Venus Flytrap

2) Marsupial, Kangaroo, Opossum

3) Spider, Snake, Poisonous

4) Dangerous, Shark, Goldfish

5) Mammal, Primate, Gorilla

6) Elephant, Indricothere, Rhinoceros

7) Reptile, Crocodile, Female

8) Egg-laying, Mammal, 4-legged

9) Orca, Aquatic, Mammal

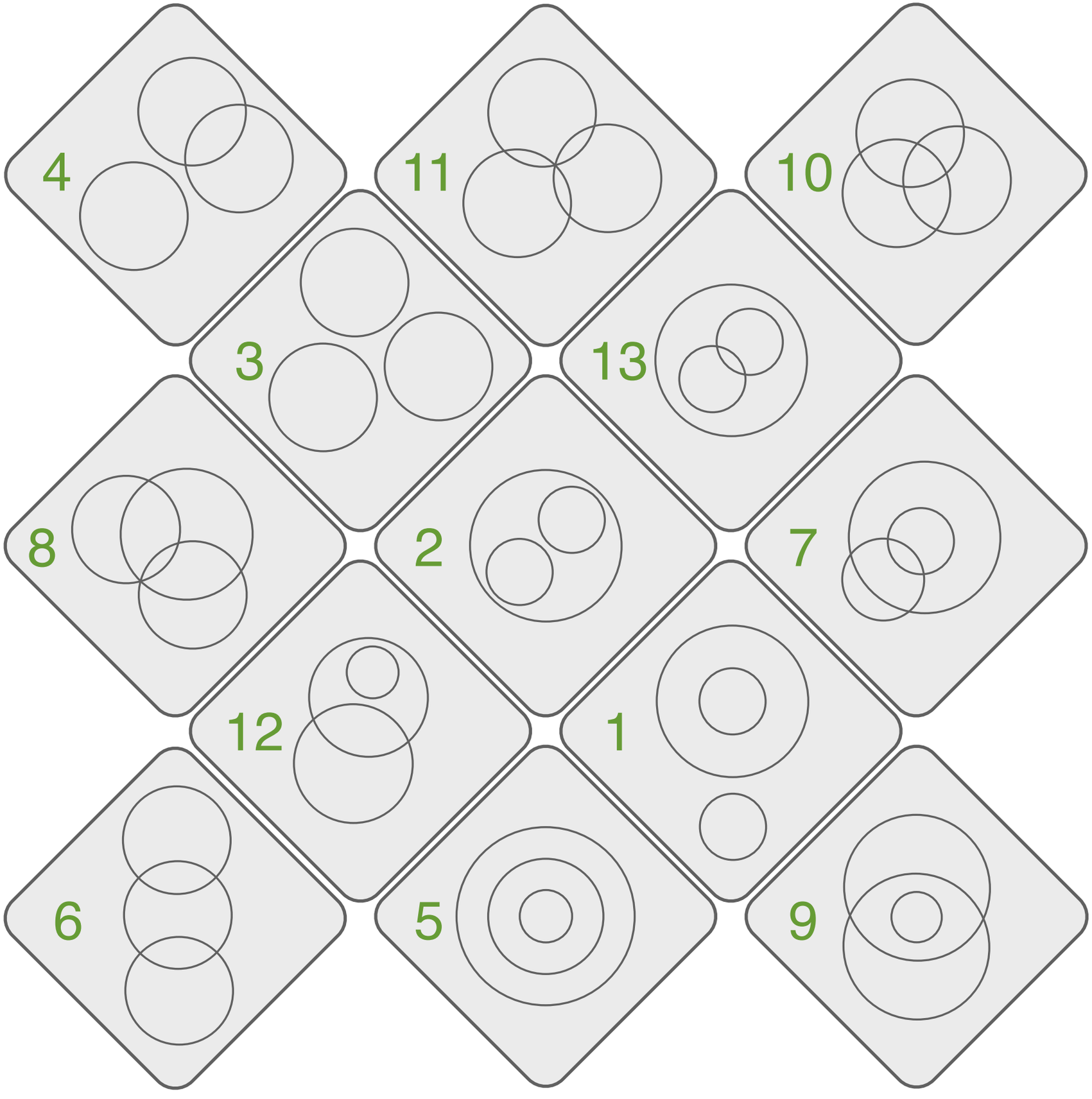
10) Extinct, Carnivore, African

11) Can Fly, Mammal, Egg-laying

12) Dinosaur, 2-legged, Triceratops

13) Egg-laying, Mammal, Vertebrate

14) Have we missed a couple of diagrams?



1) Mosquito, Insect, Venus Flytrap

2) Marsupial, Kangaroo, Opossum

3) Spider, Snake, Poisonous

4) Dangerous, Shark, Goldfish

5) Mammal, Primate, Gorilla

6) Elephant, Indricothere, Rhinoceros

7) Reptile, Crocodile, Female

8) Egg-laying, Mammal, 4-legged

9) Orca, Aquatic, Mammal

10) Extinct, Carnivore, African

11) Can Fly, Mammal, Egg-laying

12) Dinosaur, 2-legged, Triceratops

13) Egg-laying, Mammal, Vertebrate

14) Have we missed a couple of diagrams?