

Mishap at Venn Zoo



Photo by Gail Hampshire

Mishap at Venn Zoo

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Most of the class will
be spent here



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<http://youtu.be/S2z-7jOiLqU>

<http://youtu.be/ylvvfLh9atc>

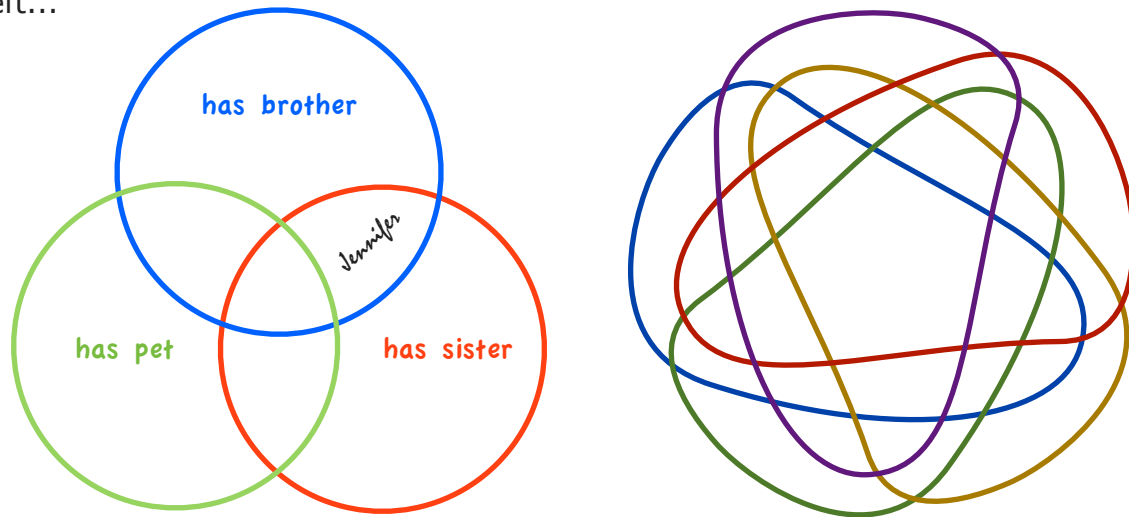
Classroom Video of similar puzzle
Video about Venn diagrams



Instructions

Mishap at Venn Zoo is a co-operative puzzle that will engage a large fraction of your students for one 40-50 minute period. You should prepare by reading this page. The five minute videos highlighted on the last page will also be helpful.

Mishap at Venn Zoo requires students to place animals into a Venn diagram. The standard Venn diagram that you will be familiar with looks the one on the left...



It can be used to categorize according to three questions. Let's say you wanted to categorize people, you could ask them three questions: if they had a brother (blue circle); a sister (red circle); or a pet (green circle). Jennifer answered "yes" to having a brother and sister, but "no" to having a pet. We ask Jennifer to write her name inside the blue and red circles, but not inside the green one.

A five question Venn diagram, like the one on the right, allows you to do the exact same thing with five questions. That's what your students are going to do.

Instead of placing people, your children will be placing polyanimals into "Venn zoo". They'll need to ask five questions to each polyanimal in order to know which cage to place it.

In your introductory presentation starting on the next page, you will show your students how to place one such polyanimal by asking five questions. Let them try to answer each question before you advance to the answer. If most cannot, you'll need to pause and explain. After they answer the five questions they'll need to find where the polyanimal goes.

After the presentation hand out the "Venn zoo" and the 32 polyanimals. Students usually work in pairs. Three is nearly always too many. Some students prefer to work alone, and that's fine.

I sometimes ask students to name the creature. You can choose whether or not to include this non-mathematical activity. I do it to entice any students who are scared of math, but enjoy the creativity of wordplay. Of course, students can only name a creature AFTER they figure out where it goes.

Tell your students that because of a mishap, one of the cages may mistakenly have two polyanimals. This is bad, because polyanimals are fiercely territorial. They also might discover that one of the cages is empty due to the same mishap. They'll need to find an animal that fits in the empty cage.

Let's say that after 30 minutes several students think they have found a cage that is empty. Instead of confirming that they are right or wrong, treat this as if you are really trying to discover the answer and really do not know. Honestly, you will teach this puzzle much, much better if you do not look at the answer. Just rip it up and throw it away. The worst thing that can happen is that you make a mistake in front of your students. We all make mistakes, and in so doing you will be modeling for your students how to pick yourself up, and try again. I started MathPickle as a direct result of failing to solve a puzzle presented to me by a grade 2 girl. I'm a mathematician, and I was a embarrassed, but I could also see that my failure was the most beautiful gift I could ever have given that child. Her evil little grin spread over her whole face ;-)

Mishap at Venn Zoo will work best in color. If you do not have access to a color printer or have a student who is color blind you may opt to use the gray Venn diagram with textured lines.

Although curricular for grade 4, it offers a beautiful challenge for higher grades. It is perfect to revisit parallel lines, mirror and rotational symmetry in later grades because top students will be deflected into tough problem solving (never a waste of their time) while the rest of the class revisits the old ideas.

In case students finish early or in case they want to work more at home, they should come up with their own puzzle to stump you, their parents, or their peers. I've included some blank Venn diagrams for this purpose.



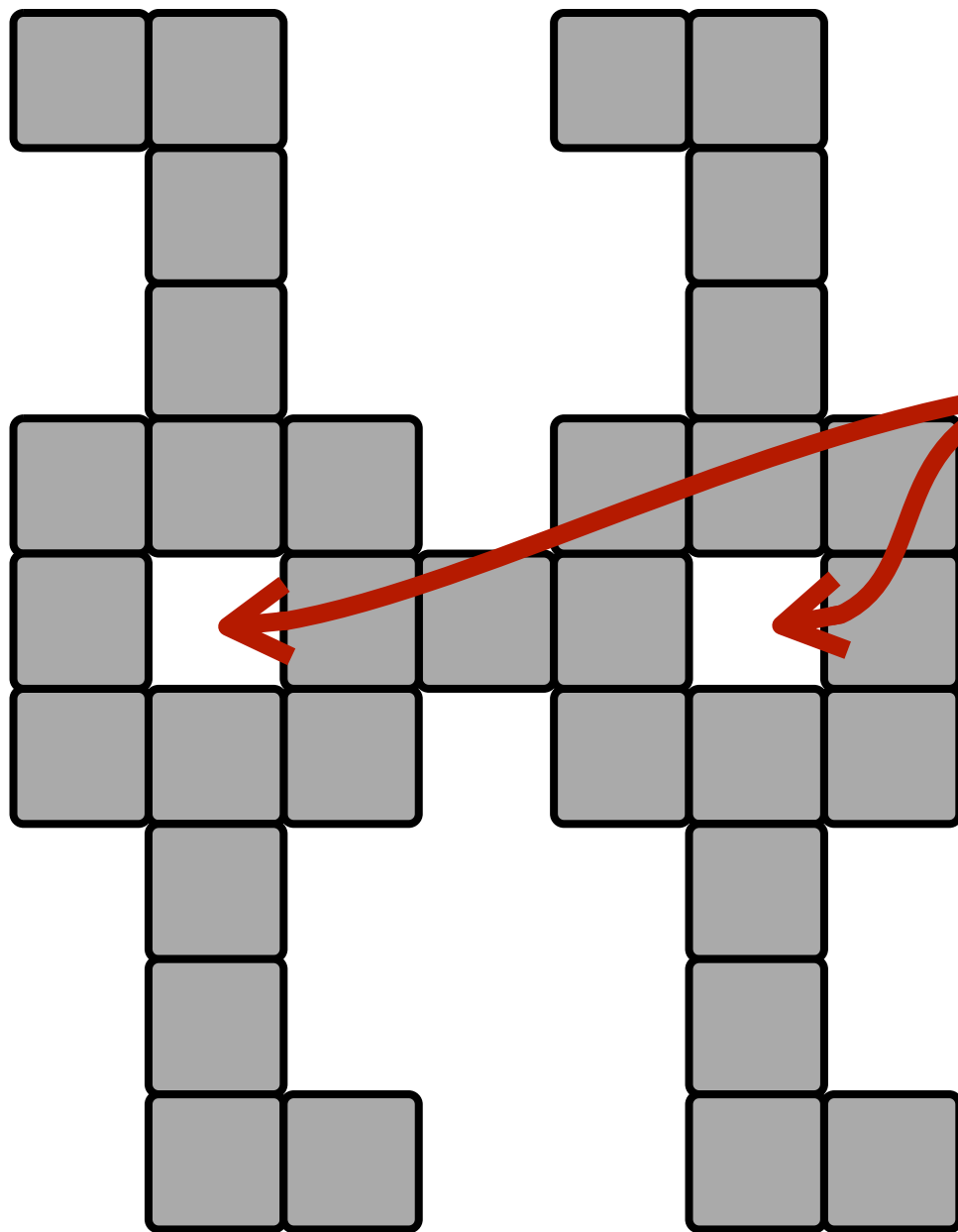
\$500 Venn Diagram Challenge

Perhaps your students have created a beautiful 5-question Venn diagram challenge or a student who is not usually excited about math has become engaged. Perhaps a pair of students have created a 7-question Venn diagram with rubber bands and nails that is ugly to you, but beautiful to them... Whatever your inspirational experience with Venn diagrams, I'd like to know.

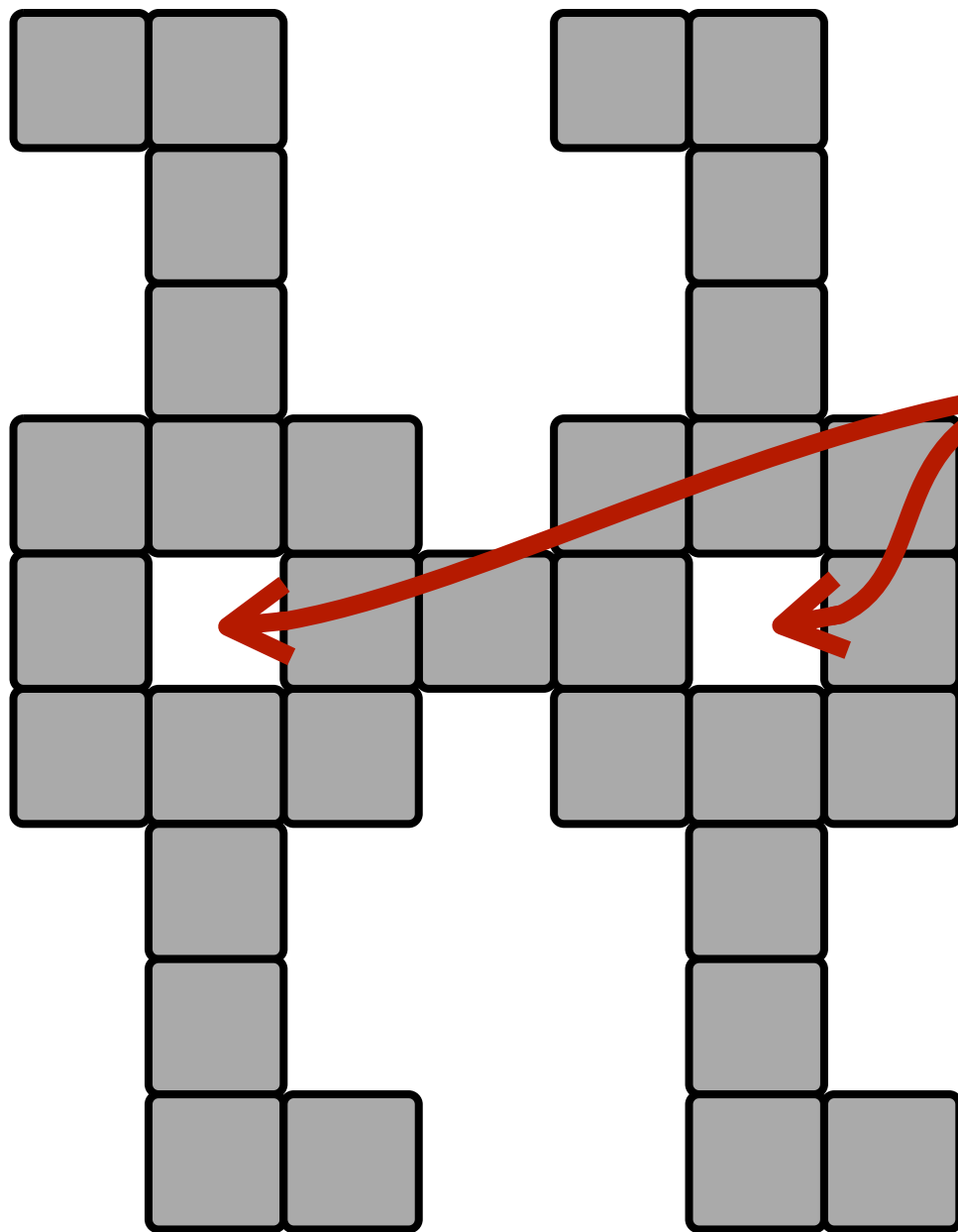
I'll offer \$500 for a photograph and/or story highlighting Venn diagrams in the classroom.

All students featured must have appropriate consent. All photographs and stories submitted may be used in an updated version of this pdf file and to promote 5-question Venn diagrams.

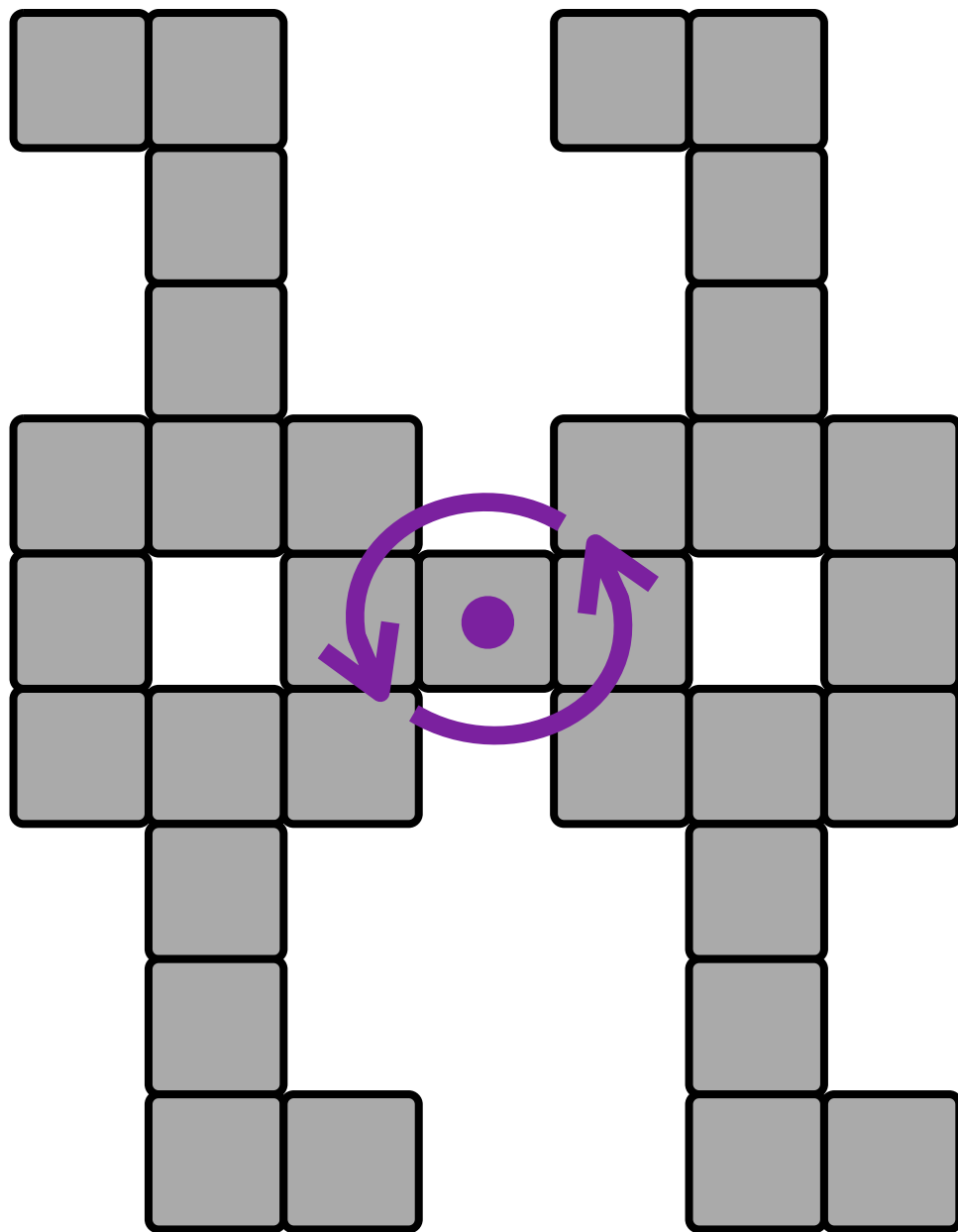
Send submissions to gord@mathpickle.com. Use "\$500 Venn Diagram Challenge" as the subject of the email. The winning classroom will be announced the first March 14th that I have at least 10 submissions from different schools. I hope this will be March 14th, 2016.



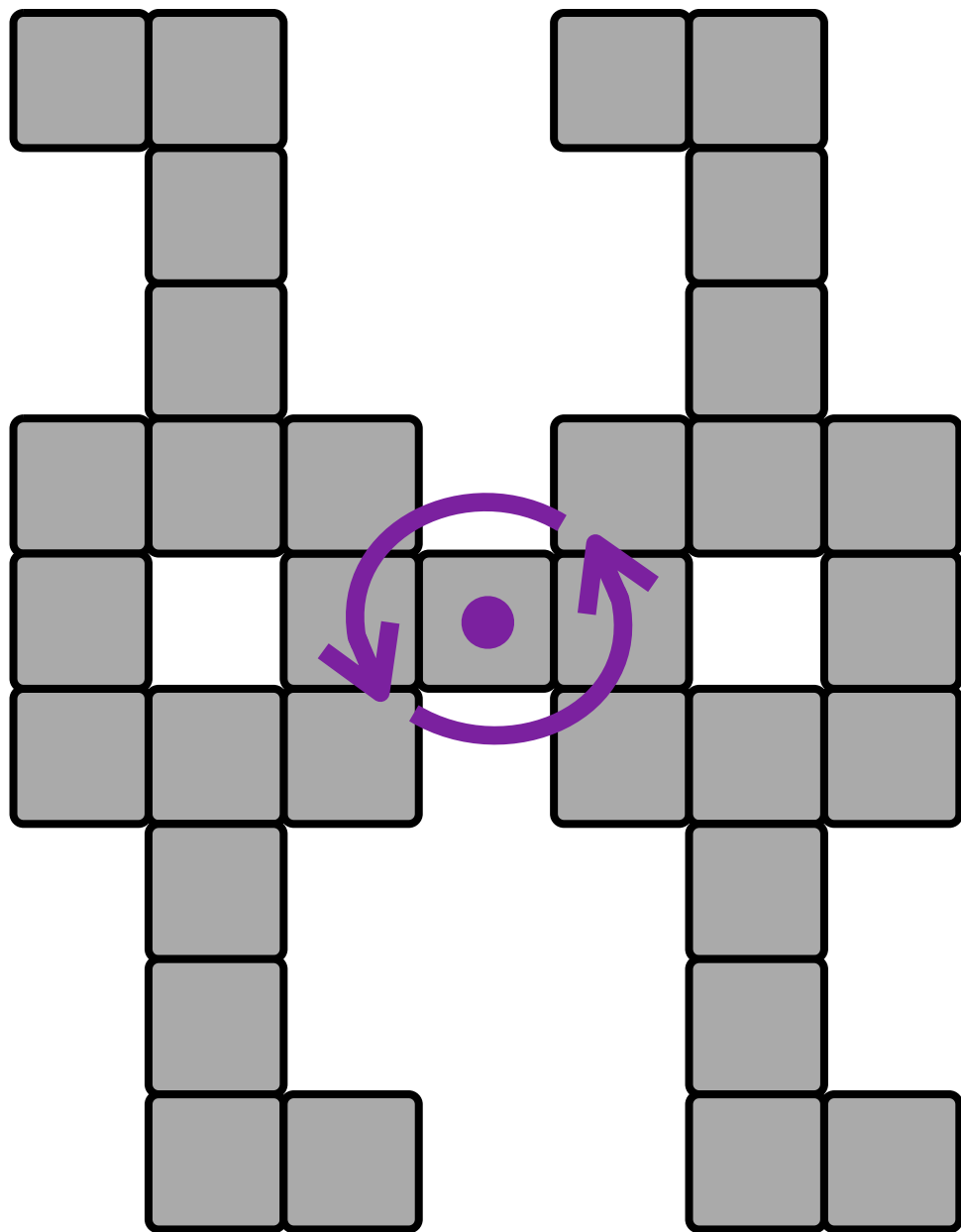
- Has exactly one hole
- Has rotational symmetry
- Has mirror symmetry
- Has exactly a dozen squares
- Is taller than it is wide



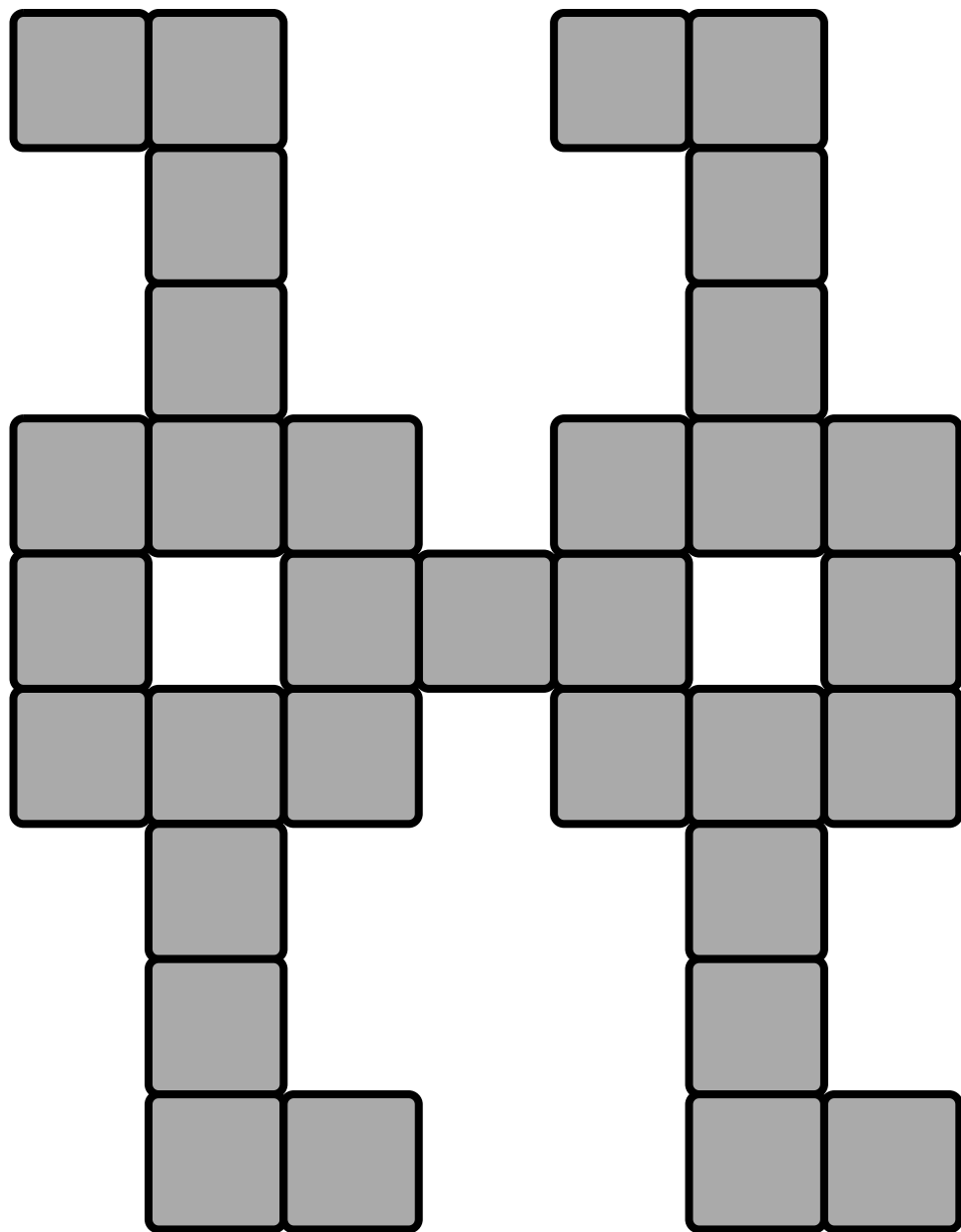
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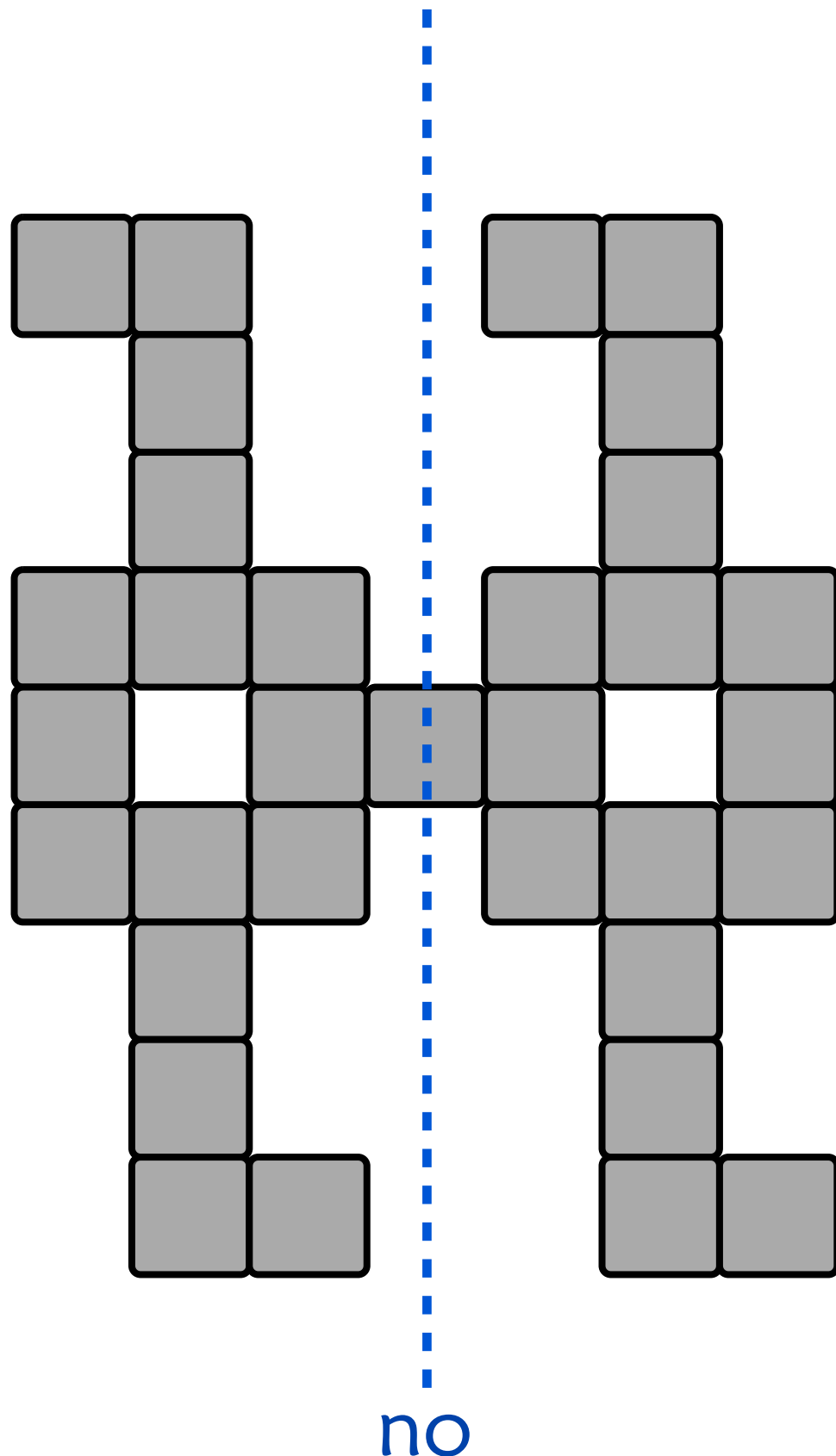
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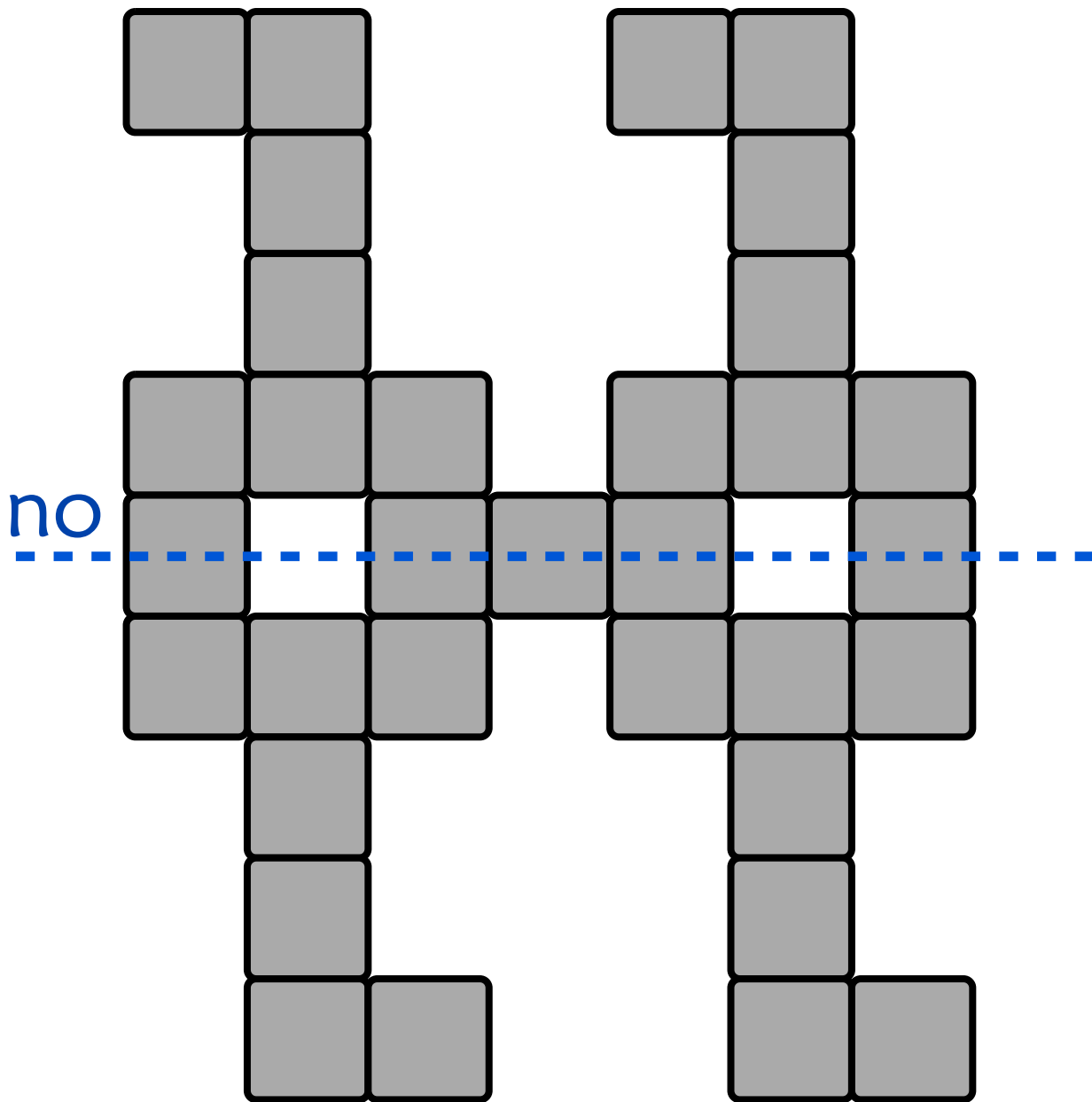
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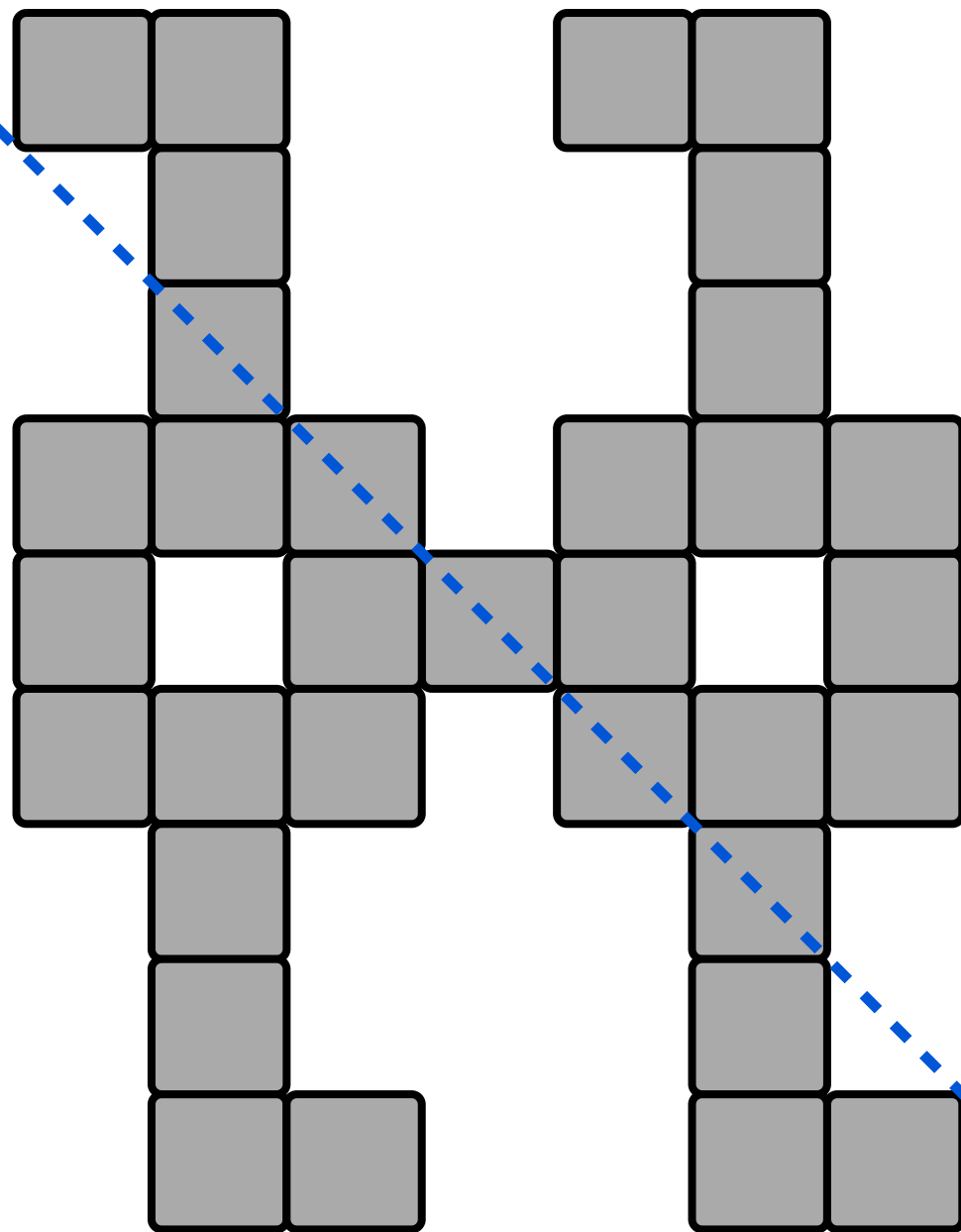
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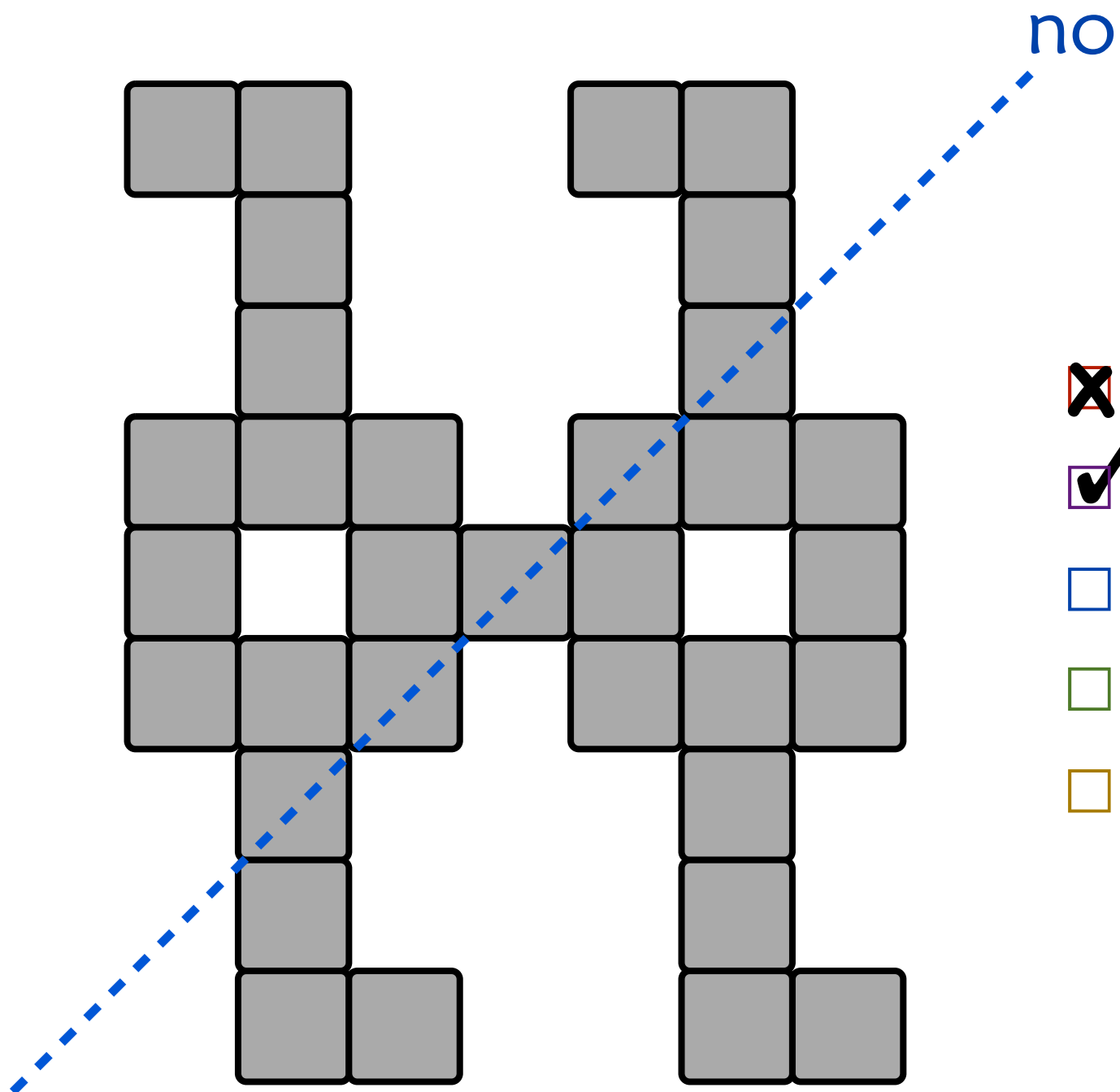


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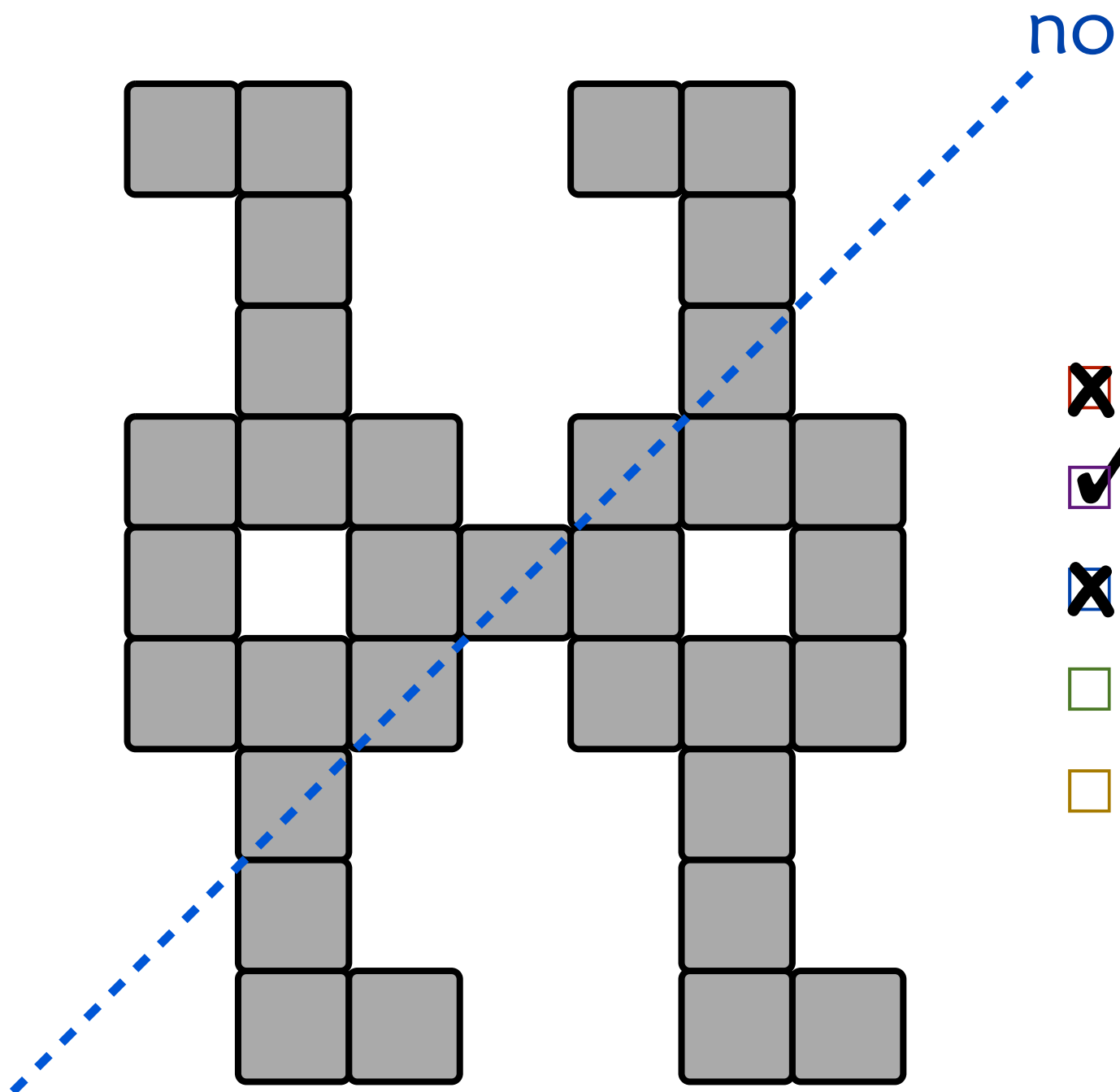


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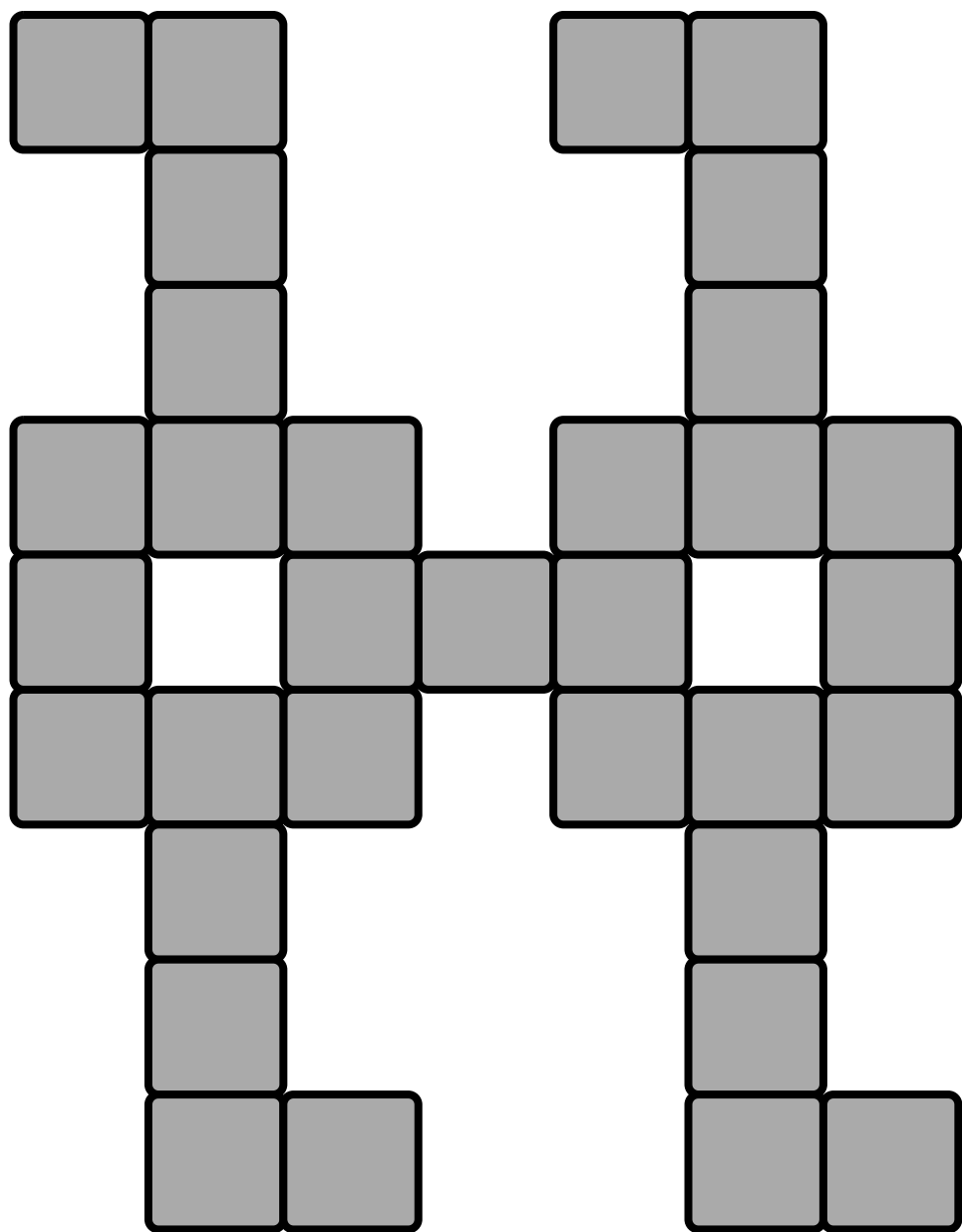
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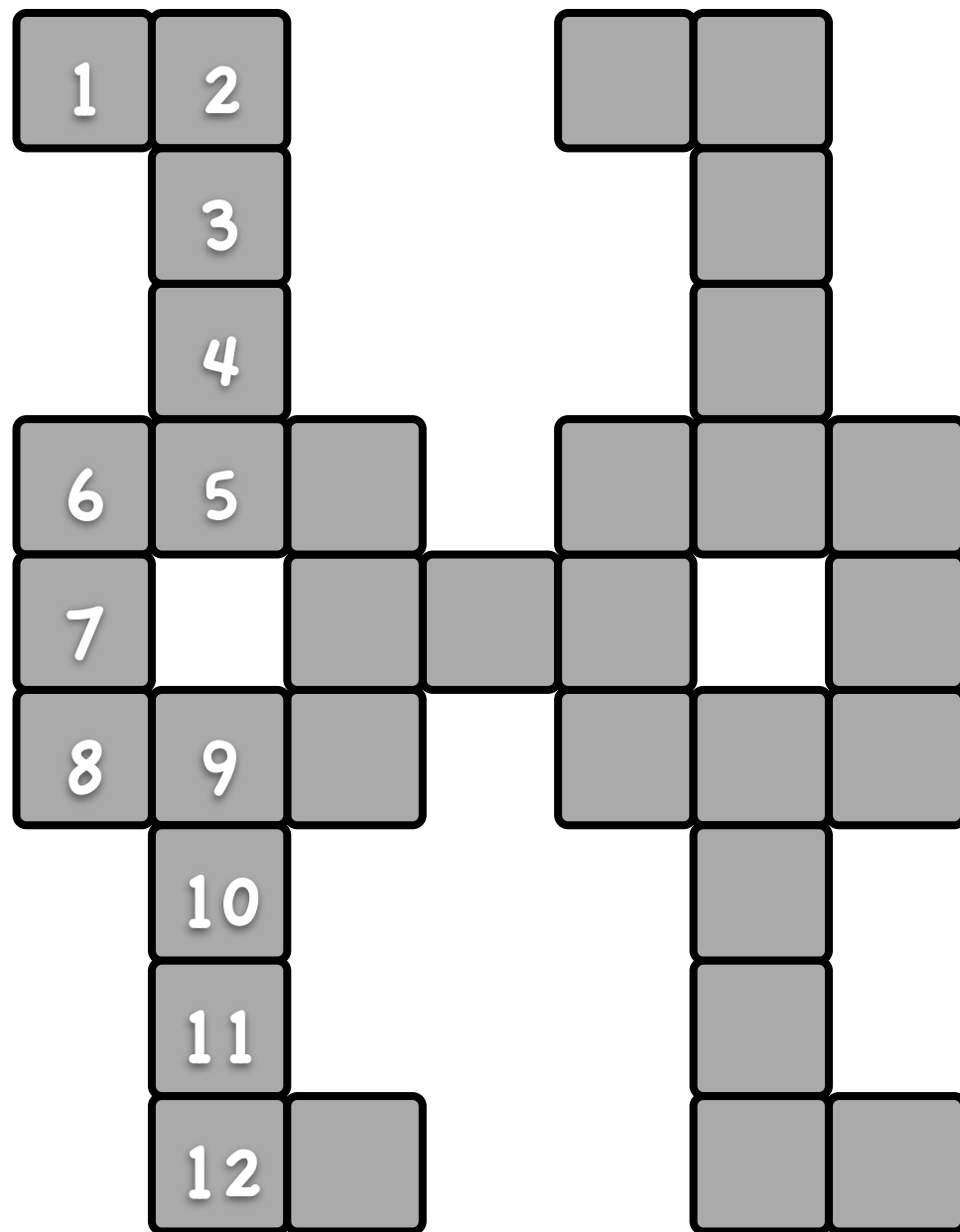
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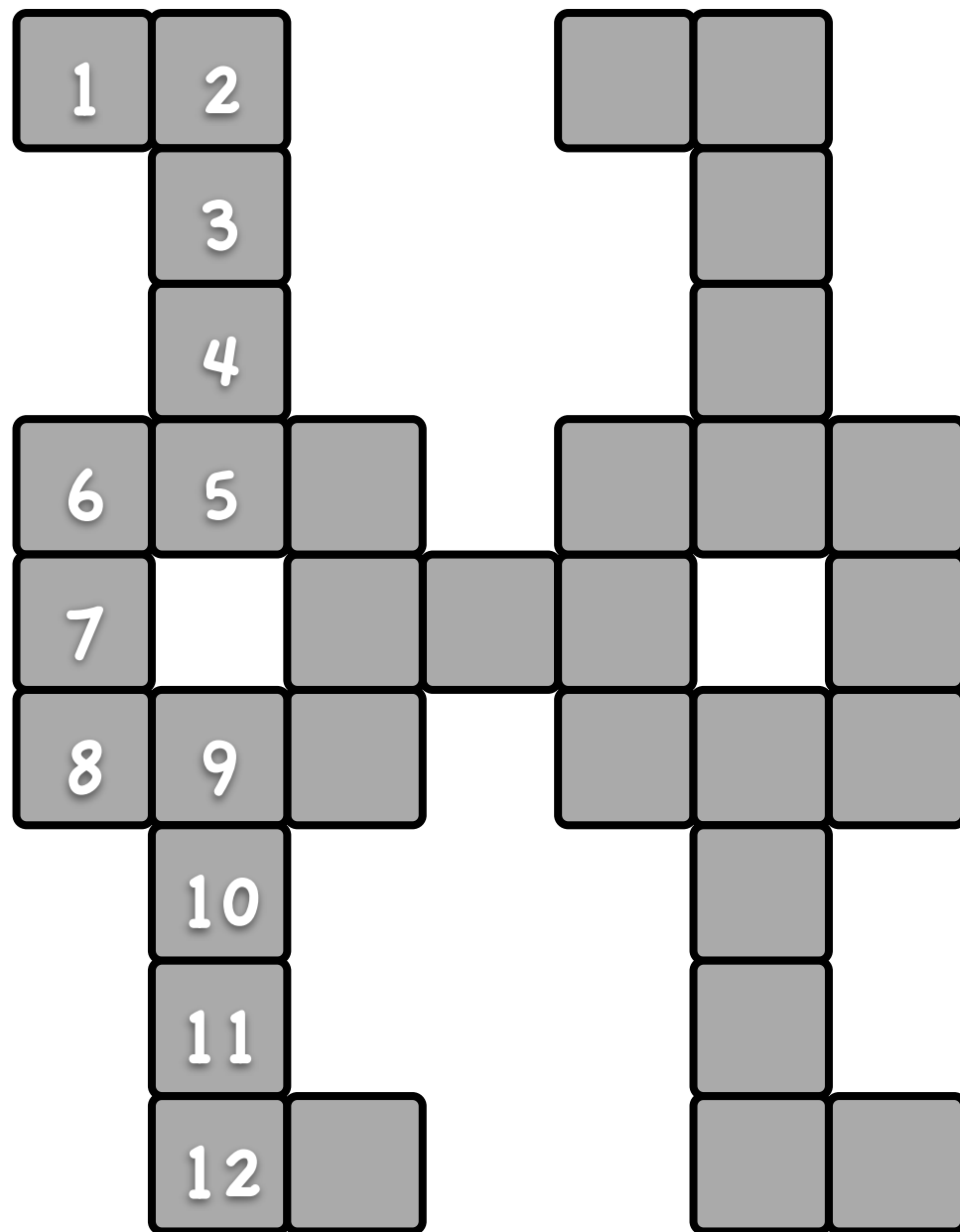
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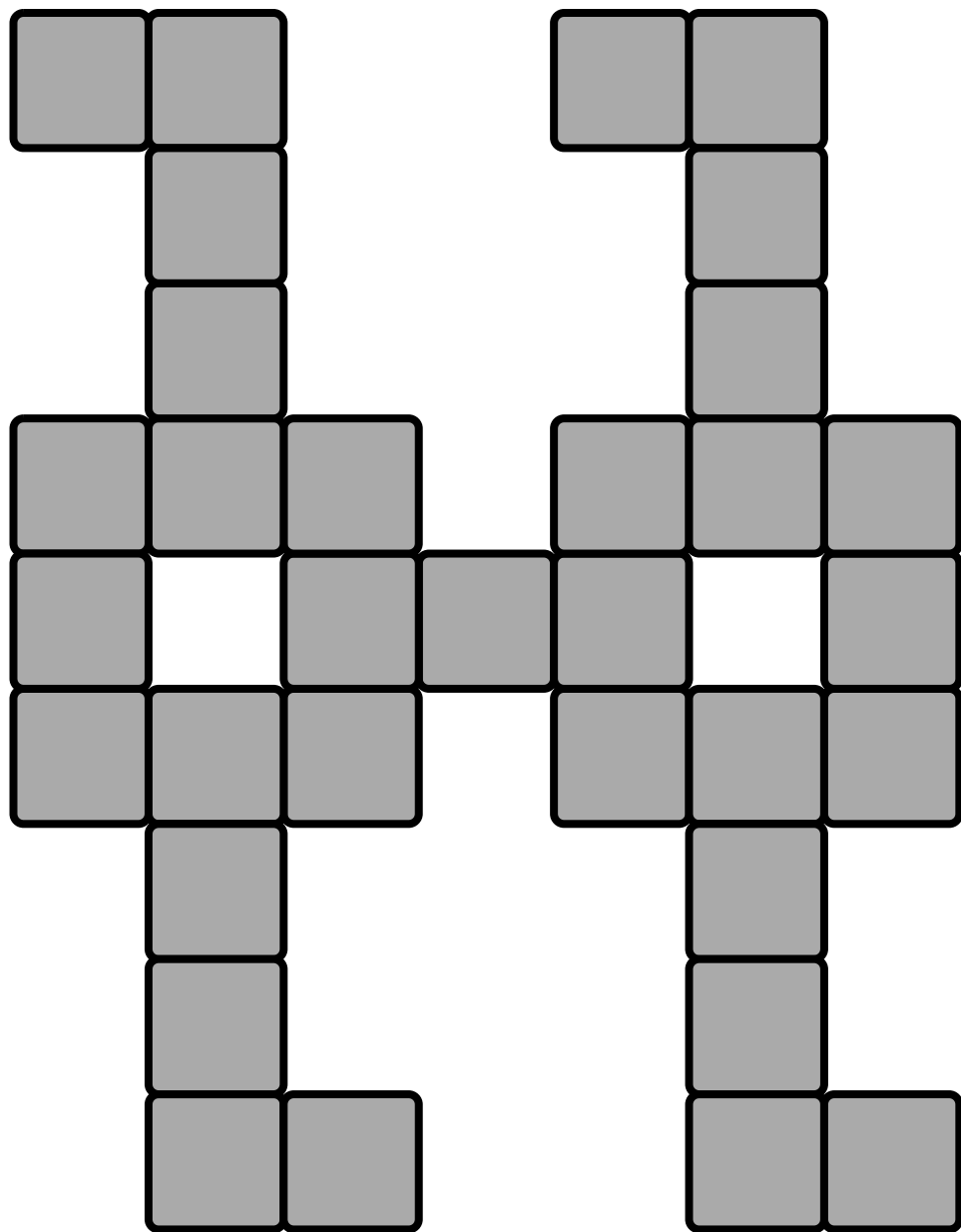
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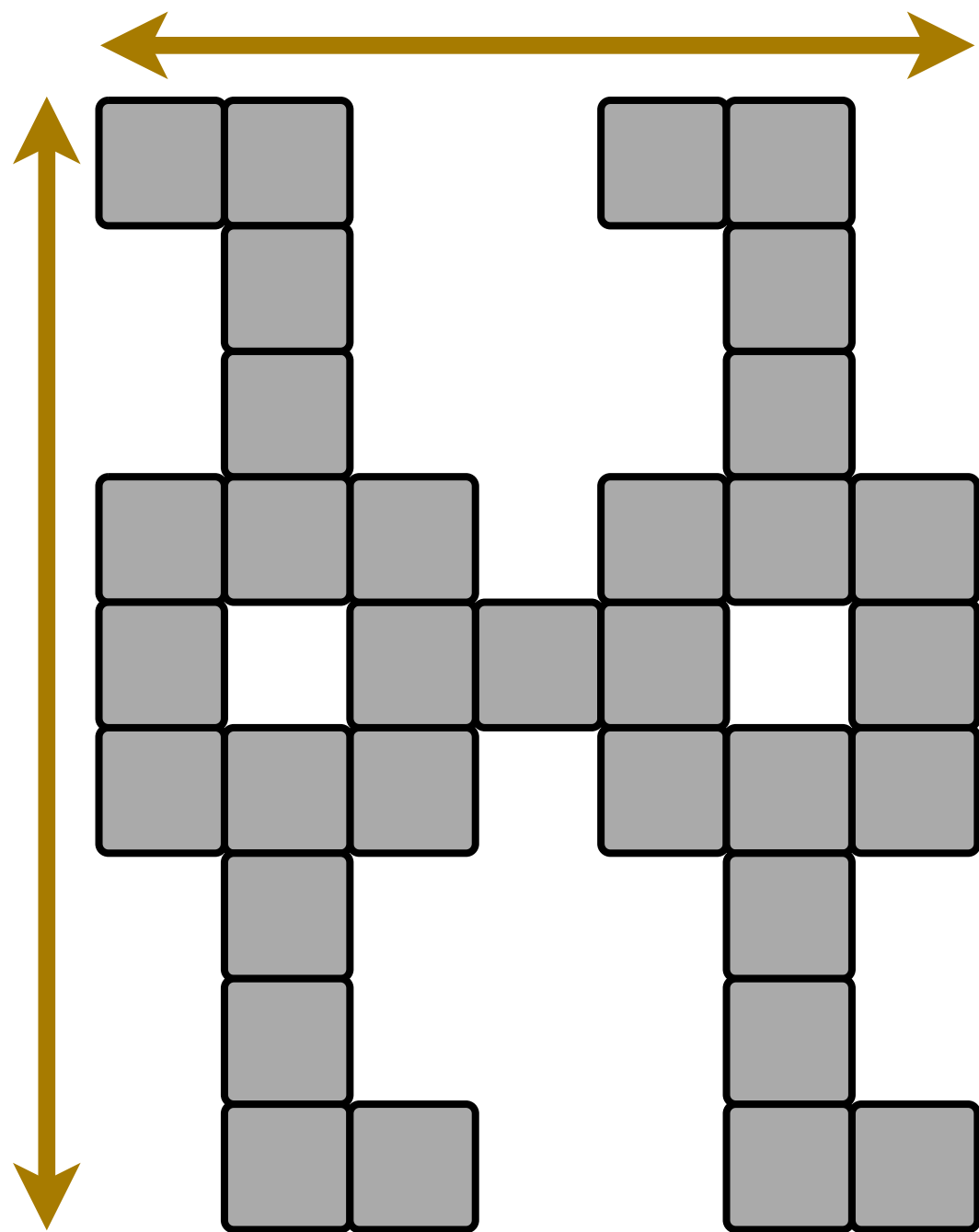
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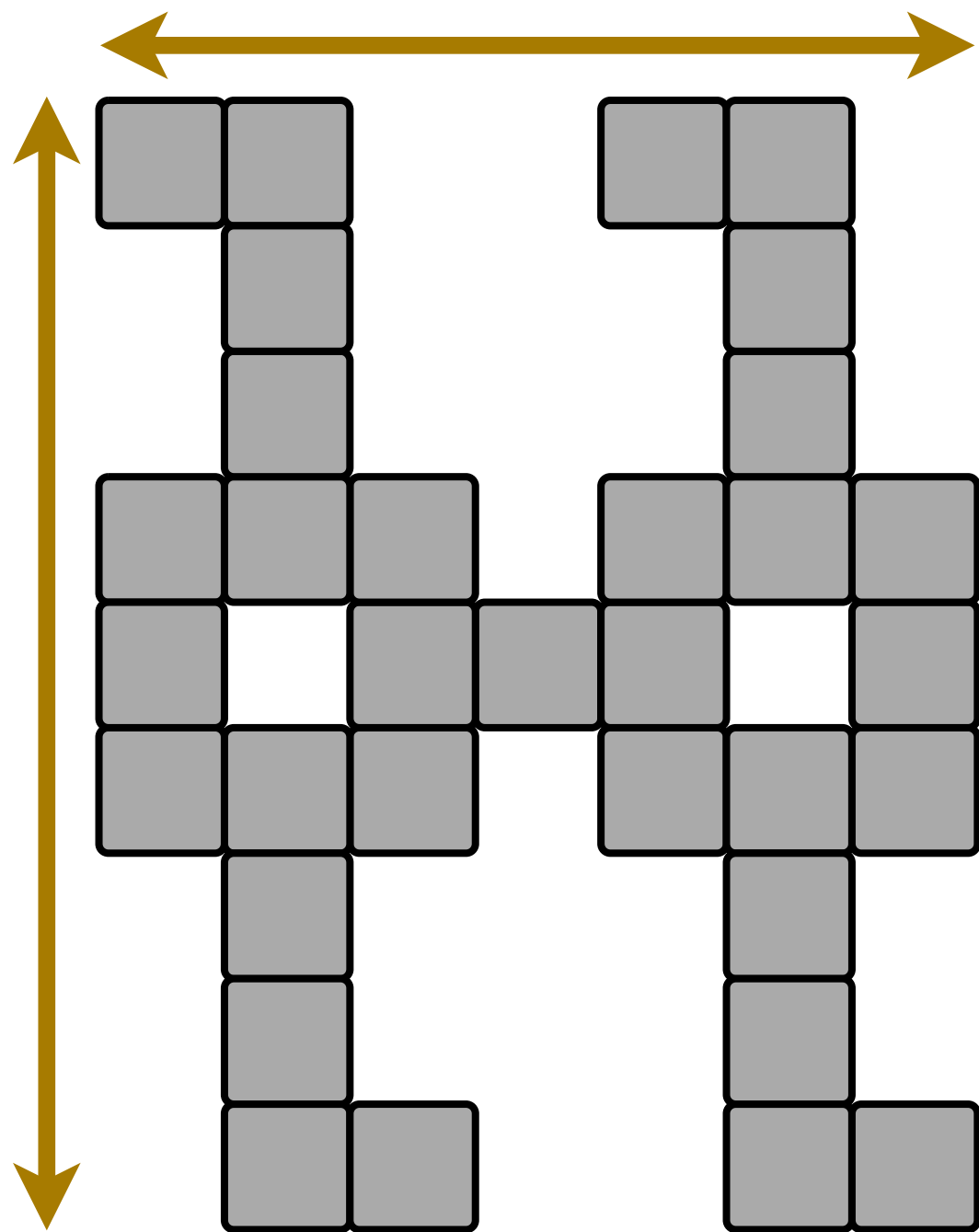
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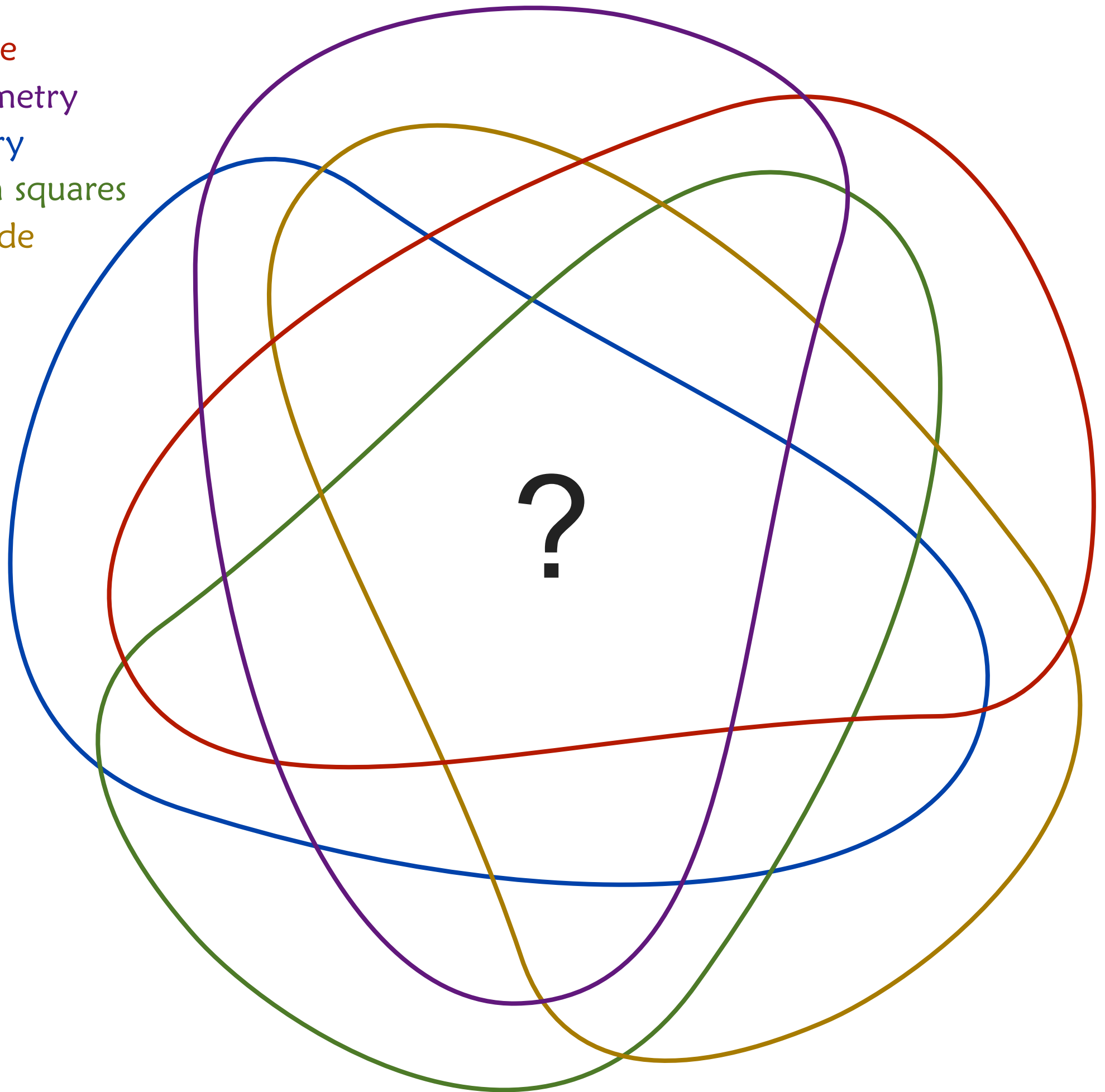
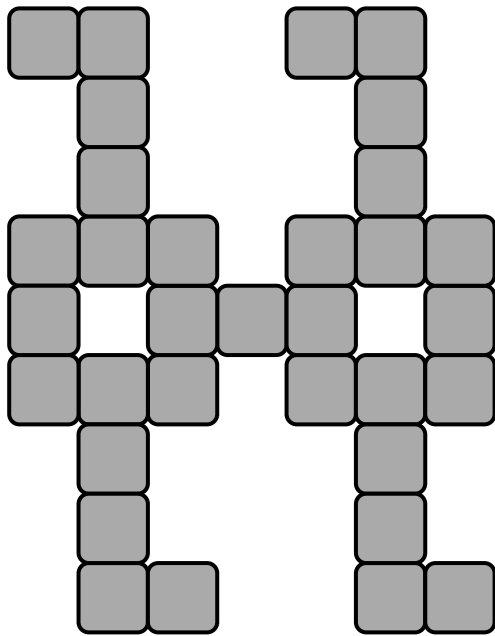


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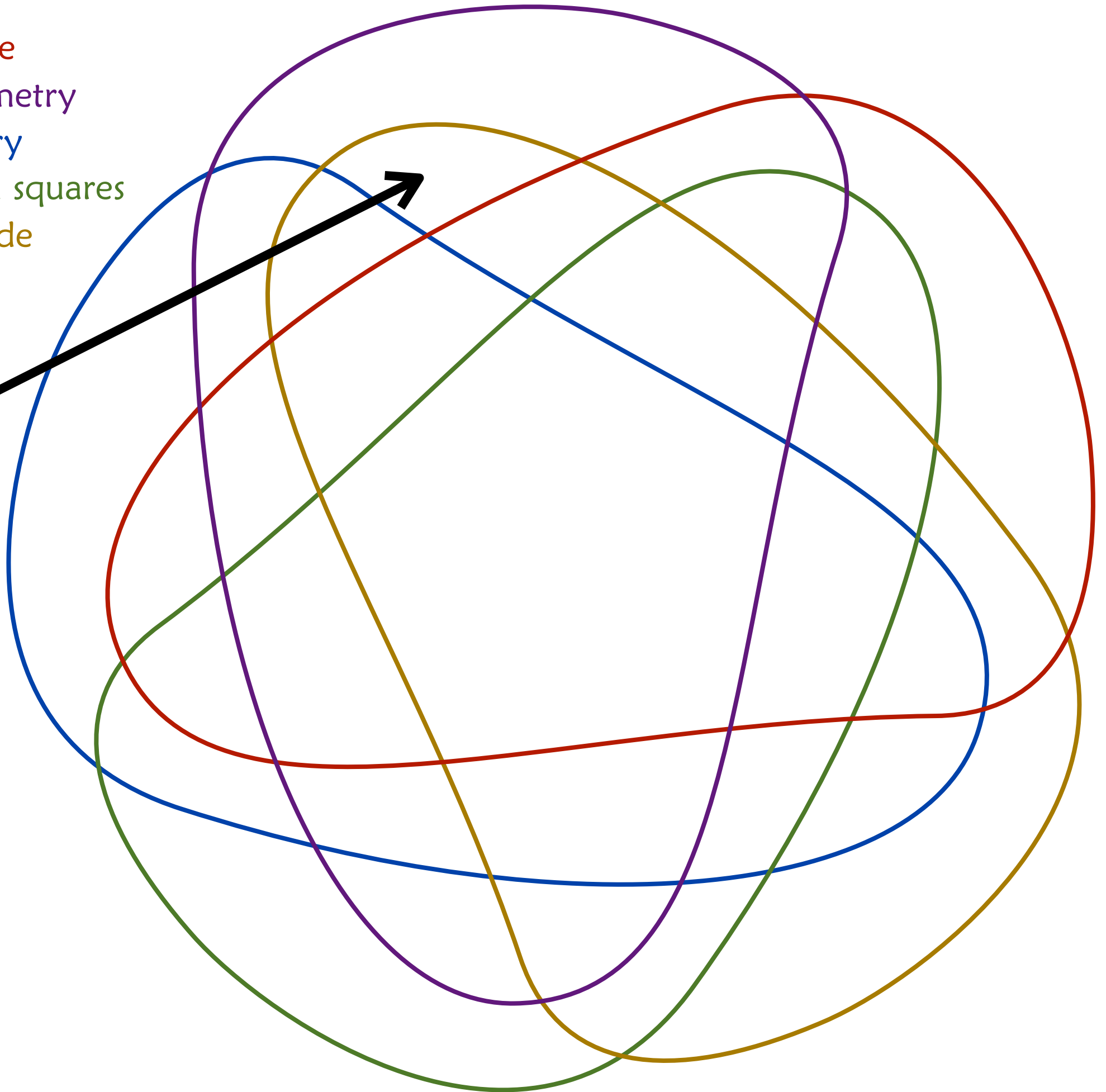
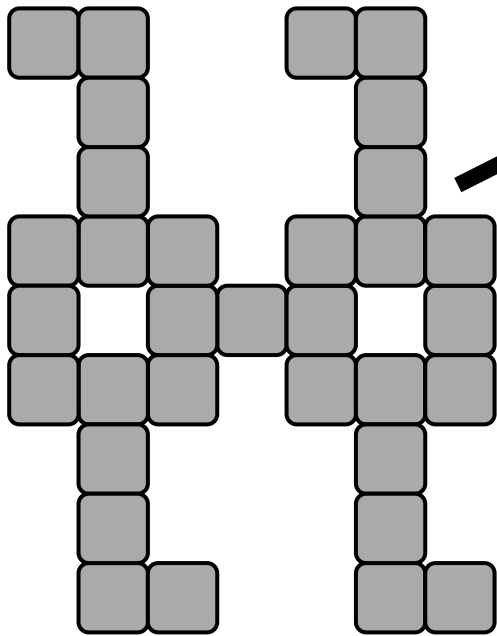


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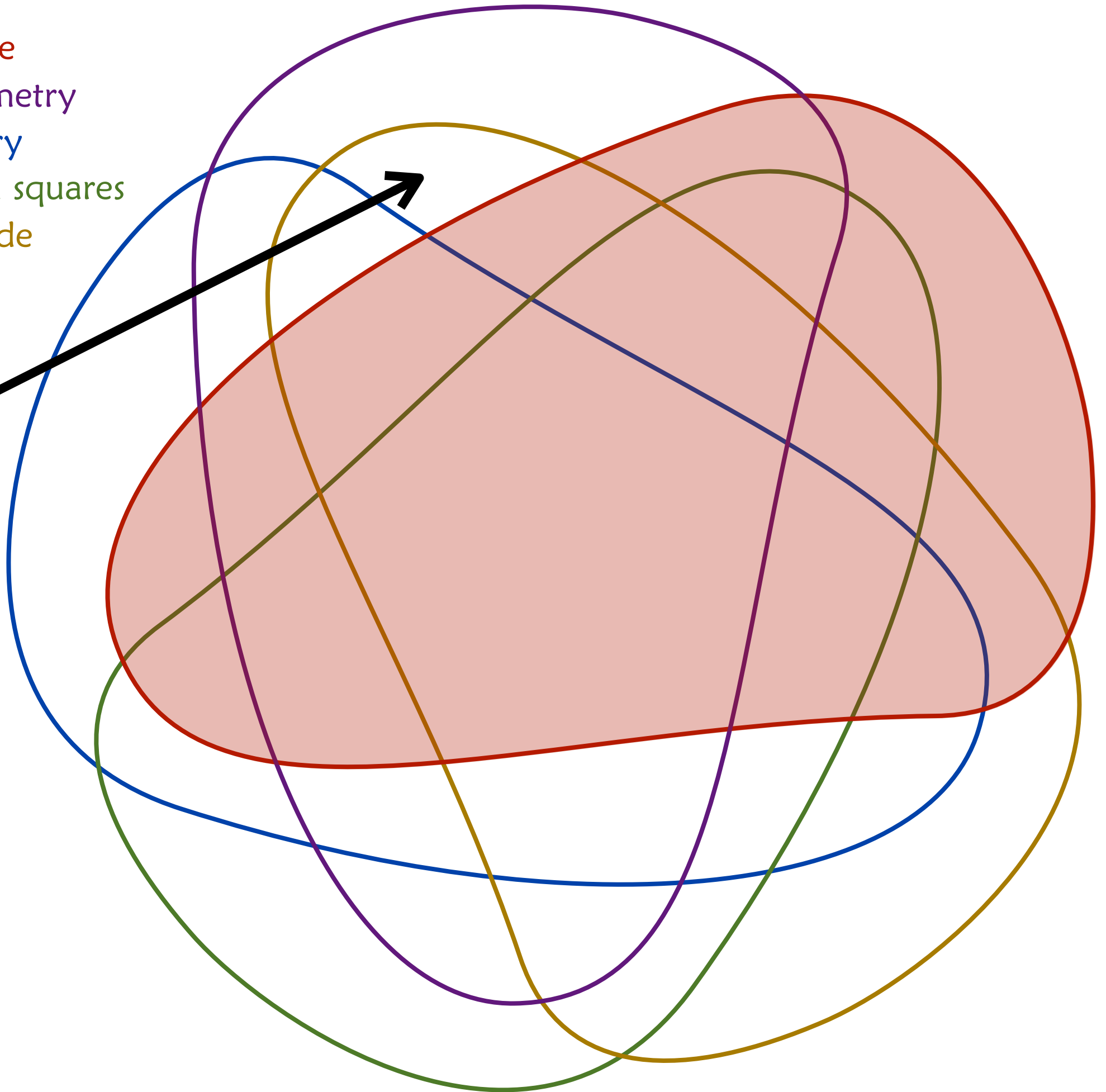
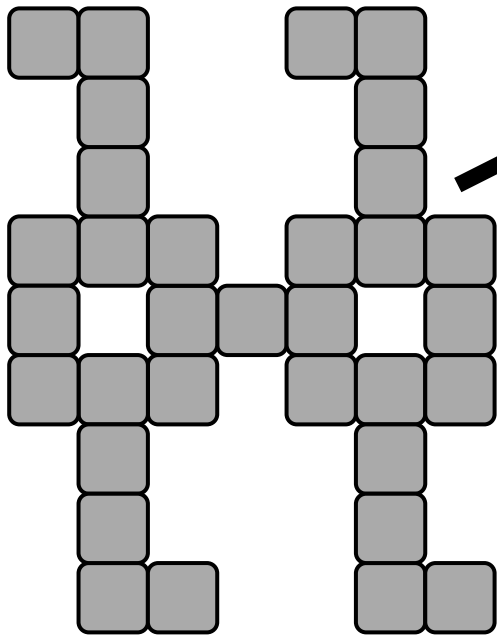
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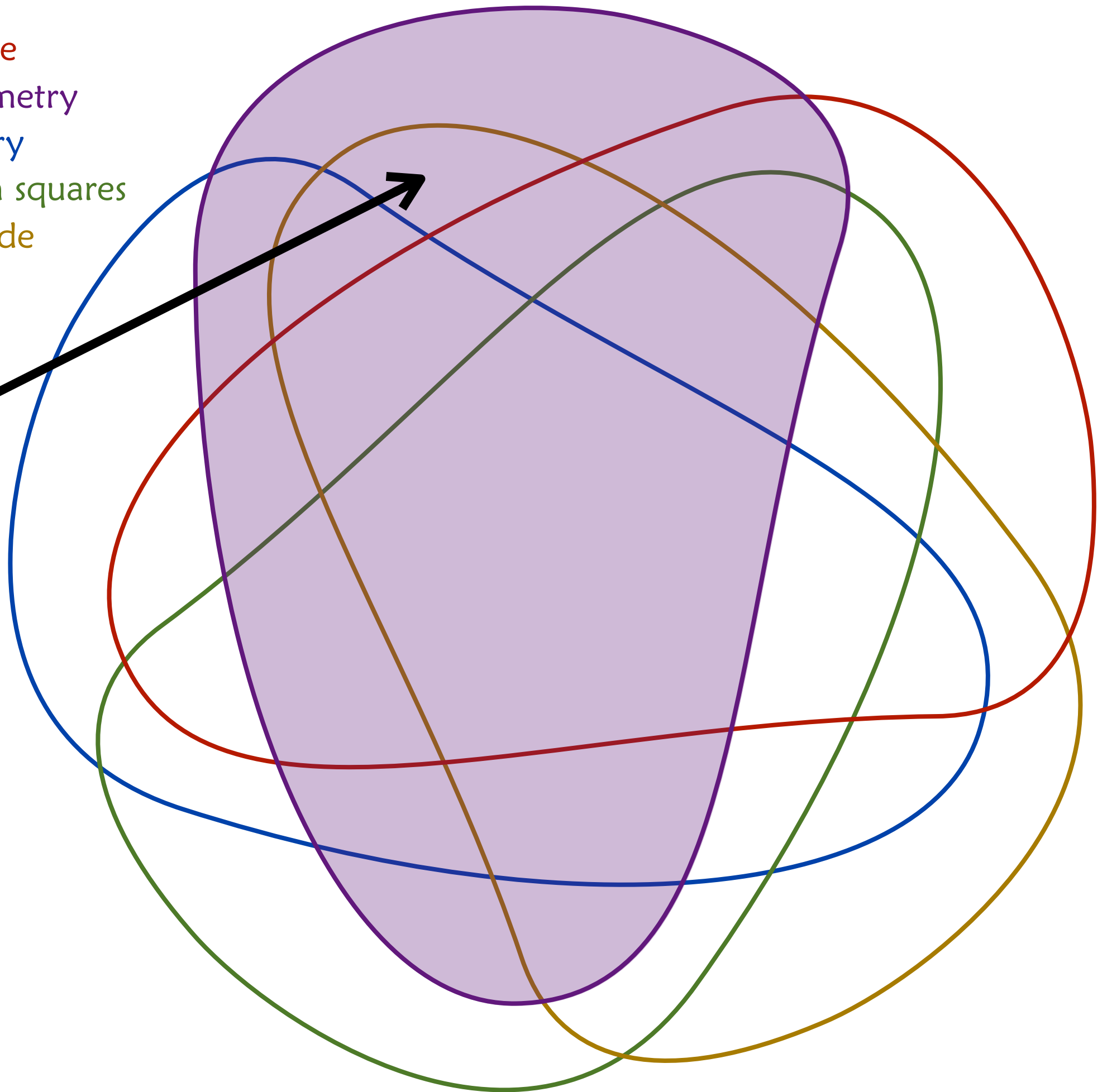
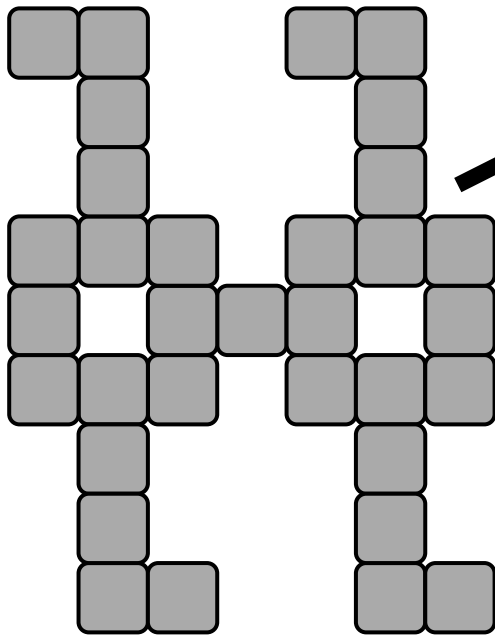
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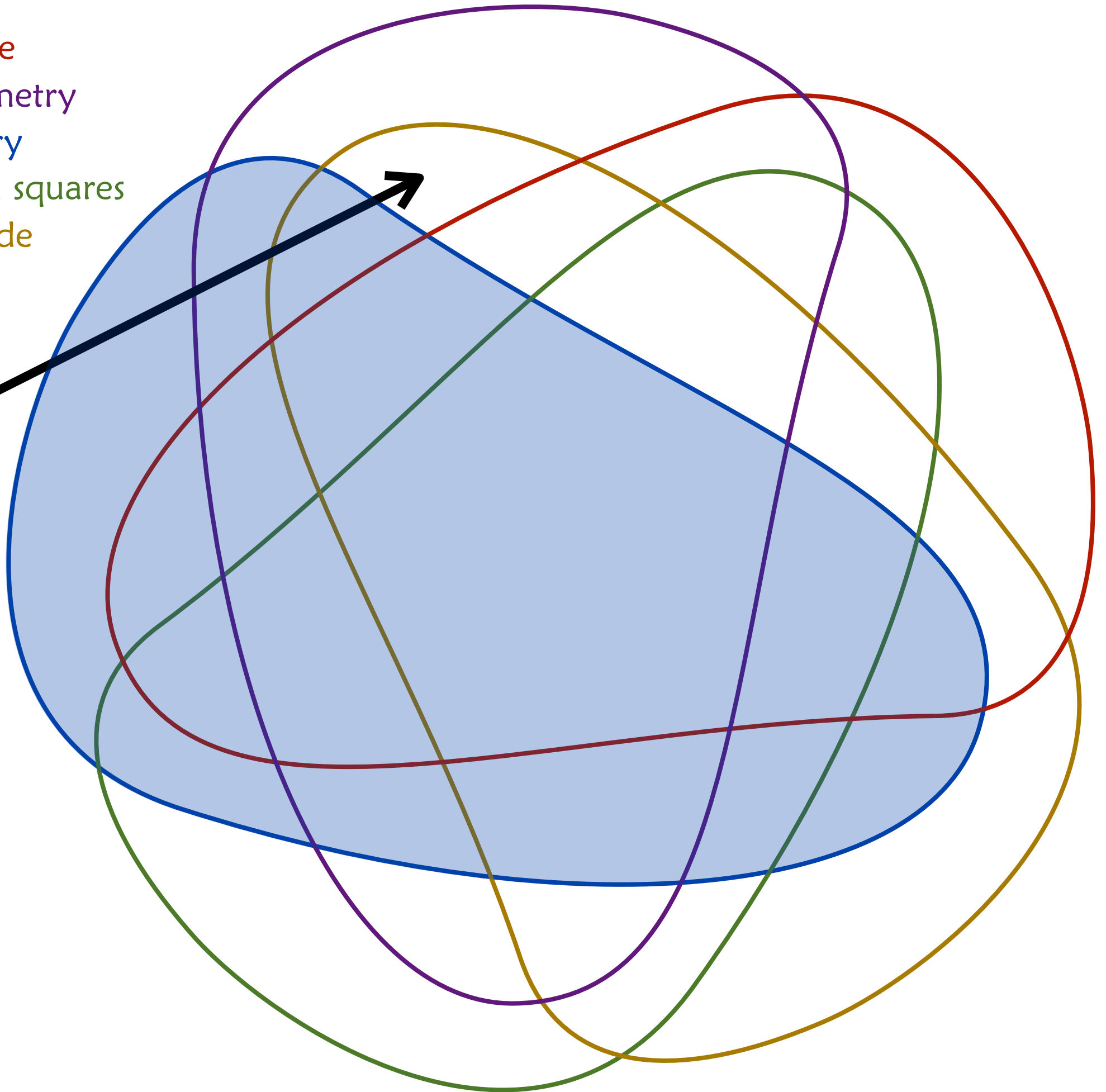
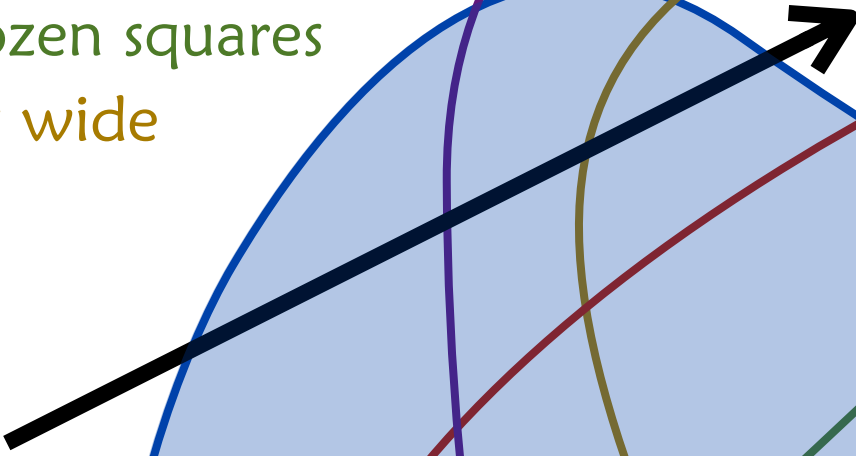
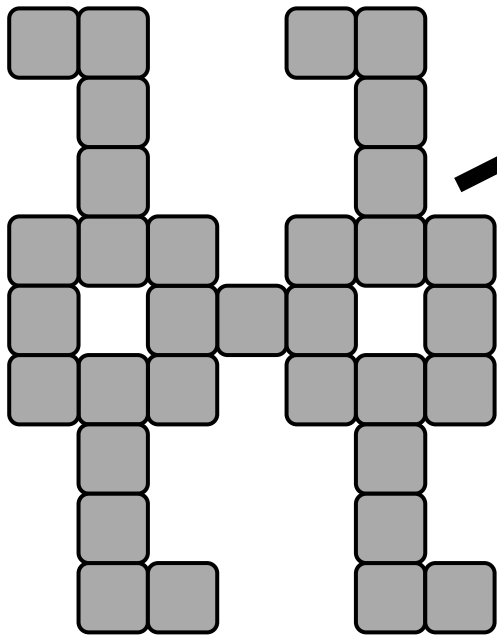
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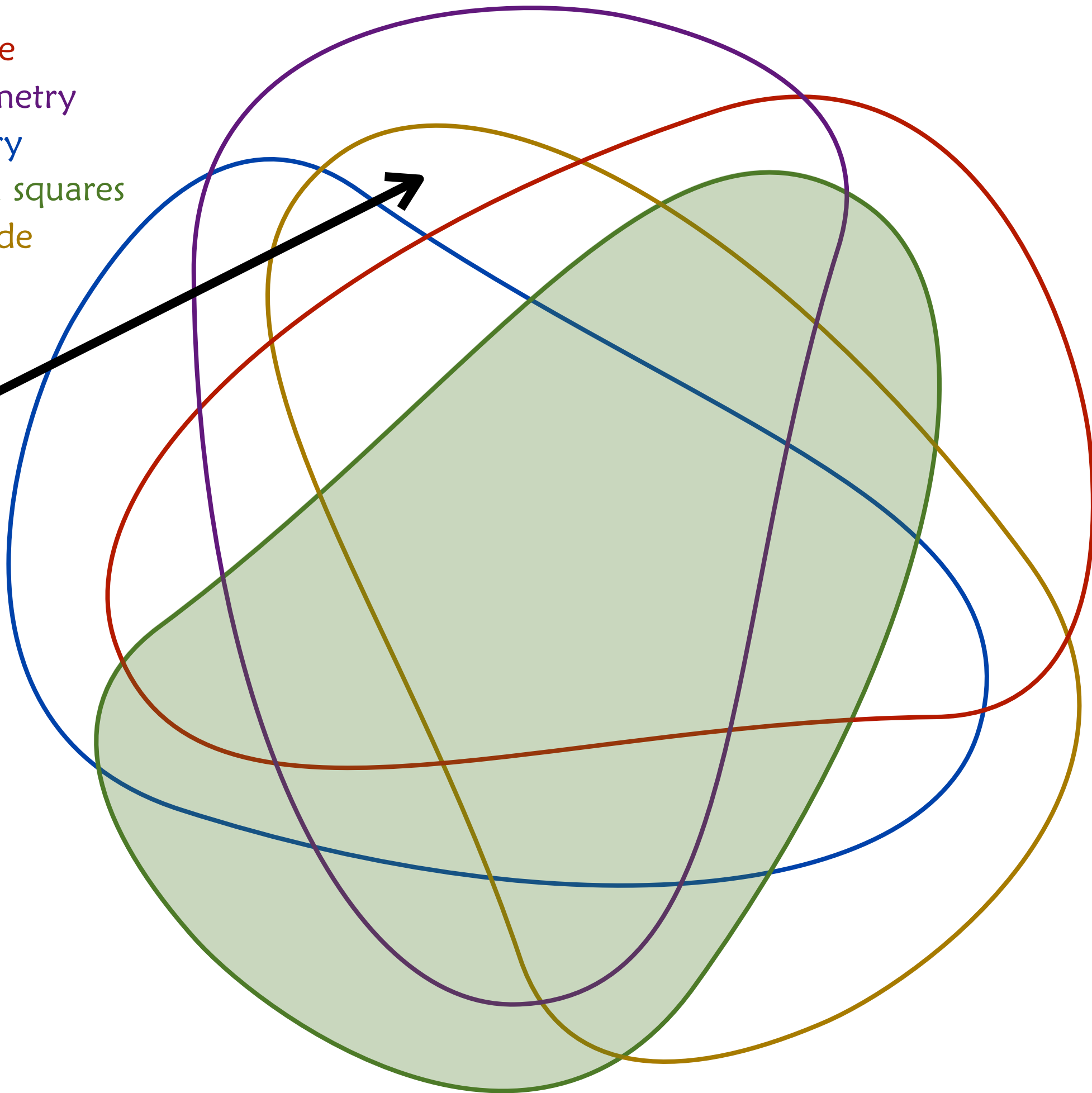
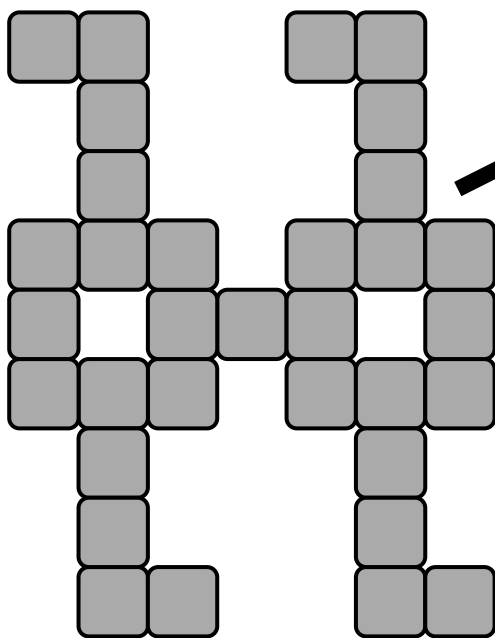
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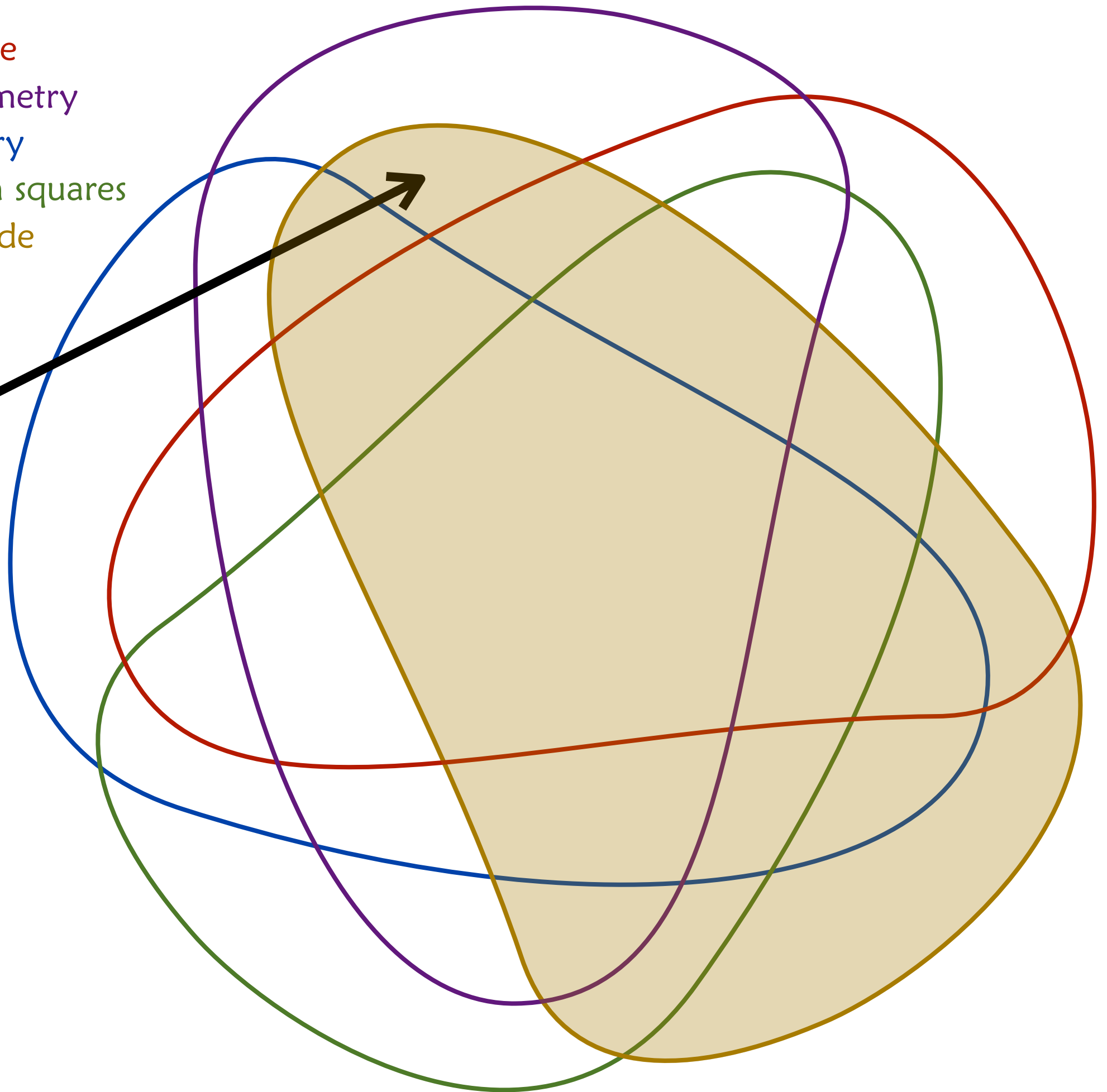
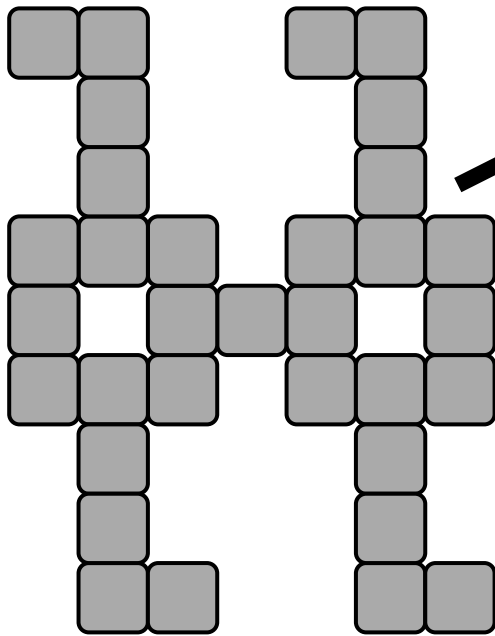
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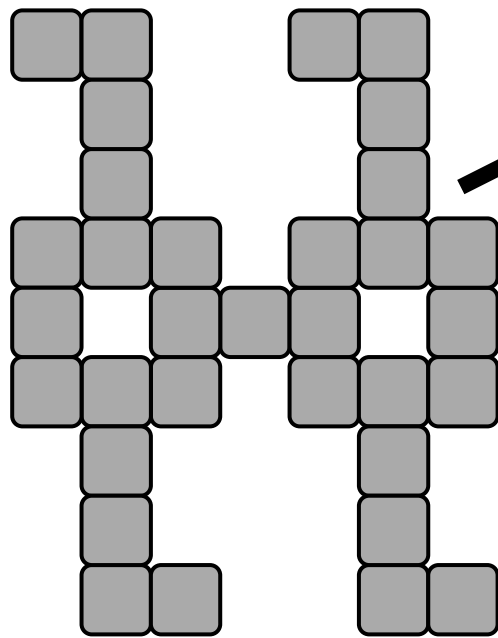
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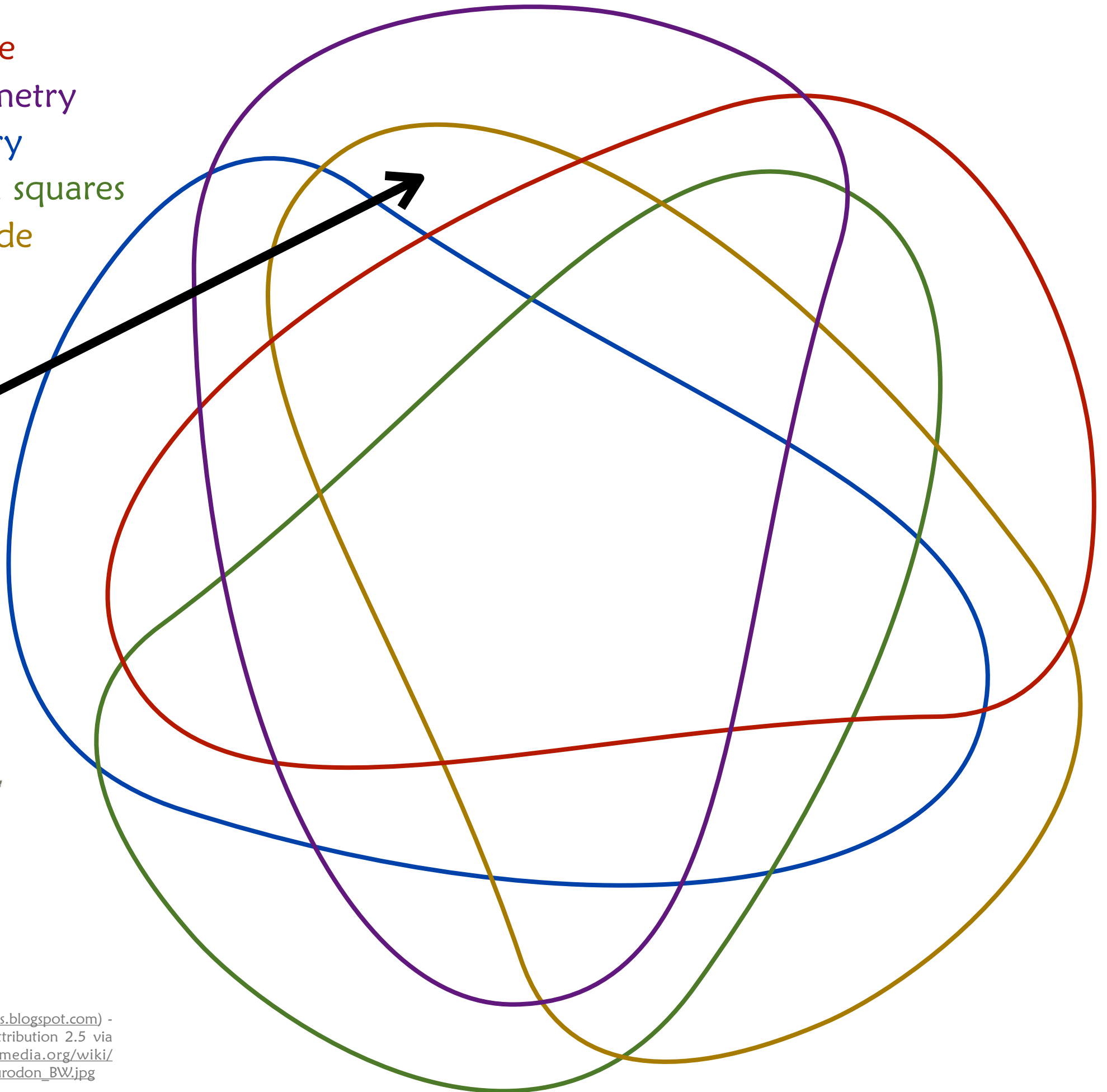
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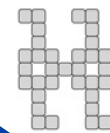
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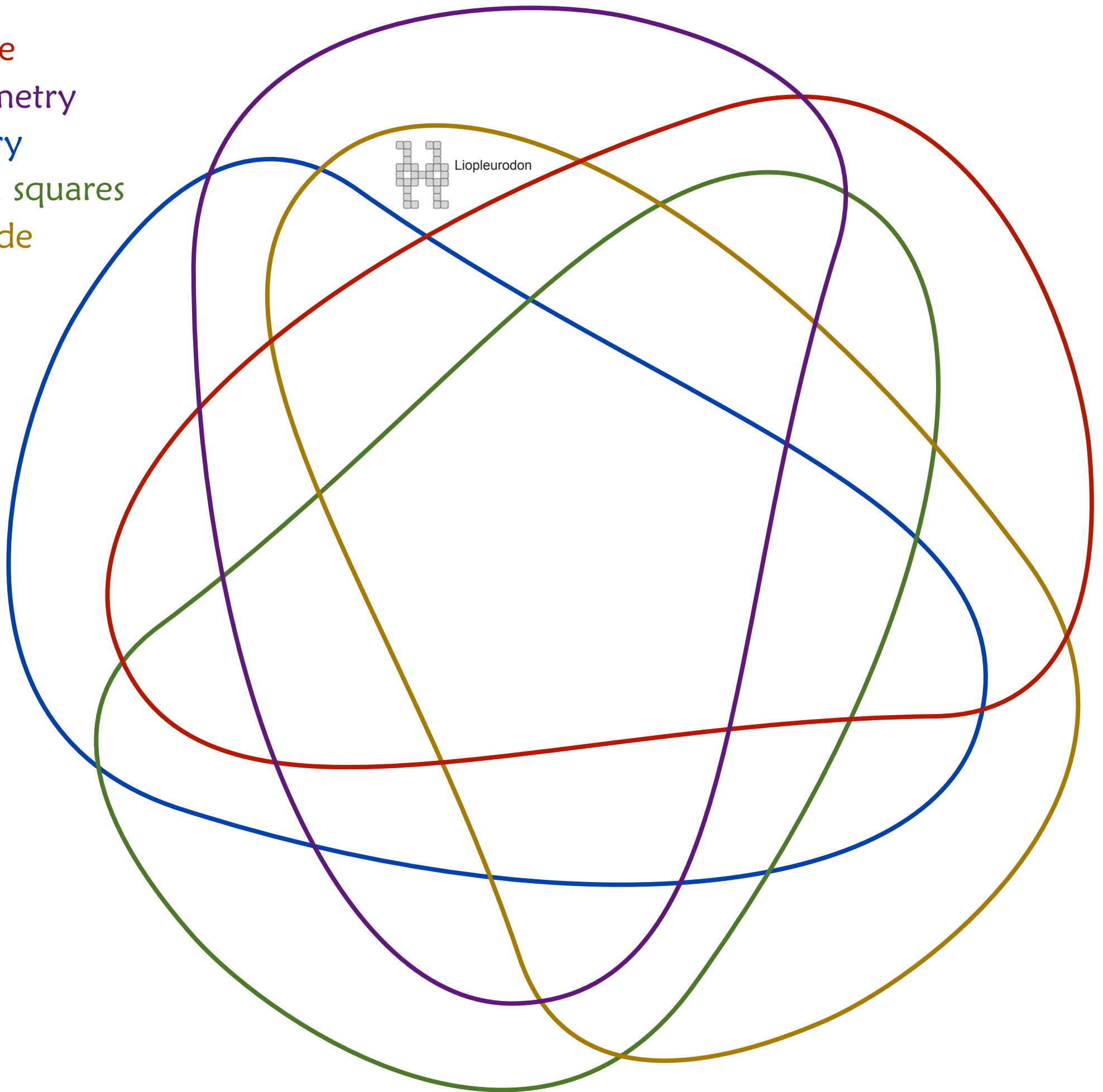
Liopleurodon



- ✗ Has exactly one hole
- ✓ Has rotational symmetry
- ✗ Has mirror symmetry
- ✗ Has exactly a dozen squares
- ✓ Is taller than it is wide



Liopleurodon



Standards for Mathematical Practice

All MathPickle puzzles including **Mishap at Venn Zoo** are guaranteed to engage a wide spectrum of student abilities while targeting the following Standards for Mathematical Practice:

MP1 Toughen up!

This is problem solving where our students develop grit and resiliency in the face of nasty, thorny problems. It is the most sought after skill for our students.

MP3 Work together!

This is collaborative problem solving in which students discuss their strategies to solve a problem and identify missteps in a failed solution. MathPickle recommends pairing up students for all its puzzles.

MP6 Be precise!

This is where our students learn to communicate using precise terminology. MathPickle encourages students not only to use the precise terms of others, but to invent and rigorously define their own terms.

MP7 Be observant!

One of the things that the human brain does very well is identify pattern. We sometimes do this too well and identify patterns that don't really exist.

[\(http://www.corestandards.org/Math/Practice/\)](http://www.corestandards.org/Math/Practice/)

Common Core State Standards

Mishap at Venn Zoo targets the following grade 4/5 Common Core State Standards:

CCSS.MATH.CONTENT.4.G.A.2

Classify two-dimensional figures based on the presence or absence of parallel or perpendicular lines, or the presence or absence of angles of a specified size.

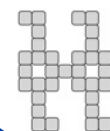
CCSS.MATH.CONTENT.4.G.A.3

Recognize a line of symmetry for a two-dimensional figure as a line across the figure such that the figure can be folded along the line into matching parts. Identify line-symmetric figures and draw lines of symmetry.

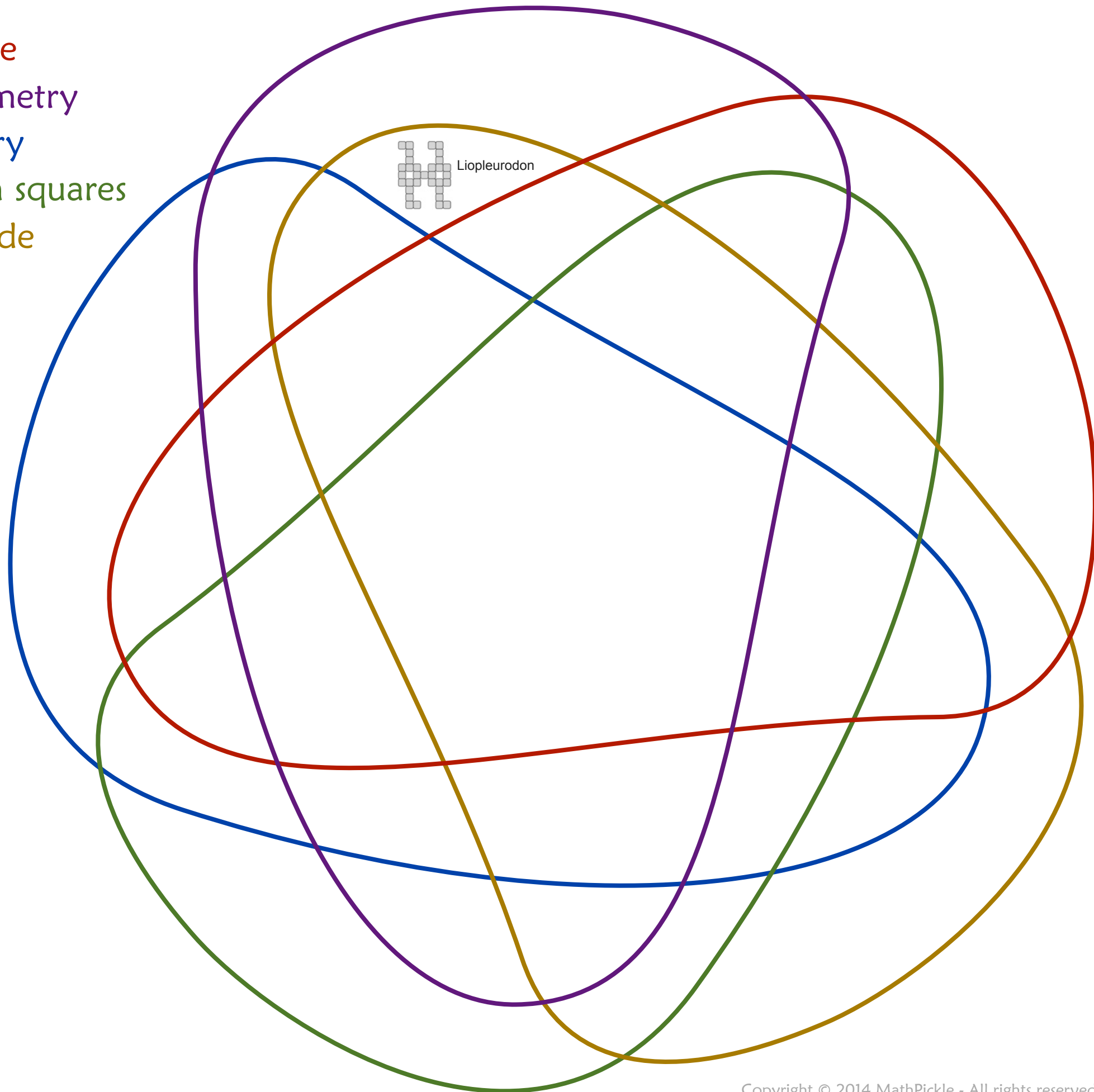
CCSS.MATH.CONTENT.5.G.B.4

Classify two-dimensional figures in a hierarchy based on properties.

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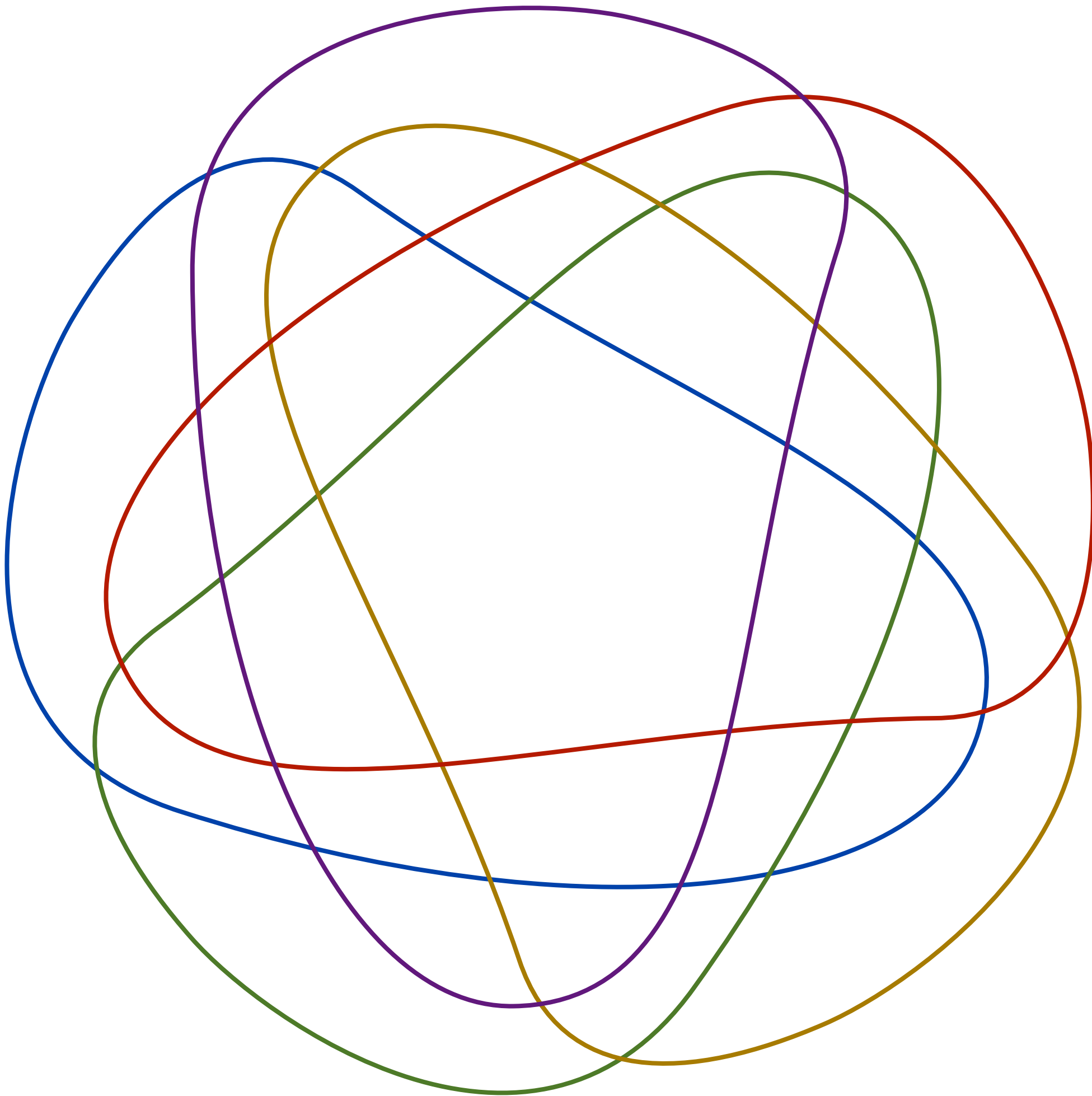
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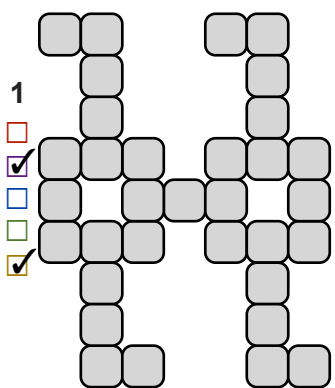


We are preparing to open Venn Zoo, but there may be a problem: We pride ourselves in caging our fiercely territorial polyanimals in private cells, but somehow one of our orders got messed up - so it is possible that one cell might get two polyanimals. This would be disastrous since polyanimals fight until one of them is reduced to little square bits.

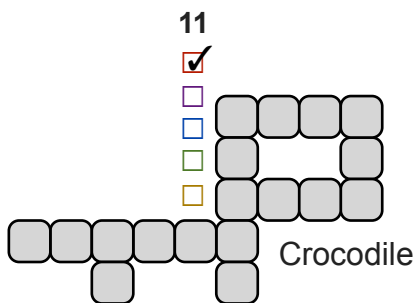
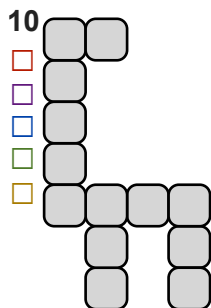
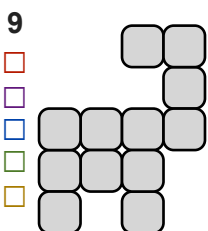
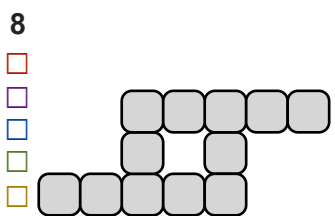
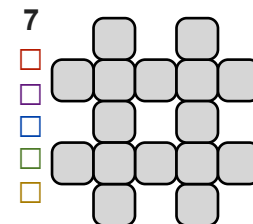
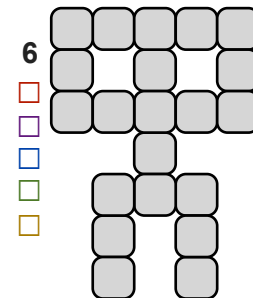
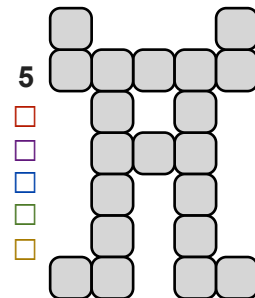
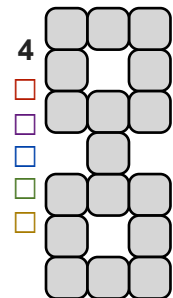
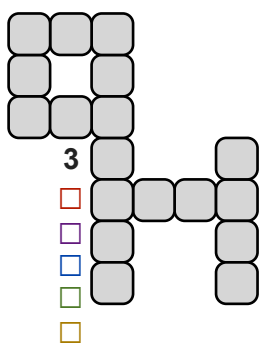
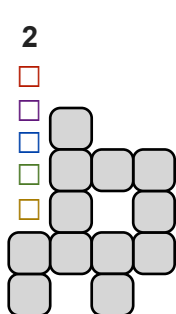
Choose a polyanimal from the other page. Put it in the correct cage, then name it. If you find a cage that has two polyanimals - please send one of them back. If you find an empty cell, please order a polyanimal for it.

Liopleurodon has already been caged. It's in the correct cage because it has rotational symmetry (must be inside the purple loop) and is taller than it is wide (must be inside the tan loop). Instead of drawing the polyanimals, you may choose to use their numbers.

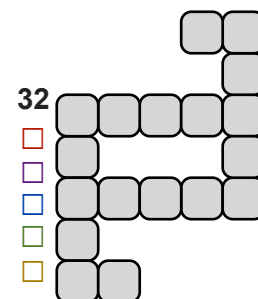
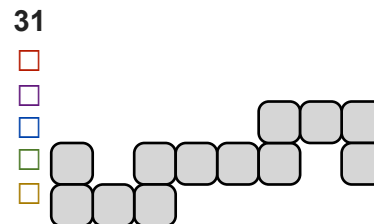
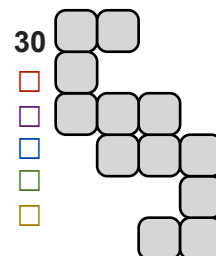
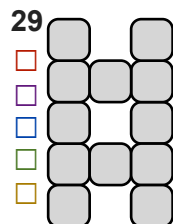
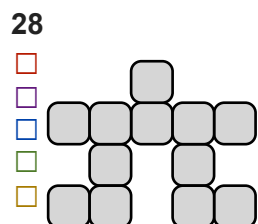
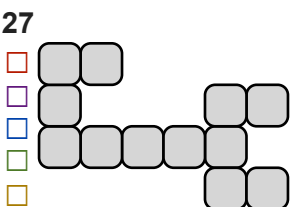
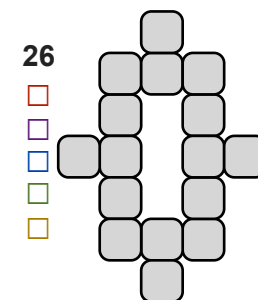
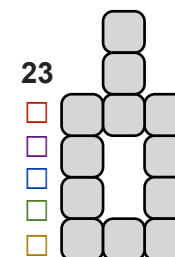
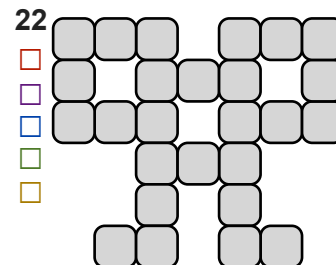
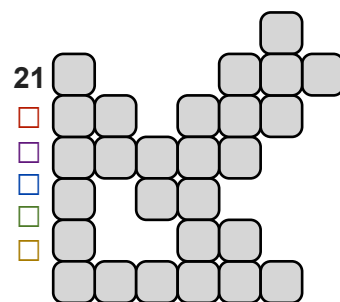
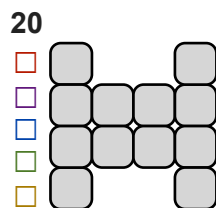
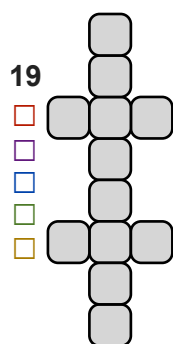
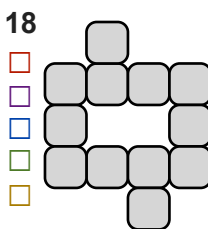
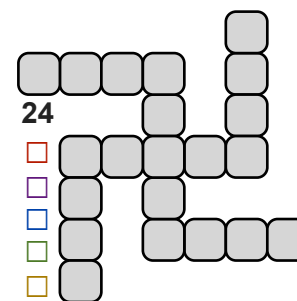
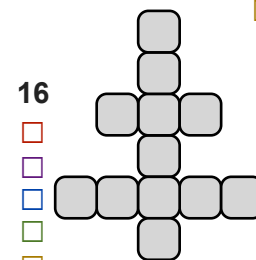
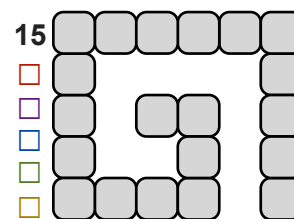
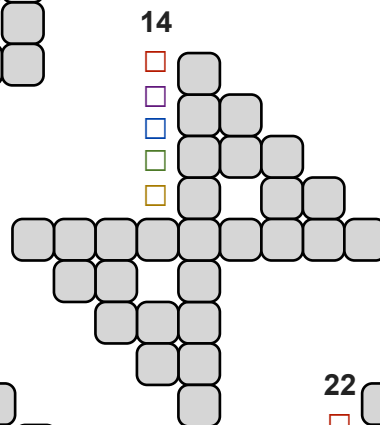
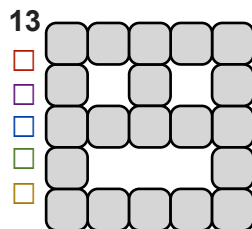
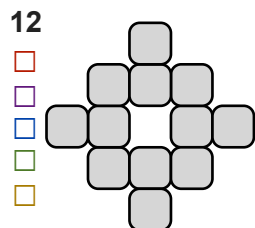




Liopleurodon



Crocodile



Mishap at Venn Zoo

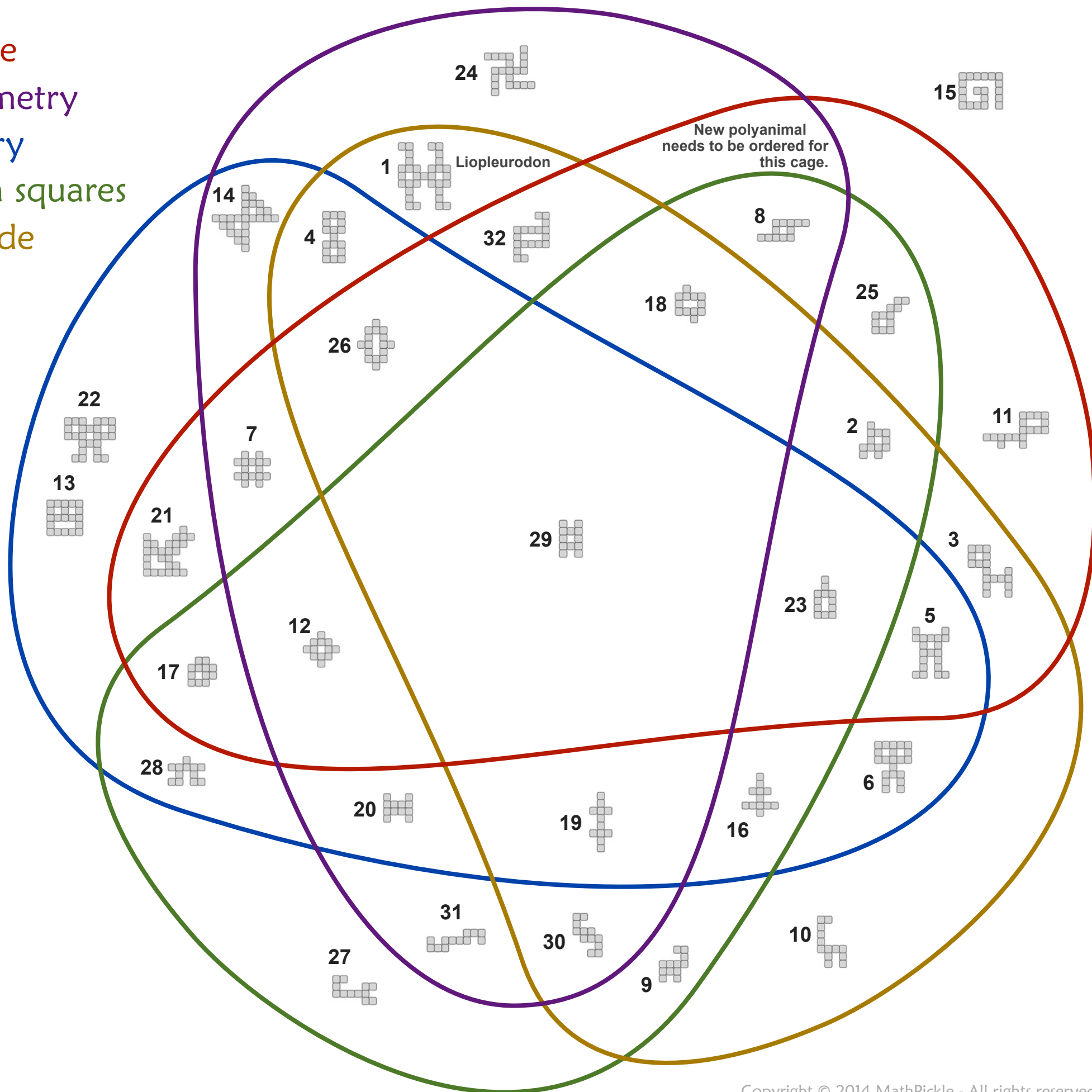
- ☐ Has exactly one hole
- ☐ Has rotational symmetry
- ☐ Has mirror symmetry
- ☐ Has exactly a dozen squares
- ☐ Is taller than it is wide

Answer Sheet


We are preparing to open Venn Zoo, but there may be a problem: We pride ourselves in caging our fiercely territorial polyanimals in private cells, but somehow one of our orders got messed up - so it is possible that one cell might get two polyanimals. This would be disastrous since polyanimals fight until one of them is reduced to little square bits.


Choose a polyanimal from the other page. Put it in the correct cage, then name it. If you find a cage that has two polyanimals - please send one of them back. If you find an empty cell, please order a polyanimal for it and draw it.

Liopleurodon has already been caged. It's in the correct cage because it has rotational symmetry (must be inside the purple loop) and is taller than it is wide (must be inside the tan loop). Instead of drawing the polyanimals, you may choose to use their numbers.



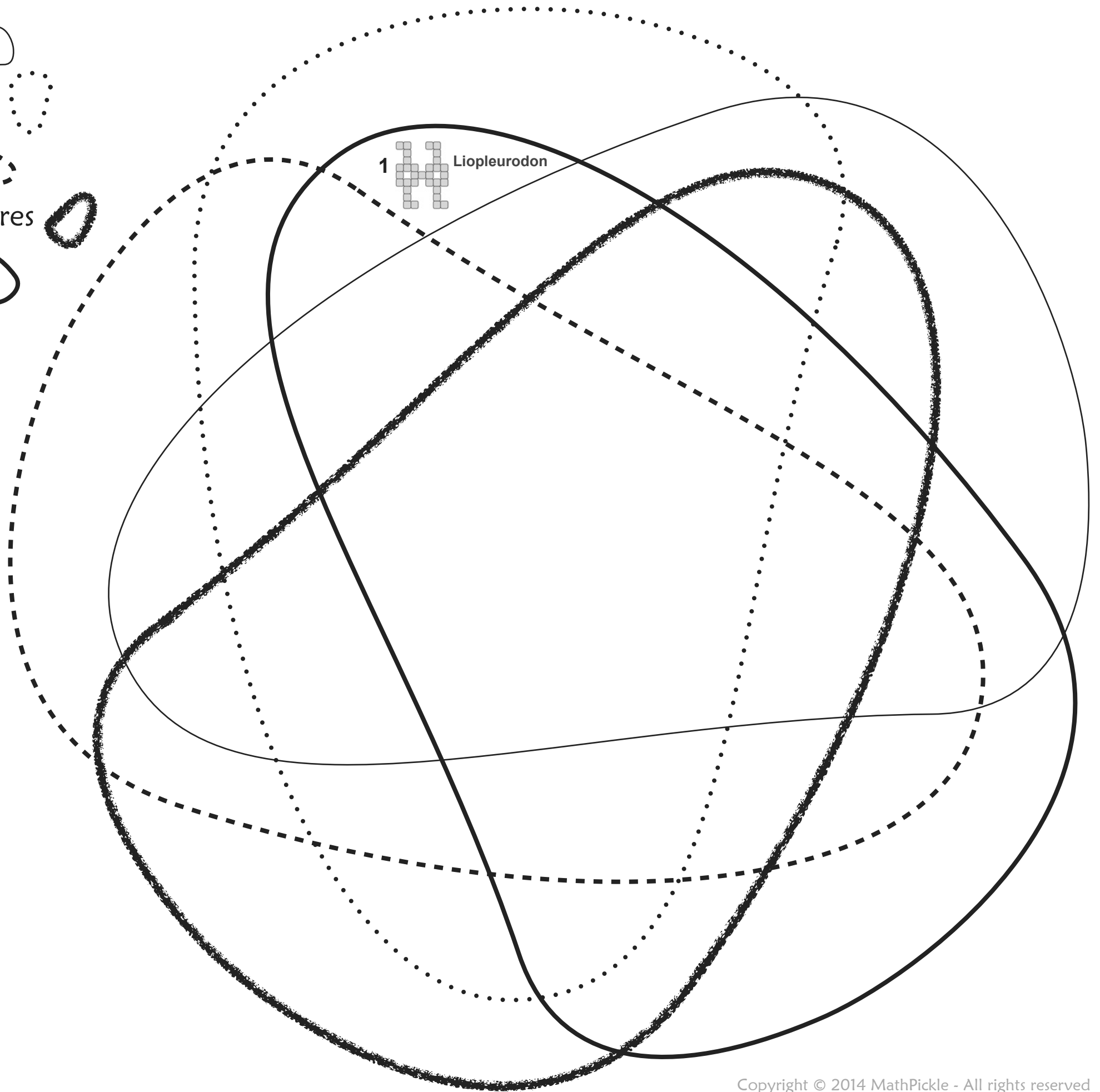
☐ Has exactly one hole 

☐ Has rotational symmetry 

☐ Has mirror symmetry 

☐ Has exactly a dozen squares 






☐ Is taller than it is wide 

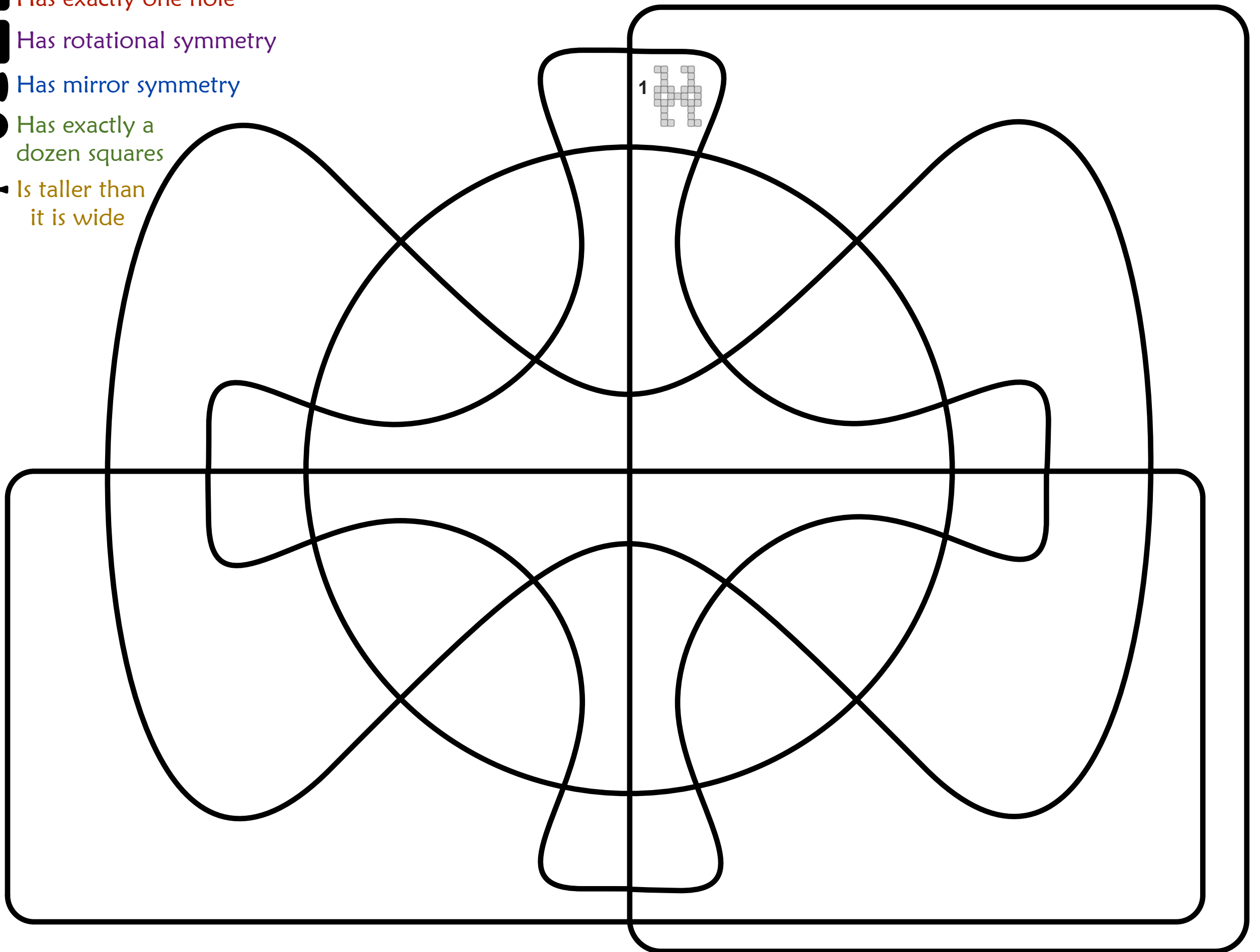


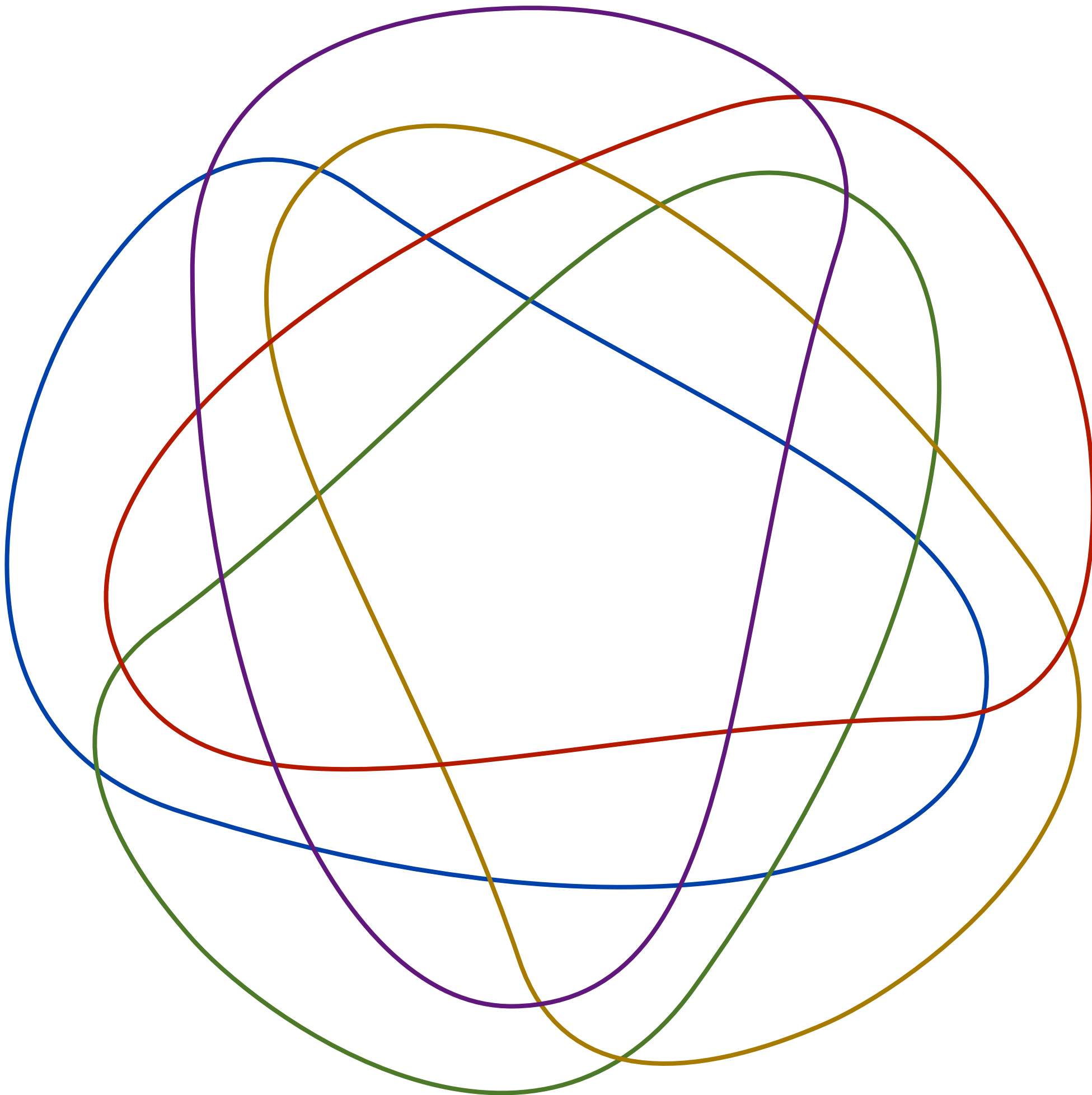
We are preparing to open Venn Zoo, but there may be a problem: We pride ourselves in caging our fiercely territorial polyanimals in private cells, but somehow one of our orders got messed up - so it is possible that one cell might get two polyanimals. This would be disastrous since polyanimals fight until one of them is reduced to little square bits.

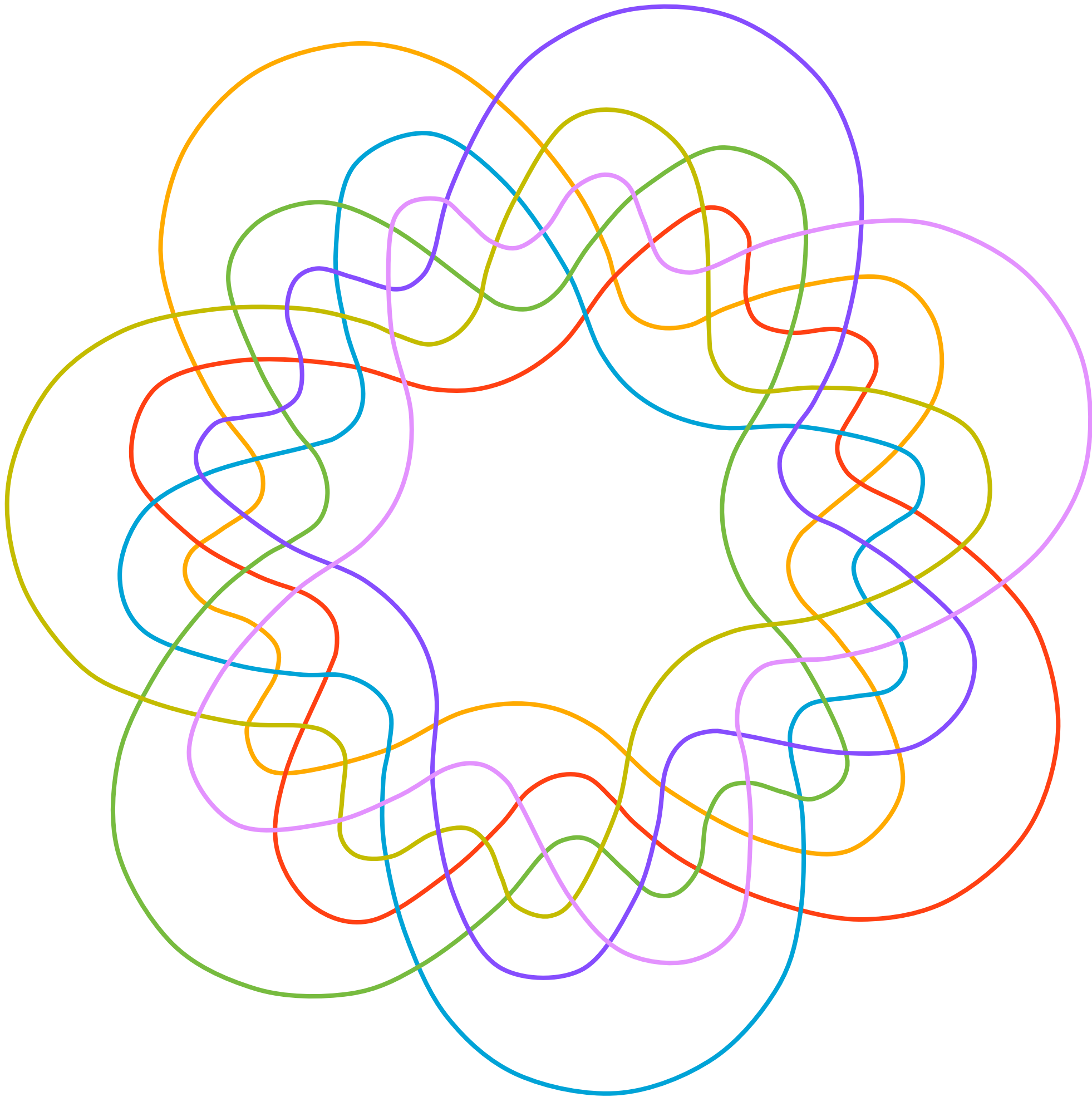
Choose a polyanimal from the other page. Put it in the correct cage, then name it. If you find a cage that has two polyanimals - please send one of them back. If you find an empty cell, please order a polyanimal for it and draw it.

Liopleurodon has already been caged. It's in the correct cage because it has rotational symmetry (must be inside the purple loop) and is taller than it is wide (must be inside the tan loop). Instead of drawing the polyanimals, you may choose to use their numbers.

-  Has exactly one hole
-  Has rotational symmetry
-  Has mirror symmetry
-  Has exactly a dozen squares
-  Is taller than it is wide







Put Your Students in a Pickle!

I'm a father of two elementary school children, a mathematician, and designer of puzzles and board games. Students call me Dr. Pickle. There is nothing I enjoy more than stumping students and having them stump me.

I founded MathPickle.com in 2010 to inject new ideas into the classroom. MathPickle's primary objective is to get thirteen curricular unsolved problems into classrooms worldwide - one for each grade K-12. A conference in November 2013 established the thirteen unsolved problems. To aid with the dissemination of these awesome problems, MathPickle is looking at setting up a \$1,000,000 reward for each - the prize money to be split between the person who solves the problem and their most inspirational K-12 educator.

MathPickle is also developing a range of curricular puzzles like the ones you'll find at TpT. These help teachers them with their number one challenge:

“How to engage the spectrum of student ability?”

Whenever an elementary school teacher wants to teach addition, she will invariably face 20% of students who already know how to add and another 20% who are struggling with last year's curriculum. How can she engage the top students without losing the bottom students? How can she engage the bottom students without boring the top students?

One solution: Parents of top students often ask that their child be allowed to accelerate through the curriculum. This exacerbates the problem for future teachers, and sets up a failure-impooverished education experience for the bright student.

A wiser approach is to use curricular puzzles, games and mini-competitions to simultaneously teach curriculum to the students who need it, and to deflect top students into tough problem solving activities. This is never time wasted, because problem solving is the primary reason we teach mathematics.

The experience of mathematics should be profound and beautiful. Too much of the regular K-12 mathematics experience is trite and true. Children deserve tough, beautiful puzzles.

Gordon Hamilton
MMath, PhD

