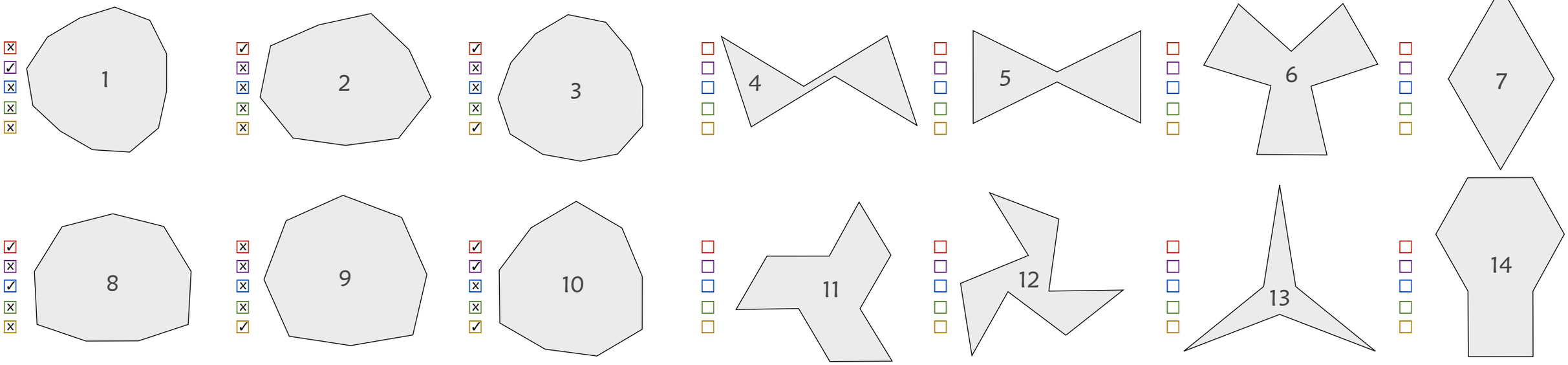
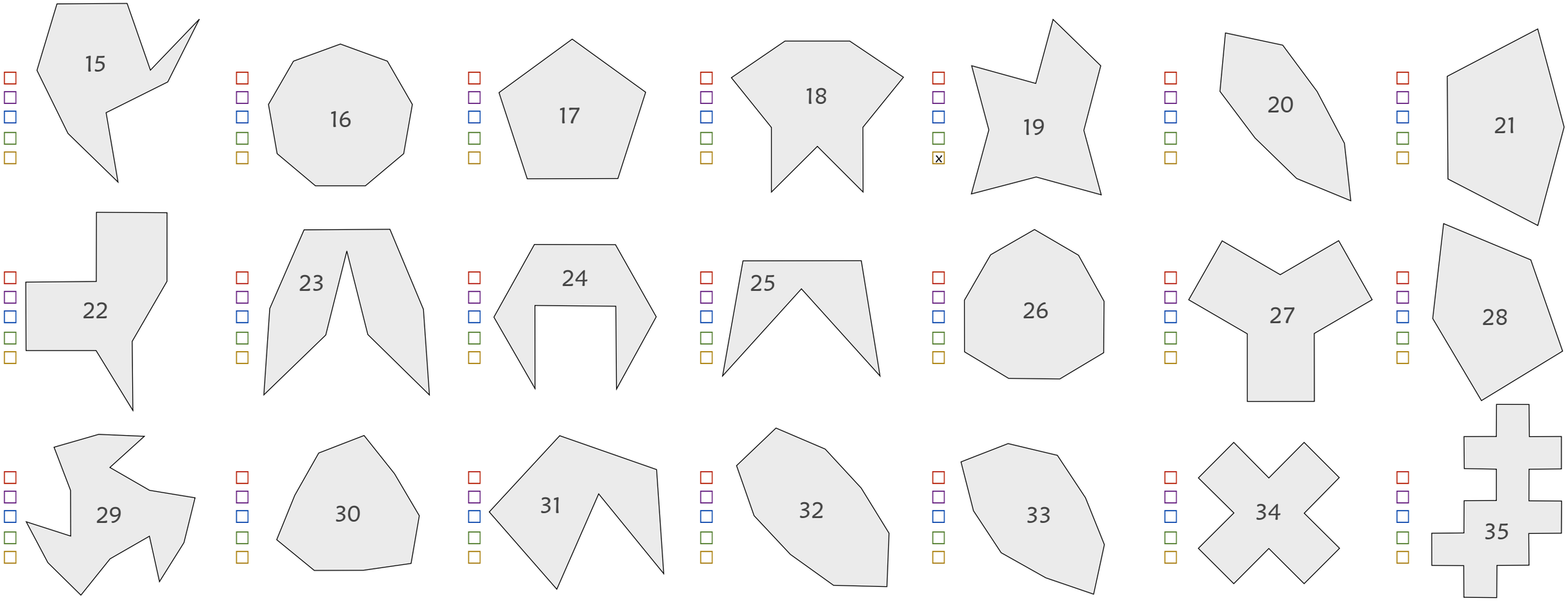
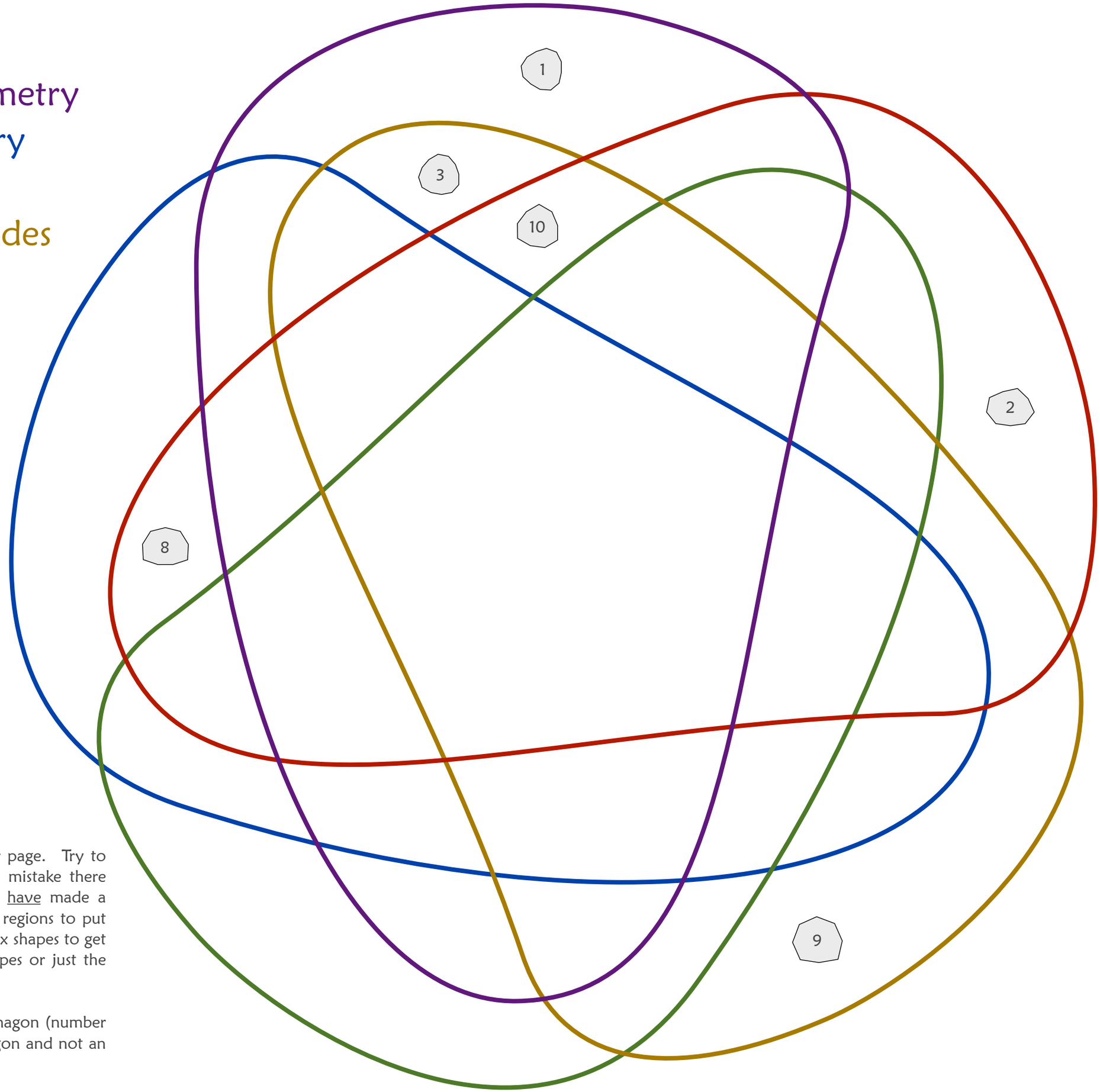
TOOTHPICK POLYGONS

categorize them on a Venn diagram based on five questions





- ☐ Is a nonagon
- ☐ Has rotational symmetry
- ☐ Has mirror symmetry
- ☐ Is concave
- ☐ Has some parallel sides

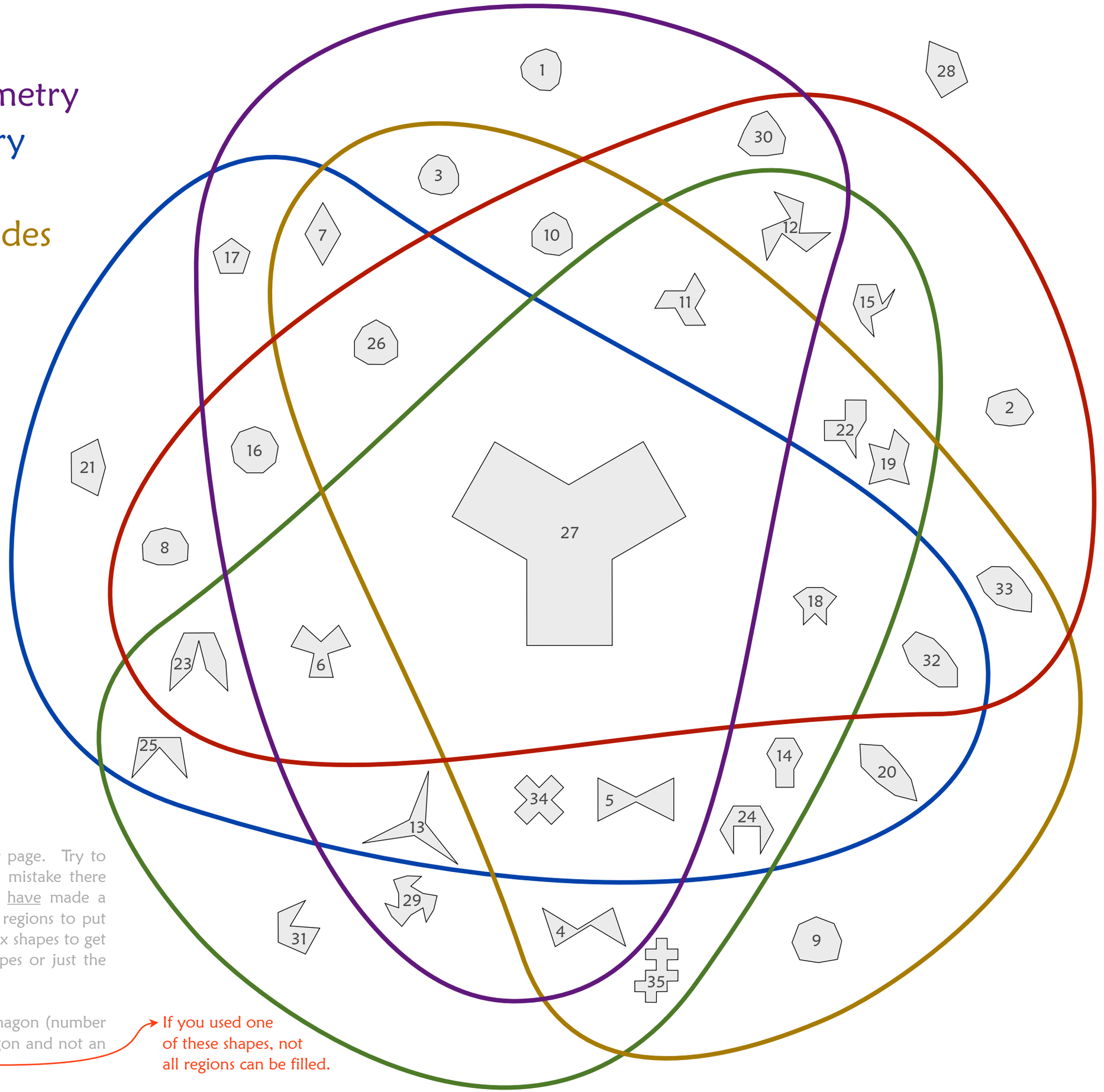


1) Choose a toothpick polygon from the other page. Try to figure out where it goes. If I haven't made a mistake there should be one polygon in each region, but I have made a mistake because there are more polygons than regions to put them in. Where are my mistakes? I've placed six shapes to get you started. You can choose to place the shapes or just the number.

2) The red question asks if the polygon is a nonagon (number of vertices = nine). Why did I choose a nonagon and not an octagon, heptagon, hexagon, or pentagon?

- ☐ Is a nonagon
- ☐ Has rotational symmetry
- ☐ Has mirror symmetry
- ☐ Is concave
- ☐ Has some parallel sides

Answer Sheet



1) Choose a toothpick polygon from the other page. Try to figure out where it goes. If I haven't made a mistake there should be one polygon in each region, but I have made a mistake because there are more polygons than regions to put them in. Where are my mistakes? I've placed six shapes to get you started. You can choose to place the shapes or just the number.

2) The red question asks if the polygon is a nonagon (number of vertices = nine). Why did I choose a nonagon and not an octagon, heptagon, hexagon, or pentagon?

If you used one of these shapes, not all regions can be filled.

Standards for Mathematical Practice

All MathPickle puzzles are guaranteed to engage a wide spectrum of student abilities while targeting the following Standards for Mathematical Practice:
(http://www.corestandards.org/Math/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 kids.

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 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.

Common Core State Standards

Those Standards for Mathematical Practice will be met by all MathPickle puzzles including Toothpick Polygons. In addition, the Toothpick Polygons Puzzle 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.

Teaching Tips

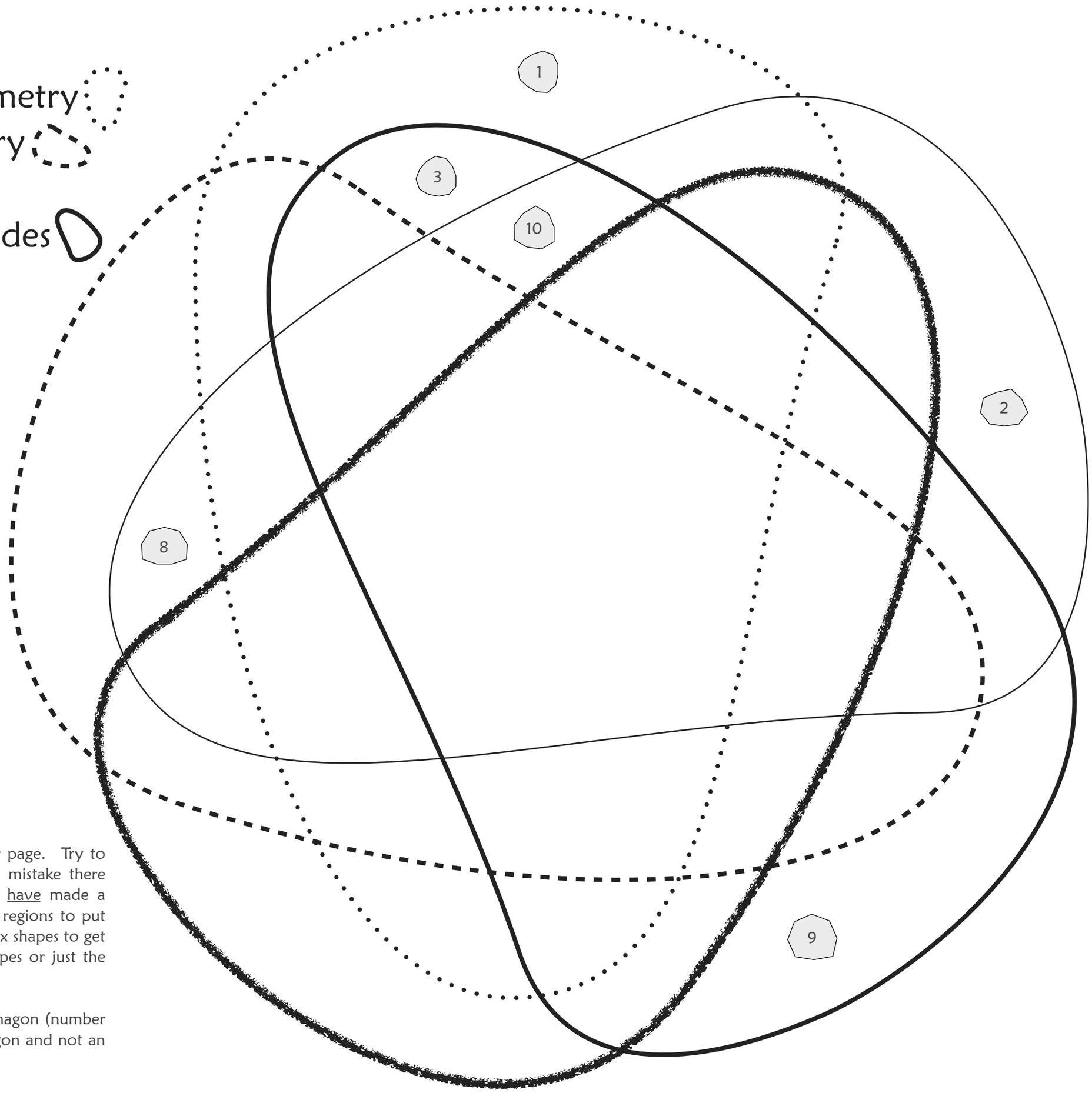
Toothpick Polygons is designed to be a co-operative, curricular puzzle for grade 4 students. It will work best in color. If you do not have access to a colour printer or have a student who is color blind you may opt to use the gray Venn diagram with textured lines.

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 is revisits the old ideas.

Photocopy these worksheets for your own students as often as you like.

A puzzle from MathPickle.com
Copyright © 2014 JRMF - All rights reserved

- ☐ Is a nonagon
- ☐ Has rotational symmetry
- ☐ Has mirror symmetry
- ☐ Is concave
- ☐ Has some parallel sides



1) Choose a toothpick polygon from the other page. Try to figure out where it goes. If I haven't made a mistake there should be one polygon in each region, but I have made a mistake because there are more polygons than regions to put them in. Where are my mistakes? I've placed six shapes to get you started. You can choose to place the shapes or just the number.

2) The red question asks if the polygon is a nonagon (number of vertices = nine). Why did I choose a nonagon and not an octagon, heptagon, hexagon, or pentagon?