

# POLY PUZZLES FESTIVAL GUIDE

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## Materials and Setup

Per table (assuming 5 students per table), you will need:

Per Table	Material Preparation	
5 sets of assorted connectable polygons	At a minimum, each set should have 15 triangles, 6 squares, 4 hexagons, and 4 pentagons. (The last puzzle requires 7 pentagons so keep the extra pentagons in the kit handy for those trying puzzle #28)	
3 copies of Instructions	1-page sheet	p. 6
5 copies of Tasks	4-page sheet <i>can be printed double-sided</i>	p. 7-10
1 copy of Table Sign	1-page sheet <i>print on cardstock for sturdiness</i>	p. 11

Per Table	Purchasing Materials		
1 Polydron Set	<a href="#">184 piece Polydron set</a> for \$167.49		
13 plastic sheet protectors	<a href="#">pack of 100</a> for \$7.67	<a href="#">pack of 500</a> for \$26.99	These are recommended in order to protect the documents that students will be handling.



## Objective

Make a polyhedron\* using the 2D shapes in the puzzle.

Rules:

1. You must use all of the shapes in the puzzle.
2. You can't use any additional shapes.
3. Your polyhedron can't have any holes. In other words, every edge must be connected to another edge.

\*A polyhedron is a 3D shape with faces that are all polygons. Polygons are 2D shapes that are made with straight lines. For example, a square is a polygon but a circle is not a polygon.

## Materials

Each Poly Puzzles table should be prepped for 5 stations.

Each station needs:

1. 15 triangles, 6 squares, 4 hexagons, and 4 pentagons
2. Poly Puzzles instructions.
3. Poly Puzzles tasks.

## How to Play

Introduce the activity without overexplaining it and without telling what strategies students might want to use. As much as possible, avoid giving away answers. Students should be encouraged to explore, experiment, and learn from their mistakes.

1. Help the student connect 4 triangles.
2. Point out that all edges need to connect with another edge.
3. Encourage them to use only the shapes and number of shapes indicated in the task.
4. Have the student explore the next puzzles.

## Standards

1. Make sense of problems and persevere in solving them. CCSS.MP1
2. Attend to precision. CCSS.MP6
3. Compose 2D or 3D shapes to create a composite shape and compose new shapes from the composite shape. CCSS.1.G.A.2



## Asking Good Questions

1. Ask questions about confidence.
  - a. When a student asks you “Is this right?”, instead of saying “yes” or “no” right away, ask them how confident they are in their answer. Here are some examples:
    - i. “Maybe. What do you think? How confident are you?”
    - ii. “On a scale of 1-5, how confident are you in your answer?”
  - b. If a student is not confident in their answer, follow up by asking “What would help you feel more confident in your answer?” or “Why do you not feel confident?” This helps you determine how best to help the student through their explorations.
2. Ask students about choices.
  - a. When a student is stuck or shows you a wrong answer, instead of jumping in and showing the student the correct answer, start by asking about the choices that the student made along the way. Here are some suggested steps to follow:
    - i. Start from the beginning.
    - ii. Ask students to show you what they’ve tried so far.
    - iii. When the student gets to a point where they have different choices, ask the student “What other choices can you make here?”
    - iv. Have the student make a different choice and try to solve the puzzle. This helps the student see that they have the power to make different choices during an activity, and they’ll start to do this on their own in the future.
    - v. If you’re familiar with the puzzle or a particular solution, stop the student only when a different choice will help them get to the solution. This will help them feel successful faster without you giving away too much of the answer.
3. Ask students about strategies.
  - a. If a student is getting into the activity and has been doing it for a while, ask the student if there are any strategies they’ve come up with to help them solve the puzzle.
  - b. Follow up by asking if they think their strategies will work for all puzzles and/or larger puzzles, more complex puzzles, etc. Have the student explore more complex puzzles to test out their strategies.
  - c. This is a great way to encourage a student to dive deeper into an activity and to start looking for patterns, structure, and proofs.

## Answers

Puzzle 1



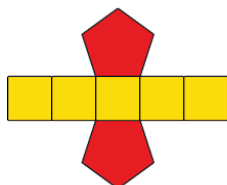
Puzzle 2



Puzzle 3



Puzzle 4



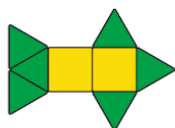
Puzzle 5



Puzzle 6



Puzzle 7



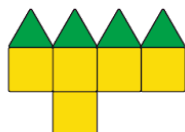
Puzzle 8



Puzzle 9



Puzzle 10



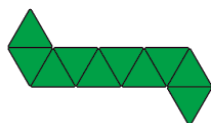
Puzzle 11



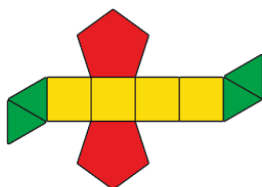
Puzzle 12



Puzzle 13



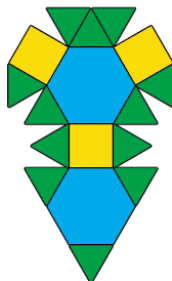
Puzzle 14



Puzzle 15

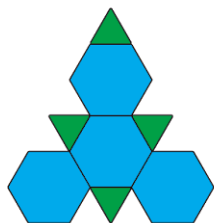


Puzzle 16

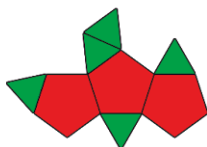


## Answers

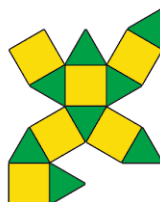
Puzzle 17



Puzzle 18

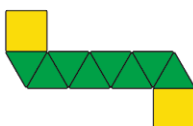


Puzzle 19



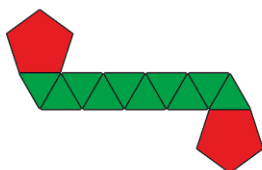
Puzzle 20  
Impossible

Puzzle 21

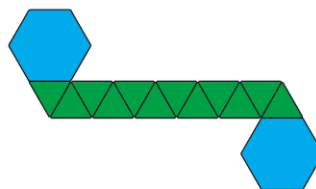


Puzzle 22  
Impossible

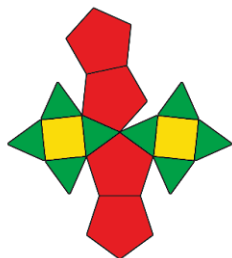
Puzzle 23



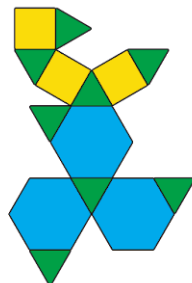
Puzzle 24



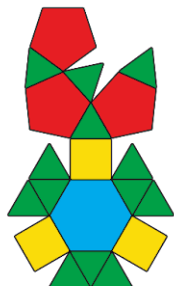
Puzzle 25



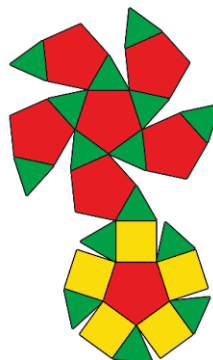
Puzzle 26



Puzzle 27



Puzzle 28

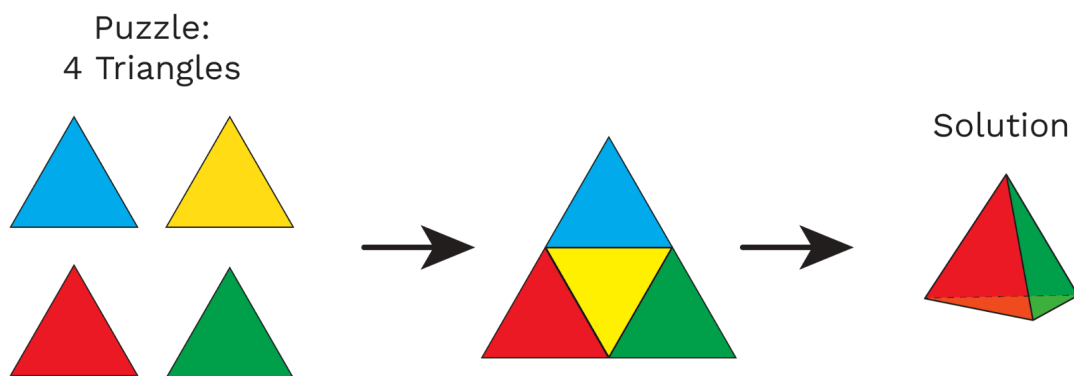


## Poly Puzzles Instructions

Make a polyhedron\*, a special kind of 3D shape, using the 2D shapes in the puzzle.

### Rules:

- You must use all of the shapes in the puzzle.
- You can't use any additional shapes.
- Your polyhedron can't have any holes. In other words, every edge must be connected to another edge.



\*A polyhedron is a 3D shape with faces that are all polygons. Polygons are 2D shapes that are made with straight lines. For example, a square is a polygon but a circle is not a polygon.

# Poly Puzzles

**Your colors don't need to match the colors in the puzzles.**

Puzzle 1:  
4 Triangles



Puzzle 2:  
4 Triangles, 1 Square



Puzzle 3:  
2 Triangles, 3 Squares



Puzzle 4:  
5 Squares, 2 Pentagons



Puzzle 5:  
6 Triangles



Puzzle 6:  
6 Triangles, 1 Square



Puzzle 7:  
6 Triangles, 2 Squares



Puzzle 8:  
6 Triangles, 3 Squares



Puzzle 9:  
8 Triangles





# Poly Puzzles

Puzzle 10:  
4 Triangles, 5 Squares



Puzzle 11:  
5 Triangles, 5 Squares,  
1 Pentagon



Puzzle 12:  
4 Triangles, 3 Squares,  
1 Hexagon



Puzzle 13:  
10 Triangles



Puzzle 14:  
4 Triangles, 4 Squares,  
2 Pentagons



Puzzle 15:  
8 Triangles, 3 Squares,  
2 Pentagons



Puzzle 16:  
12 Triangles, 3 Squares, 2 Hexagons



# Poly Puzzles

**At least one of these puzzles is impossible.**

Puzzle 17:  
4 Triangles, 4 Hexagons



Puzzle 18:  
5 Triangles, 3 Pentagons



Puzzle 19:  
8 Triangles, 6 Squares



Puzzle 20:  
9 Triangles



Puzzle 21:  
8 Triangles, 2 Squares



Puzzle 22:  
10 Triangles, 1 Pentagon



Puzzle 23:  
10 Triangles, 2 Pentagons



Puzzle 24:  
12 Triangles, 2 Hexagons



# Poly Puzzles

Puzzle 25:

8 Triangles, 2 Squares, 4 Pentagons



Puzzle 26:

8 Triangles, 3 Squares, 3 Hexagons



Puzzle 27:

13 Triangles, 3 Squares, 3 Pentagons,  
1 Hexagon



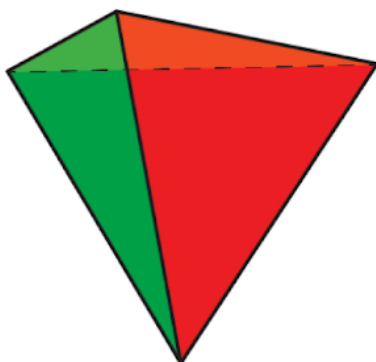
Puzzle 28:

15 Triangles, 5 Squares, 7 Pentagons





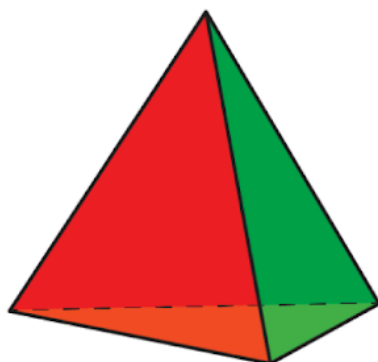
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# POLY PUZZLES



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