SFB TRR 109 Discretization in Geometry and Dynamics · Freie Universität Berlin · Technische Universität Berlin · Deutsche Mathematiker-Vereinigung · DFG Deutsche Forschungsgemeinschaft

Polly and her family

Name: ____________________________

Name: Class: Date:

My name is Polly and I am a polyhedron. The great thing about my name is it describes what I am!

The word polyhedron comes from the ancient Greek words “poly”, meaning many and “hedron” meaning surface. I am made up of only flat surfaces that meet at straight edges and because polyhedra like to eat, we all have corners that stick outwards. As you can imagine, I have a very large family. My brother is a superstar. His name is Cube and I’m sure you already know him. You’ve probably seen my aunt, the pyramid, before too.

Sadly, I do not know all of my family members, so I would like to make a family photo album with everyone in it!

I asked my friends, the mathematicians at the Freie Universität Berlin, if they could help me, but they only know the structure of each of my family members and cannot build them all – there are just too many of us!

That’s why I need your help! Please adopt one of my family members and build a model. You can even give your own polyhedron an official name. The crafting sheets for building my relatives can be downloaded at www.polytopia.eu. After you build the model, please take a picture of my relative and upload it so I can get to know them.

But first, I want to show you what is so special about us polyhedra, how to build your model, and much more…

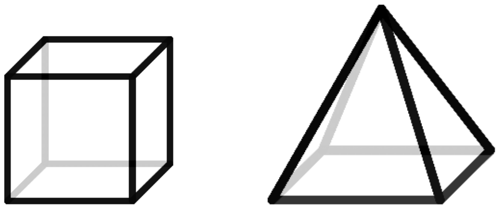
Name: Class: Date:

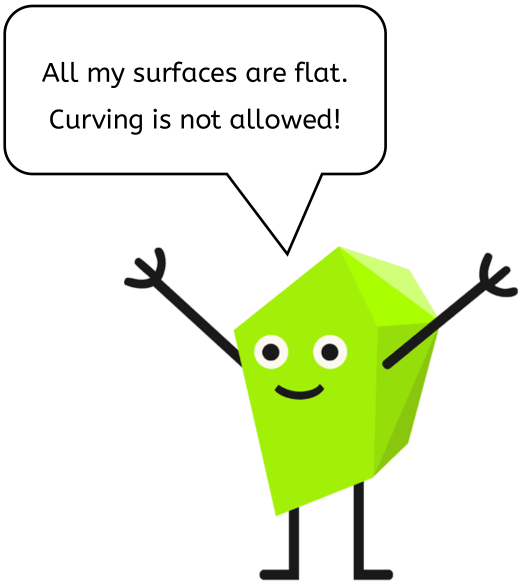
What does a polyhedron from Polly’s family look like?

Polyhedra belonging to Polly’s family are bodies that are made of

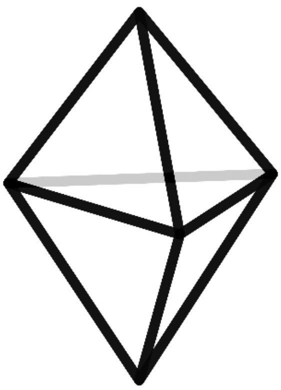
- flat surfaces
- straight edges
- outward corners

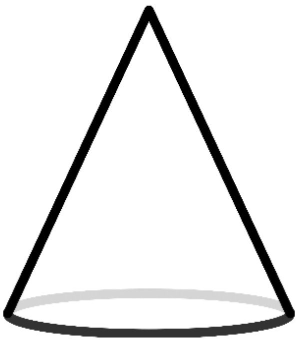
The cube and the pyramid are examples of Polly’s relatives.

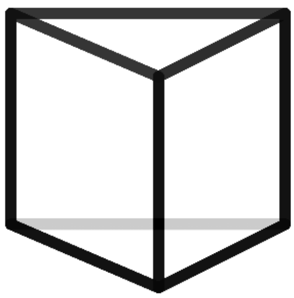




Mark which bodies are polyhedra:

☐ 

☐ 

☐ 

Name: Class: Date:

Do you know any more polyhedra from Polly's family? Draw as many as you can.

Hint: Look around the classroom or think about your room. You can probably find a few polyhedra there.

Here you can draw bodies that are not part of Polly's family or are not polyhedra.

Name: Class: Date:

Which statement best fits you?

- □ I already knew about polyhedra.
- □ I knew of such shapes, but the term polyhedron was new for me.
- □ This is all new for me.
- □ I am still not sure what polyhedra are.
- □ ____.

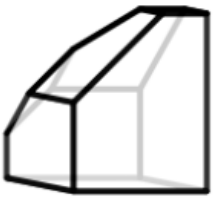
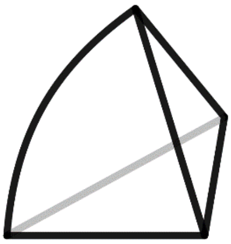
Want some more practice? Right this way! If you are already a polyhedron expert, continue to the next page.

Fill in the blanks with the correct words from the box.

straight, ball, round, inward, outward, prism, flat

Polyhedra from Polly's family are bodies made from ____________ surfaces, ____________ edges and ____________________ corners. The cube and the pyramid both belong to Polly's family. The ____________ is not a polyhedron.

Is it a polyhedron? Mark the box if it is and explain why or why not.

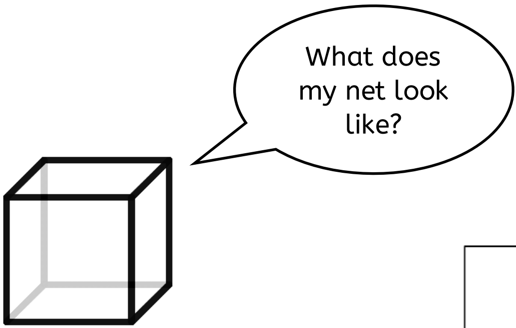
□ 	□ 	□ 

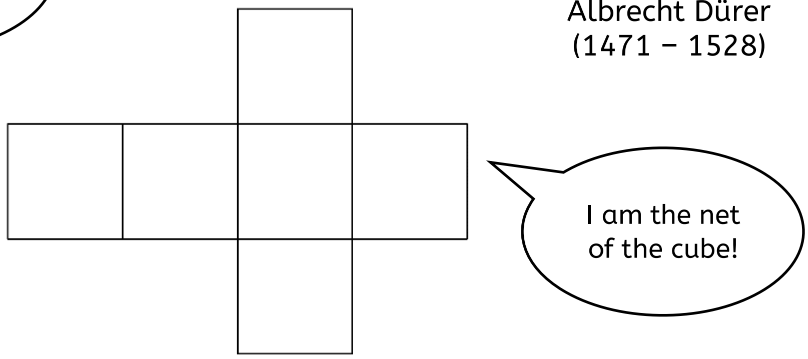
Name: Class: Date:

The net of a polyhedron

Albrecht Dürer
(1471 – 1528)

The painter and mathematician Albrecht Dürer first discussed the idea of polyhedral nets more than 500 years ago. If you cut open a polyhedron along its edges and unfold it, you get the net of the polyhedron.

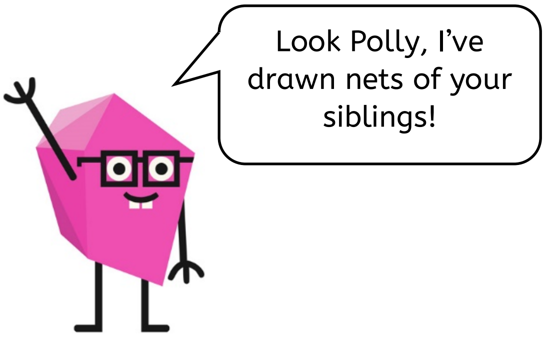


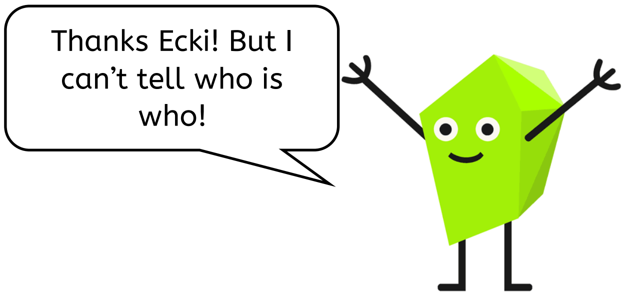


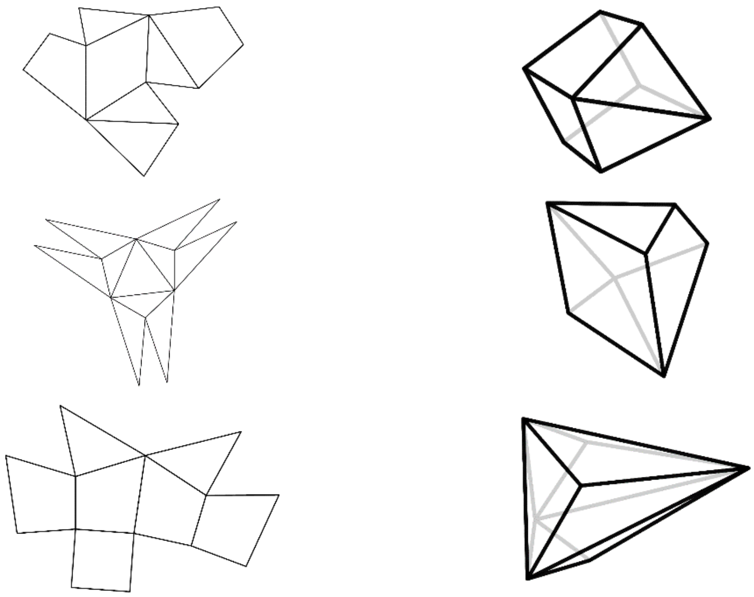
There are always several different ways to draw the net of any polyhedron.
Draw as many cube nets as possible.

Name: Class: Date:

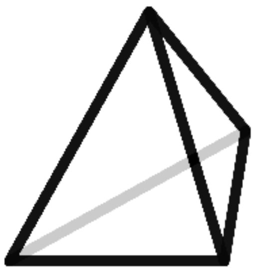
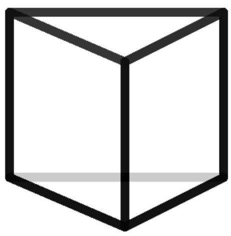
Polly’s friend Ecki has drawn nets of Polly’s siblings. However, Polly doesn’t know which net belongs to which sibling. Connect the polyhedra to the matching nets.







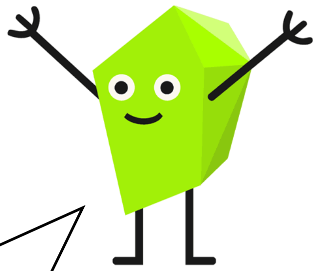
Now it’s your turn! Draw a net for at least one of the two polyhedra.

			
Tetrahedron		Prism	

For the quick drawers: Draw a polyhedron from Polly’s family and its net on a separate piece of paper.

Name: Class: Date:

Your whole class can help me bring one of my family members to life! To do this, you need to build a model of the polyhedron. Your teacher has already prepared the net of a polyhedron. The goal is to build a big cardboard model of this polyhedron together. The polyhedral net will be cut apart and each group will receive a piece. As a group, you are responsible for the enlargement of this piece. In the end, all the sides will be put together to make a large polyhedron.

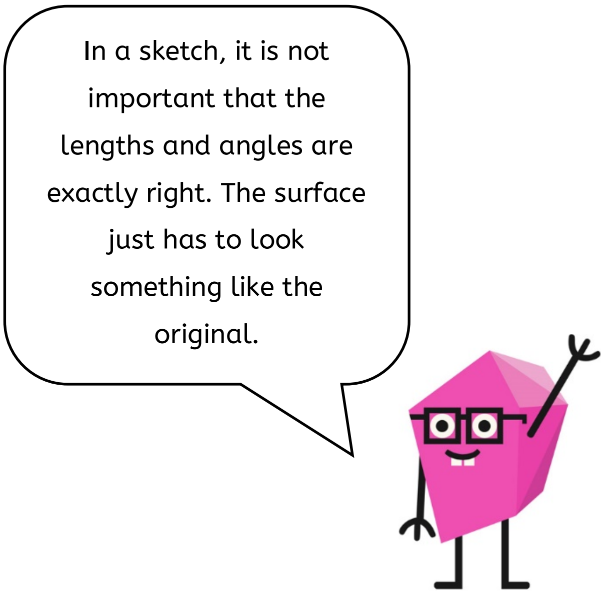


First, describe your group's piece with a few words.

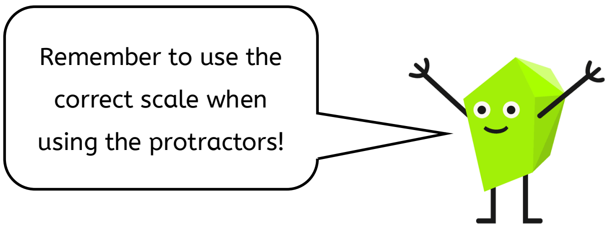
These questions can help you: How many edges does it have? What is the name of the shape of the surface? Are the angles acute, right or obtuse?

Name: Class: Date:

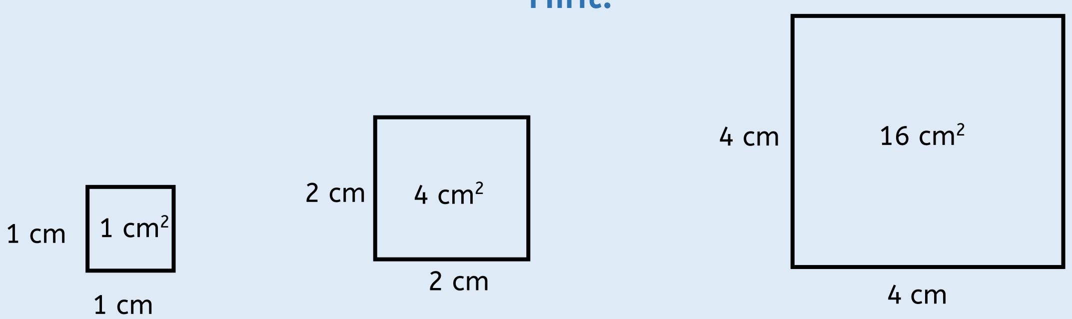
Draw a sketch of your piece in the box.



Now measure the lengths of the edges and the degrees of the inner angles of your piece. Write down your results next to the edges and angles in your sketch. Also, calculate the surface area if you can.



Hint:



If the edge length doubles,
then the surface area increases by a factor of _____.

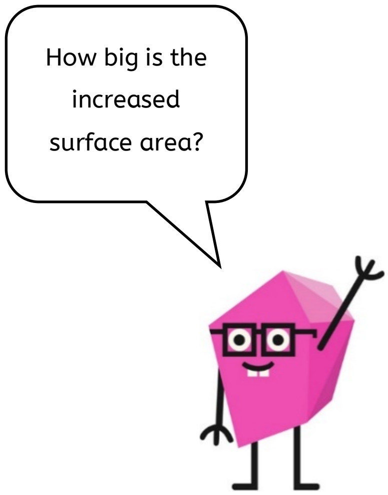
Name: Class: Date:

Write the measured lengths of your edges in the table. Discuss as a class by what factor you want to increase the edge lengths.

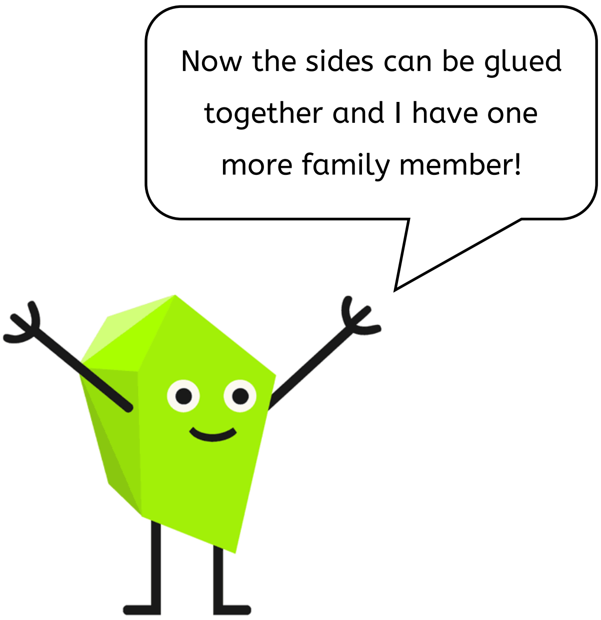
The edge lengths should be _______ times as long.

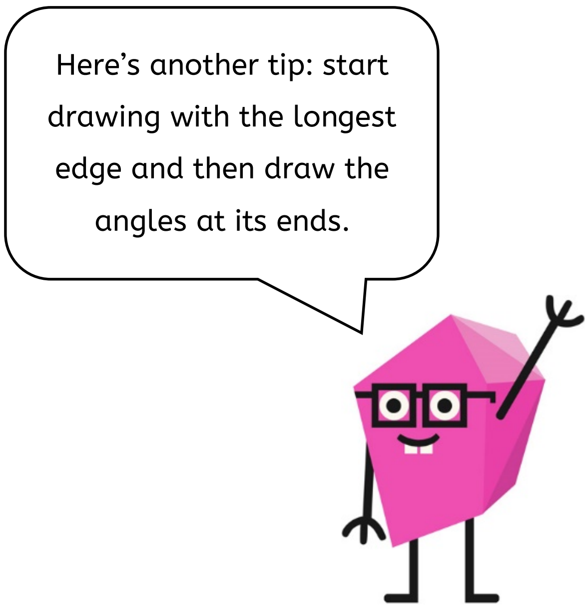
Write the calculated enlarged values in the table as well.

Original edge length	Enlarged edge length



Now we need the cardboard to draw and cut out the new enlarged side surface. Before you start cutting, make sure to compare your drawing to the template. Are all the angles and lengths correct?





Name: Class: Date:

Fact sheet for your class polyhedron

Name: ______________________________

Birthday: ______________________________

Number of side surfaces: ______________________________

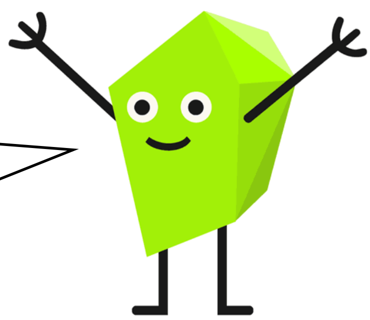
Number of edges: ______________________________

Number of corners: ______________________________

Paste a photo of your polyhedron here.

Please upload the photo of your polyhedron to www.polytopia.eu. Here you can also adopt your own polyhedron and build a model.

Thanks for all your help!



Name: Class: Date:

Fact sheet for your own polyhedron

Name: ____________________________

Birthday: ____________________________

Number of side surfaces: ____________________________

Number of edges: ____________________________

Number of corners: ____________________________

Paste a photo of your polyhedron here.

Write something about your polyhedron in the lines below:

____

____

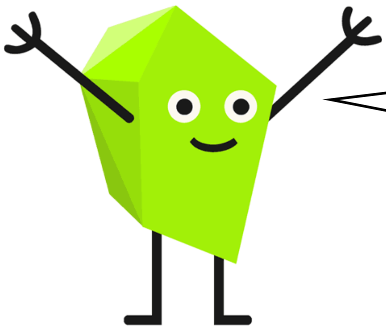
____

____

____

____

Name: Class: Date:

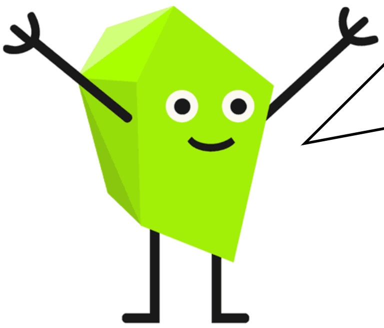


Did you know that mathematical research begins with looking for new questions? Let's research together and find interesting math questions!

Write down as many mathematical questions about polyhedra as possible:

Mathematical research questions could begin with *why, when, how much, what happens if, …*

Name: Class: Date:



The special thing about mathematical research questions is that sometimes they cannot be solved quickly, even if they sound simple.

Therefore, it is not important if you can answer your research questions. Today, it is just about finding

Write down a mathematical research question that you think is difficult to answer:

Hint: If you think your own questions are too easy, discuss with your classmates.
Everyone will have different and interesting questions!

By the way, we polyhedra love mathematical research questions. Feel free to send them to us:

polly@polytopia.eu

ecki@polytopia.eu

We look forward to your emails!

IMPRESSUM:

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