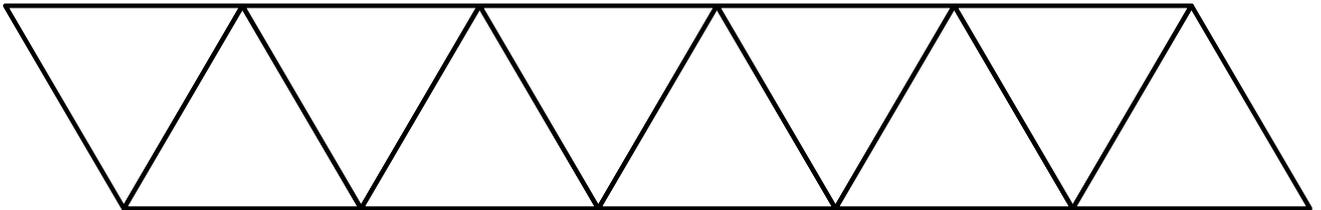


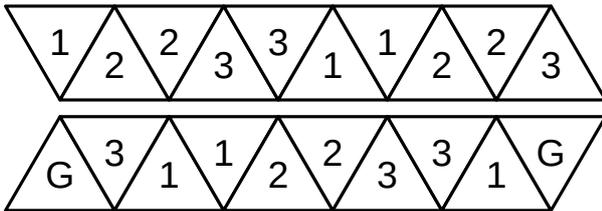
Activity

Playing with flexagons: Making a trihexaflexagon

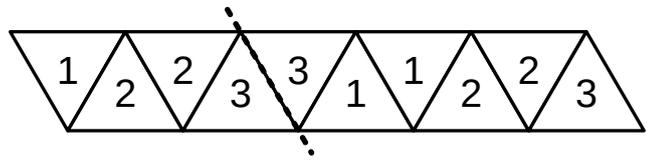
- 1 Start with a strip of 10 equilateral triangles (either draw your own using a pencil and protractor, or use this one). Pre-crease a fold on the line between each triangle.



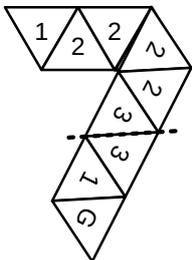
- 2 Use a pencil to lightly label the strip of triangles on both sides, according to this scheme. (You'll know you've done it right if there are no triangles with the same label on both sides.)



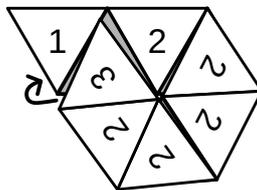
- 3 Start with the strip this way up. Make a valley fold between the pair of 3's so the two faces touch (but don't glue them together).



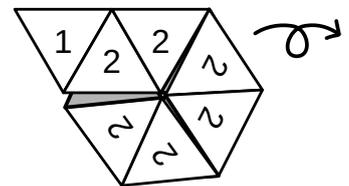
- 4 Make a valley fold between the other pair of 3's (again, don't glue them together).



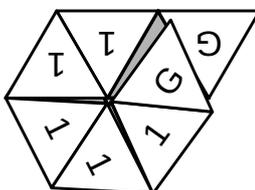
- 5 Tuck the end triangle (labelled "3") under the beginning of the strip.



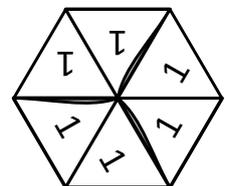
- 6 Turn over.



- 7 Glue the two triangles labelled "G" together.



- 8 Now rub out the pencil labels and enjoy decorating your flexagon!



Challenge

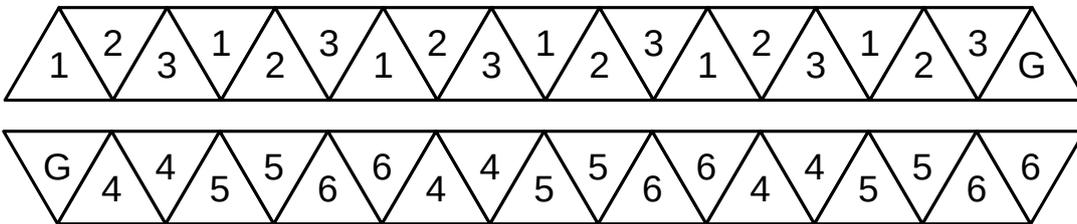
Trihexaflexagons are *chiral* (pronounced ky-rul), which means they are *not the same as their mirror image*. Why not make two mirror image flexagons? You'll need to work out how to adapt the instructions!

Activity

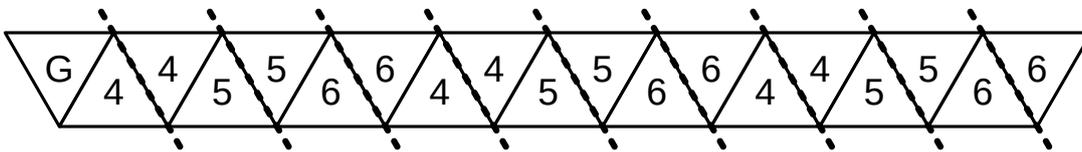
Playing with flexagons: Making a hexahexaflexagon

You will need this sheet, and the trihexaflexagon instruction sheet. It's a good idea to make a trihexaflexagon first as practice.

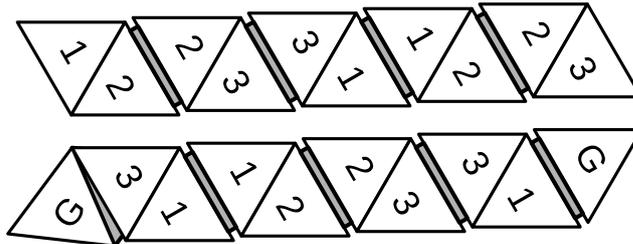
- 1 Start with a strip of 19 equilateral triangles (make your own or use the one on the right). As before, pre-crease a fold on the line between each triangle.
- 2 Use a pencil to lightly label the strip of triangles on both sides, according to this scheme. (You'll know you've done it right if the label "G" does not appear on both sides of the same triangle.)



- 3 Starting with the 4's, 5's and 6's facing you, add valley folds to the strip between each pair of triangles with the same label, so the corresponding sides always end up folded together (but don't glue anything).



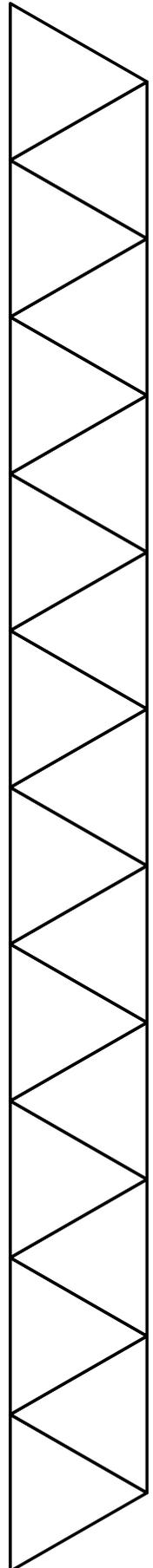
- 4 The paper will "spiral up" into a new strip of triangles - here is what each side will look like.



- 5 The new strip of triangles now has the exact right labels to fold it up like a trihexaflexagon! Follow the instructions above to fold it up, and enjoy your finished hexahexaflexagon!

Tricky challenge

The dodecahexaflexagon is the next step up from the hexahexaflexagon! It has 12 faces, and is made from an even bigger strip of triangles. Try working out how many triangles you need to make one. (Hint: how many faces is each triangle part of, and how many triangles per face? Don't forget the triangles you need to glue!) Then try making one, taking inspiration from the way that making a hexahexaflexagon needs you to make a trihexaflexagon. You'll need to make decisions as you go, so keep experimenting until it works! Then try writing instructions for a friend to follow to make one.

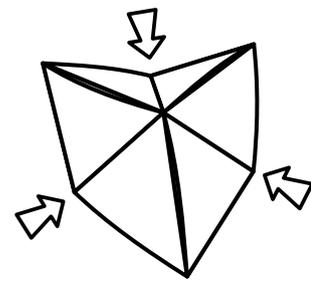
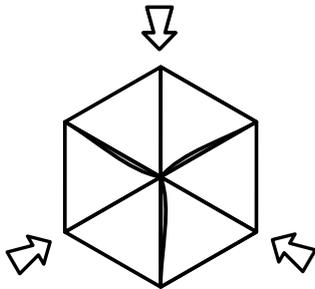


Activity

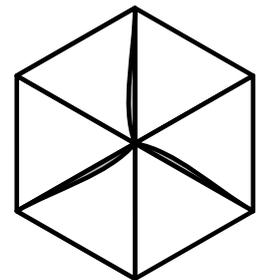
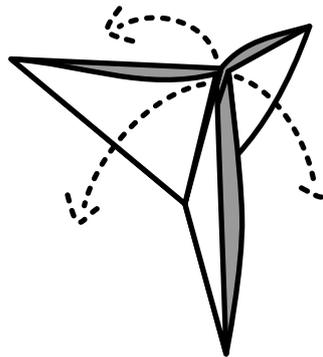
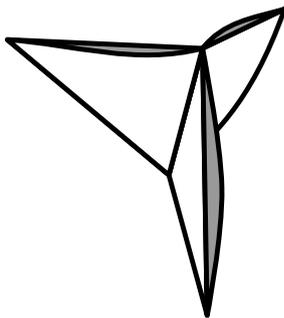
Playing with flexagons: What to do with your flexagon

How to flex a flexagon

- 1 Find the three corners of your flexagon with flaps which don't go near them (like the picture). The trihexaflexagon will always look like the picture below, but a hexahexaflexagon sometimes has flaps going to every corner (then you get free choice of corners).
- 2 Bring the three corners you've found downwards.



- 3 Keep going until they meet at the bottom.
- 4 The top of the flexagon should start to open up.
- 5 Open the flexagon fully. You've now completed one flex of your flexagon!



Challenge

A trihexaflexagon has 3 different faces, and a hexahexaflexagon has 6 different faces (hopefully you found them all when you were decorating yours). But with a hexahexaflexagon, some faces can come up more than once, with a different face on the back in each case, and you can reach different faces from the different positions! Try making a map of all the different possibilities to help you learn how to navigate your flexagon. You could ask your friends to challenge you to get from one face to another as fast as you can!

If you've made a dodecahexaflexagon, try making a map for it too! How does it relate to the maps for trihexaflexagons and hexahexaflexagons? Can you predict what the maps would look like for even more complicated flexagons?

Activity

Playing with flexagons: Become a flexagon master

Make a flexagon wherever you are

To truly master the flexagon, it's important to be able to make one starting with only a strip of paper, wherever you happen to find yourself. The first step is to make the strip of paper into triangles quickly and easily (see the section below), but here are some other tips:

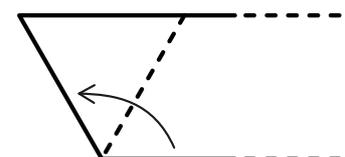
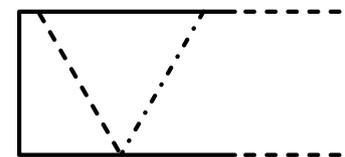
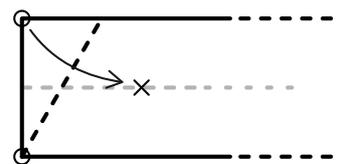
-  Make a strip of paper without measuring! Simply fold a strip at the edge of a standard piece of paper - make sure you get a consistent width by folding parallel to the edge of the paper. Then either cut along the fold, or if you don't have scissors, keep reversing the fold and running your fingernail along it to weaken the paper, then carefully tear along the fold line.
-  Make a trihexaflexagon from the instructions without relying too much on the labels, so in the future you can make one without labelling it first.
-  Pay attention to the way the strip spirals when you make a hexahexaflexagon, and how this relates to the way it folds into a flexagon. Then you'll be able to make a hexahexaflexagon without instructions!

Making the strip of triangles

The first step in making a flexagon is the strip of triangles - but how do you make one without resorting to a pencil and protractor? The hardest part is getting the first 60° angle, and here's three ways to do that:

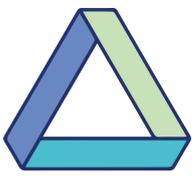
-  Make a 60° angle guide out of card (and carry it with you in case of flexagon emergencies)
-  Fold a 60° angle! Start by folding the beginning of the strip lengthways as a guide. Then fold one corner of the strip to the guideline, while making sure the resulting fold goes through the other corner.
-  Fold and adjust! Start by guessing a 60° angle and lightly make a valley fold. Then finish the equilateral triangle by lightly making a mountain fold. You want everything to line up into a neat 60° wedge, but it probably won't immediately work out. Now adjust your folds until it looks good!

Once you have your first fold, you can finish off the strip of triangles by repeatedly folding the edge of the strip to your previous fold. You should end up with lots of triangles all on top of each other - now cut (or carefully rip) off any excess and make your flexagon!



Find out more

If you want to know even more about flexagons, then flexagon.net is a great resource! There might even be something there that helps with the dodecahexaflexagon challenge...



Activity

Playing with flexagons: Extra strips of triangles

Here's some extra strips of triangles for flexagon making! Each strip has 20 triangles in, so you can cut it in half and make two trihexaflexagons, or remove one triangle and make a hexahexaflexagon.

