Welcome to the World of HyperTiles®

You are about to embark on an incredible journey of creativity and discovery- math, art, and science - all rolled into a construction set like you've never seen before!

*HyperTiles are based on a mathematical shape called a hyperbolic paraboloid. HyperTiles are simple, super-versatile building blocks that can be linked together in an infinite number of configurations that flex and move in **fun and unique ways**. There are endless options, surprising outcomes, and hours of adventure!*

*Here are a few projects to get you started. **Have fun!***


BEGINNERS CONSTRUCTION PROJECT: An 8-Tile Zig-Zag Flexi-Loop!

When you complete this project, you will know how to build a special HyperTile structure called a **Zig-Zag Flexi-Loop.**

It is a very "dynamic" shape - dynamic means it can move and bend and twist, and it can be used as a kind of fidget toy if you like.

If you have access to a cell phone or tablet, you can use the QR code at right to see a video that shows how this Flexi-Loop can be bent and twisted around!
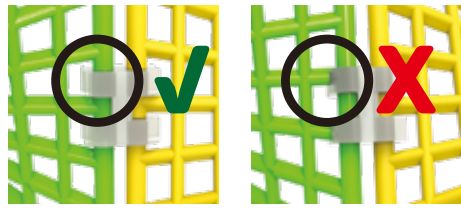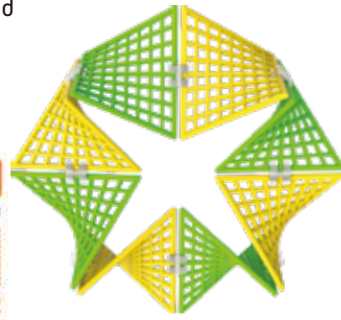
If you are new to HyperTiles, spend some time just playing around with them. See how the connectors can be used to attach tiles together edge to edge.
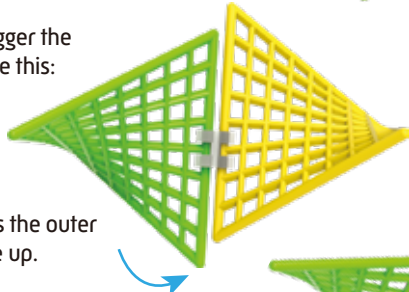
To make sure the tiles can fold back and forth easily, make sure the connectors are lined up with the holes in the tiles.

There are many ways to put two tiles together. You can connect them "flush" with one another like this. Flush here means the outer edges line up.

See how the edges here are lined up with each other.
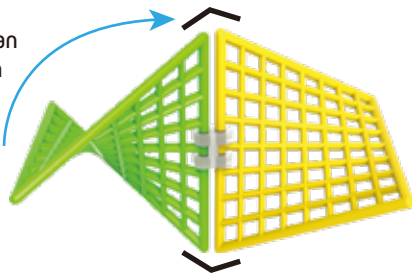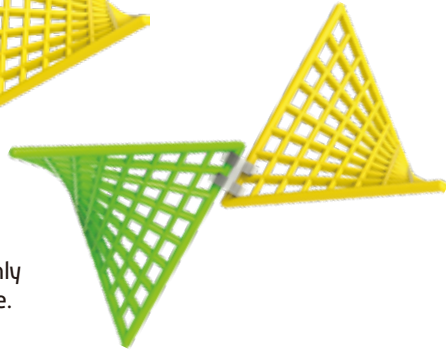
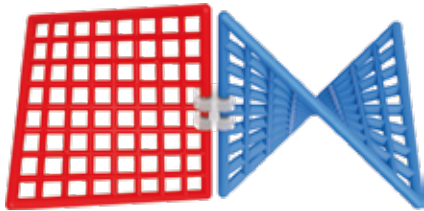You can also stagger the tiles a little bit like this:

Staggered means the outer edges do not line up.

Or stagger them a lot like this:

For this construction you will want to use only flush connections like the top diagram above.

Try making a few flush connections. Can you see that there are two different ways to connect two tiles flush with one another?

You can connect them like this, which we will call a "spiral" connection.

If you made a chain of HyperTiles and made every connection a spiral, you would end up with this shape. Do you see how it spirals around like a snake around a stick?

A spiral is also known as a coil or helix.
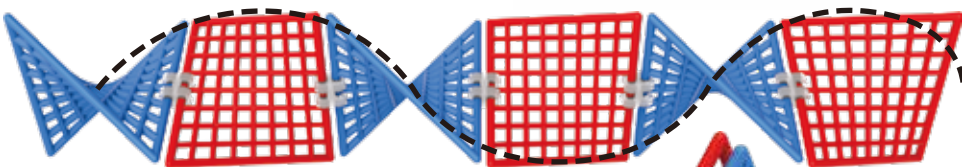
Try making a spiral connection? Check to see if it's really spiral. Try to fold one tile back on top of the other.

If they lay directly on top of each other like the picture at right, then you did indeed make a spiral connection!

The other way/ to connect two tiles is like this: We will call this a "zig-zag" connection.

If you made a chain of HyperTiles and made every connection a zig-zag, it would look like this. Do you see what we call ii a zig-zag connection?
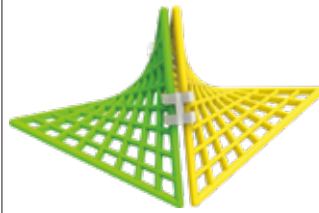
Try making a zig-zag connection. Check to see if it's really zig-zag. Try to fold one tile back on top of the other. If they make a little beak shape like the picture at left, then you did indeed make a zig-zag connection.
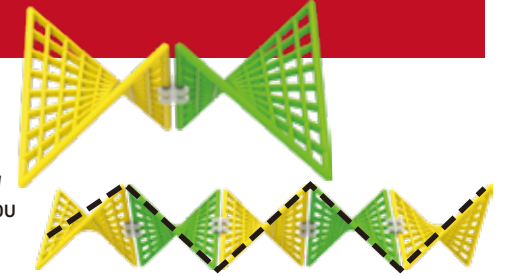
**OK, are you ready to make an 8-Tile Zig-Zag Flexi-Loop?**

To make one, you will want to use *only zig-zag connections*. And you will make them into a chain 8 tiles long.

Step 1: Pick out eight tiles: four of one color (like yellow) and four of another color (like green). If you want to use colors other than green and yellow, that's fine. You will also need eight connectors.
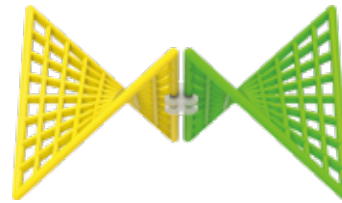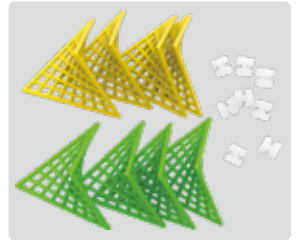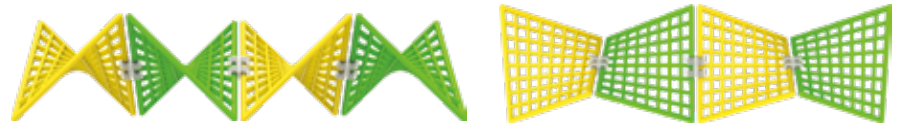
Step 2: Join one yellow tile and one green tile with a zig-zag connection.

Step 3: Add another yellow tile onto the other end of the green one. Make sure you have used a zig-zag connection, and they are in a straight line and *not turning a corner.*

SIDE VIEW   TOP VIEW
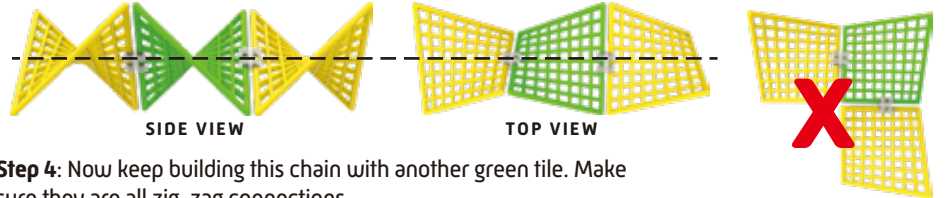
Step 4: Now keep building this chain with another green tile. Make sure they are all zig-zag connections.

Step 5: Keep adding the tiles - green, yellow, green, yellow. When finished, you will have a chain that looks like the one below. The edges will zig-zag the whole length of the chain.
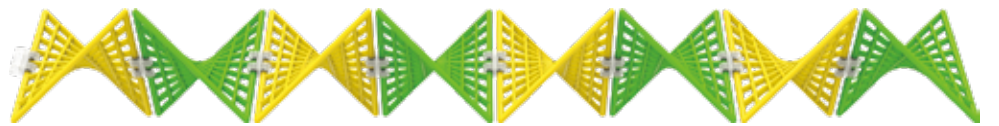
Step 6: Place a connector on the end of the last yellow tile like you are about to add another green tile to the chain. But instead of connecting it to a new green tile, bend the chain into a complete loop and connect it to the far end of the first green tile.
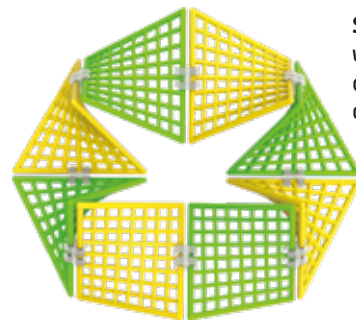
If you've done this correctly, your 8-Tile Flexi-Loop should look like this:

Now try twisting your loop through itself! See how many different shapes you can fold it into. Try making new Flexi-Loops using different numbers of tiles, like six or ten or twelve.
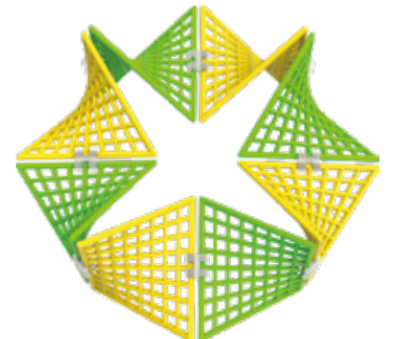
INTERMEDIATE CONSTRUCTION PROJECT: A Tetro-Octahedral Box!

When you complete this project, you will know how to build a special HyperTiles structure called a **Tetra-Octahedral Box**. If you have access to a cell phone or tablet you can use the QR code at left to get a better idea of what this Tetra Octahedral Box looks like and how it opens!
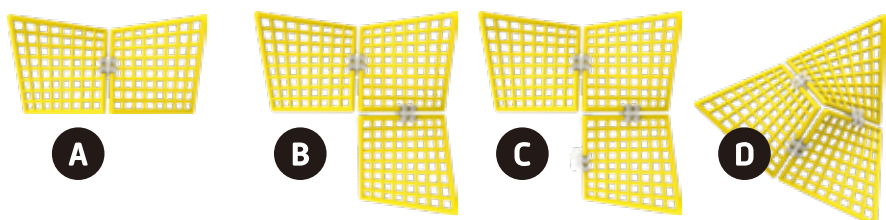
Note: If you are new to HyperTiles, you may want to play with them a while and see for yourself the different ways that HyperTiles can be connected.
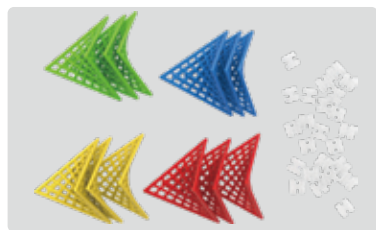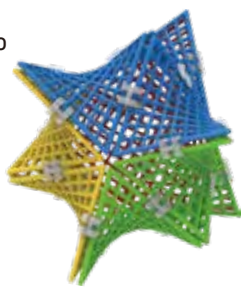
Step 1: Pick out twelve tiles: three yellow, three green, three blue and three red. If you want, you can use four different colors. You will also need 24 connectors.

Step 2: Connect two yellow tiles as shown in A below.

A   B   C   D

Step 3: Add the third yellow tile onto the second tile as shown in B.

Step 4: Add a connector as shown in C. Then bend the third tile over to connect it back to the first as shown in D. This creates a triangular shape that looks like an old-fashioned tricorn hat!
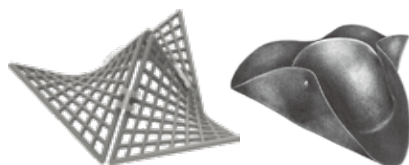
**Step 5**: Make three more of these "hats" - each one a different color.

Step 6: Take one corner of the green hat and use two connectors to attach it to a corner of the yellow hat as shown in E below.

Step 7: Now use four connectors to add on the red hat as shown in F.

Step 8: Finally, use six more connectors to add on the blue hat shown in G. Your box is complete! If you've made it correctly, all 12 tiles and 24 connectors will be used.

E   F   G
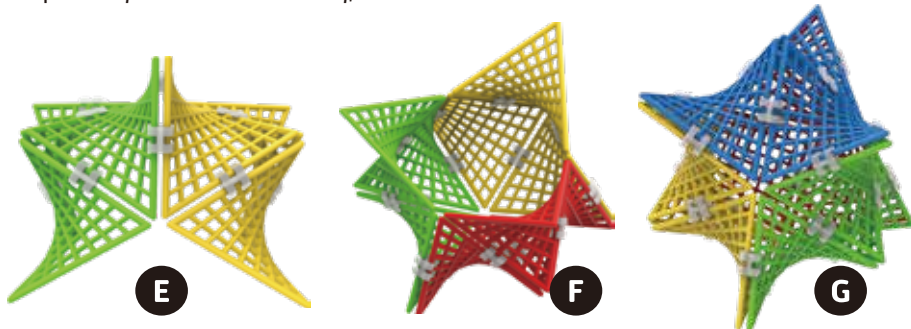
Step 9: Your box is complete, but there's no way to open it! If you want to be able to open your box and put things inside, change one of the four hats into a 3-piece lid. Do this by removing six of the connectors. Can you figure out which six? The 3-piece lid hinges open as shown in the figures below. (This hinging is also shown in the QR code video at left.)
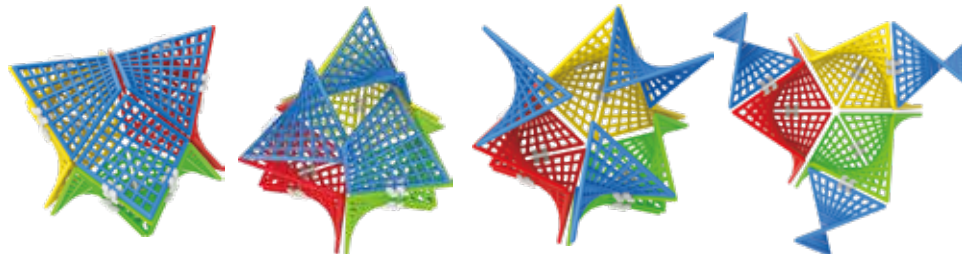
***So, why is this structure called a Tetra-Octahedral Box?***

It is called this because it is a combination of two special shapes in math. The first shape is called a "tetrahedron." A tetrahedron has four triangular faces and looks like the shape at right:
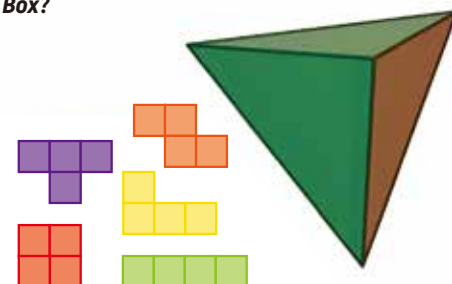
[**Tetra**- means four - like in the game Tetris in which you are playing with shapes that are all made of four squares.]

The second shape is called an octahedron.

An octahedron has eight triangular faces and it looks like the shape at right: [**Oct**- means eight - like an octopus which is an animal with eight legs.]
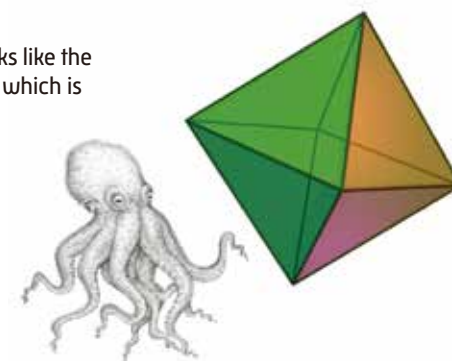
It may be hard to see how the structure you just built is a combination of these two mathematical shapes.

The picture below might help. It might also help to scan the QR code below and watch the video.
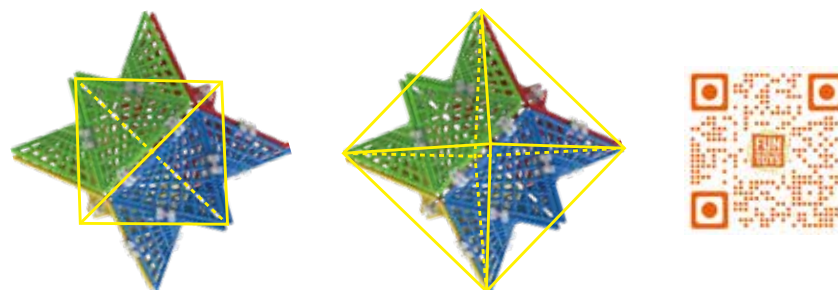
EXPERT CONSTRUCTION PROJECT: Dragon's Head!

When you complete this project, you will know how to build a special HyperTiles structure called a **Dragon's Head**.

If you have access to a cell phone or tablet you can use the QR code below to get a better idea of what this Dragon Head looks like and how you can make it open and close its mouth!

Note: If you are new to HyperTiles, you may want to play with them a while and see for yourself the different ways that tiles can be connected. This is reviewed in the Beginner level build.

Step 1: Pick out six green, six black, two orange and two red tiles. Or use whatever colors you want. You will also need 22 connectors - plus an additional 10-14 connectors for teeth (optional).
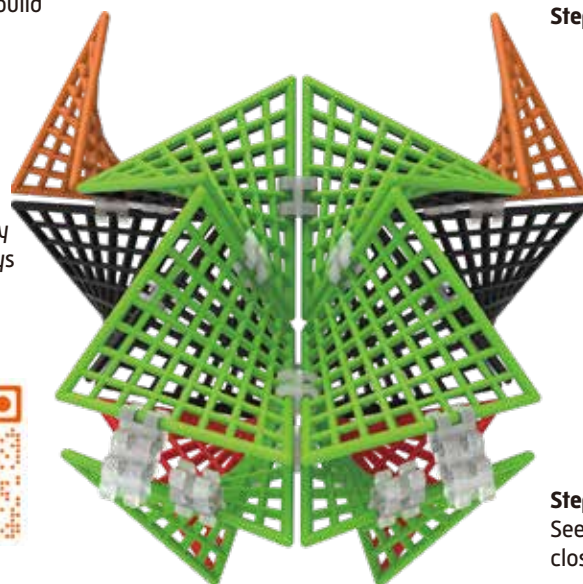
Step 2: See if you can figure out for yourself how to construct the array of tiles shown below.

A
B
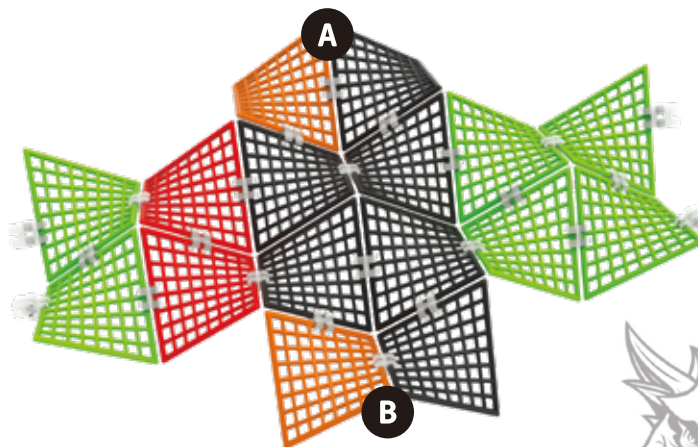
Step 3: Pick up the array of tiles by the two small side flaps [A and B]. See if you can fold them back in a way to make the dragon open and close its mouth. You will need to supply the "ROOOOAAARRRR!"

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