

Tangram

Have you ever made a puzzle? If you have, you know that there are small pieces, and when you put them together the right way, you can see a whole picture. Breaking a shape into smaller pieces is an important part of a certain kind of math called geometry.

People began exploring these ideas over 1000 years ago in China. They invented the **tangram puzzle**, which is a particular set of pieces that you can use to make hundreds of different whole shapes. People have puzzled over these pieces and designed their own puzzles for centuries!

The tangram is an amazing way of exploring how whole shapes break apart into pieces, a process we call decomposition. The tangram can also be a fun game! We can look at a shape and try to visualize the pieces that fit together to make that shape. This is a kind of decomposition, and is a fun and challenging way to develop skills of abstraction and spatial relationships.

This week, we will make our own tangrams and use them for a number of puzzles. In fact, some of our tangram puzzles will be made of sugar cookies! So there's a sweet treat at the end of the lesson (a more crumbly kind of decomposition :)

Tangram

Activity 1: Colorful Tangram Cookies

Objective

An introduction to the tangram puzzle; children will explore the seven pieces of the tangram, and use their hands and spatial skills to reconfigure the pieces - making the connection that smaller pieces can become part of a larger whole.

Ages: 3 - 9 years

Materials

- sugar cookie dough recipe + ingredients
 - icing recipe + ingredients (optional)
 - food coloring (optional)
 - rolling pin
 - paper
 - pencil
 - scissors
 - sharp knife
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- Tangram template (either printed out from the Tangram Template PDF, or used as a guide to create your own paper template)
 - Colorful Tangram Cards (printed from the Tangram Template PDF, or viewed on the screen)

Setting up

1. Either with your child(ren) or ahead of time, mix up the sugar cookie dough, and whip up the icing. You can use food coloring to create 7 different colors if you are feeling ambitious!
2. Print off or create a paper template for the tangram puzzle from the Tangram Template PDF. If you are creating your own, follow the guide in the PDF. Cut out the pieces, either from the printed template, or from one that you create.
3. Roll out the cookie dough, and place your cut paper pieces on the dough. Using a sharp knife and the paper template, cut the pieces out of the dough. Make multiple sets.

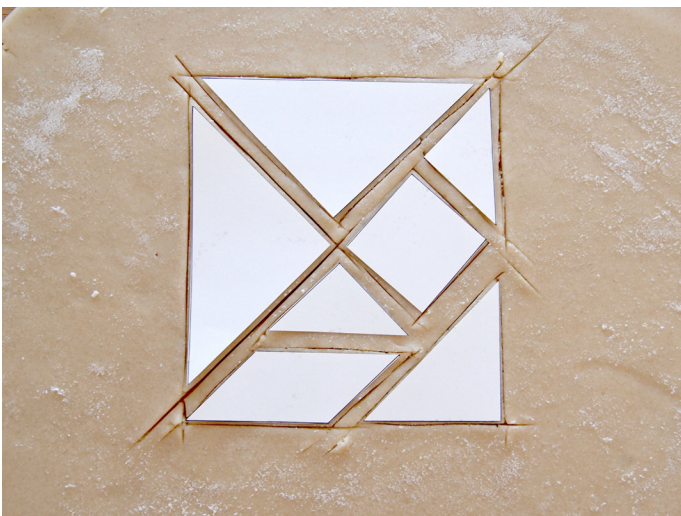
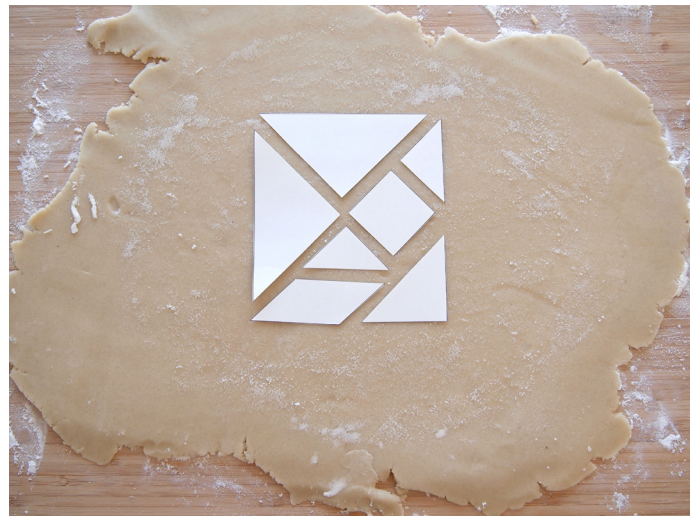
* Note that you will need to flip the parallelogram over; this is the only shape that uses both sides so make sure that you have both orientations.

4. Bake, cool. Icing!

5. Using the Tangram Cards, show your child how to arrange and configure the pieces so that they can match the cards and create a new image. Together explore the cards, and match them by arranging the cookies.

7. *What do you see? What does it look like?* Even though it is just made up of simple shapes, it still represents something else. *This is called abstraction.* Our mind can identify whole shapes and meanings from these simple individual shapes. Even though it isn't a real cat, or even a picture of a cat, it can *represent* a cat.

8. Eat cookies!



** The parallelogram is a unique shape! It is the only one that we will flip over at times, and so when you cut out the pieces from the dough, make sure that you flip the parallelogram template over, so that you have both versions.



Tangram

Activity 2: Tangram with Colors

Objective

An introduction to the tangram puzzle; children will explore the seven pieces of the tangram puzzle, and use their hands and spatial skills to reconfigure the paper pieces - making the connection that smaller pieces can become part of a larger whole. Children will match colors to easily associate shapes with the color and differentiate the individual pieces.

Ages: 3 - 9 years

Materials

- print off of [Colorful Tangram Pieces](#) (from [TangramTemplate.PDF](#))
- print off the [Colorful Tangram Cards](#) OR set up a screen so that the child can see the patterns.

(You can also make your own Tangram from paper, cardboard, cardstock, construction paper by following the cutting guide in the [TangramTemplate.PDF](#). For this you will need:

- paper, cardstock, light cardboard, colored construction paper (or you can color the pieces with crayons, colored pencils, paint, watercolors)
- scissors
- ruler
- pencil

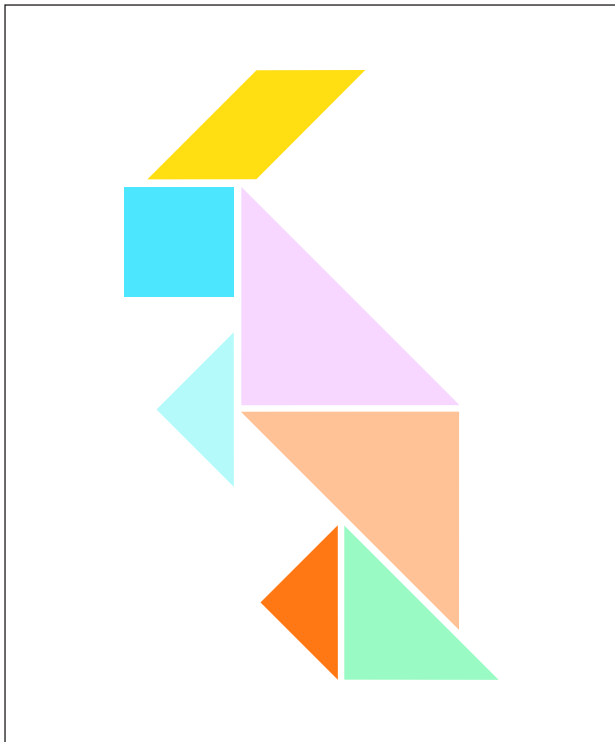
**Note that the Parallelogram is a unique piece in that sometimes we flip it over. If you make the pieces yourself, you can color both sides (or use colored paper) so that both sides are ready to be used.

Setting up

1. Find a clear space that is free of clutter; a table works well, or a solid surface on the floor.
2. Print and cut out the [Colorful Tangram Pieces](#) from the template (Or make your own, and do your best to match the colors.)
3. Print the [Colorful Tangram Cards](#) (the colorful arranged shapes) and have them ready nearby. (Or have a screen available so that the child can see them clearly.)

Process

4. Show the child the seven colorful tangram pieces. Together point to each one, and ask - *what kind of shape is this?* (a triangle, a square, etc.) *How many sides does it have?*
 5. You may start by explaining that we have seven different pieces, and each is a different color. *We can arrange them together, so that they make a larger shape.* You could create a square (see the pattern card with the square) as the first example. What do you notice about this new shape that we made from the smaller shapes? How many sides does it have? What kind of shape is it?
 6. Take one of the Tangram Colorful Cards, and place it in front of the child. Can you match the pieces to this shape?
- A good place to start is placing the individual pieces on the card - they are the same size, so that the child can match them easily.
7. Depending on the age of the child, and after you have done the previous step a couple of times, show the child how to arrange the pieces to match the card, but do not place the pieces on the card.
 8. Repeat and explore the other cards. Perhaps with some of them, the shape looks like something else. *What do you see? We can use simple shapes to make images that look like a house, or a cat, or a swan! Even though it is not a detailed photo of a rabbit, we still see a rabbit - why is that?*



Tangram

Activity 2: Tangram with Solid Shapes

Objective

Children will explore the seven pieces of the Tangram, and use their hands and spatial skills to reconfigure the paper pieces - making the connection that smaller pieces can become part of a larger whole. This activity is more challenging than the previous, because we no longer rely on the color to match the pieces.

Ages: 4 - 9 years

Materials

- print off the **Tangram Pieces** (from [TangramTemplate.PDF](#)) and cut them out

OR make your own Tangram Pieces from paper, cardboard, cardstock, construction paper by following the cutting guide in the [TangramTemplate.PDF](#). For this you will need:

- paper, cardstock, light cardboard
- scissors
- ruler
- pencil

***Note that the parallelogram piece is special - because it is double sided and we will be flipping it over at times, you will need to fold the template piece, and glue it together so that both sides are the same. Keep this in mind if you are making your own.*

- print off the **Solid Tangram Cards**; cut and fold the pieces so that there are 2 sides for the cards

OR set up a screen so that the child can see the patterns.

Process

1. Find a clear space that is free of clutter; a table works well, or a solid surface on the floor.
2. Set up the Solid Tangram Cards, or set up a screen so that the child can easily see the patterns.
3. Show the child the seven pieces, if you haven't done the previous activities. Together point to each one, and ask - what kind of shape is this? (a triangle, a square, etc.) How many sides does it have?

4. You may start by explaining that we have seven different pieces, and each is a different shape. And we can arrange them together, so that they make a larger shape.
5. Take the solid black pattern cards; you will see that there are two sides: one has spaces in between the pieces, and the other is a solid shape. The cards without the spaces, just the solid shapes, are more challenging and may be appropriate for older children, or after completing the other cards (both the colorful cards and the ones with spaces.)
6. *Can you could create a square?* (See the pattern card with the square as the first example.)
7. Go through the pattern cards, matching the image by arranging the tangram pieces. The tangram activity is a great activity to do together with the child (you can print off more pieces so that 2 people can do it at once) or work independently.
6. Try making your own shapes from the pieces, what can you make?

