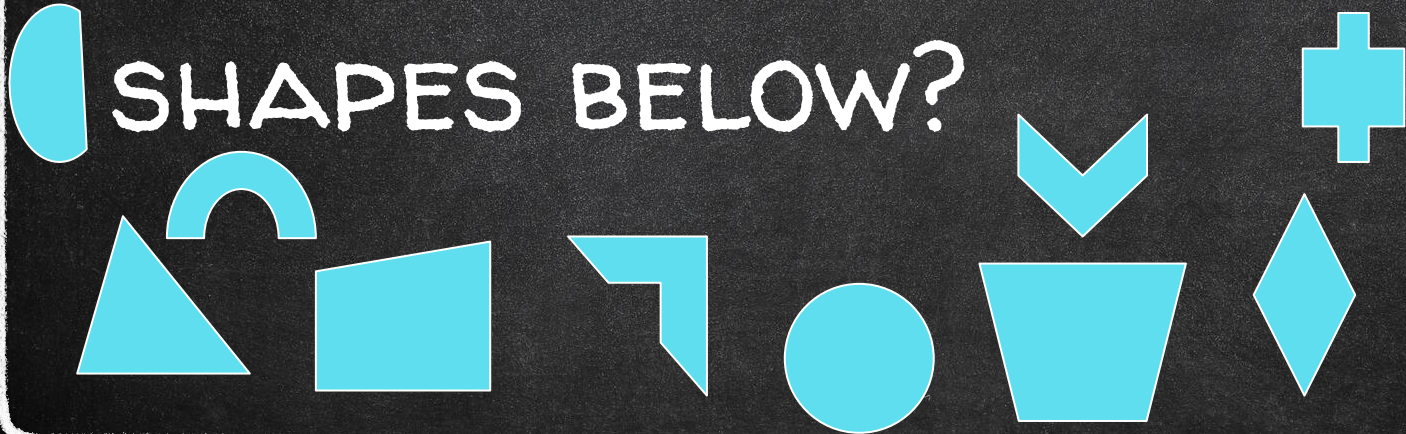
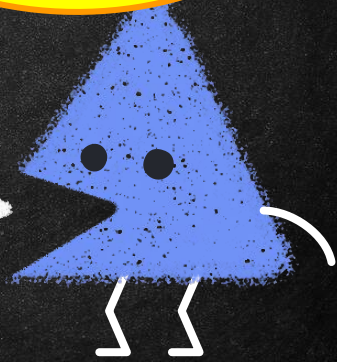


AS YOU ENTER THINK
ABOUT, WHAT ARE ALL
OF THE WAYS YOU
COULD SORT THE
SHAPES BELOW?



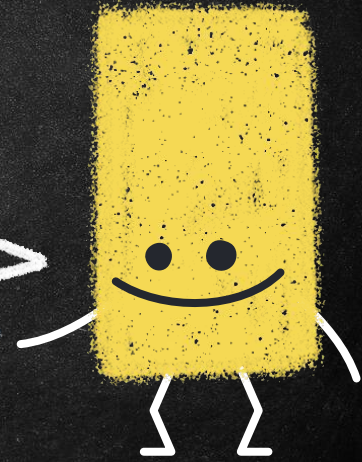
Think about
it but do not
share yet



EARLY CHILDHOOD
MATHEMATICS:
BUILDING A SENSE
OF SPACE AND
SHAPE PK - 1



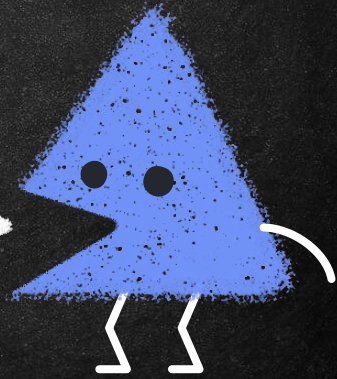
Melissa Hosten mhosten@math.arizona.edu
crr.math.arizona.edu



Session Goals

1. Understand the profound thinking inherent in the concepts of Space and Shape.

2. I can help children internalize and apply the principles of Space and Shape.



PreK

The child recognizes names and describes common shapes and their properties.

- Recognizes basic two-dimensional shapes when presented in different orientations.
- Uses the names of geometric shapes when describing objects found in the environment. Creates three-dimensional (solid) shapes during play.
- Compares, describes, analyzes, and sorts two- and three- dimensional objects in the environment using formal and informal mathematical language with prompting and support based on their attributes.

The child uses and demonstrates an understanding of positional terms.

- Uses and responds to spatial language.
- Describes the relative position or location of objects in relation to self or to other objects with mathematical precision.

K

Identify and describe shapes (squares, circles, triangles, rectangles, hexagons, cubes, cones, cylinders, and spheres)

- Describe objects in the environment using names of shapes.
- Describe relative positions of these objects.

Analyze, compare, create, and compose shapes

- Analyze and describe 2D and 3D shapes in different sizes and orientations...

1

Reason with shapes and their attributes

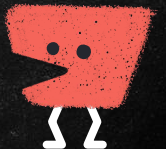
- Distinguish between defining vs. non-defining attributes.
- Build and draw shapes to possess defining attributes.
- Compose 2D or 3D shapes to create a composite shape.
- Partition circles and rectangles into two and four equal shares.
- Describe the partitioned shares using fractional words.

What do you notice as you look across?
Type "me" in the chat to share

3

BIG Ideas

For Space



THE TRAIN RIDE

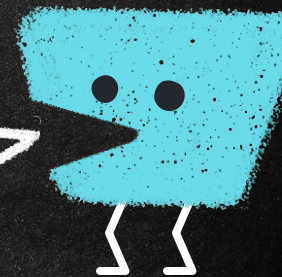


“OK, I’ll make the track.”


“Yeah, make it over there in the corner by the shelf.”

“Let’s make the train that we took around the zoo last time.”

“Be sure it turns four times so that it comes all the way back to the start. I will make the cage with the wild cats that we saw.”

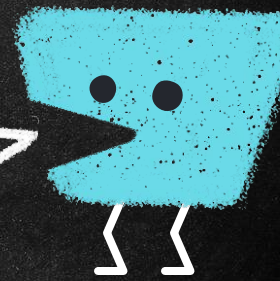


THE TRAIN RIDE

A yellow, textured, round character with two black dots for eyes and a simple curved line for a smile. It has two thin white legs.

“I will build the bridge that we crossed before the Monkey Cage.”

“Over here, just past one of the turns.”

A blue, textured, rectangular character with two black dots for eyes and a simple curved line for a mouth. It has two thin white legs.

“Where will the bridge be?”

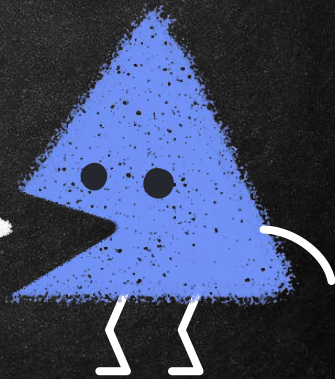
“OK, then the Monkey Cage has to be over here by the chair.”

A yellow speech bubble with a black outline and a tail pointing towards the blue character.

What do you notice?
Type “me”
in the chat
to share

BIG IDEAS #1

Relationships between objects and places can be described with mathematical precision

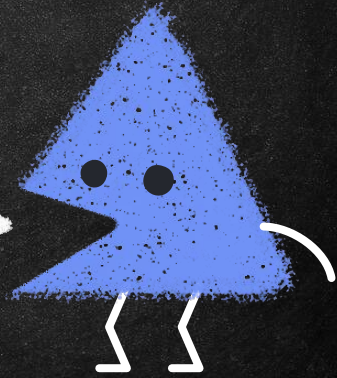


MORNING CIRCLE TIME

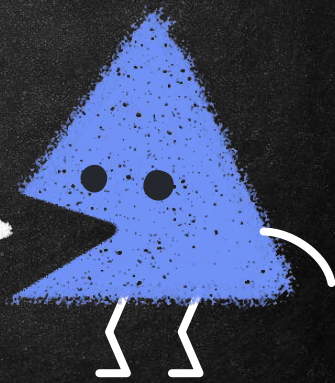
Count

Describe

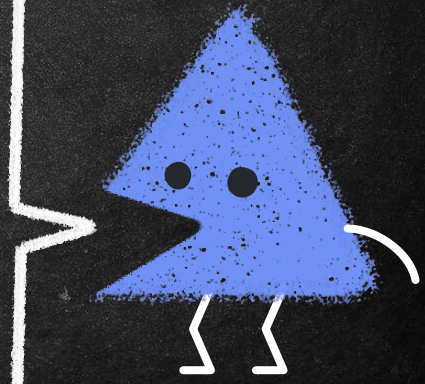
Geometry of Letters



HOW MANY RED LADYBUG ROCKS DO YOU COUNT?



WHAT SHALL WE DESCRIBE?



Use the shapes to make the letter b



Level 2

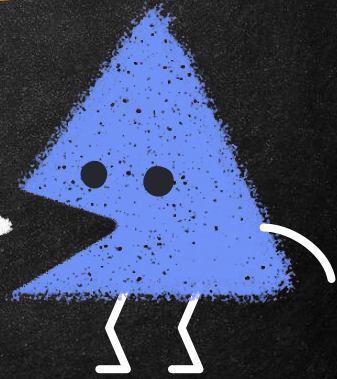


REPRESENTING SPACE

“where” can be described

- Building (represents location, movement, and direction)
- Talking
- Drawing
- Writing

How do you reinforce these daily? Type “me” in the chat to share

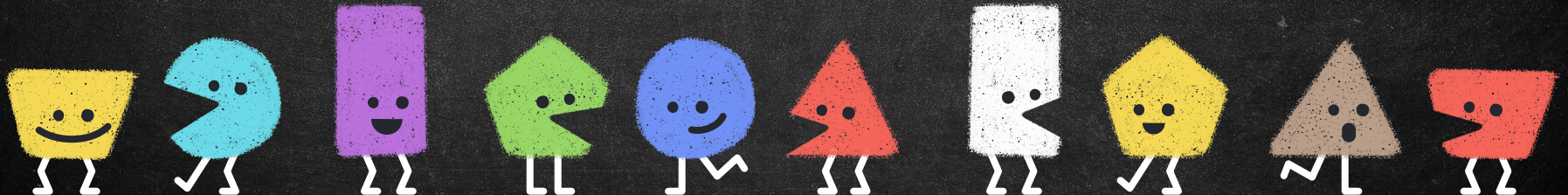


By preschool children can:

- Locate items
- Decide how to get from here to there

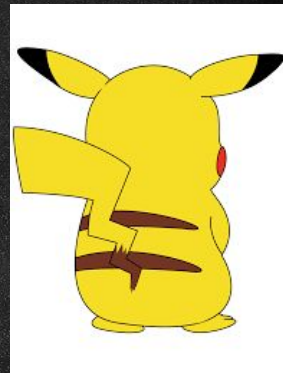
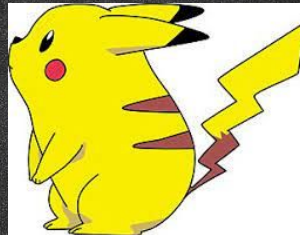
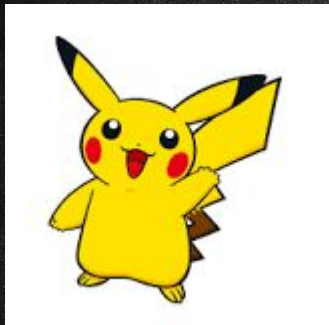
And they are *beginning* to represent space.

- By building models - FIRST
- By drawing maps - AFTER
- By describing the relationship between objects and locations (using words and using gestures) - ALWAYS

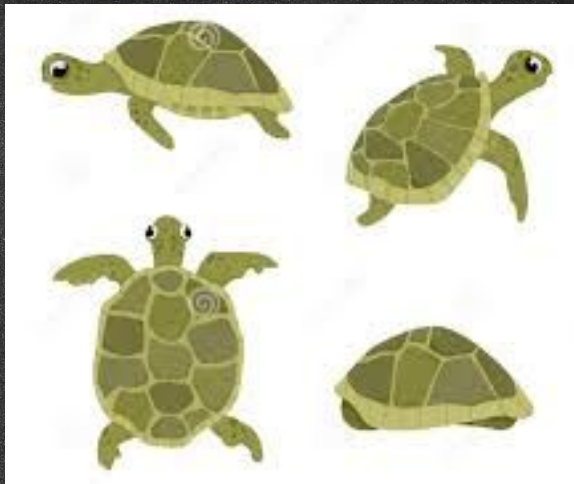
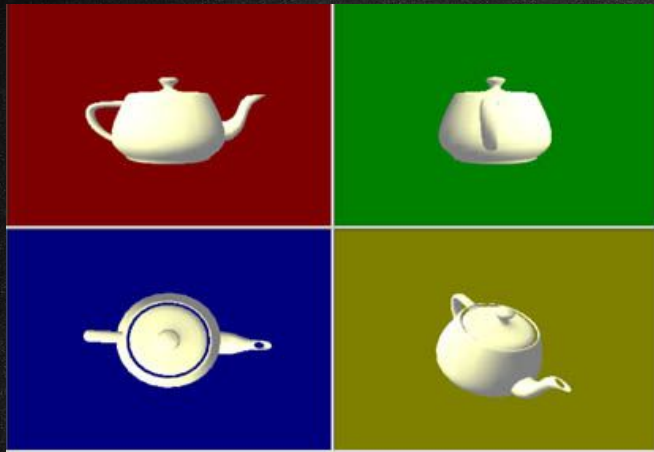


Type
"me" in
the chat
to share

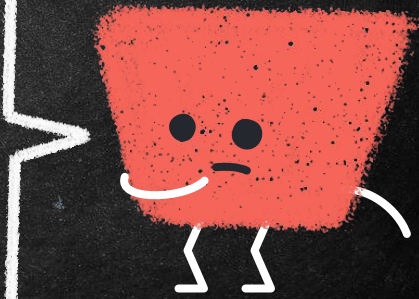
IS THIS THE SAME POKEMON?



CAN WE DESCRIBE IT?



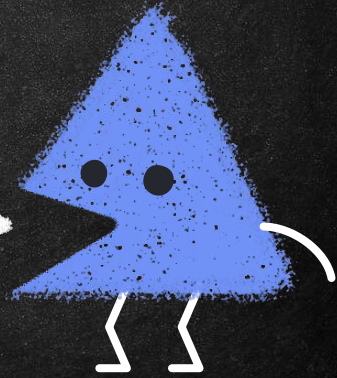
Type
"me" in
the chat
to share



SPACE REFLECTS A POINT OF VIEW/ PERSPECTIVE

Space descriptions change based on the position of the describer

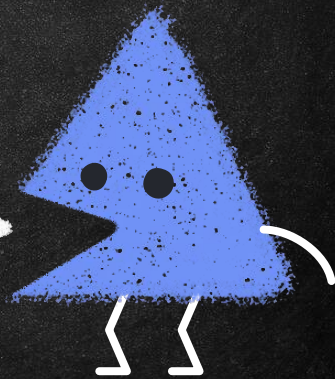
- viewing from different positions
- right or left



BIG IDEAS #1 & #2

Relationships between objects and places can be described with mathematical precision

Our own experiences of space and two-dimensional representations of space reflect a specific point of view



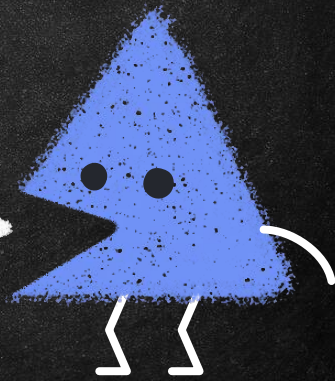
THE IDEA OF "FIT" Transformations

Flip

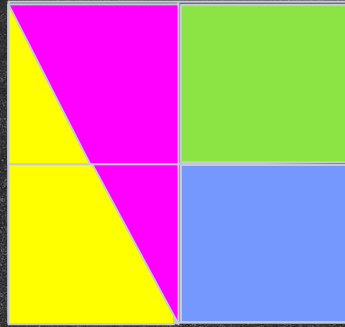


Turn

Slide

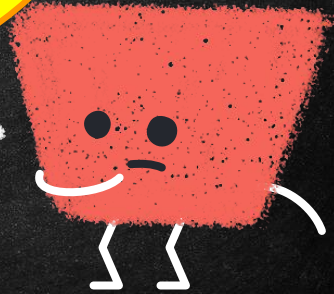


MANIPULATING SPACE (PHYSICALLY –
THEN MENTALLY)



Cut each shape out.
Use them to
make squares.
Now look at the
picture and do
the same in your
mind

TANGRAM TASKS

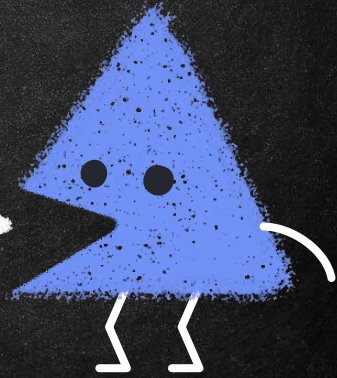


BIG IDEAS #1, #2, & #3

Relationships between objects and places can be described with mathematical precision

Our own experiences of space and two-dimensional representations of space reflect a specific point of view

Spatial relationships can be visualized and manipulated mentally

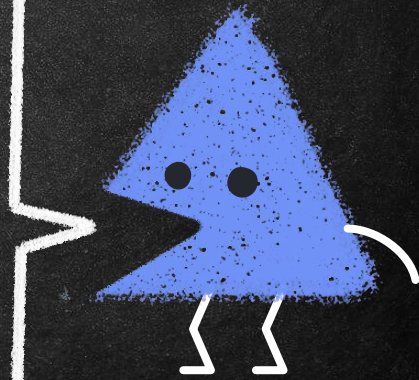


LET'S REFLECT

What centers do you already have that support the exploration of Big Idea #1?

What centers do you already have that support the exploration of Big Idea #2?

What centers do you already have that support the exploration of Big Idea #3?



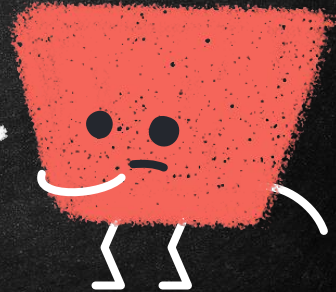
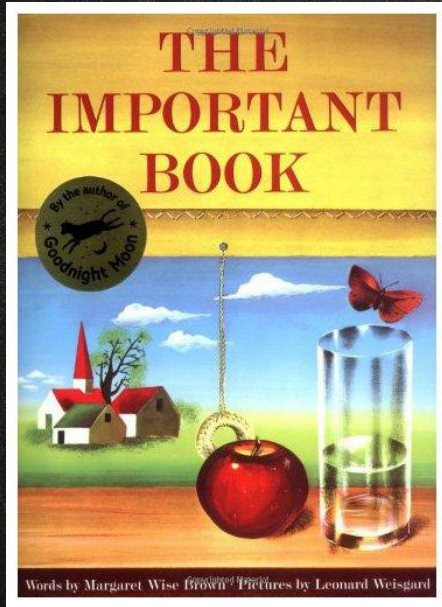
3

BIG Ideas

For Shape



THE IMPORTANT BOOK





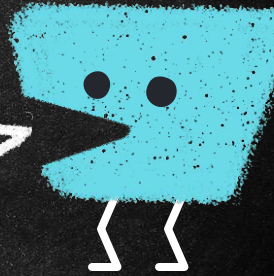
Triangles

Have three sides
Have three corners
Are flat
Are closed

But the most important thing is that they have three sides

Squares

Have four sides
Have four corners
Have corners that make different "L"s
Have sides that are as long as each other
But the most important thing about squares is they have sides that are as long as each other





Circles

Go around

Are curvy

Are closed

Look like the sun

Look like a plate

But the most important thing about circles is they go around

Cones

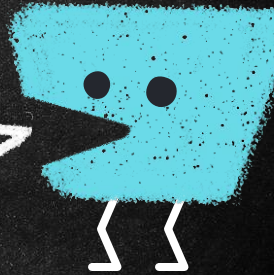
Have one tip

Can hold an ice cream scoop

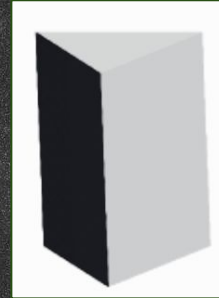
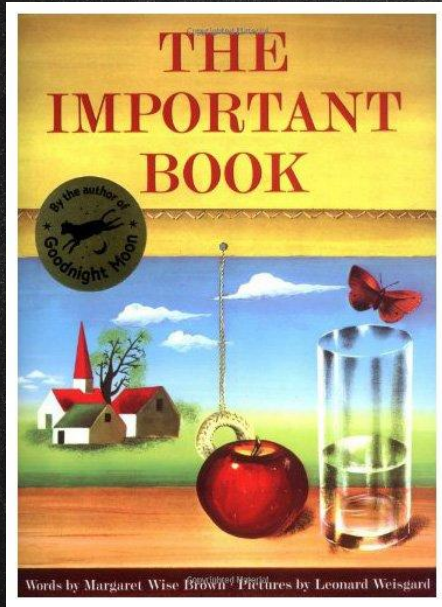
Have a curvy part to hold

Have a flat part

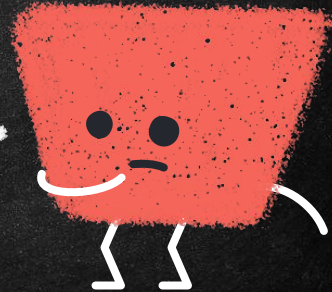
But the most important thing about a cone is it has one tip



THE IMPORTANT BOOK



Type
"me" in
the chat
to share



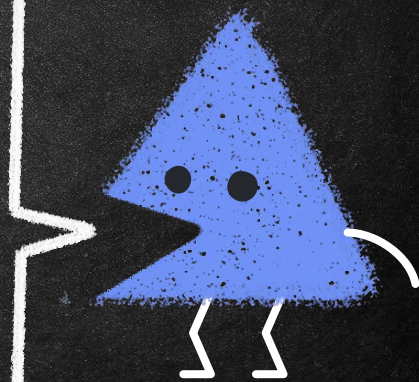


- ▶ **Children need to judge the importance of a shape's characteristics.**

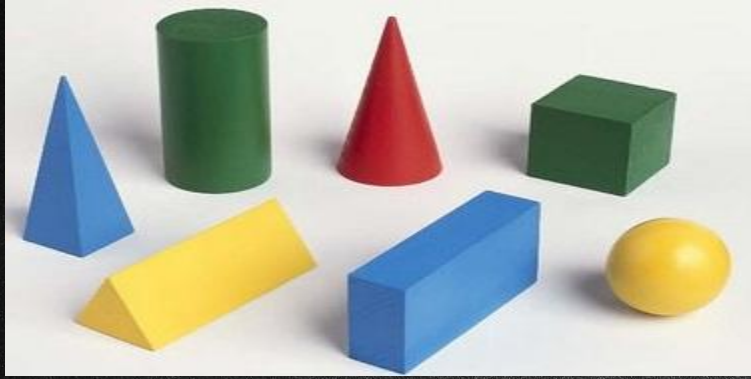
BIG IDEAS #1

Shapes can be defined and classified by their attributes

- **Attributes are *outside* of the shape
- **Properties are *inside* of the shape
- **Precision in language and naming is VITAL!



GRADE K SHAPE FOOTPRINTS



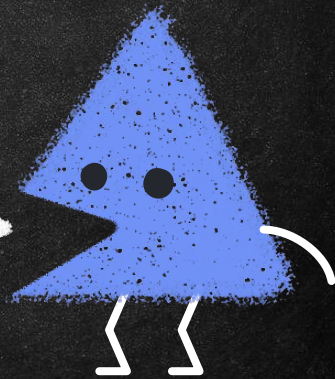


- ▶ **Children need to discern between 2D and 3D in a relevant and personal way.**
- ▶ **Children need to feel empowered to discover and be curious about mathematics.**

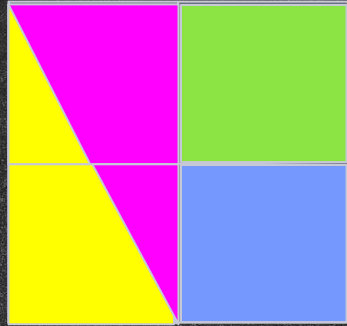
BIG IDEAS #1 & #2

Shapes can be defined and classified by their attributes

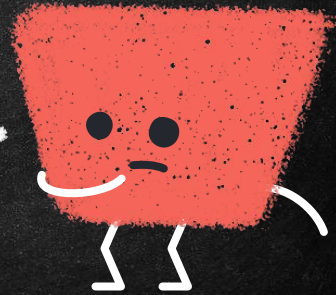
The flat faces of a solid (3-dimensional shape) are two-dimensional shapes (footprints)



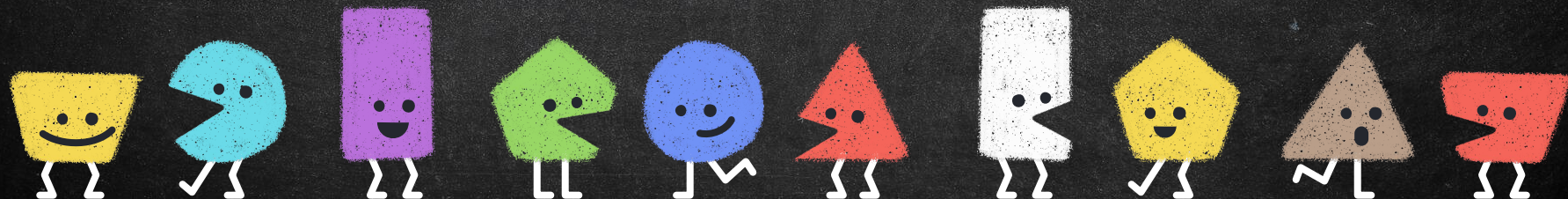
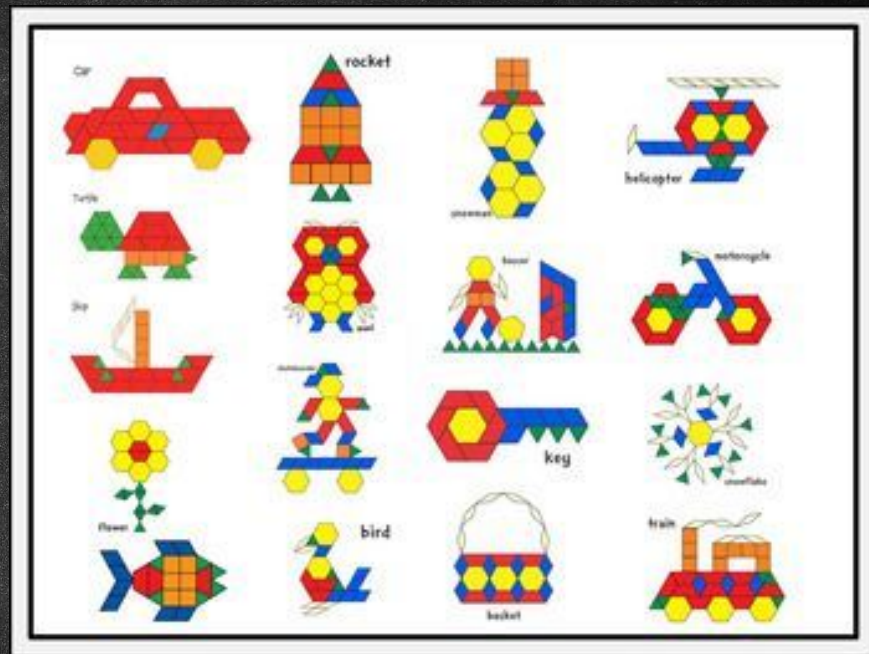
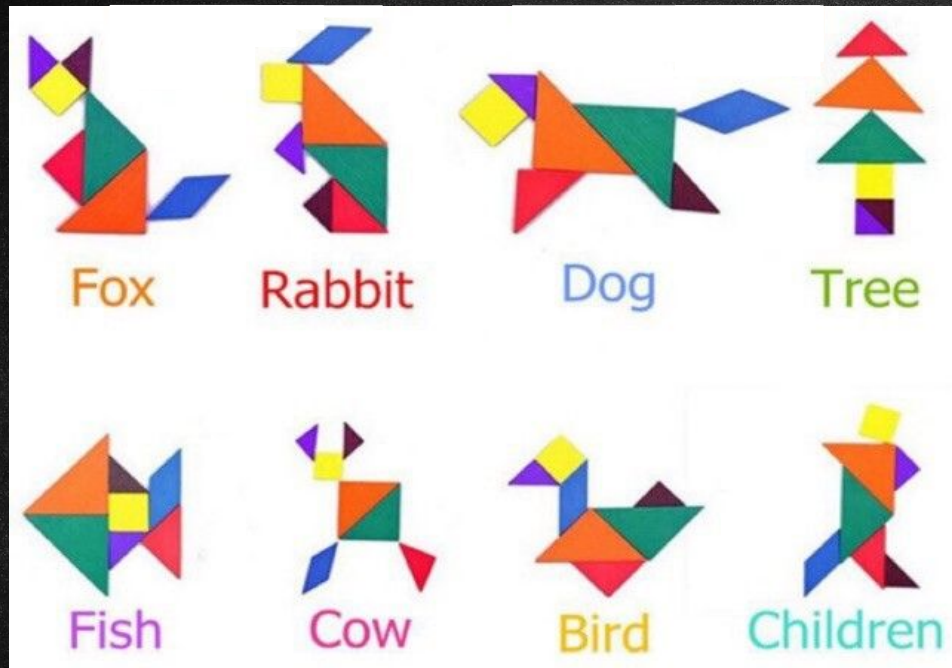
SHAPES CAN MAKE NEW SHAPES.
NEW SHAPES CAN BE FOUND INSIDE OF
SHAPES.



TANGRAM TASKS & EARLY
GEOMETRY PATTERN BLOCK TASK



Use the online manipulatives to make an image.



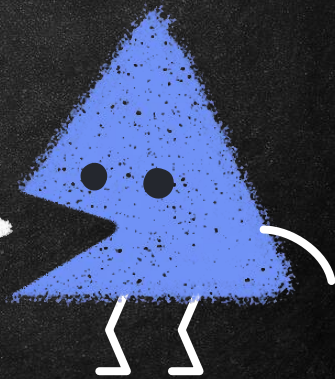
BREAKOUT ROOM 1

Pattern Blocks:

<https://www.mathlearningcenter.org/apps/pattern-shapes>

Tangrams:

<https://toytheater.com/tangram/>



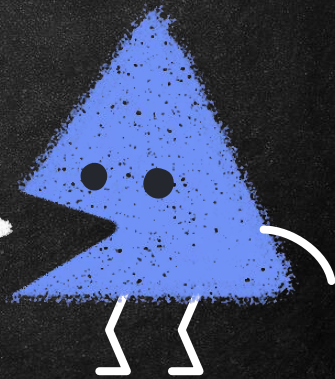
BREAKOUT ROOM 2

Pattern Blocks:

<https://www.mathlearningcenter.org/apps/pattern-shapes>

Tangrams:

<https://toytheater.com/tangram/>



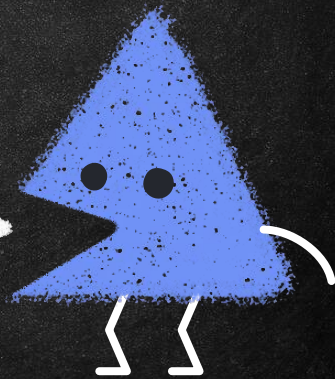
BREAKOUT ROOM 3

Pattern Blocks:

<https://www.mathlearningcenter.org/apps/pattern-shapes>

Tangrams:

<https://toytheater.com/tangram/>



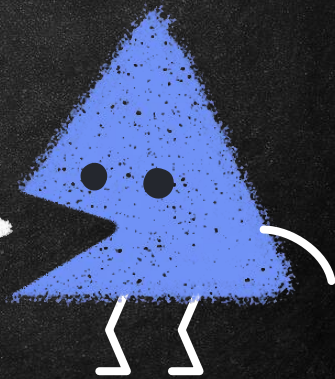
BREAKOUT ROOM 4

Pattern Blocks:

<https://www.mathlearningcenter.org/apps/pattern-shapes>

Tangrams:

<https://toytheater.com/tangram/>



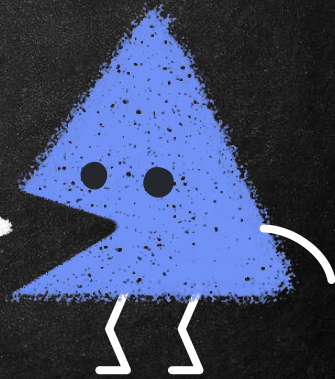
BREAKOUT ROOM 5

Pattern Blocks:

<https://www.mathlearningcenter.org/apps/pattern-shapes>

Tangrams:

<https://toytheater.com/tangram/>



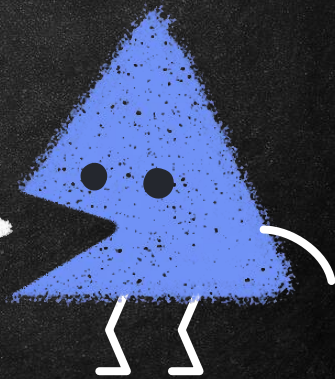
BREAKOUT ROOM 6

Pattern Blocks:

<https://www.mathlearningcenter.org/apps/pattern-shapes>

Tangrams:

<https://toytheater.com/tangram/>



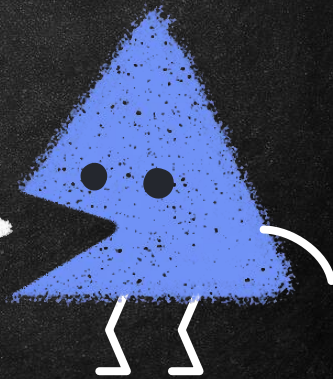
BREAKOUT ROOM 7

Pattern Blocks:

<https://www.mathlearningcenter.org/apps/pattern-shapes>

Tangrams:

<https://toytheater.com/tangram/>



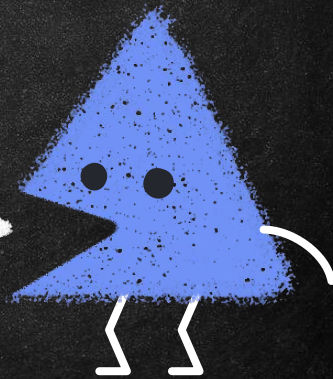
BREAKOUT ROOM 8

Pattern Blocks:

<https://www.mathlearningcenter.org/apps/pattern-shapes>

Tangrams:

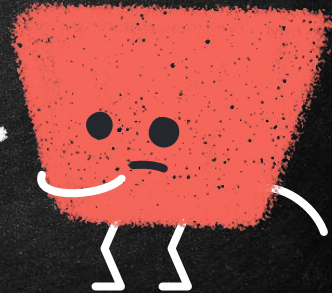
<https://toytheater.com/tangram/>



SCAVENGER HUNT



Type
"me" in
the chat
to share

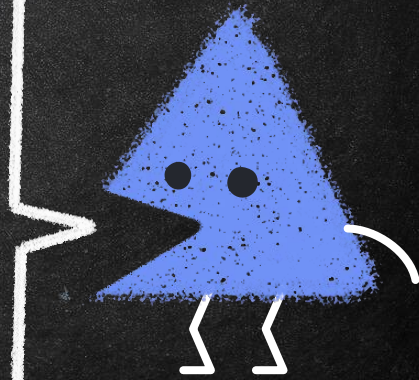


BIG IDEAS #1, #2, & #3

Shapes can be defined and classified by their attributes

The flat faces of a solid (3-dimensional shape) as two-dimensional shapes (footprints)

Shapes can be combined and separated (composed and decomposed) to make new shapes

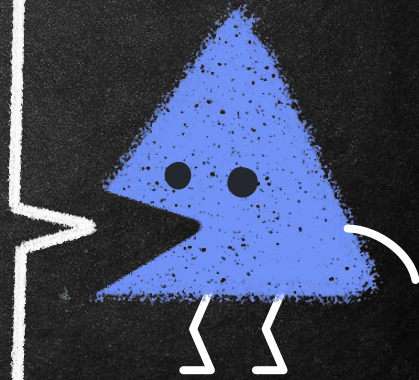


LET'S REFLECT

What centers do you already have that support the exploration of Big Idea #1?

What centers do you already have that support the exploration of Big Idea #2?

What centers do you already have that support the exploration of Big Idea #3?



TEACHING IMPLICATIONS...

Show shapes in different orientations

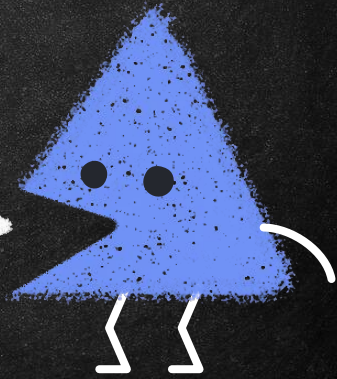
Connect shapes to their world

Connect their world to shapes

Space and Shape centers all year

Equal Access

Life Experiences





WHEN IS IT APPROPRIATE TO ASK FOR A DEFINITION OR GIVE ONE?

A definition of a concept is only possible if one knows, to some extent, the thing that is to be defined.

Pierre van Hiele

How can you define a thing before you know what you have to define?
Most definitions are not preconceived but the finished touch of the organizing activity.

The child should not be deprived of this privilege...

Hans Freudenthal



Type
“me” in
the chat
to share

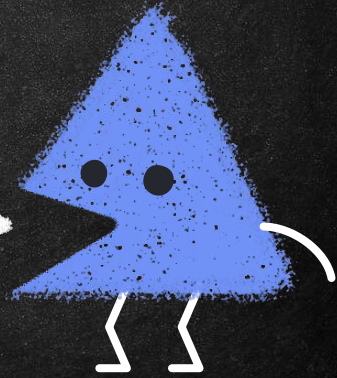
What is the same? What is different?

What is the same and different in how we learn numbers and how we learn shapes?

Session Goals

1. Understand the profound thinking inherent in the concepts of Space and Shape.

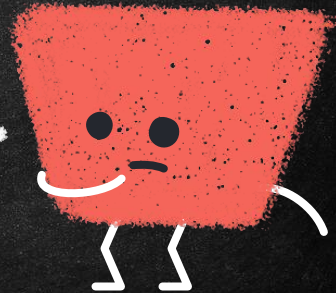
2. I can help children internalize and apply the principles of Space and Shape.



YOUR OPINION MATTERS!

Please complete the survey! Feel free to share feedback directly as well:

mhosten@math.arizona.edu



SESSION DESCRIPTION

Early Childhood Mathematics: Building a sense of space and shape PK - K

How do preschool children build a sense of space and shape, and why do some children have a more robust sense than others? We will explore the ways a child engages in understanding space and shape and ways that we can fortify this understanding in our preschool classrooms.

