

# Playing with Mathematical Ideas preK-grade2



#NCTM100  
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# Playing with Mathematical Ideas in studio and outdoor spaces for all learners



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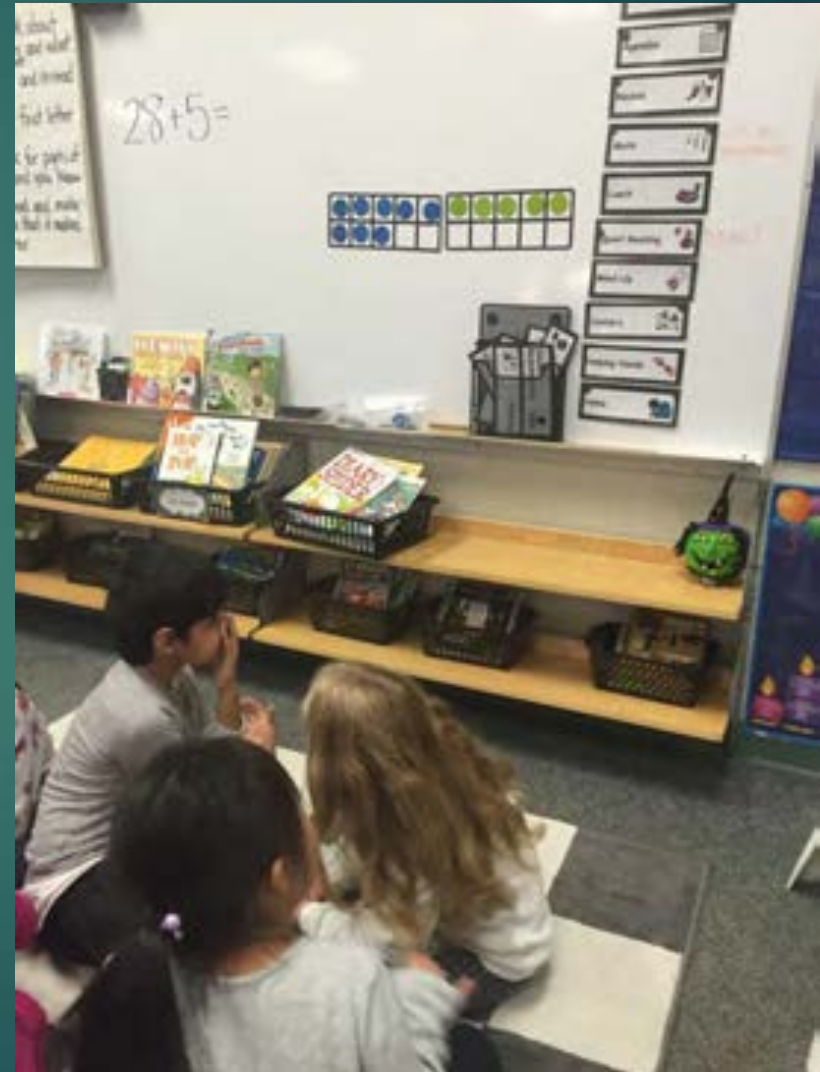
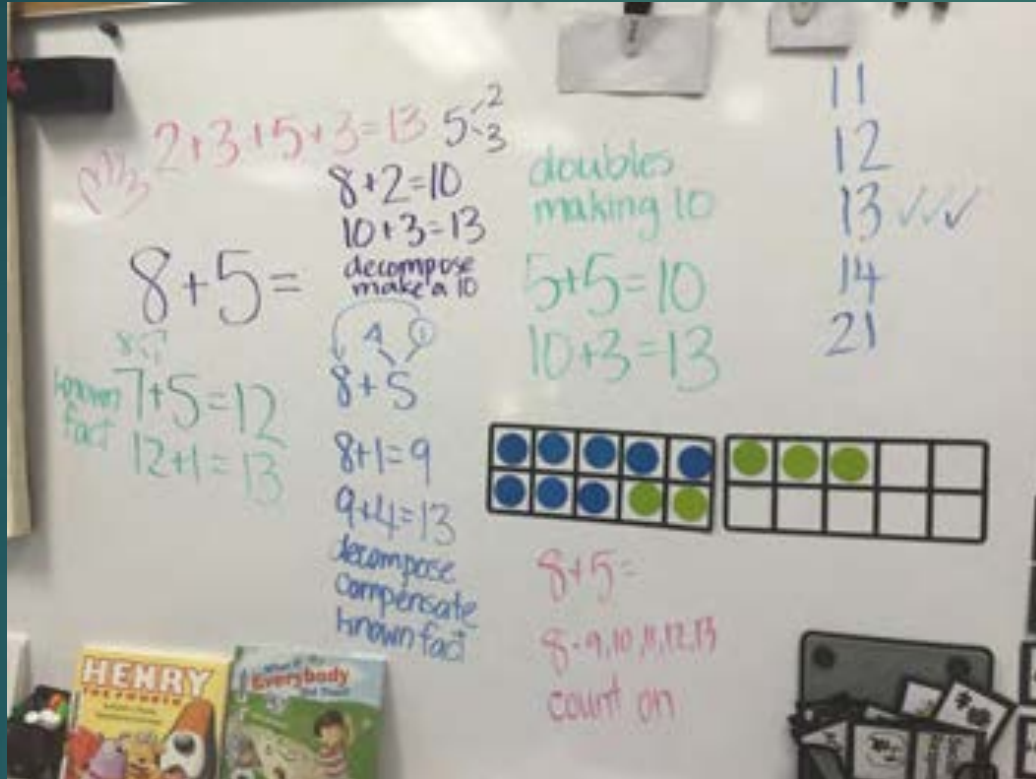


[jnovakowski](https://www.instagram.com/jnovakowski)

# Land Acknowledgement



# Investigating Addition and Subtraction Grades 1&2



How does knowing  
about 5 and 10  
help you add  
numbers?



**Make a number.**  
**Roll a die.**  
**Add or subtract.**  
*What strategies did you use?*



What stories live in  
these equations?

$$8 + 4 + 6 = \underline{\quad}$$





What different ways  
can you make 10?





1	2	3	4	5	6	7	8	9	10
11	12	13	14	15	16	17	18	19	20
21	22	23	24	25	26	27	28	29	30
31	32	33	34	35	36	37	38	39	40
41	42	43	44	45	46	47	48	49	50
51	52	53	54	55	56	57	58	59	60
61	62	63	64	65	66	67	68	69	70
71	72	73	74	75	76	77	78	79	80
81	82	83	84	85	86	87	88	89	90
91	92	93	94	95	96	97	98	99	100

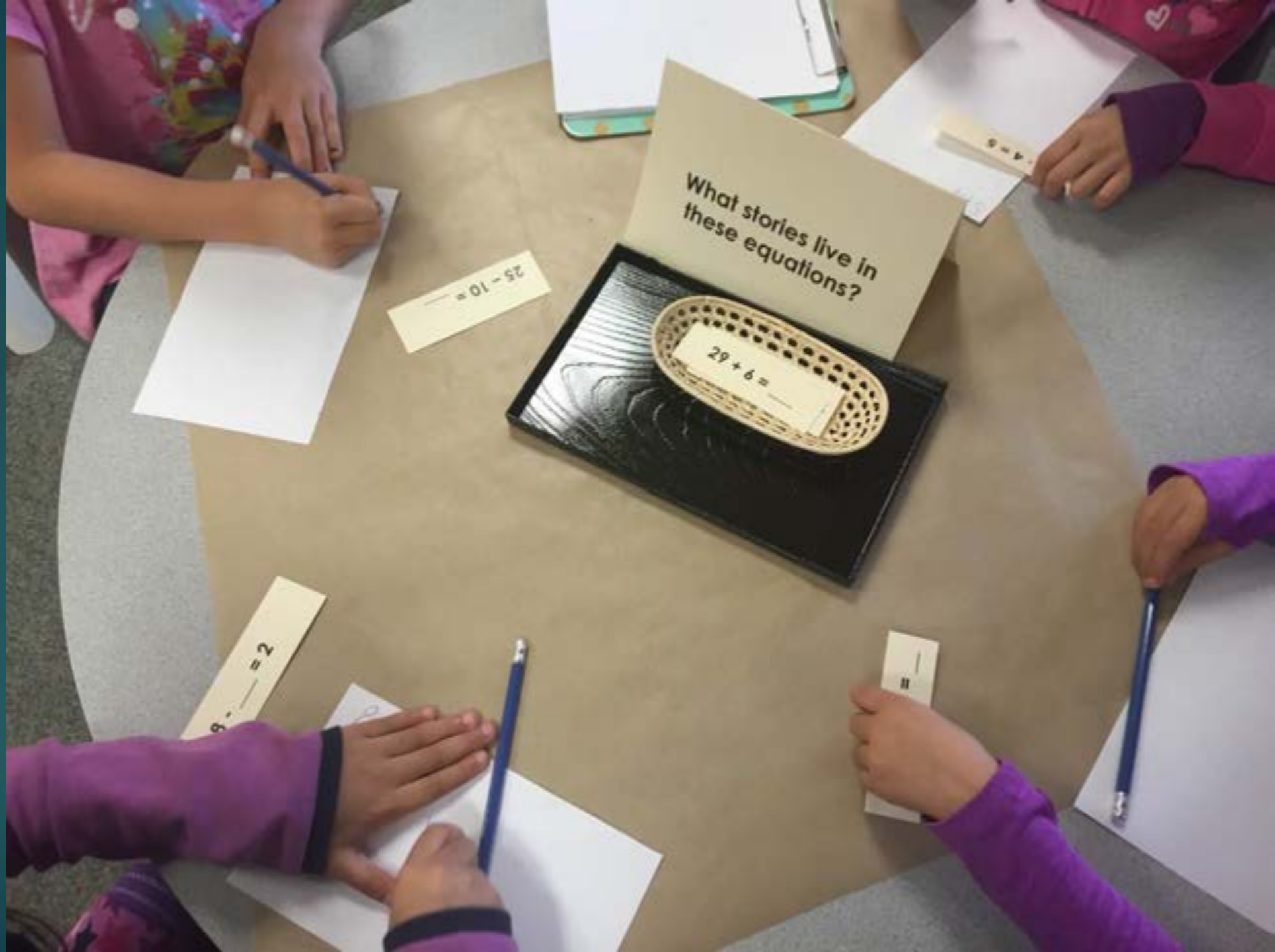
How many different ways can you solve \_\_\_\_\_?

$o + \_ = 10$   
 $48 + 6 = \_$



How are addition  
and subtraction  
connected?





What stories live in these equations?

$$29 + 6 =$$

$$25 - 10 =$$

$$9 \cdot \_\_ = 2$$

$$5 = 5$$



# Guiding Questions for The Studio



- ▶ *What does it mean to belong in a space?*
- ▶ *How is math connected to you and the world around you?*

# In The Studio



“It’s a math  
sun!  
It’s full of  
math!”

– Grauer Kindergarten student



# Influences...

- ▶ Pedagogy of Play
  - ▶ Harvard Graduate School of Education
- ▶ Playful Inquiry
  - ▶ Opal School, Portland Oregon
- ▶ The Reggio Emilia Approach
  - ▶ Reggio Children, Reggio Emilia, Italy



What does it mean to play with  
ideas and concepts?



“Play is to mathematics what  
books are to reading.”

DAN FINKEL, MATHEMATICIAN, SEATTLE

[MATHFORLOVE.COM](http://MATHFORLOVE.COM)

# “the ball toss”

- ▶ Loris Malaguzzi of Reggio Emilia, Italy often spoke of the ball toss or the back and forth of a ping pong game as a metaphor for the roles of adults and children in teaching and learning.

# questions to nurture mathematical thinking, play and inquiry:

- ▶ How are these alike?
  - ▶ How are these different?
- ▶ What do you notice?
  - ▶ What do you wonder?
- ▶ What do you think?
- ▶ How do you know?

# Some frames...

- ▶ What stories live within...?
- ▶ What do you notice? What do you wonder?
- ▶ What is the relationship between....?
- ▶ What are the connections between...?
- ▶ What happens when...?
- ▶ How many different...?
- ▶ How do these materials help you think about...?
- ▶ Where do we see...in the world?

# Connections

- ▶ math to self
- ▶ math to world
- ▶ math to math

# PLAY



- ▶ playing with materials
- ▶ playing with language
- ▶ playing with ideas



# MIRRORS, WINDOWS & DOORS

- ▶ Dr. Rudine Sims Bishop
- ▶ Dr. Rochelle Gutierrez
  - ▶ *equity, access and re-humanizing mathematics*

*How do the materials  
in our schools reflect  
the children within our  
community?*

**“THIS ONE  
IS JUST  
LIKE ME!”**

-Grauer Grade 2 student



# MIRRORS

- ▶ Do students see themselves reflected in your classroom mathematical experiences?



# WINDOWS

- ▶ Do students have opportunities to be exposed to new perspectives and worldviews?



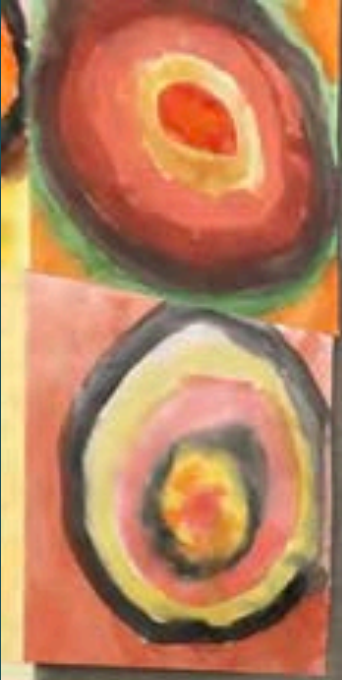
# DOORS

- ▶ Do students have openings to new opportunities and to reach their goals?

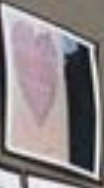


# in The Studio





What mathematics do you think about and do while you are designing and creating string art?  
- [Name]



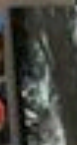
"I like making different patterns with the same string and colors. It's fun to try to make something new."/>

"I like making different patterns with the same string and colors. It's fun to try to make something new."/>

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"I had fun making a new different pattern with the same string and colors. I just wanted to try it out!"  
- [Name], grade 2

"I had fun making a new different pattern with the same string and colors. I just wanted to try it out!"  
- [Name], grade 2



"I like making different designs. When I see a pattern, I measured how long the string is. The design is simple and elegant. When I see that pattern, it is like magic. I want to try to make other designs in the future."  
- [Name], grade 2



Handwritten notes on a clipboard, including a list of names and dates.





September 13 2018

**How do art materials inspire children to play with mathematical ideas?**



What authentic materials and tools can we use to enhance mathematical thinking and learning?

**"My Grandpa has one of those."**

*Grauer Grade 2 student*



How do the materials in our schools reflect the children within our community?

**"THIS ONE IS JUST LIKE ME!"**

*Grauer Grade 2 student*



**What materials bring children together to learn with each other?**







What math do you see?



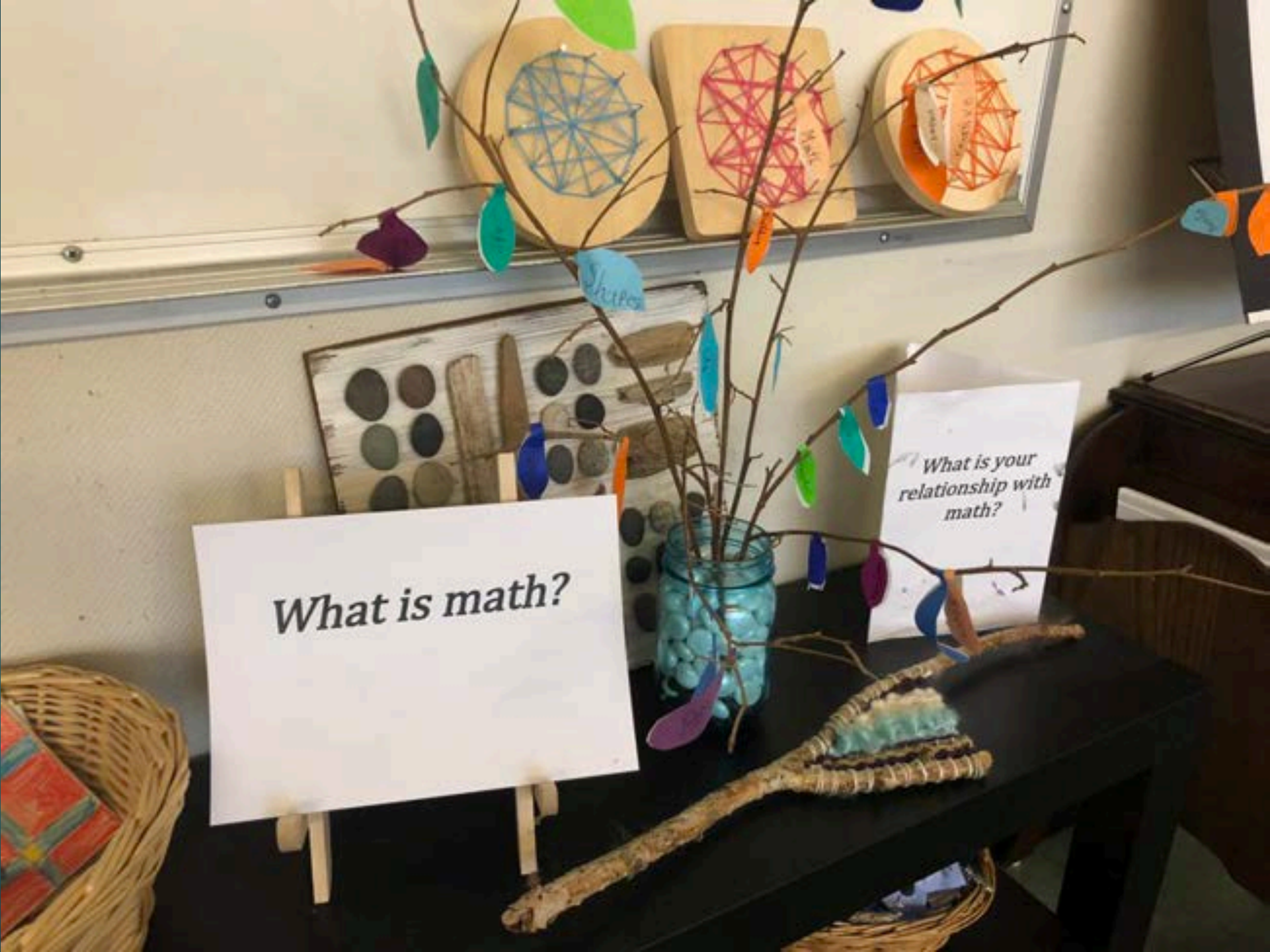
How are these shapes alike?

How are these shapes different?



*What is math?*

*What is your  
relationship with  
math?*



everything  
 finding patterns problem-solving  
 powerful continuous... life-changing awesome  
 Fraction-Symmetry  
 What is math? lines power  
 life clock-time counting (by 2s, 4s, 5s, 10s) Putting things together  
 adding, subtracting, dividing, multiplying Organizing together  
 splitting building ten, hundred important  
 fun shapes puzzles patterns measuring size  
 estimating blocks sticks  
 creative thinking blocks sticks Working together creativity  
 epic





What is math?



*What is your  
relationship with  
math?*

05  
22

How does math  
make you feel?





# Where is the math?

## Investigating Cranberries





Where is  
the math?

how many will fill up  
the truck?



lots of water  
how deep? how do they  
measure?

floating and sinking

marathon runner  
(Jan Longstaff)  
- distance (km, miles)  
- speed  
- time

basketball  
- sales points  
- passing  
- time

what is math?

at work  
- hot lunch  
- talk at party

mom's  
- games  
- dancing

who does math?

builders  
- playground

cook at restaurant  
- counting  
- measuring

measuring  
quilter

knitter  
weaver  
sewer  
crocheter

sewing  
- make clothes  
- fix clothes

what is math?

teachers  
- science

baking  
- counting  
- measuring

making cakes

mathematician  
- testing  
- measuring  
- problem-solving  
- writing

nurse  
- docs  
- measuring  
- other tests

families

baker  
- at home  
- store  
- bakery

hairdresser  
- measuring  
- cutting

"We do math!"

source  
- games

grandma  
- original math

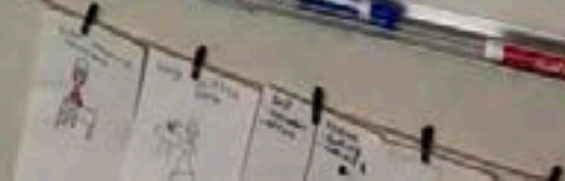
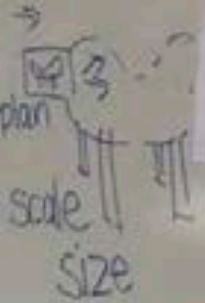
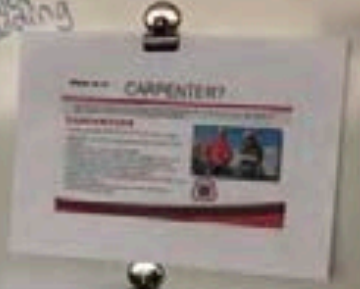
bank stores  
- count money

carpenter  
- build  
- measure  
- counting

A carpenter  
does math.

wood  
- space they  
- where they  
- are building

measuring  
- cutting  
reading  
plans



Who does math?

My Dad Working on the Computer



He designs buildings He fixes heaters

baker measuring ingredients





HELLO  
WORLD

ILLUSTRATED BY  
Yvettahj Muhammad  
with S. K. Ali  
and  
Watem Ali

THE  
PROUDEST  
BLUE

Boxitects

Kim Smith

THIS  
IS HOW  
WE  
DO IT

MATT CAMOTHE

RAINBOW  
WEAVER

TEJEDORA DEL ARCOIRIS

Crescent Moons and  
Pointed Minarets

MEET  
Viola Desmond

THE GIRL WITH  
A MIND FOR MATH

The Story of  
Raya Montague

What If...

The Colors  
of Us

THE BOY WHO  
LOVED  
MATH

KATHERINE

Nothing Stopped Sophie

the world is not a rectangle

A BOOK IN  
FOUR  
LANGUAGES  
MY  
NUMBERS

One Eagle  
Soaring

# Vision for The Studio

- ▶ A space to re-imagine the teaching and learning of mathematics through an inclusive, flexible learning environment that offers choice of materials to consider mathematics through the aesthetic dimension.

# Goals for The Studio Experience

## for educators

- to disrupt thinking about mathematics teaching and learning
  - to learn about the affordances of different materials
  - to consider how the environment can support thinking and learning
- ▶ to learn more about instructional approaches that focus on deeper learning, inquiry and place-based and culturally responsive pedagogies
  - ▶ to consider ways to teach mathematics more holistically, weaving together elements of our curriculum framework

## for students

- ▶ to have opportunities to experience math to math, math to self and math to world connections
- ▶ to have choice in where they choose to learn, the materials they use and how they share their thinking and learning and what projects they might take up

# Connecting Big Ideas/Concepts



▶ Identity

▶ Story

▶ Place

▶ Community

▶ Relationship

▶ Connection

▶ Decomposing

▶ Change

▶ Transformation

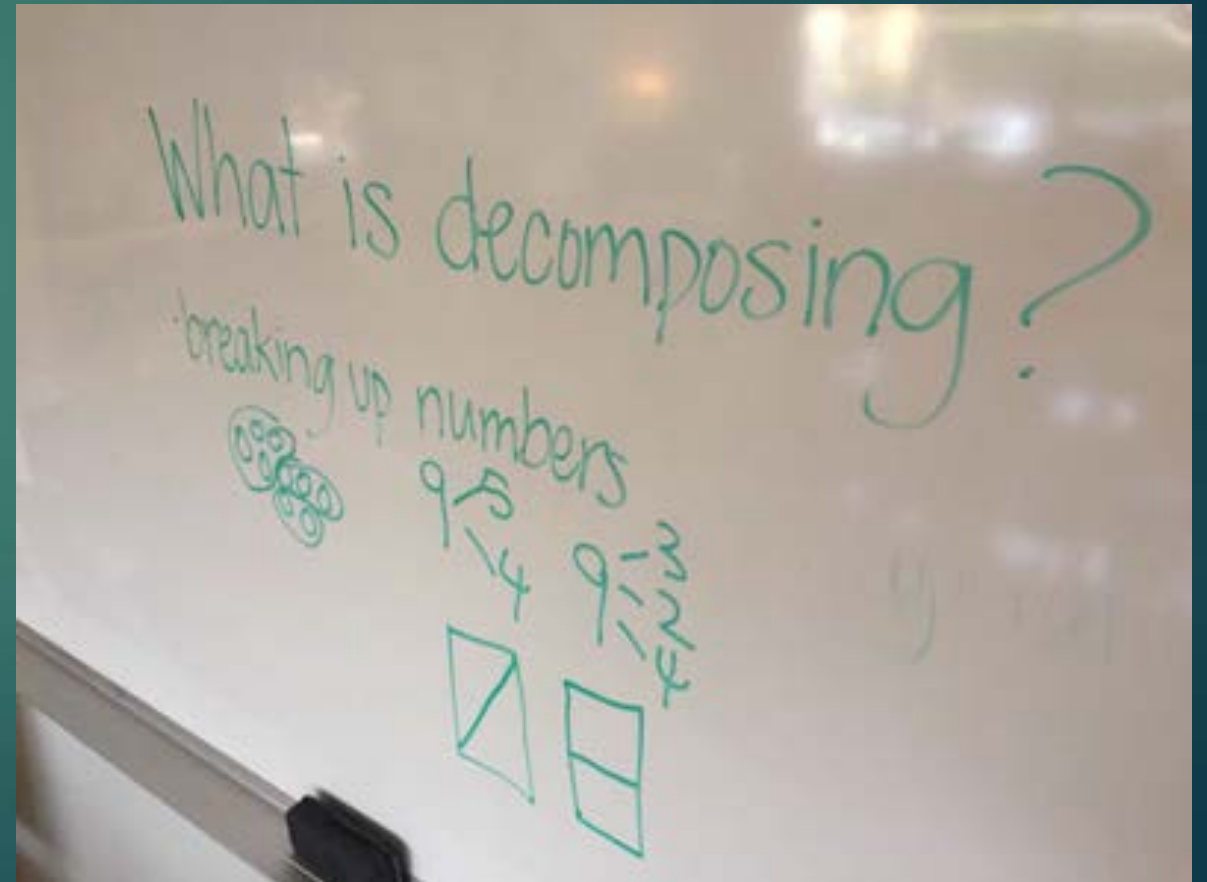
▶ Equivalence

▶ Shape

▶ Pattern



# Teaching and Learning Through a Mathematical Big Idea/Concept: Decomposing



What is decomposing?

How might these materials help you think about decomposing quantities and shapes?

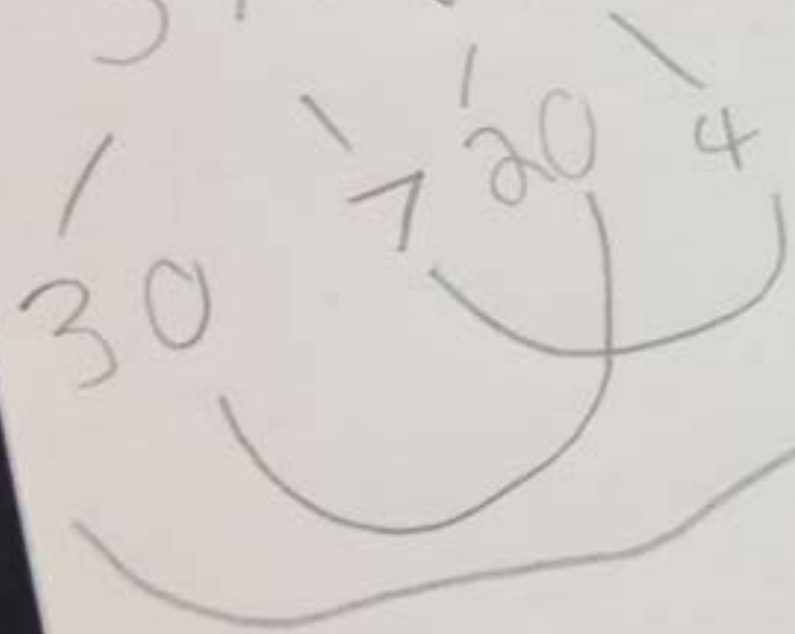




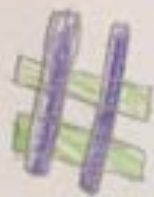


$$37 + 24$$

$$37 + 24$$

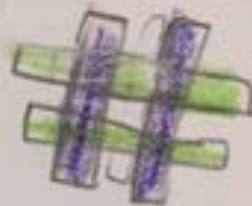


$$= 10 + 50 + 1 = 61$$



!numbers!

$$37 + 24$$



1)  $37 + 24 = 61$

30 7 20 4

2)  $37 + 24 = 61$

20 17 20 4

3)  $37 + 24$

33 4 22 2

4)  $37 + 24$

32 5 21 3

5)  $37 + 24$

30 7 21 3

6)  $37 + 24$

31 6 20 4









48

20



8



20



## Decomposing

1. Why do we use decomposing?  
panic.

2. When we use decomposing?  
wouldn't

When you find math too hard.

How we use decomposing?  
braking numbers a part.

**Student Outcomes 8**  
**Grade 2A 2 2017-2018**

Grade 1  
 Big idea: Number operations and number words  
 Grade 2 Big idea: Numbers to 100 represent quantities that can be decomposed into hundreds, tens and ones  
 Grade 3 Big idea: Numbers to 1000 represent quantities that can be decomposed into thousands, tens and ones

What is decomposing? How about decomposing only on what about numbers?  
 How can objects be decomposed? How can numbers be decomposed?  
 How about understanding 1 or 10? How can that about other numbers?

Grade 2	Outcome Single-digit numbers and operations in multiple ways	Outcome Use place value to describe and explain	Outcome Representing operations with numbers in various forms, including drawing, objects, manipulatives, equations, and other representations	Outcome Use mental strategies to multiply and divide within 100, including problem solving	Outcome Use mental strategies to multiply and divide within 100, including problem solving
100	100	100	100	100	100
10	10	10	10	10	10
1	1	1	1	1	1
1000	1000	1000	1000	1000	1000
100	100	100	100	100	100
10	10	10	10	10	10
1	1	1	1	1	1
1000	1000	1000	1000	1000	1000
100	100	100	100	100	100
10	10	10	10	10	10
1	1	1	1	1	1
1000	1000	1000	1000	1000	1000
100	100	100	100	100	100
10	10	10	10	10	10
1	1	1	1	1	1
1000	1000	1000	1000	1000	1000
100	100	100	100	100	100
10	10	10	10	10	10
1	1	1	1	1	1

Term 1

Big Idea: Number represents and describes quantity.

Grade 2 Big Idea: Numbers to 100 represent quantities that can be decomposed into tens and ones.

Grade 3 Big Idea: Numbers to 1000 represent quantities that can be decomposed into hundreds, tens and ones.

*What is decomposing? How does decomposing help us think about numbers?*

*How can shapes be decomposed? How can fractions be decomposed?*

*How does understanding 5 or 10 help us think about other numbers?*

Grade 2	Decompose single digit numbers into parts in multiple ways	Decompose two-digit numbers into parts (tens and ones)	Represent decomposing of two-digit numbers in multiple forms (concrete, pictorial, symbolic) - using tens or other benchmark numbers	Develop mental math strategies by applying concept of decomposing to + & - facts to 20	Develop and use multiple strategies to apply concept of decomposing to addition and subtraction to 100, including problem solving
ista	05 016				
l	528		016 <sup>7</sup>		016?
g	528	016	016		
		016			
	528 05 016	016	016	016	016
	528 05 016	016	016		
	528	528 016	05		016
hin			016 <sup>1000</sup>		016

Grade 3	Decompose two-digit and three-digit numbers in	Represent decomposing of three-digit numbers into parts by place value in multiple forms (concrete, pictorial, symbolic) - hundreds, tens & ones and other benchmark numbers	Develop mental math strategies by applying concept of decomposing to + & - facts to 20 - increasing	Develop and use multiple strategies to apply concept of decomposing to addition and subtraction to 1000 - including problem	Apply concept of decomposing to understanding of multiplication - grouping, arrays

What is decomposing?

How do shapes come together to make new shapes?

How can shapes be decomposed?

↳ How does this help us think about positional patterns?



## COMMUNICATION in Mathematics

### Core Competencies

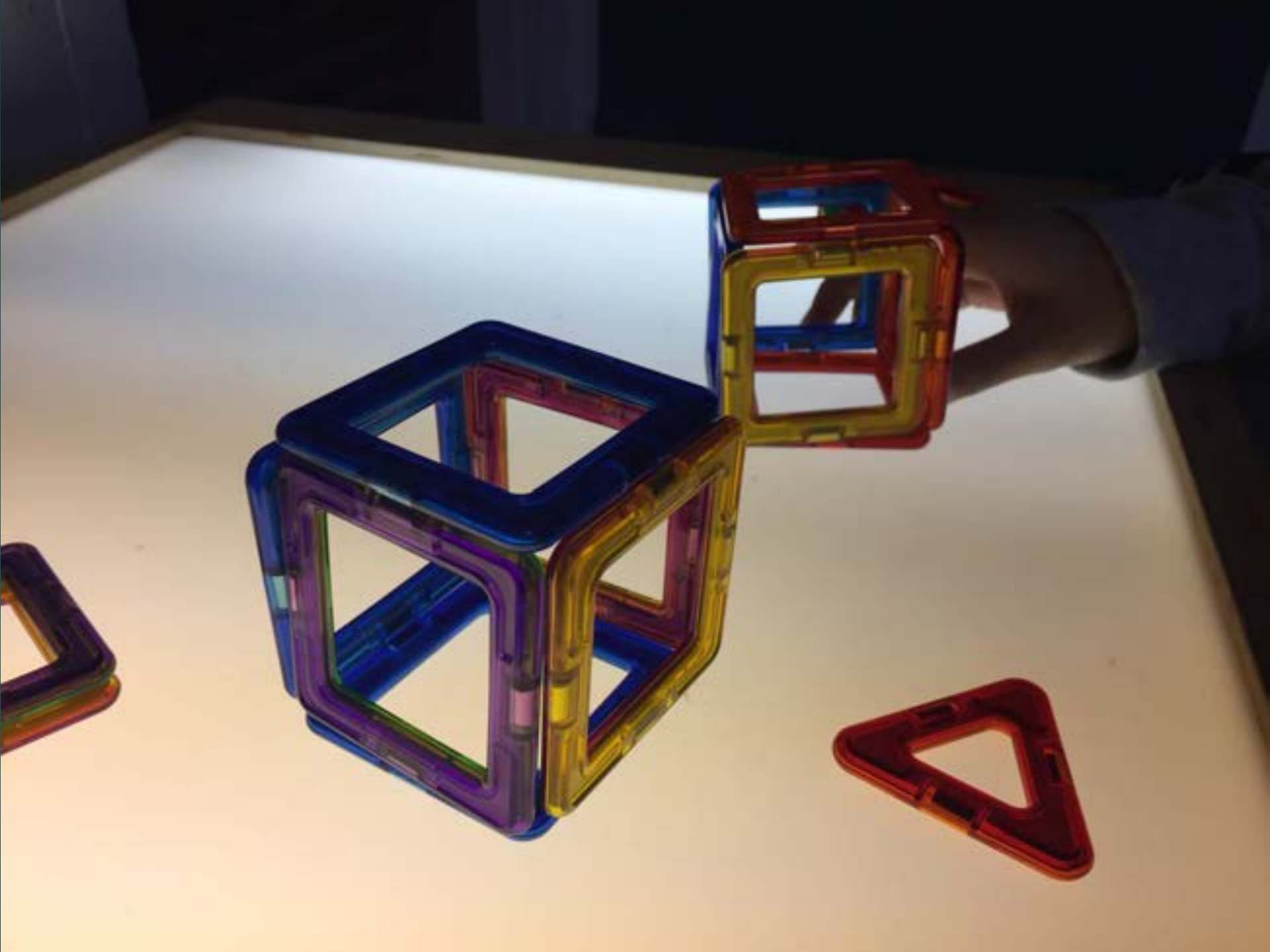
- Communication**
- context and engage with others (to share and develop ideas)
  - acquire, interpret, and present information (includes inquiries)
  - collaborate to plan, carry out, and review constructions and activities
  - explain/recount and reflect on experiences and accomplishments

### Curricular Competencies

- Communicating and Representing**
- Communicate mathematical thinking in many ways
  - Use mathematical vocabulary and language to contribute to mathematical discussions
  - Explain and justify mathematical ideas and decisions
  - Represent mathematical ideas in concrete, pictorial, and symbolic forms





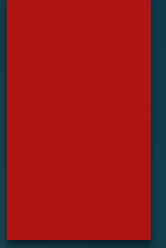








# Investigating Snowflakes



- ▶ playing with ideas of size, shape and symmetry



# notice

- they are different
- the middles are not the same
- the lines go in different directions



6 sides



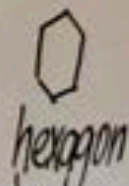
6 sides

# What math do you see?

- arrows
- lines
- ~~circles~~
- hexagons
- shapes
- different sizes of shapes

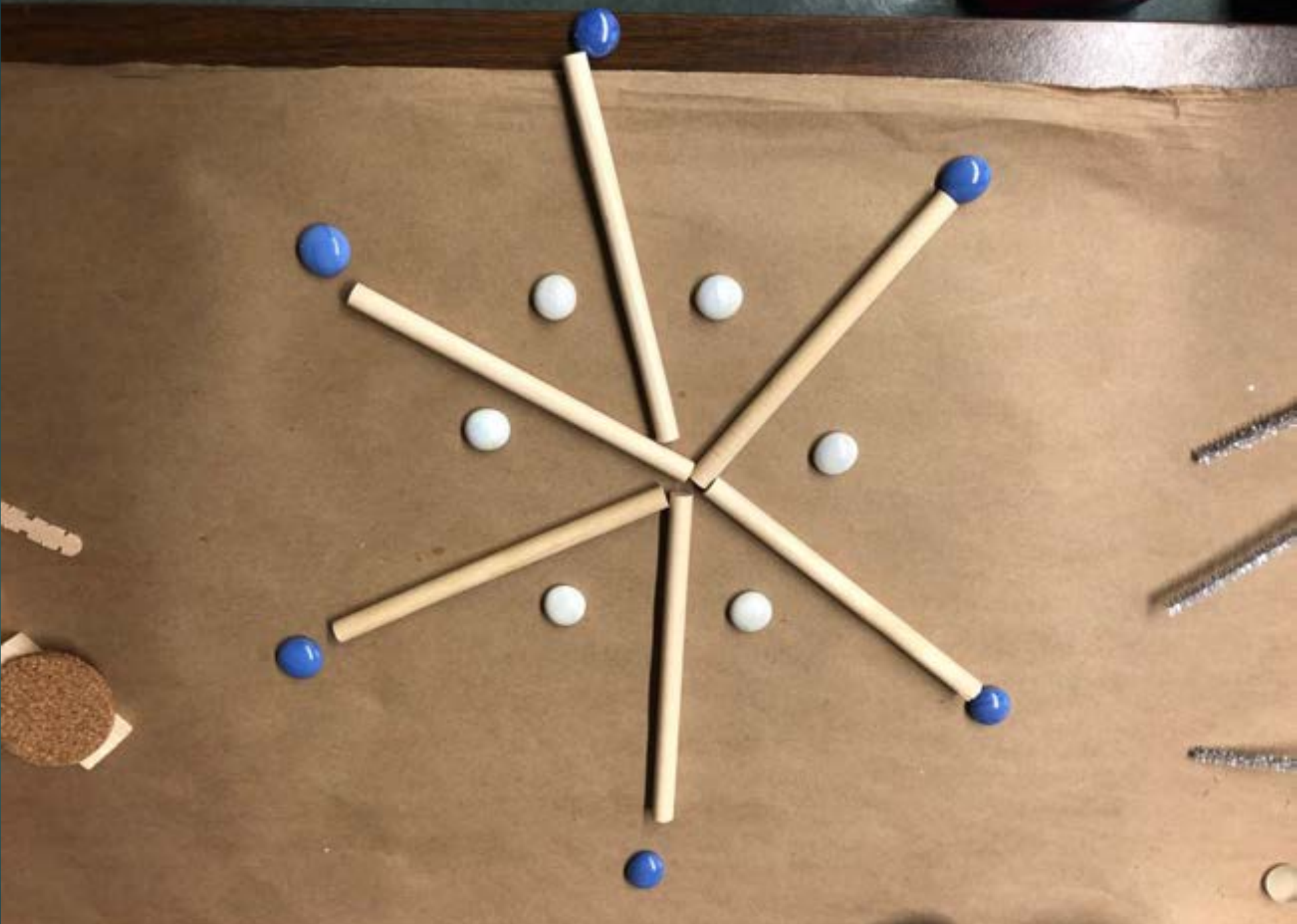
- triangles

- six arms
- same on both sides









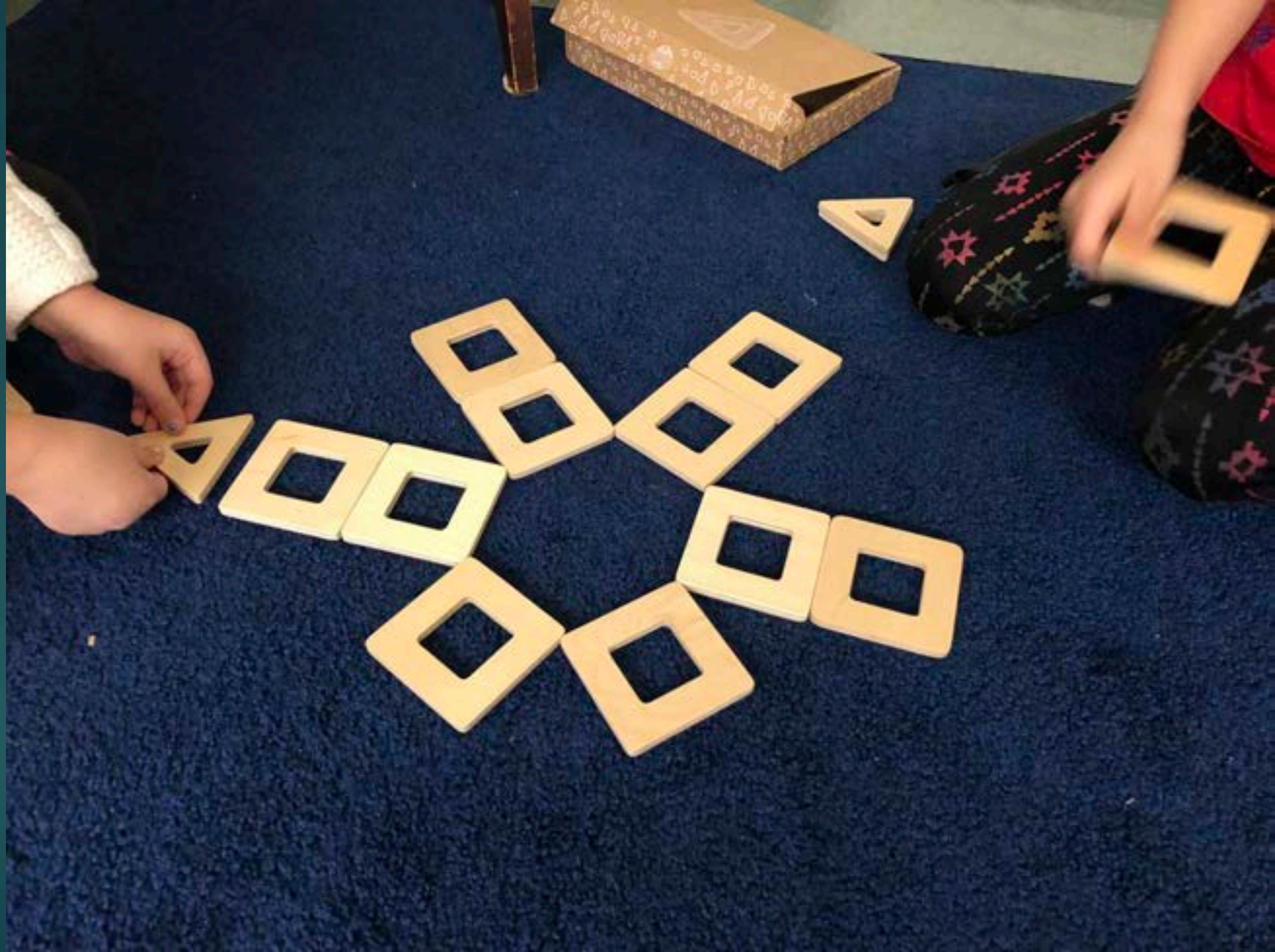














# Questions to support student inquiry around spatial reasoning:

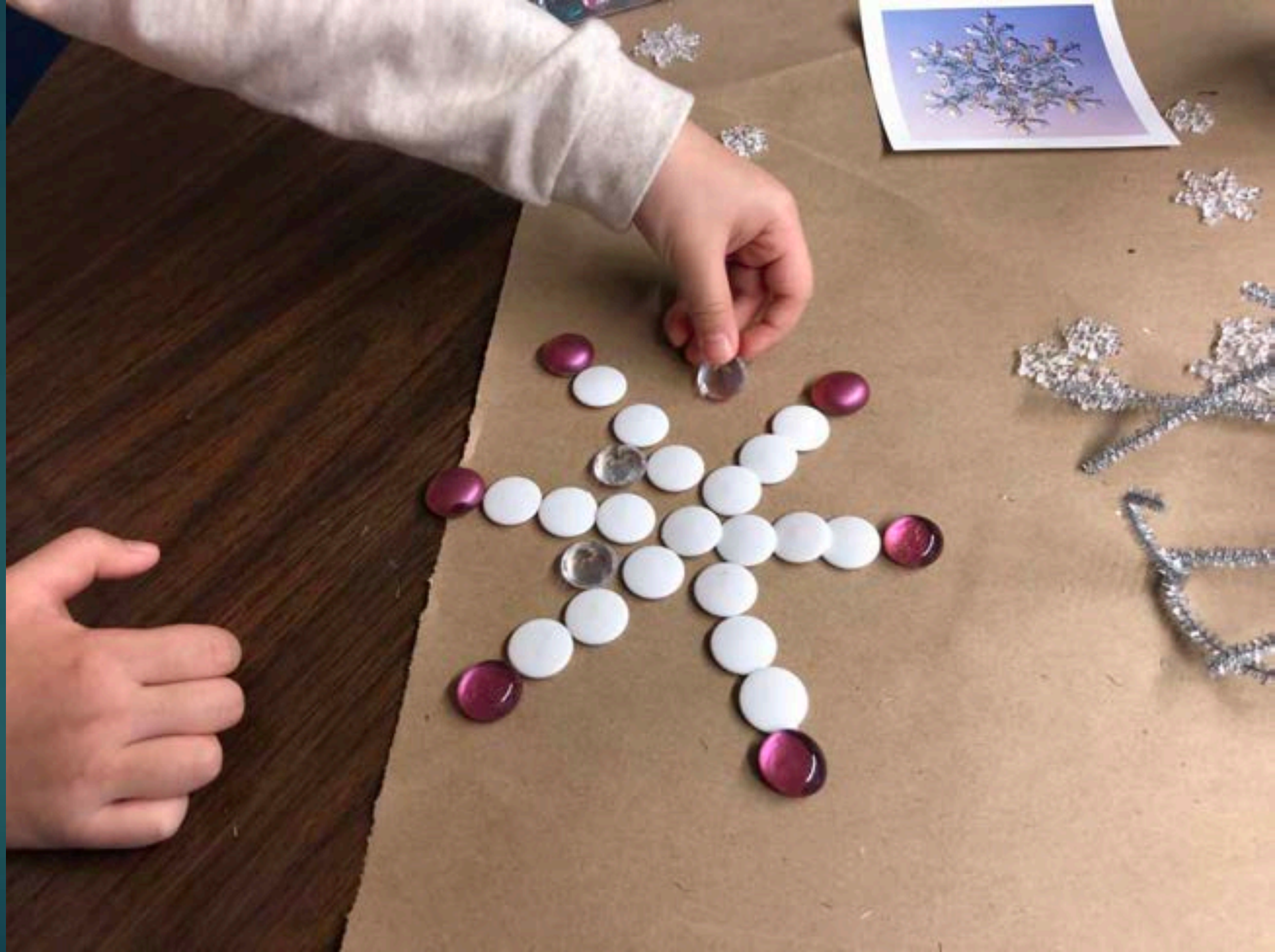
- ▶ What stories live in these shapes?
- ▶ What is the relationship between 2D and 3D shapes?
- ▶ How can you combine shapes to make new shapes?
- ▶ What shapes live in this shape?
- ▶ How do shape and size help you make a map?
- ▶ How does visualizing help you make sense of the world?

















Malke Rosenfeld  
@mathinyourfeet





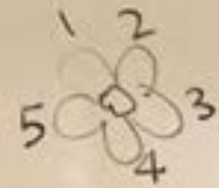






# Math to World Connections: Botany

- ▶ *connecting our thinking about size, shape and symmetry*



count the petals

- shapes
  - circle
  - ☆ star
  - lines
  - △ triangle
- sizes
- grow in groups
- hanging down
- different colours



Where do we see lines, shapes and





























... parallel to  
...  
**Redcedar**  
To 175 ft. (53 m)  
Scales are covered  
with waxy scales.  
Tree of B.C.

**Black Spruce**  
Picea mariana To 25 ft. (7.6 m)  
Small tree with dense, dark green  
needles. Male cones are about 2 in.  
(5 cm) long. Common in northern B.C.

**Fir**  
Abies spp. To 200 ft. (61 m)  
Cylindrical cones grow upright on  
branches. When cones open, they  
disintegrate, leaving a ladder-like stalk.

**Douglas Fir**  
Pseudotsuga menziesii  
To 200 ft. (61 m)  
Flat needles grow in a spiral around  
branches. Cones have 3-pronged  
bracts protruding between the scales.

**Black Cottonwood**  
Populus trichocarpa To 120 ft. (36.6 m)  
Flower clusters are surrounded by woolly  
capitula containing cottony seeds.

**Oregon White Oak**  
Quercus grisea To 70 ft. (21 m)  
Distinctive leaves have 5-7 deep lobes.  
Common on bluffs in southwestern B.C.

**Pacific Madrone**  
Arbutus menziesii To 80 ft.  
Red-brown bark with characteristic  
warts, exposing smooth inner bark.  
Common along southwestern coast.

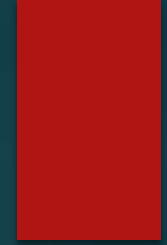
**Hawthorn**  
Crataegus spp. To 40 ft. (12 m)  
Tree has multiple stems of spiny branches.  
Apple-like fruits appear in autumn.

**Crabapple**  
Malus spp. To 25 ft. (7.6 m)  
Flowers are usually  
white or pinkish.  
Fruit is round.

**Black Cottonwood**  
Populus trichocarpa To 120 ft. (36.6 m)  
Flower clusters are surrounded by woolly  
capitula containing cottony seeds.

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Populus trichocarpa To 120 ft. (36.6 m)  
Flower clusters are surrounded by woolly  
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What connections are you making to your context?

- ▶ Think of a mathematical big idea or concept and consider materials or investigations that might support connection-making for your students.
- ▶ What kind of studio-like experience could you provide for your students?

# Investigating Circles

## Investigating Circles

Why are circles so important?

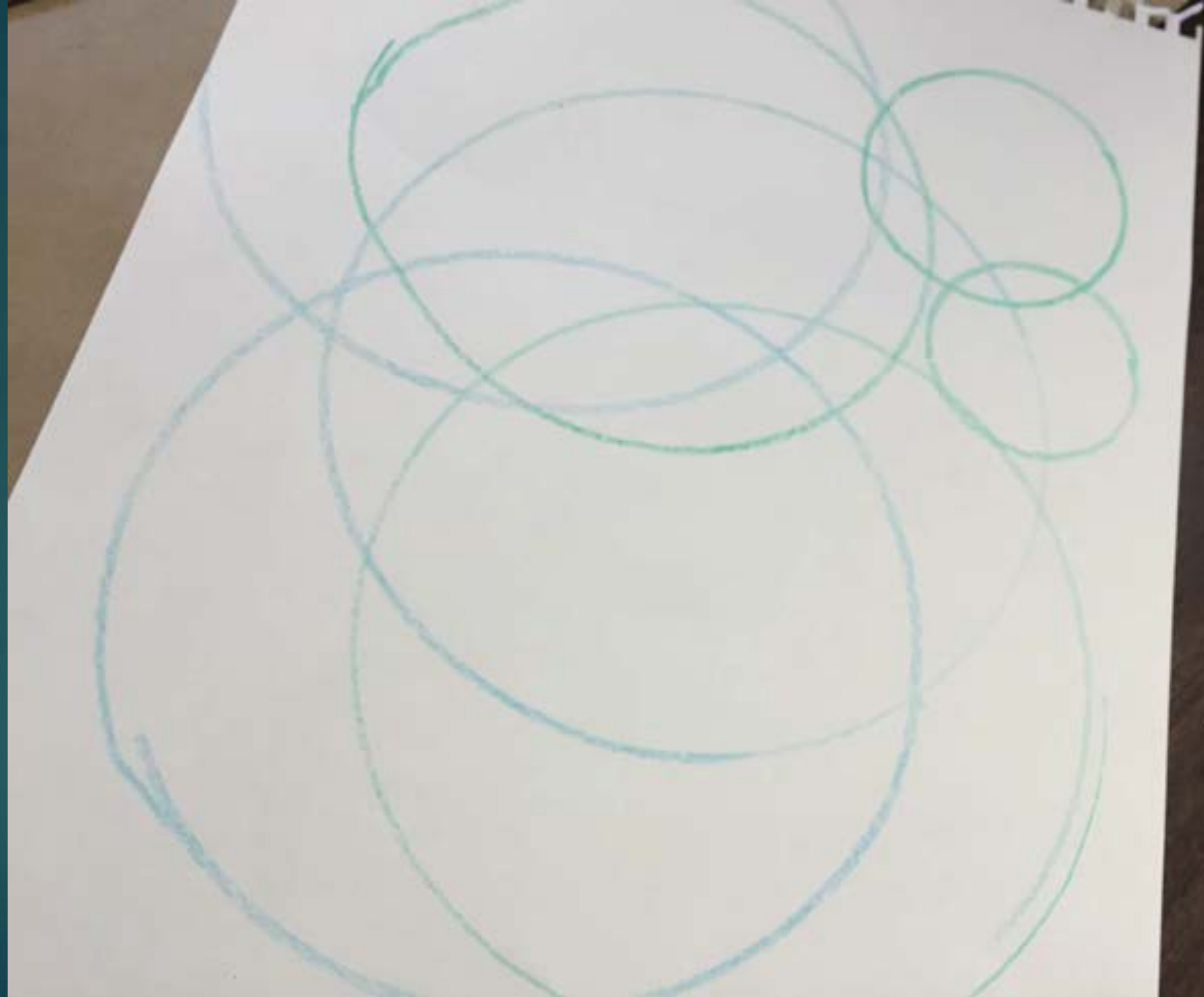
How are diameter and circumference related?

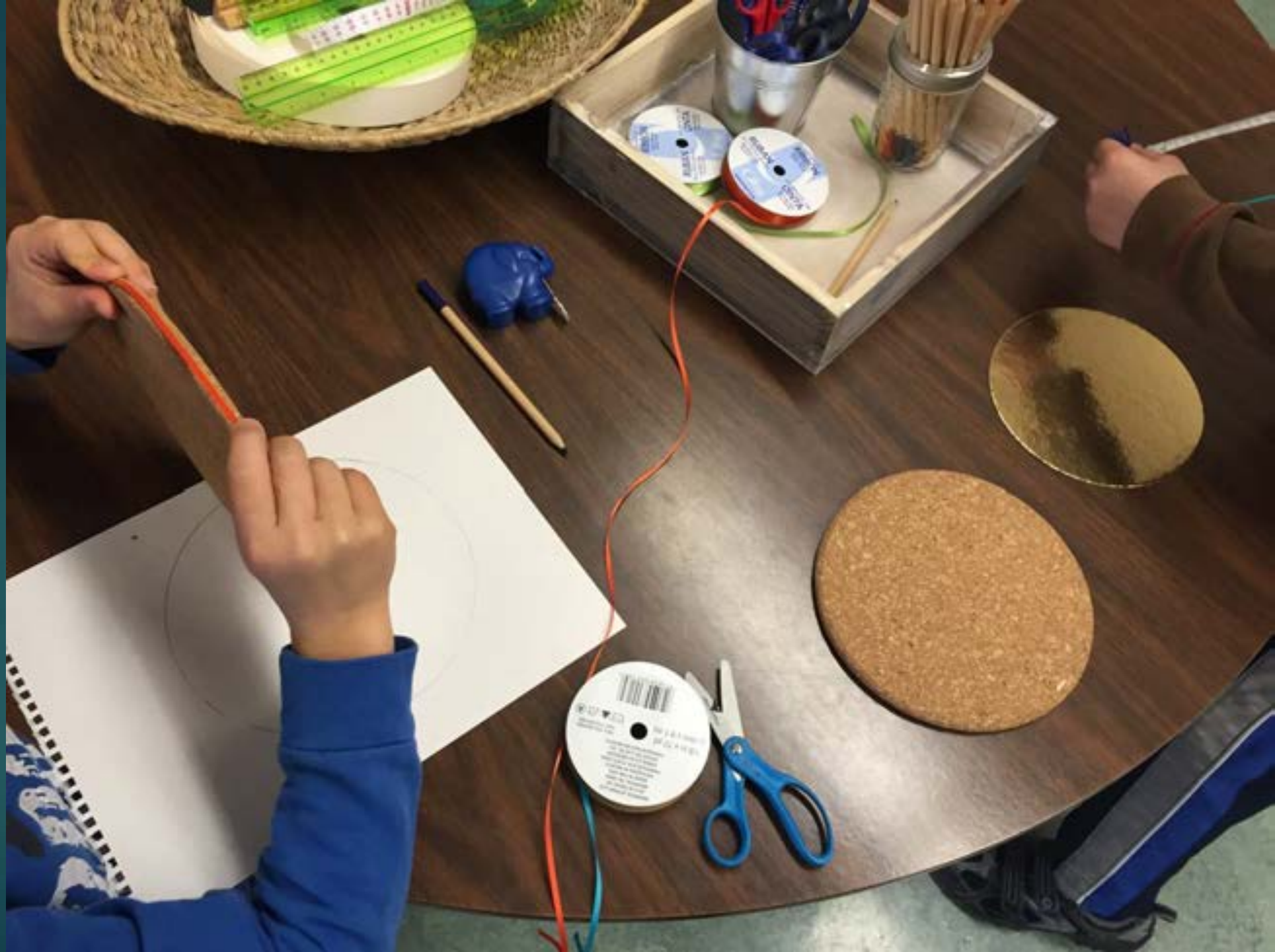
How can I draw circles with a compass?

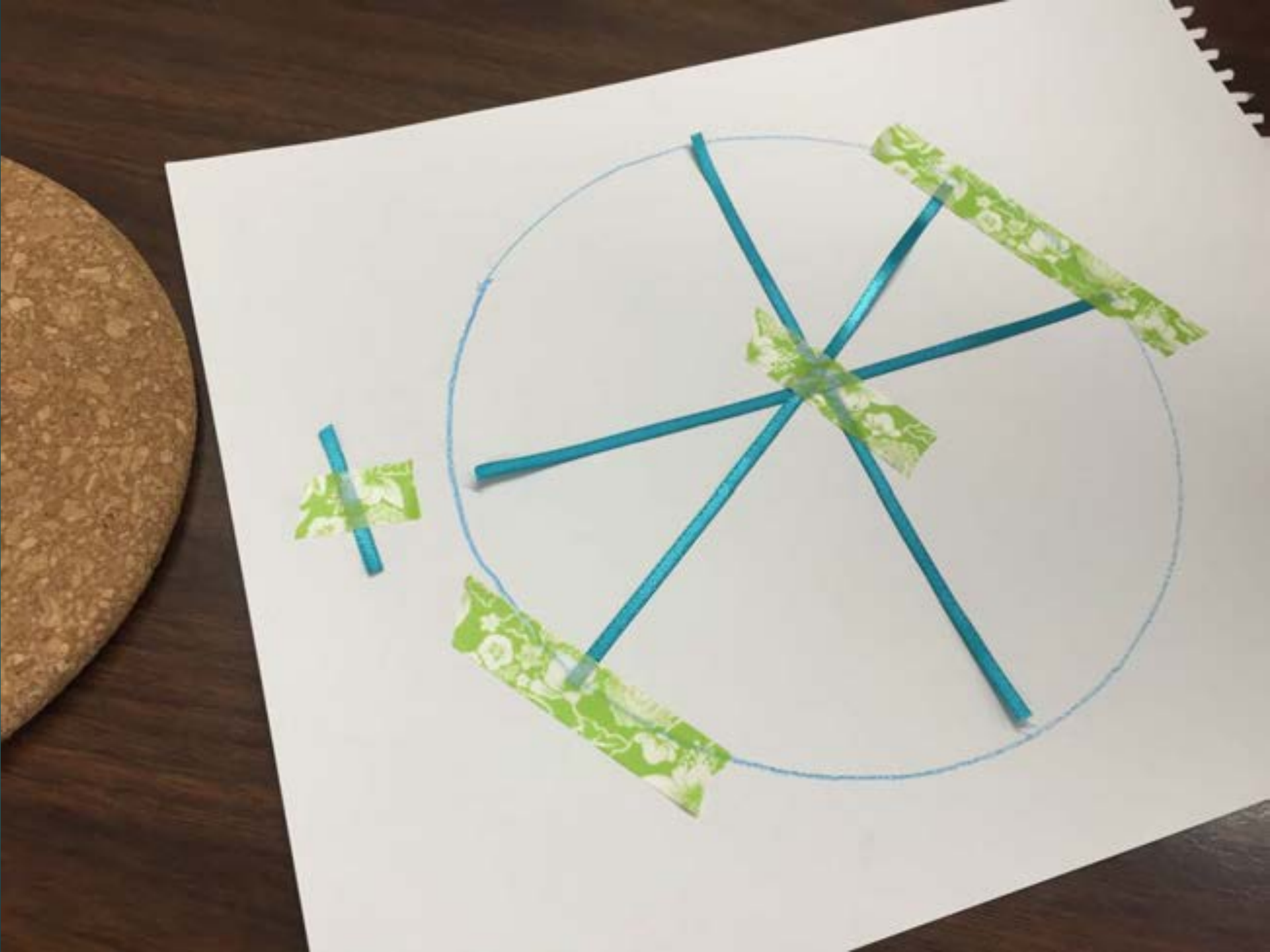
How can we measure circles?

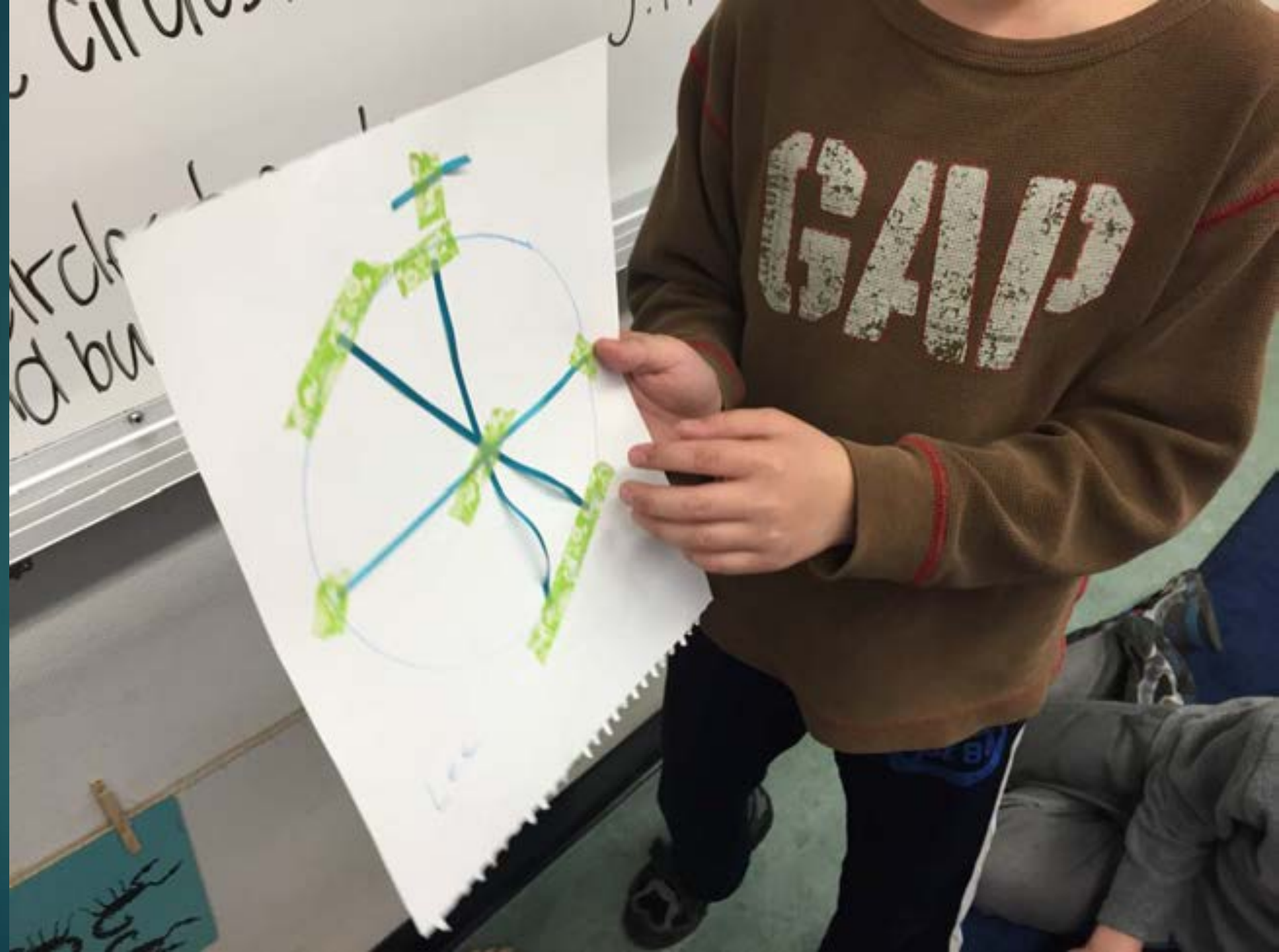
How can we use circles to create and build with?



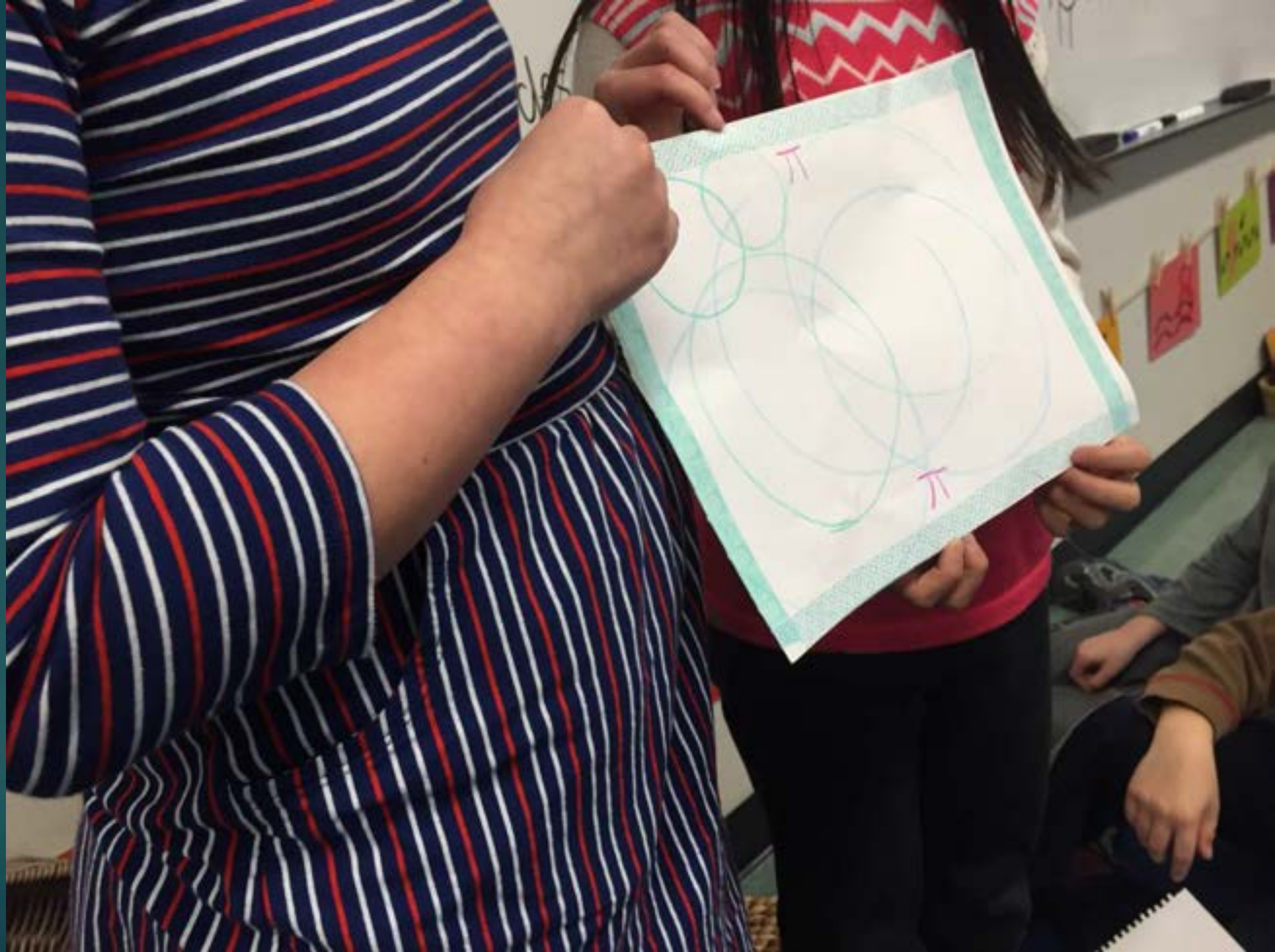












Thinking about the Circle:  
*Where does math live  
in Susan Point's  
spindle whorl art?*



# Coast Salish Art shape elements

○ circles

☾ crescents

∇ curved triangles

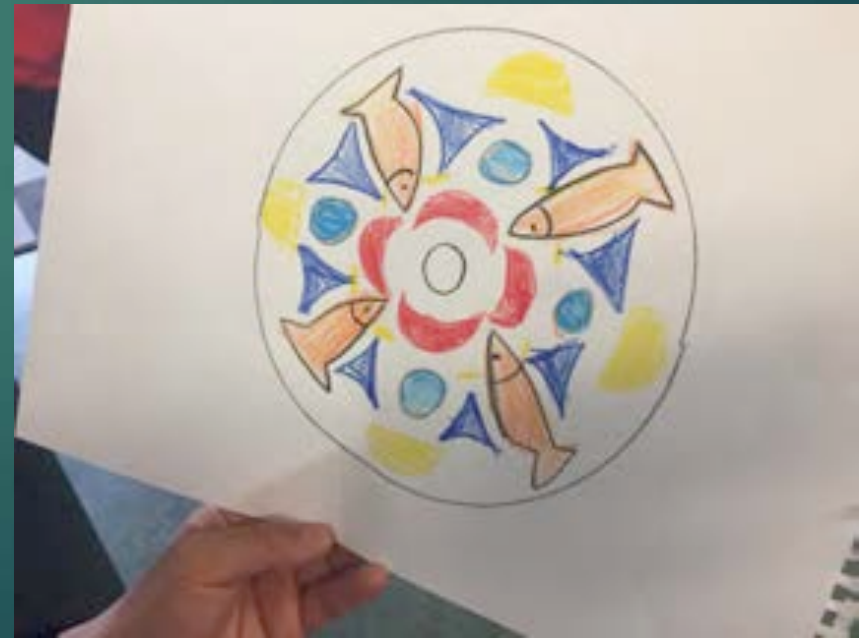
4 frog  
salmon  
symmetry environment

The circle is also a primary design element in Coast Salish art because it represents unity and wholeness. The circle is seen throughout nature, for instance, in the sun, moon, and sky. The curves of waves and of clouds, of mountains and rivers. The philosophy of the circle is that of unity, wholeness, and interconnectedness. When you place your hands on a round object, like the apple of your hand, you feel the curve of the circle. It is important to remember that when you are present, your people and possessions are a circle.

The concept is addressed in places, and it is about the circle of the earth. It is the relationship between the circle of the earth, the sun, the moon, and the stars.

















Write a paragraph of your own design.

Write your thoughts on the writing. Do you think you did well? How do you think you did? What do you think you did well on? What do you think you need to work on?

**Creating Thinking**  
Carefully read the text. How do you think you did? What do you think you need to work on? What do you think you did well on? What do you think you need to work on?

**Creating Ideas**  
How do you think you did? What do you think you need to work on? What do you think you did well on? What do you think you need to work on?

**Creating Skills**  
How do you think you did? What do you think you need to work on? What do you think you did well on? What do you think you need to work on?

**Creating Mindset**  
How do you think you did? What do you think you need to work on? What do you think you did well on? What do you think you need to work on?

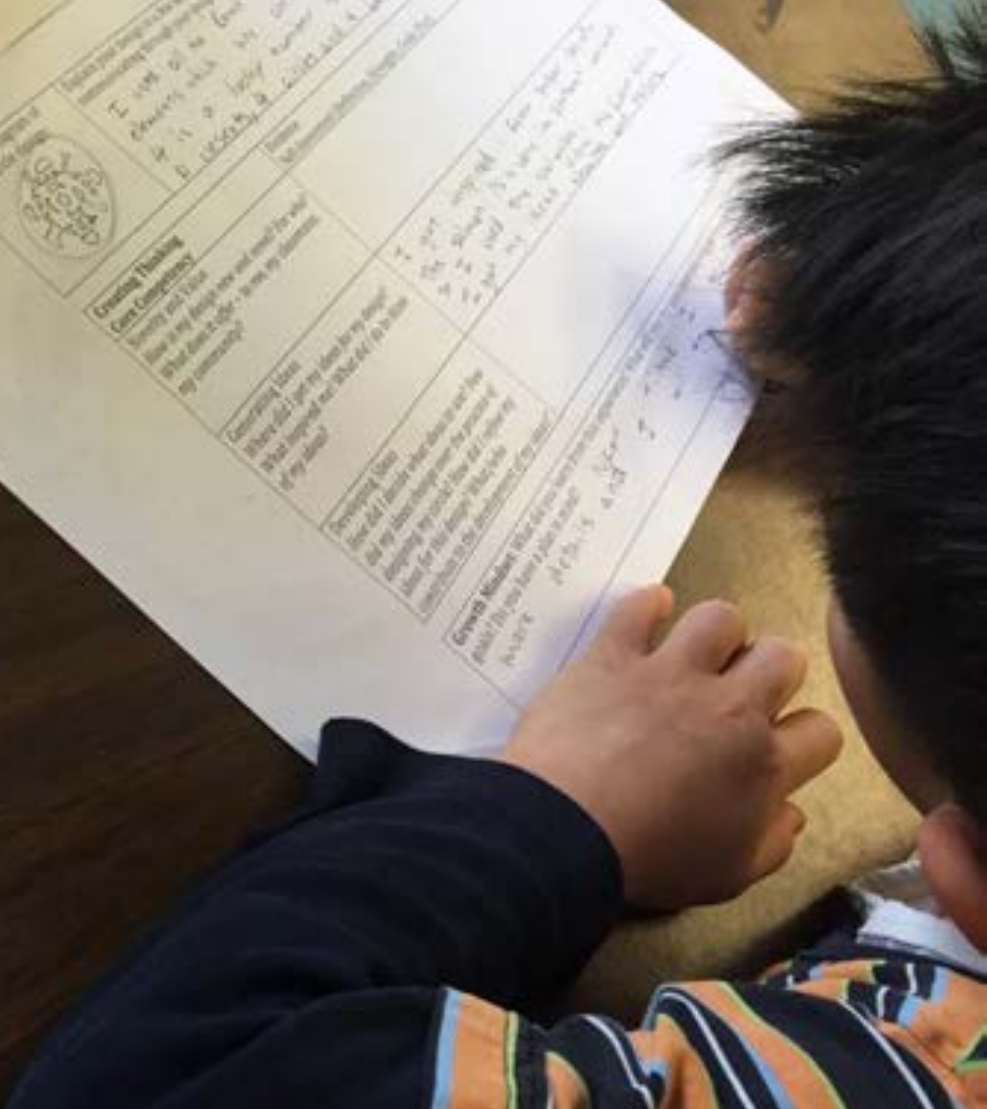
Write your thoughts on the writing. Do you think you did well? How do you think you did? What do you think you did well on? What do you think you need to work on?

**Creating Thinking**  
Carefully read the text. How do you think you did? What do you think you need to work on? What do you think you did well on? What do you think you need to work on?

**Creating Ideas**  
How do you think you did? What do you think you need to work on? What do you think you did well on? What do you think you need to work on?

**Creating Skills**  
How do you think you did? What do you think you need to work on? What do you think you did well on? What do you think you need to work on?

**Creating Mindset**  
How do you think you did? What do you think you need to work on? What do you think you did well on? What do you think you need to work on?



SUSAN A POINT  
COAST SALISH ARTS



3917 West 51<sup>st</sup> Avenue • Vancouver, BC V6N3V9 • P: 604.266.7374 • F: 604.261.5683 • s.point@slaw.ca • www.susanpoint.com

May 26, 2017

Dear Pupils of Ms. Partridge,

This year, Ms. Novakowski mailed me your letters and photographs and told me that she was introducing you to Coast Salish Art. Thank you for the kind letters and drawings.

Many people think that I use computers to create my artwork because my lines, crescents, and wedges are perfectly shaped. I want to tell you that I do not. All of my drawings are done by hand, with the help of what is called a flexible ruler.

Every one of my designs begins as a small sketch in one of my many sketchbooks. After I am happy with a small thumbnail sketch I begin to redraw it bigger so that





## MUSQUEAM WELCOME

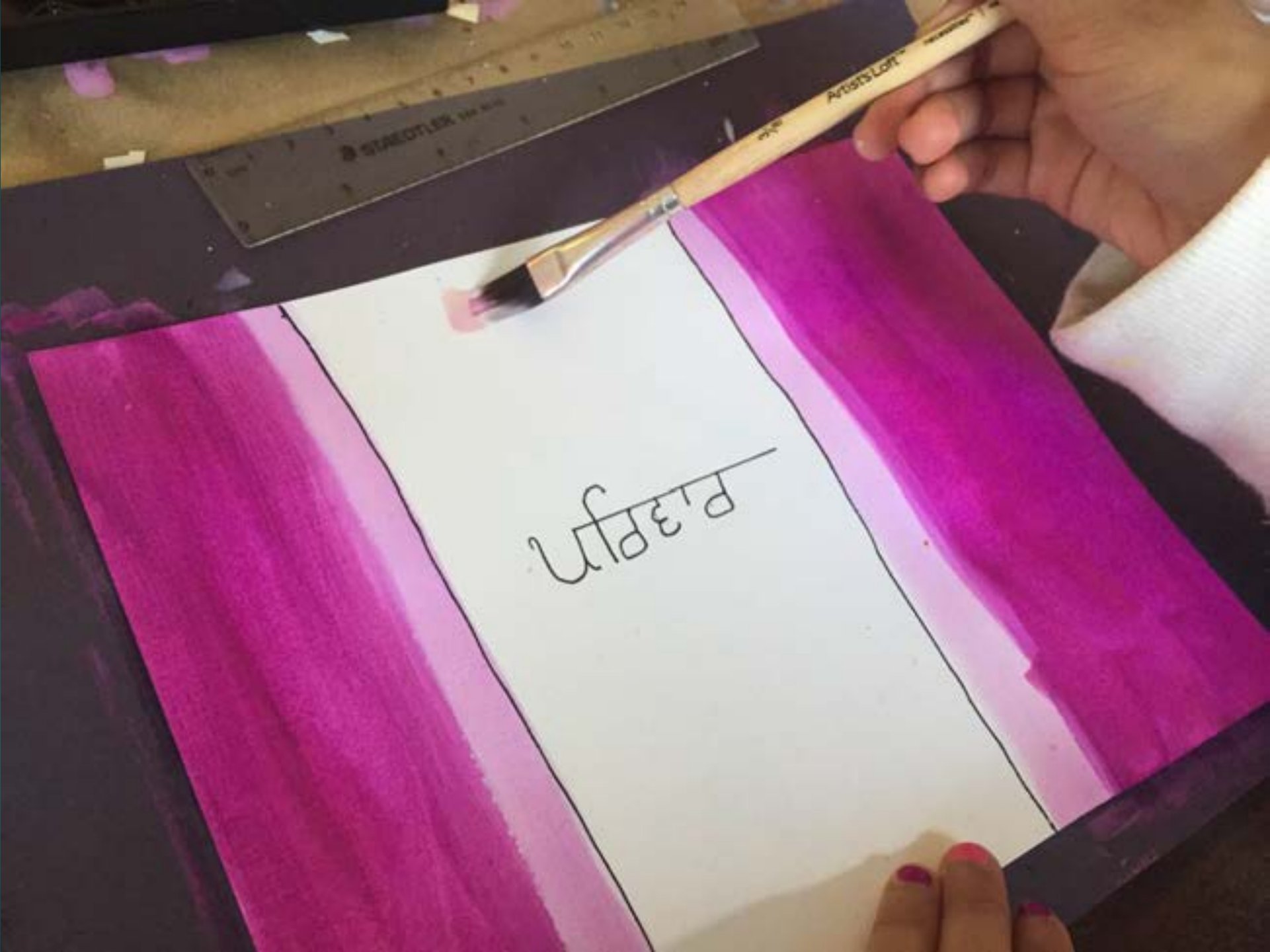
### Susan Point

email: ted.cedar@ccc.ca | 604-273-5226

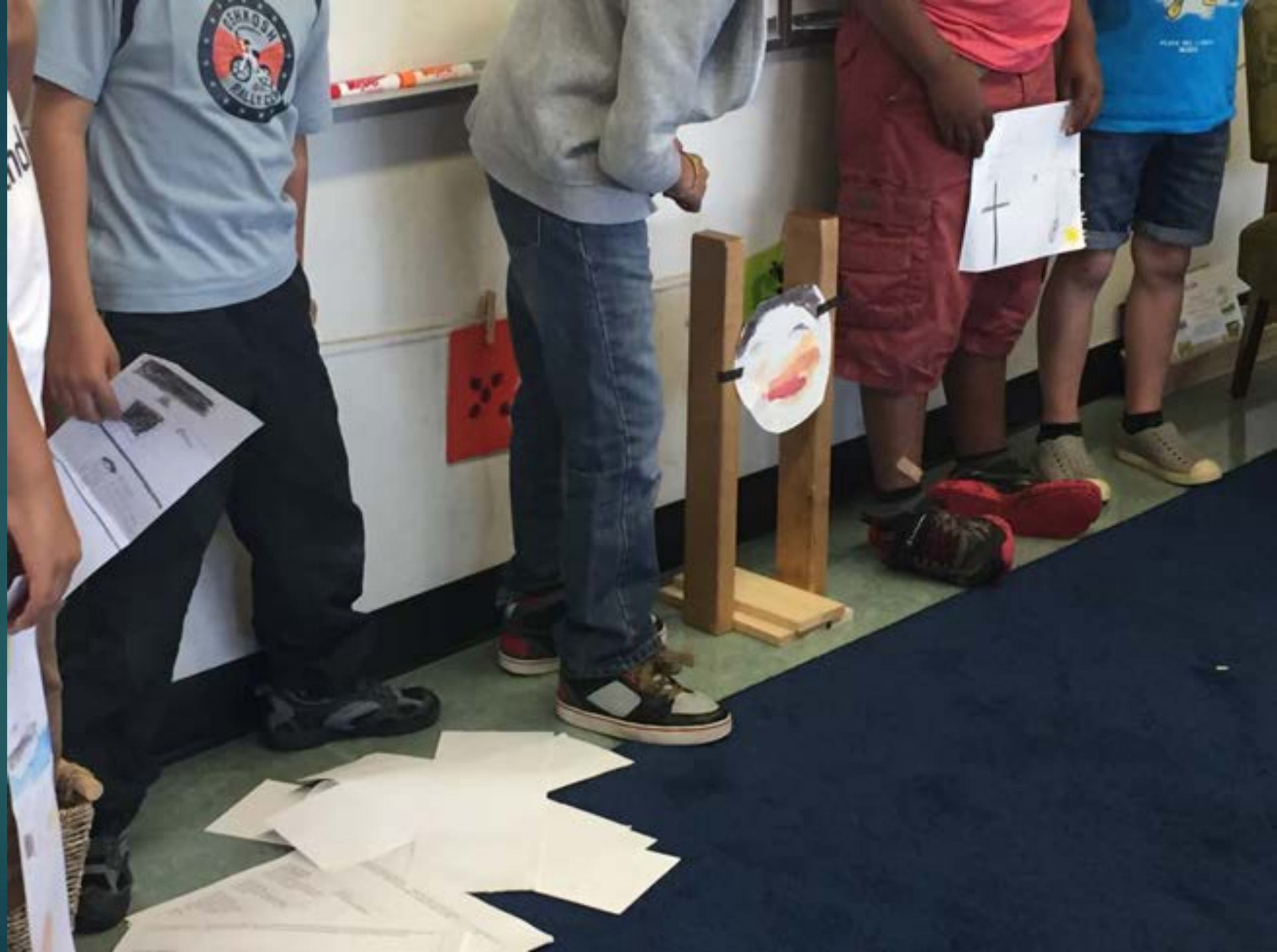
Susan Point's striking pair of welcome totem poles stand near the bottom of the escalator stairs and streams in Canada Customs extend a First Nations greeting to visitors and cross-border travellers. The two frontal aspects of both figures are historical Coast Salish house posts. The back panels reveal the artist's innovative traditional images and motifs. The figure on the left is depicted wearing a basketry headdress, signifying her gender and high status. She also wears a ceremonial tunic with buttons and fibers. Fishermen members of the weasel family are in Coast Salish sculpture and with cleansing rites. The male figure is more shallowly carved and depicts sea serpents and of eagles along the eagles on Point's (Spindle Whorl) located on







प्राज्ञ












*What local artists or pieces of art might inspire mathematical thinking?*







# The Playground Project

*-playing with ideas of  
shape and size  
and spatial reasoning*

Help us build our dream playground!



Stay tuned for Phase 2



*Thank the sponsors*

*WE DID IT!!*

\$60,000


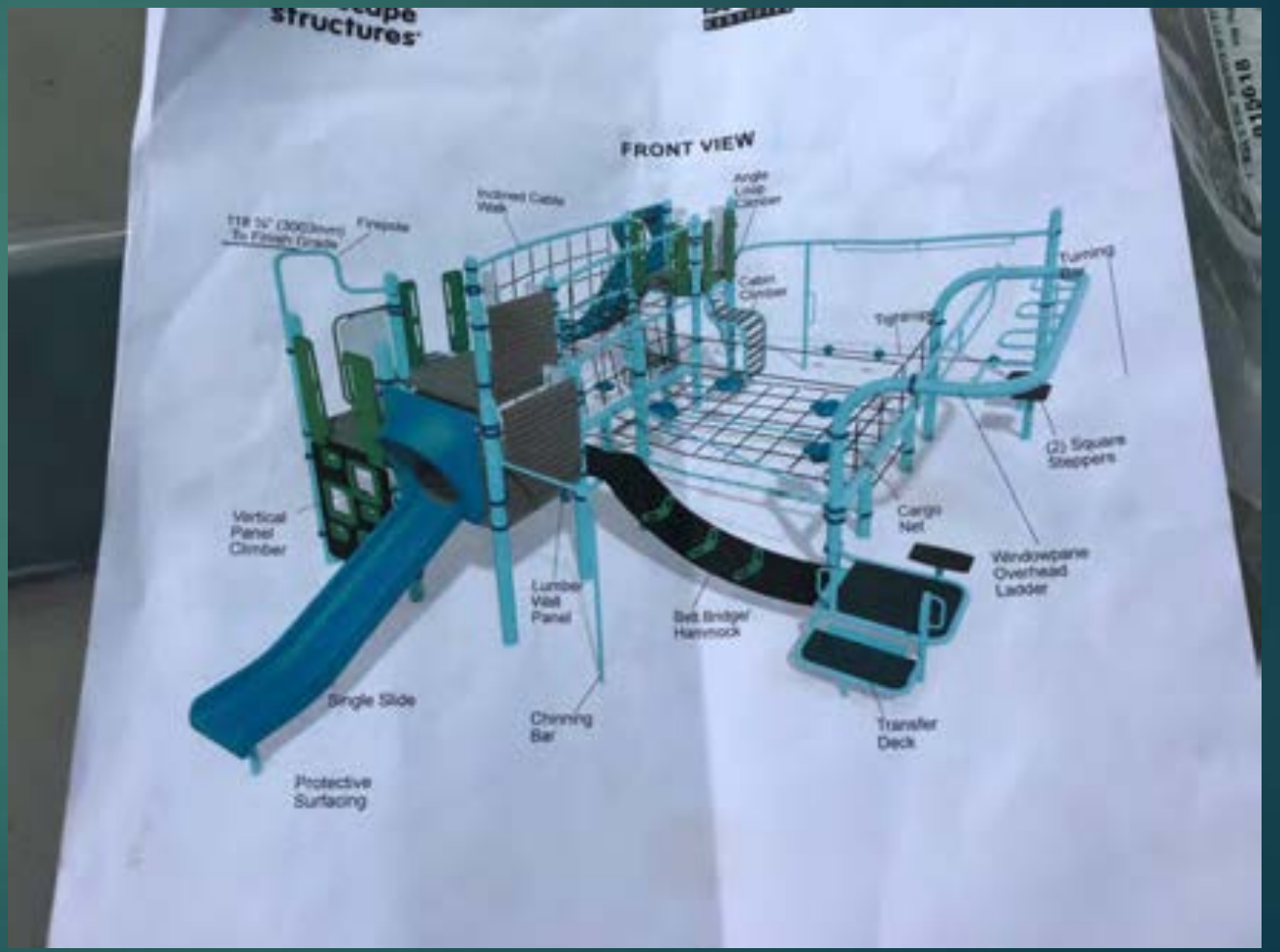
\$50,000

\$40,000

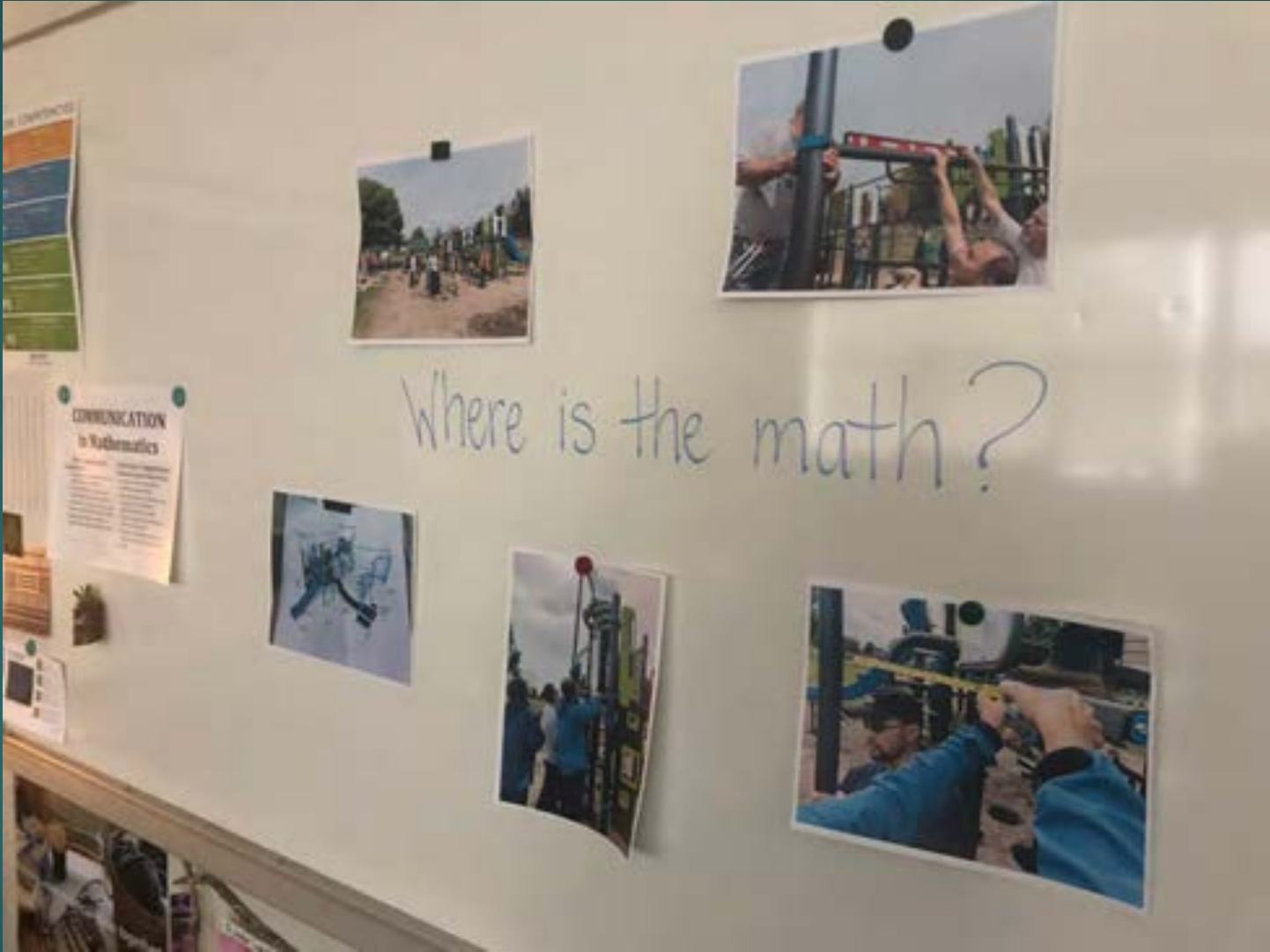
\$30,000

\$20,000

\$10,000

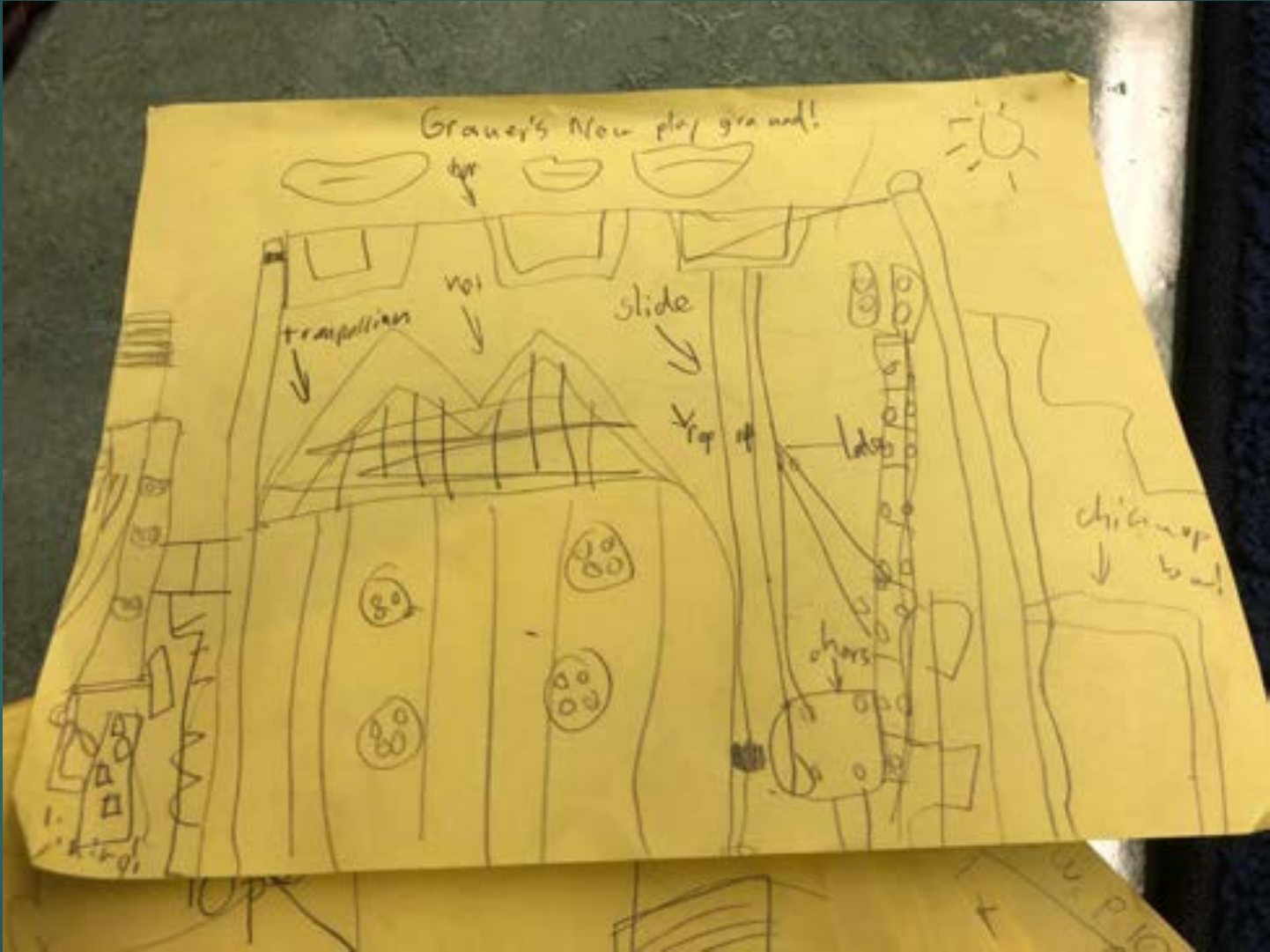









Graney's New play ground!













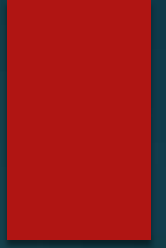


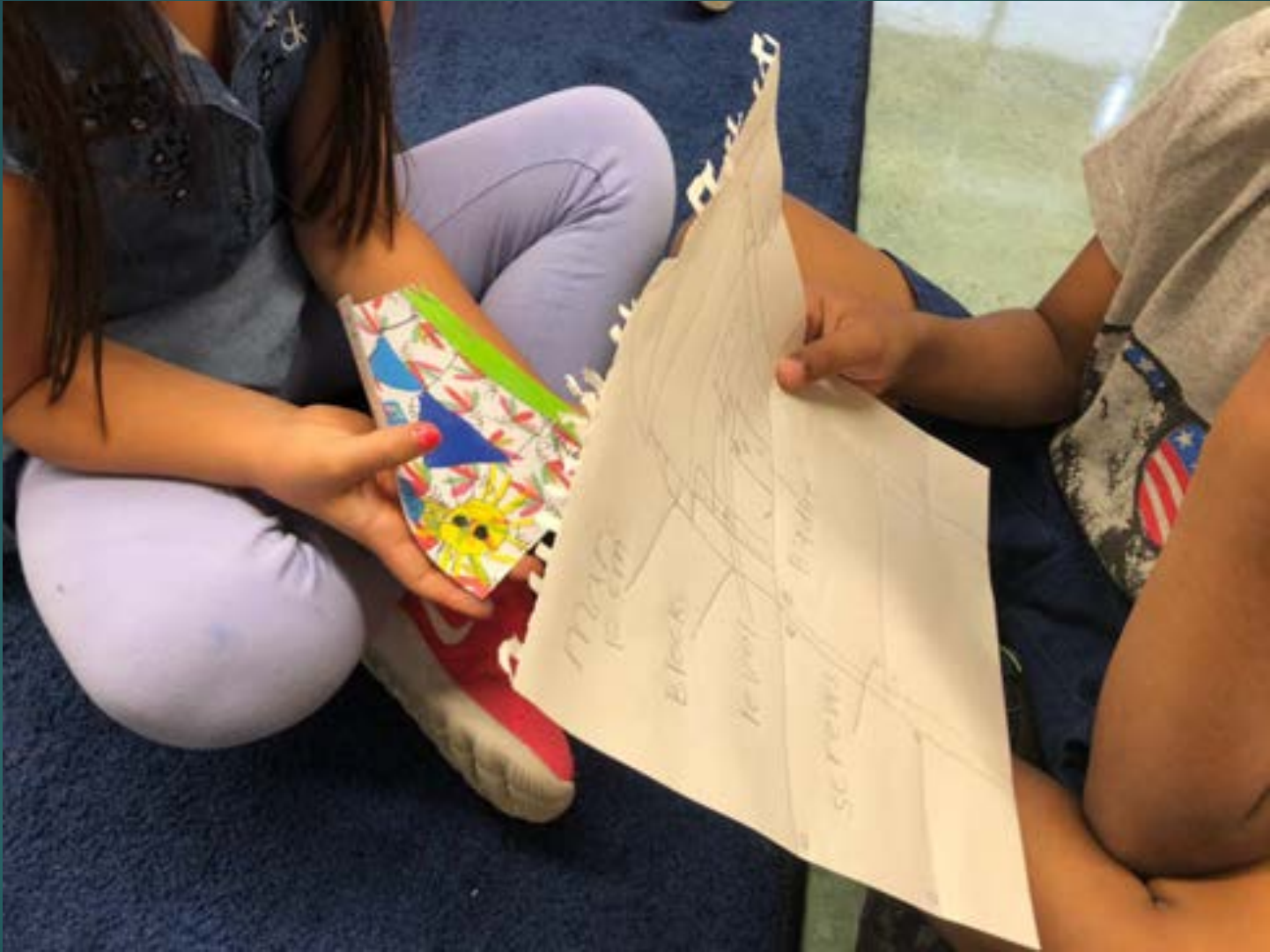














tool math  
level/balance

Where is the math?

math tools  

●	●	●	●
●	●	●	●

plan  
slates



measuring

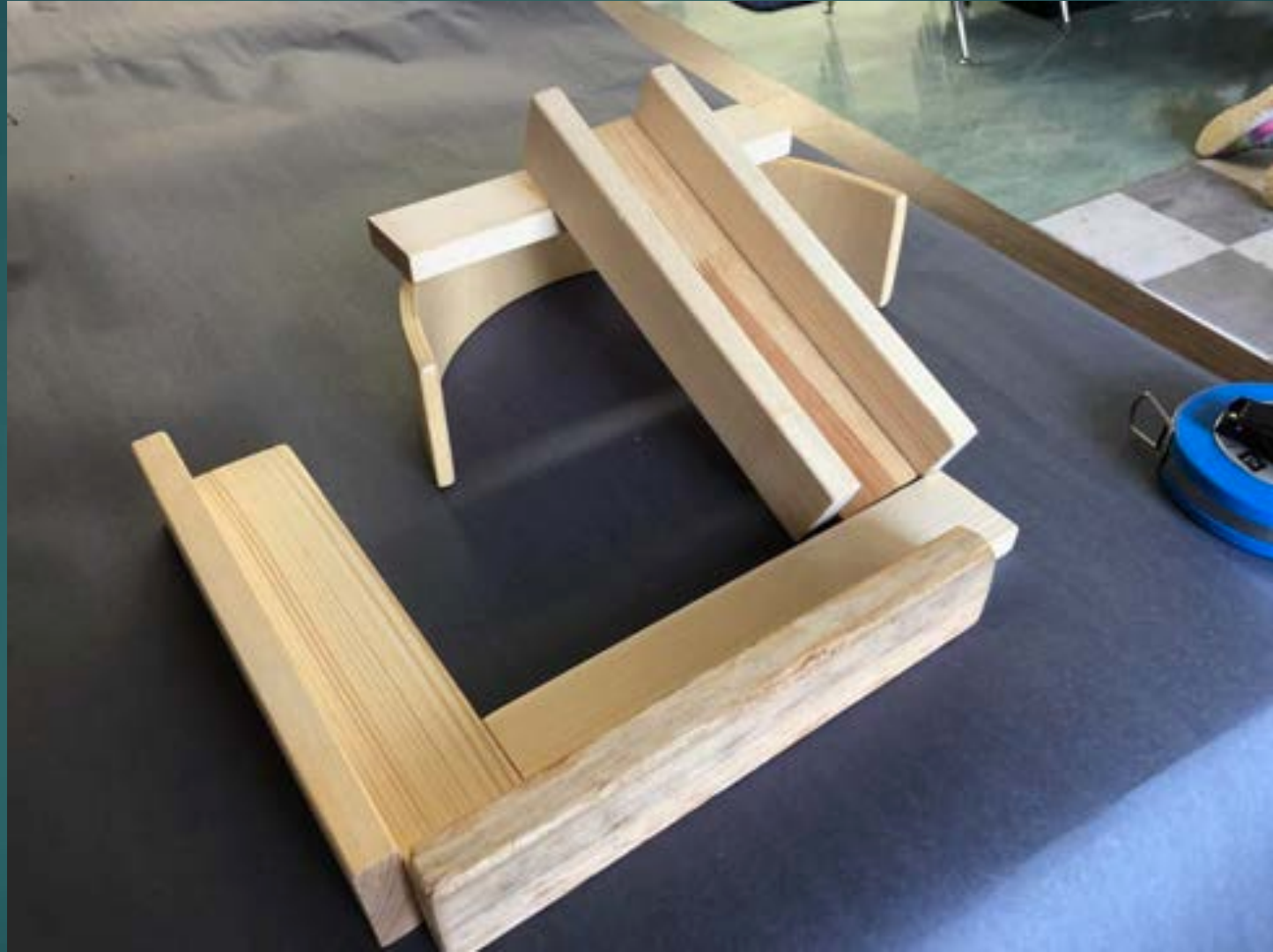
shapes

whole-measure ↓









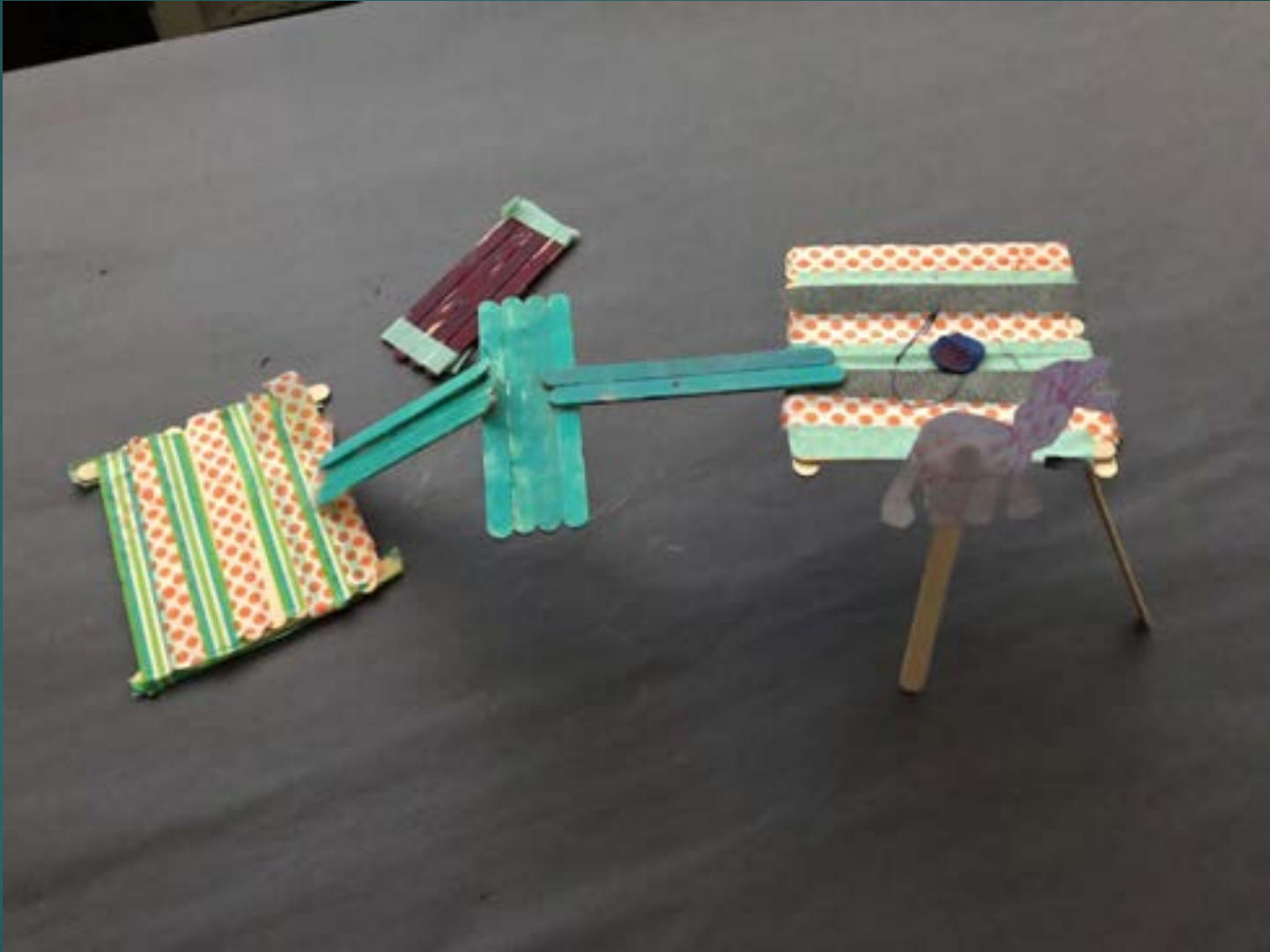














*following a plan, reading diagrams,  
labels and specifications*

## WHERE IS THE MATH?

Divisions 5 & 6 (grades 1 and 2) considered where, when and how mathematics was used to install Grauer's new playground. We first had to think about "what is math?" and broaden our thinking beyond thinking math is only about numbers. Students began to connect the playground installation to other authentic experiences they have had in which they used mathematics



*measuring distance*



*using tools  
level and balance*



*measuring  
depth*



*shapes  
and  
design*



***Where, when and how do we  
use mathematics in our lives?***

September 2018



*"a playground for animals"*

## DESIGNING PLAYGROUNDS

Divisions 5 & 6 (grades 1 and 2) have been inspired by the installation of the new playground at Grauer. They were invited to design and create their own playgrounds and consider the mathematics embedded in the process of design and creation. The students were introduced to the idea of creating math maps to consider *where is the math?* in their playgrounds.



*"We keep checking to see if its level so it won't fall down."*



*math maps*



***What mathematics do we use when designing and creating?***

September 2018

# encounters with measurement

- ▶ What opportunities for measurement are there in your social studies, science, ADST, Arts or Physical Education curriculum?
  - ▶ In exploratory play?  
Outdoors?
- ▶ What tools or materials could be used to support and enhance students' understanding of measurement?

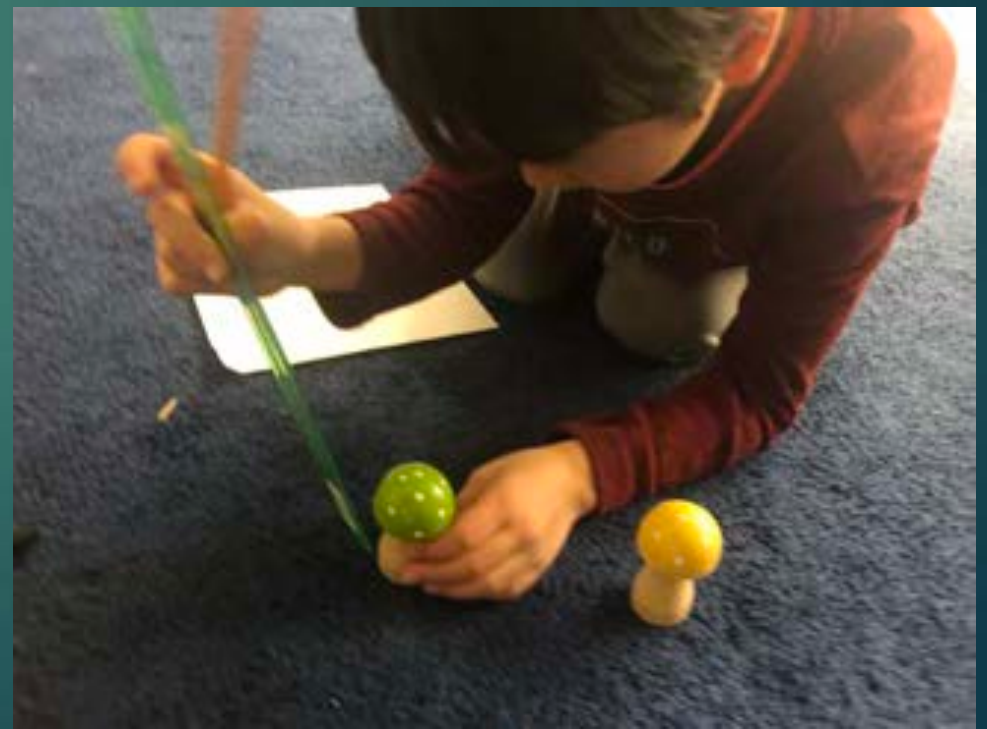


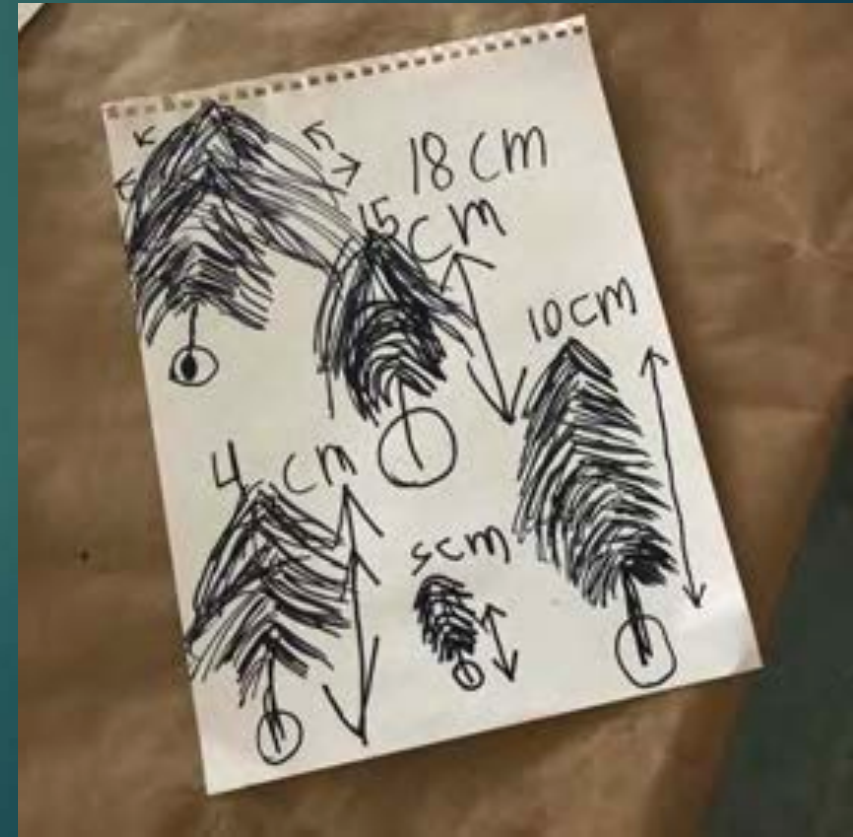
# playing with the idea of measuring





Choose  
measure  
compare  
record







*What does it mean to measure?*

*What do we do when we measure?*

*How do we communicate  
measurements?*

*When do we measure in our daily lives?*

# Who does math?

baker  
chef  
cook

builder  
carpenter  
construction  
worker

measurement

how many?  
how much?

waiter

doctor  
nurse

how big is it?

- how long is it?
- how heavy is it?
- how wide is it?
- how tall is it?
- how small is it?
- how short is it?

What's the  
pounds?  
tons tonnes  
what's the colour?  
→ how do we  
measure colour

units

pounds

tons

tonnes

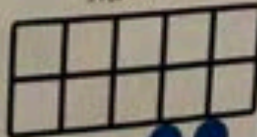
blocks

centimetres (cm)

659

metres

inches



In discussing attributes of objects that we can measure, a grade one student wondered, How do we measure colour?


















What is an interdisciplinary investigation that would connect and deepen understanding of a mathematical idea?

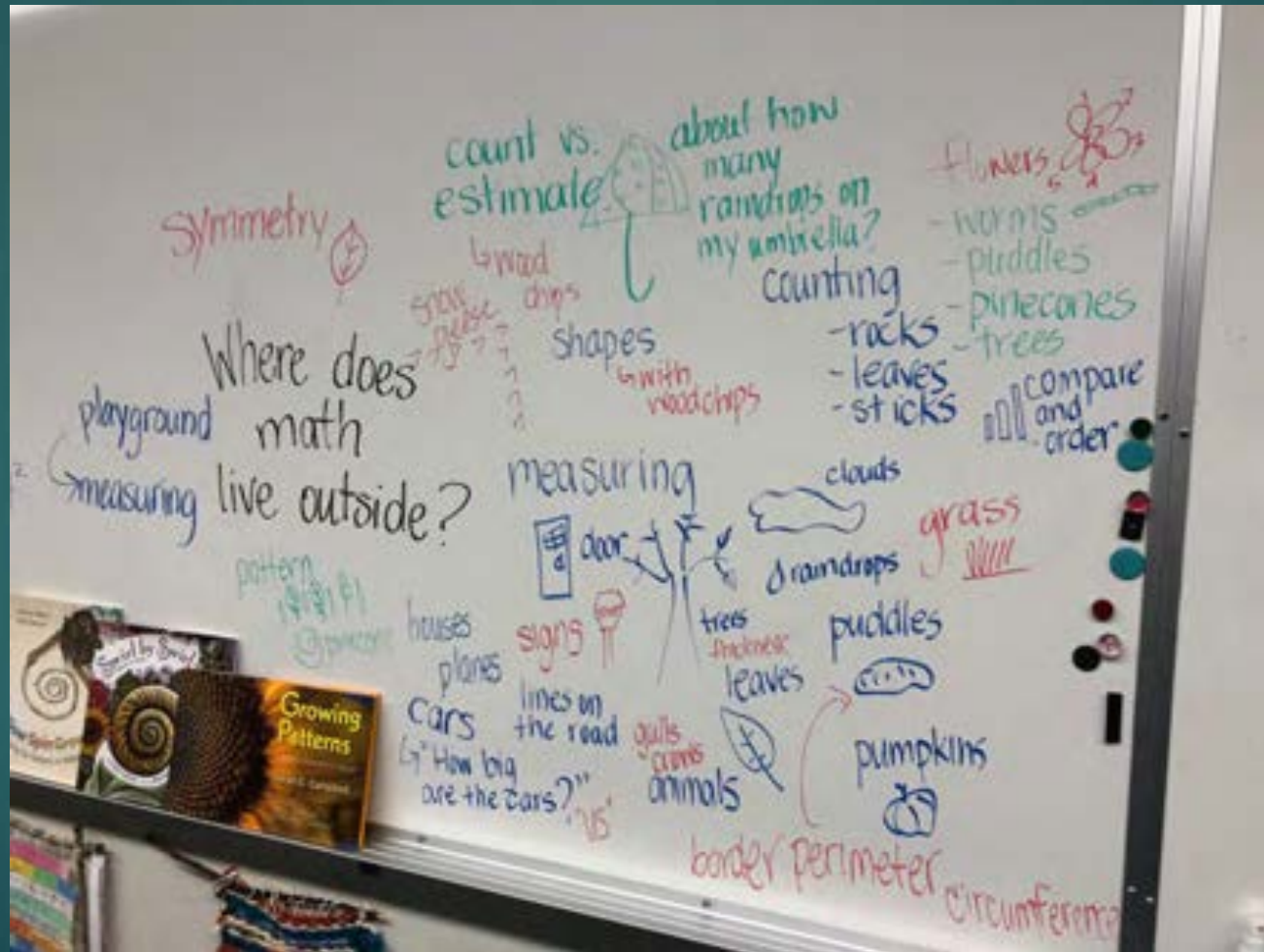
# taking The Studio experience out in the community

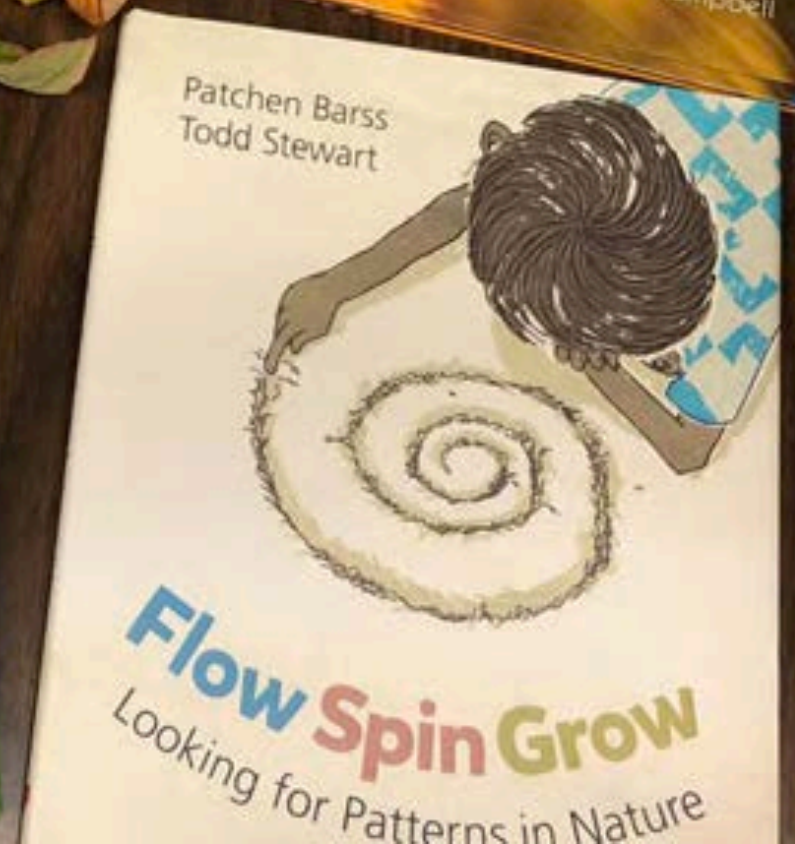
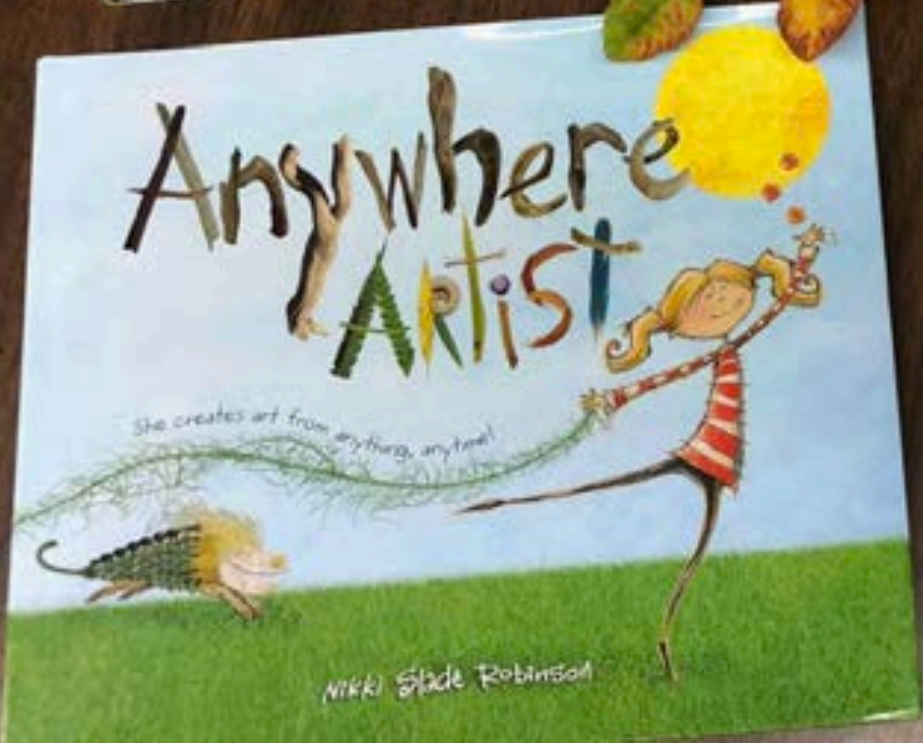
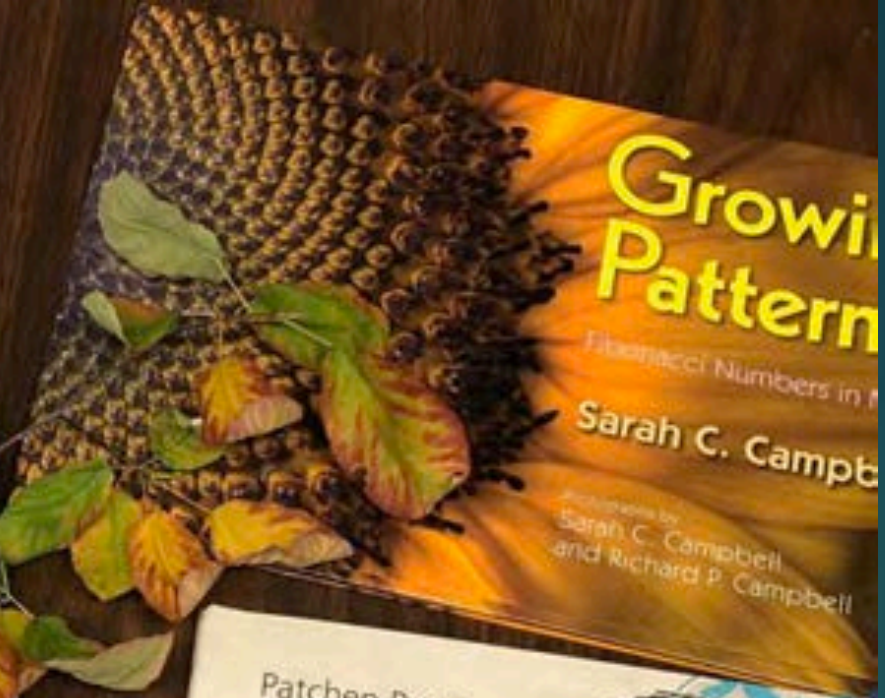
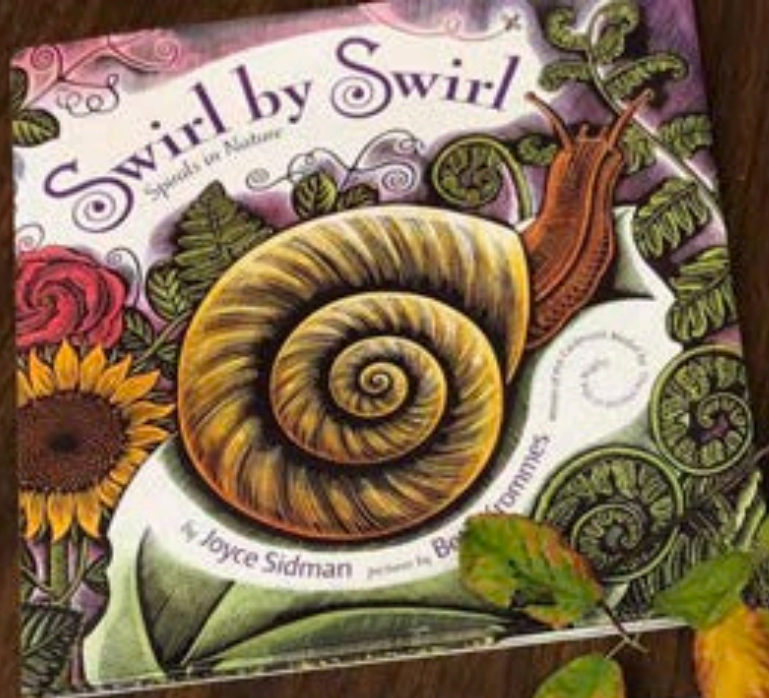
- ▶ SD38 Math Play Space
- ▶ more info
  - ▶ NCTM Regional Boston 2019
  - ▶ [https://bit.ly/JN\\_NCTM\\_Boston](https://bit.ly/JN_NCTM_Boston)





# taking The Studio outdoors




























# #100LeavesChallenge

 **james brunt artist** @RFJamesUK · 5d  
Wonderful [#100LeavesChallenge](#) play at [@Grauer\\_Phoenix](#)

**Janice Novakowski** @jnovakowski...  
Beginning the #100LeavesChallenge with grades 1&2 at @Grauer\_Phoenix - how will you know that you have 100 leaves? @RFJamesUK #BCAMTreggio #sd38learn



   16 











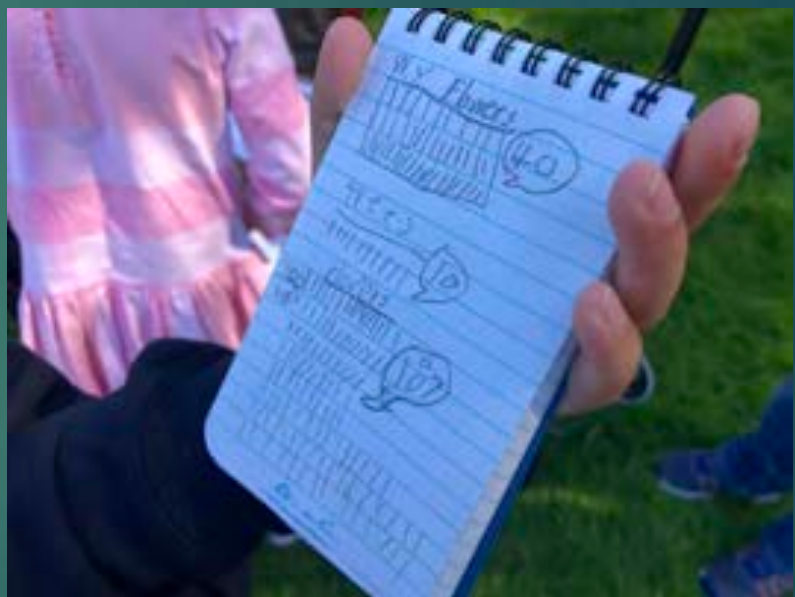

















▶ What places and spaces might you find to play with mathematical ideas with your students?

# considerations for remote learning

- ▶ weekly math plans
- ▶ outdoor math experiences
- ▶ at-home interdisciplinary projects
- ▶ Zoom math studio sessions

# Weekly Math Plans



## SD 38 K-12 Mathematics & Numeracy

Kindergarten – Grade Two: Week Twelve

**Big Ideas:** Number represents and describes quantity.

Computational fluency develops from a strong sense of number.

**Curricular Content:** counting, decomposing and representing quantities, addition and subtraction facts to 20, addition and subtraction to 20, 100 (concept, process)

**Curricular Competencies:** develop mental math strategies and abilities to make sense of quantities, develop, demonstrate, and apply mathematical understanding through play, inquiry and problem solving, engage in problem-solving experiences that are connected to place, story, community, and culture, communicate mathematical thinking in many ways, represent mathematical ideas in concrete, pictorial, and symbolic forms

**Core Competencies focus:** Positive Personal and Cultural Identity

**Teachers and Families:** The following are five problems/tasks to choose from for this week, based on the above curricular areas of focus.

Draw and write a math story for one of these questions:

2 and \_\_\_ make 7 /  $9 + \_ = 12$  /  $28 + \_ = 33$  /  $\_ + 20 = 53$  /  $75 + \_ = 135$

Choose numbers that stretch your thinking!

What problem will you pose as part of your math story?

Choose three of these numbers: 10, 25, 89, 100, 142

What different ways can you represent the numbers?

Consider using symbols, pictures, ten frames, tally marks, coins, etc.

Choose a number that stretches your thinking: 12, 25, 75, 99, 200

Find that quantity of items (rocks, seeds, books, blocks, toys).

What different ways can you count the items?

How can you show or record how you counted them?

Choose three questions that seem just right for you:

2 and 6, 8 and 4, 3 and 10,  $9+8$ ,  $46+7$ ,  $52+9$ ,  $69+24$ ,  $98+37$ ,  $147+72$

What different strategies can you use to solve these questions?

What strategy/method do you think is a strength of yours?

**Numeracy Task:**

There are 24 pieces of sidewalk chalk in a box. They need to be shared between four children. One child already has 3 pieces of chalk of their own. What are some different ways you could share the new box of sidewalk chalk?

Which way do you think is the most fair and why?

Use pictures, numbers and words to share your thinking.



created by Janice Novakowski for the Richmond School District  
SD38K-2MATH-12

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# Outdoor Math Experiences

## Outdoor Learning Experiences for in-school and at-home learning K-5 Mathematics & Numeracy June 2020

<p><b>Counting Collections</b></p> <p>Find a collection of materials outside (leaves, rocks, twigs, cones). What different ways can you count them? How could you record your counts? Find plants, trees or flowers and think about how you could count them. For example, buttercups have five petals - find a patch of buttercups and count by 5s.</p>	
	<p><b>WODB</b></p> <p>Using sidewalk chalk on concrete or twigs, create a 2x2 grid. Choose four numbers, shapes or natural items found outside and place one in each section. How are they the same? How are they different? If you had to choose one thing to not belong, which would it be and why? Leave your WODB out for others to think and talk about.</p>
<p><b>Math Walks</b></p> <p>Go on a daily math walk, with a different focus each day. Take a notebook or clipboard with paper and pencil to record what you find. What shapes do you see? What numbers can you find? What could we count? What strategies can you use to estimate the number of leaves on the tree? What do you notice about the different patterns you find in plants and trees?</p>	

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June 2020

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<p><b>Patterning</b></p> <p>Use materials found outside to create repeating patterns, growing patterns, patterns in circles or spirals. Create patterns on safe concrete areas with sidewalk chalk, leaving parts for others to think and talk about. What part of the pattern is missing? What could come next?</p>	
	<p><b>Measuring</b></p> <p>What could you find outside to measure? Find 10 of something outside and put them in order from shortest to longest. Choose an area outside (garden, field, backyard). What different ways could you measure it? Length, width, area, perimeter. Record your measurements using pictures, numbers and words.</p>
<p><b>2D &amp; 3D Shapes</b></p> <p>Find twigs and use string to lash or tie them together to make nets/frames of 2D and 3D shapes. How do shapes come together to make new shapes? What shapes do you see within your shape? What could you create with your shapes?</p>	
	<p><b>Tic Tac Toe</b></p> <p>Gather materials outside to make a tic-tac-toe game or use chalk on a safe, clear concrete area. What strategies do you use when playing tic-tac-toe? What other games could you create with materials you can find outdoors?</p>

**Suggested materials to pack in an outdoors "go bag":** clipboard, paper, pencil, eraser, sidewalk chalk, string or yarn, scissors, ruler, measuring tape, magnifying glass.

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June 2020

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# At-Home Interdisciplinary Projects

## At Home Project

# SHADOWS

Walk around your home or outside at a time when the sun is in the sky. What shadows do you notice? How do they change? What different surfaces do you notice shadows on?

Find some materials around your home and put them in front of a light source - from a window, flashlight, candle (with an adult) or a lamp. Can you create a shadow?

How can you play with shadows? How can you make them longer or shorter? Can you create a coloured shadow? Can you create a shadow on top of another shadow? How can you make darker or lighter shadows?

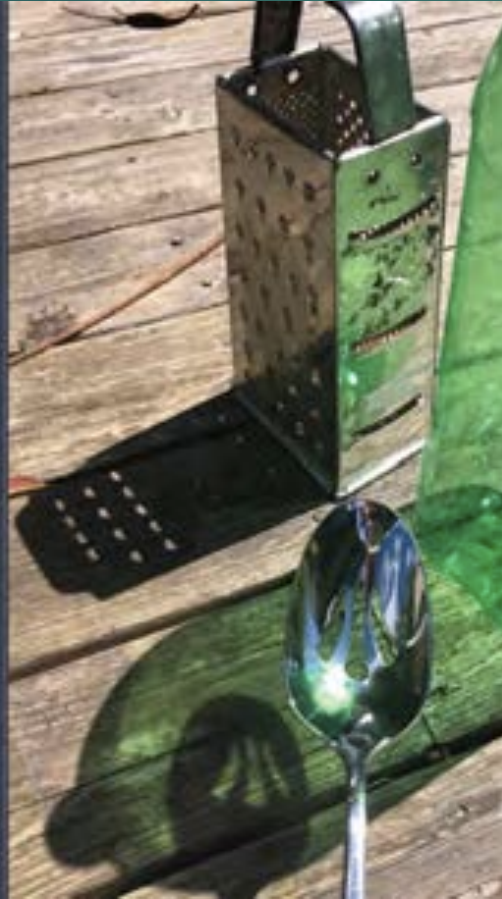
Draw objects and the shadows they make. What shapes do you notice? How is the shape and size of the shadow the same as and different than the object?

On a sunny day, place an object outside and observe and measure its shadow at three or four different times. If you have chalk, you could trace around the shadow. What do you notice? Record your measurements, including the unit you used to measure with.

Create a shadow story. Use your hands or cut-out paper to make characters. What will your light source be? What sort of setting could you create? Share your story.

What else do shadows inspire you to think about or do?

**RICHMOND**  
SCHOOL DISTRICT NO. 39 JUN/2020



## At Home Project

# GROWING THINGS

Look around your home, out your window or in your neighbourhood for things that grow. What different plants or parts of plants can you find?

You can grow new plants from seeds or parts of plants. Where could you find seeds? Many fruits that you eat have seeds in them that you can try and grow. Many vegetables such as carrots, celery and green onion can be cut and put in water to grow new plants. You can grow some plants in water but some seeds need soil to grow in. You can try going seeds in wet paper towel. You can plant seeds in a bit of soil in a jar, egg carton, egg shell cup or a small section of a paper tube.

What different ways can you measure and keep track of how your plants are growing? Days? Centimetres?

What do you notice about the plants - size, shapes, growth patterns or symmetry? Draw your plants and label them with your observations.

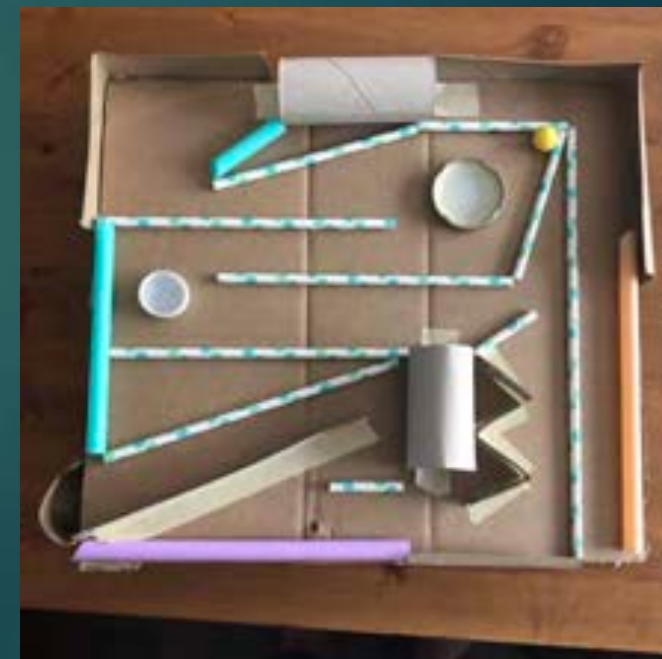
Create a story about plants. A story about life creatures that live under and around the plants? A story about how plants are important in our lives? Share your story.

What else do plants inspire you to think about or do?

**RICHMOND**  
SCHOOL DISTRICT NO. 39 JUN/2020



# Zoom math studio sessions



# student reflections on The Studio experience



Math! enjoyed doing finger knitting  $4 \times 4 = 16$  Math Fairy's

I Like Weaving

I Like Weaving and decomposing

decomposing, weaving, painting.

There are many ways of making math.

never

I really liked string





I never realized how much fun math is!

I like shapes, patterns, fun and more!

I like learning and taking it off

I like to do math by flowers and some text

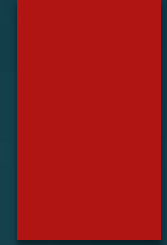
There are many ways of making math.

I like learning and drawing

I like jumping, playing, and painting.

I really liked string art.

I like drawing flowers and math is fun







MATH IS Really Fun!

Math is beautiful



# creating a new narrative for mathematics

- ▶ *"Math is beautiful."*
- ▶ *"Math is fun."*
- ▶ *"There are many ways of making math."*
- ▶ *"Math is everywhere."*
- ▶ *"We all do math."*

# What math lives here?

uncovering mathematics in  
playful studio experiences



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