A collage of wooden math manipulatives. On the left, a vertical strip shows dominoes with black dots. In the center, a wooden block is painted with a yellow and teal geometric pattern. On the right, a wooden structure is built with a large block on top of two smaller blocks with dots, supported by a vertical block.

Math Learning through Games

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Cornell University
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A little about me



- Father of two young learners
- B.S. Finance, Babson College
- M.S. Childhood Ed, SUNY Cortland
- Thirteen years as math educator
- Serial entrepreneur
- Founder Ithacatoys

Beginning

Local manufacture:

The great thing about this product is its big, durable, natural, and fun. Toddlers can build with it and also touch dimple holes and match like kind sides as they acquire number sense and as they get older they can master game theory by becoming an expert domino player. **made in USA with real wood*

Variable Costs per set

Materials Wood product	\$20.00
Labor to make domino	\$10.00
Packaging	\$4.00
Lesson Plan Dominos	\$2.50

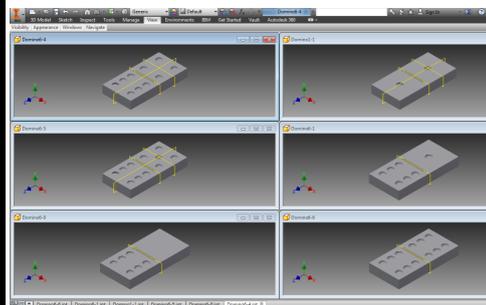
Total Variable Cost \$36.50 per set

Fixed costs

Setup costs (jiggs) \$1,000.00

Total Fixed Costs \$1,000.00

Lets make a sample run of 100 sets



Algebraic Formula

$$y=mx+b$$

y= Total cost to manufacture

m=variable costs per domino sets

x= Number of domino sets to manufacture

b= fixed costs

$$y= 36.50x+1000$$

Total Cost to Manufacture \$4,650

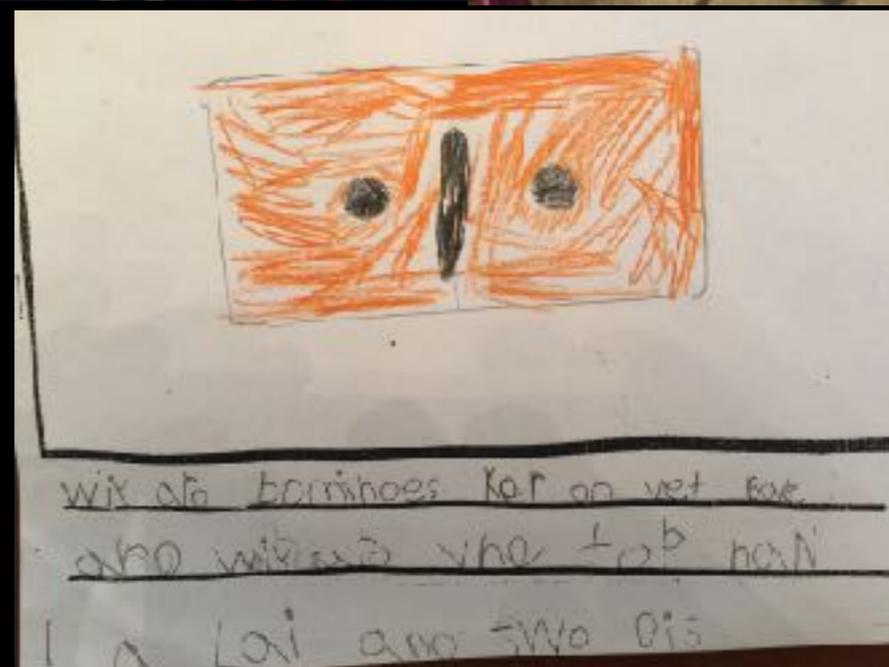
Vanessa estimates we can sell a set of wood dominos, and lesson plan in good packaging for \$95.00

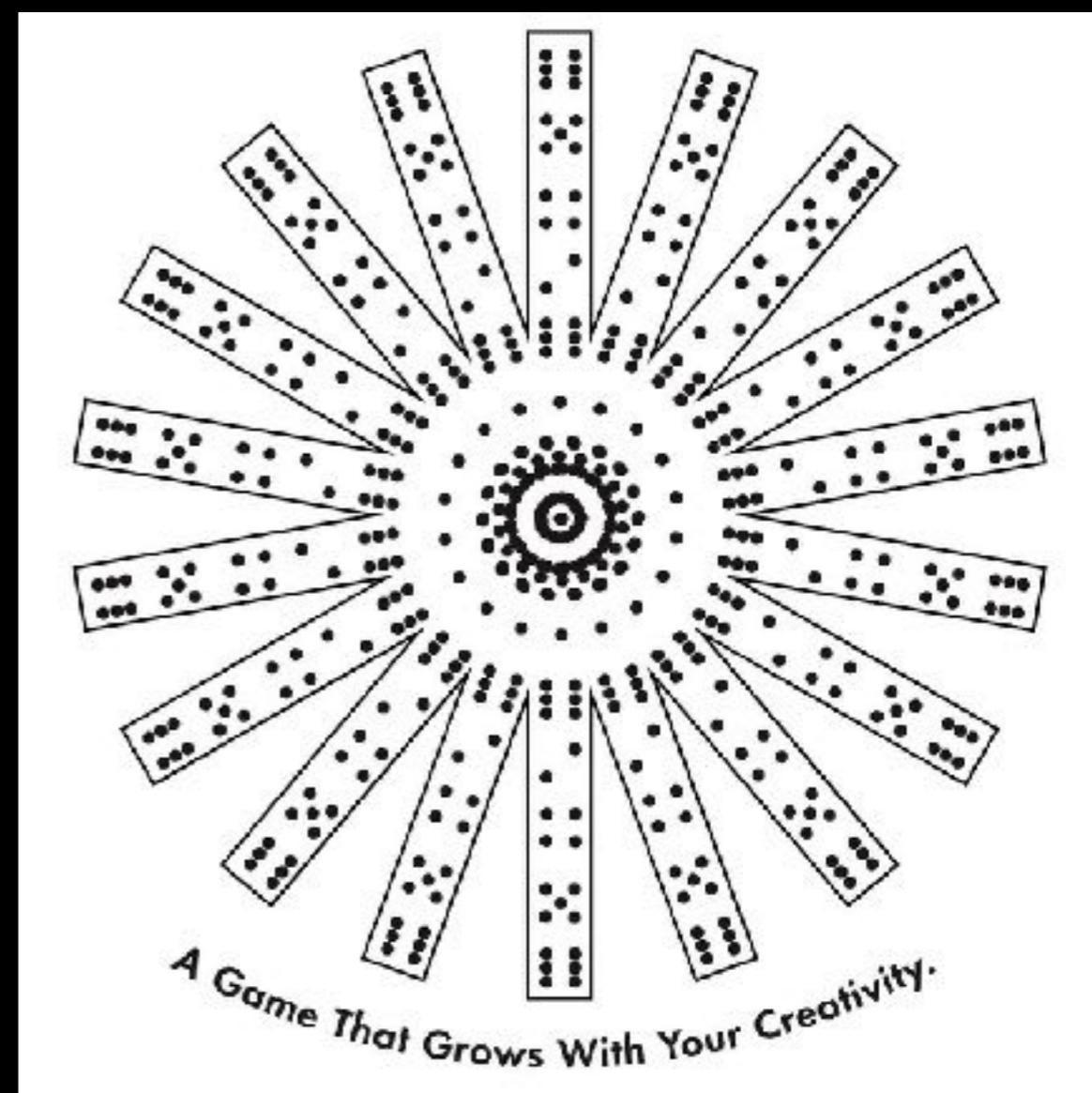
Quantity sold	Sale Price per set	Total Revenue
100 sets	\$95.00	\$9,500.00

Revenue minus	Total Costs	Net Profit
\$9,500.00	\$4,650.00	\$4,850.00

Net Profit Percent 51.05%

Total Revenue / New Profit





How many different ways can you create the value 25?



A young creative explains BLOX.

<https://vimeo.com/207866305>

What is a BLOX?



*dictionary.com defines BLOX as a visual language.

We made a physical BLOX.

What properties does a physical BLOX have?

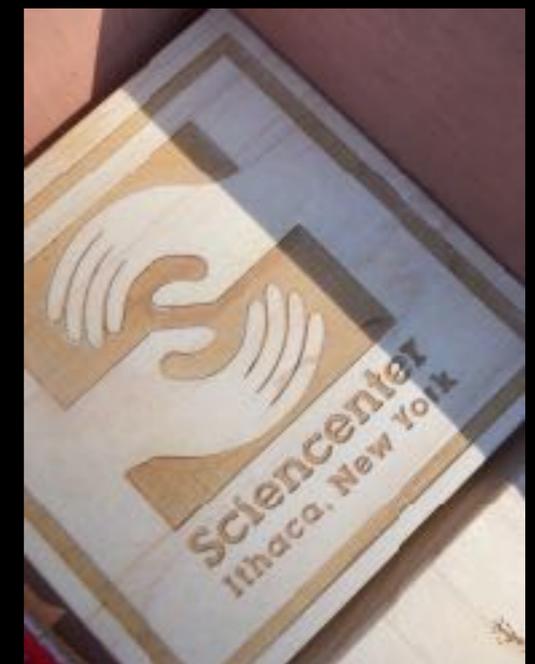
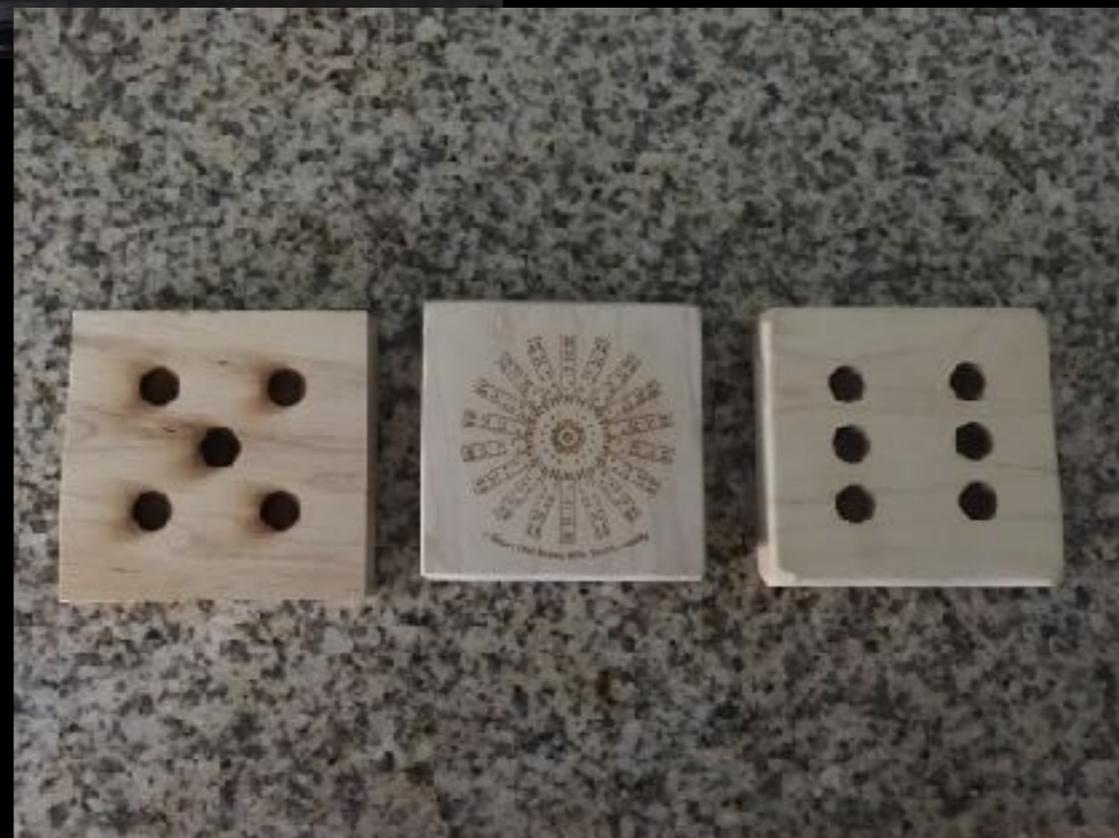
How would you define each unit?

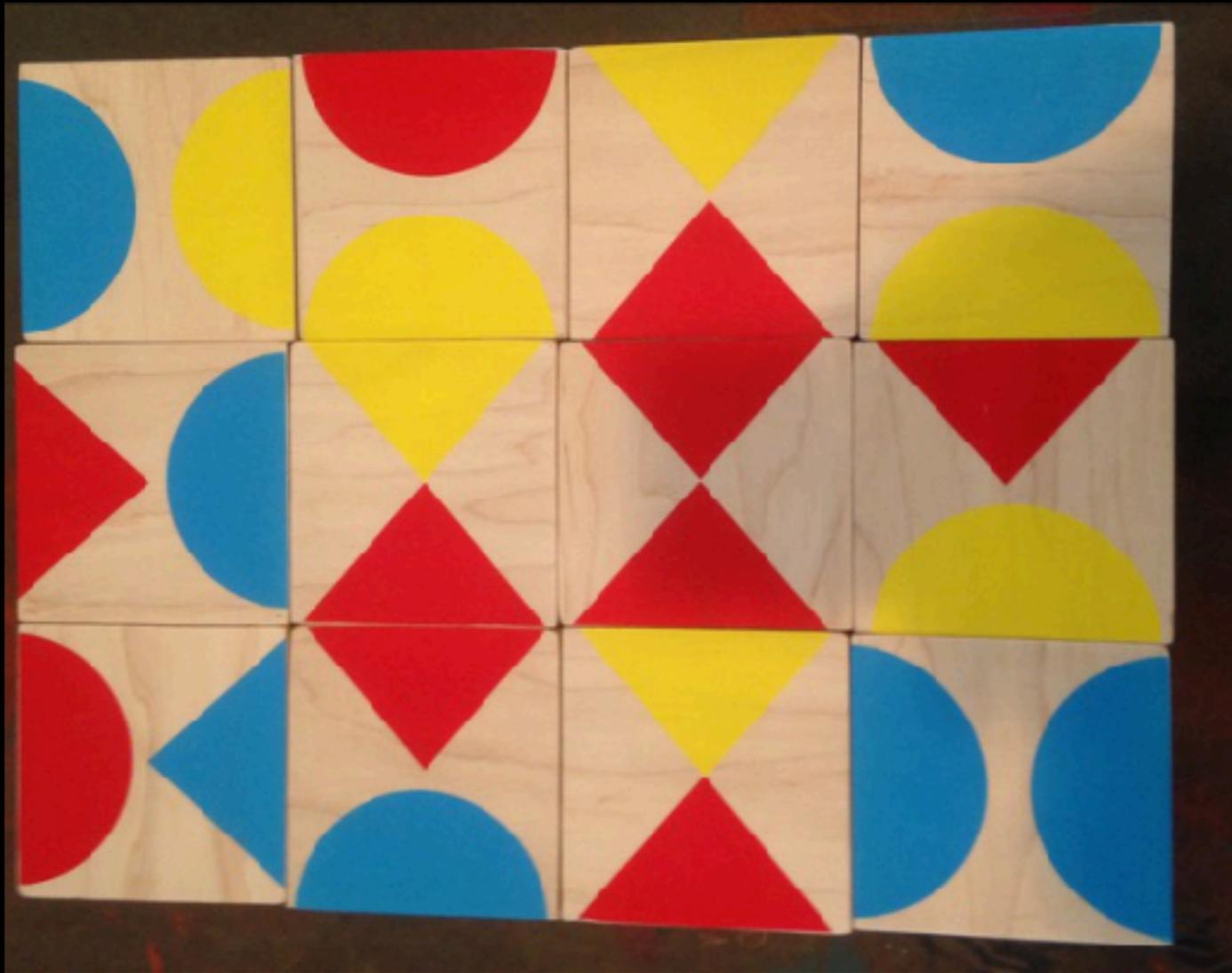


A BLOX is a rectangular prism with square bases and bevelled edges.



What visual languages can you draw / inscribe on a BLOX?





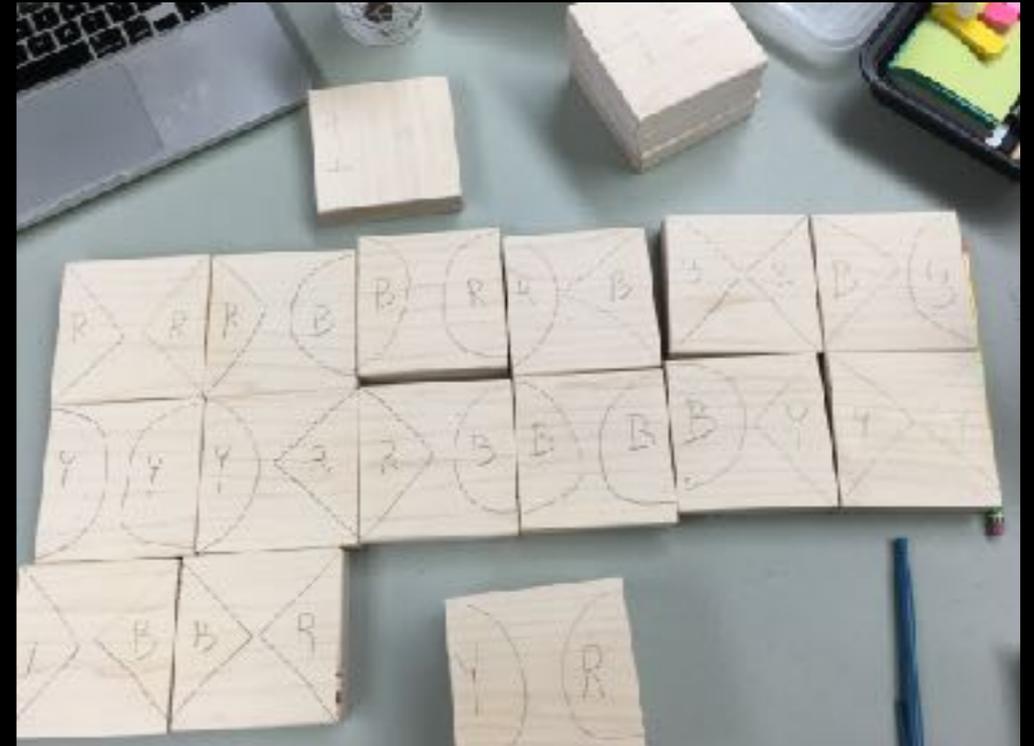
ColorBLOX

simple but complex visual images

- Mix and match colors and shapes
- Create patterns and designs
- Work together and have fun
- Return BLOX to the box

ColorBLOX problem:

How many distinctly different BLOX would be in a complete set?



Conditions:

- Each BLOX has either a triangle / triangle, half circle / half circle or a half circle / triangle on one of its bases.
- Each shape will be filled with a primary color.
(Magenta, Yellow, Red)
- One of every design per BLOX for a whole set ie no BLOX is the same.

Solution

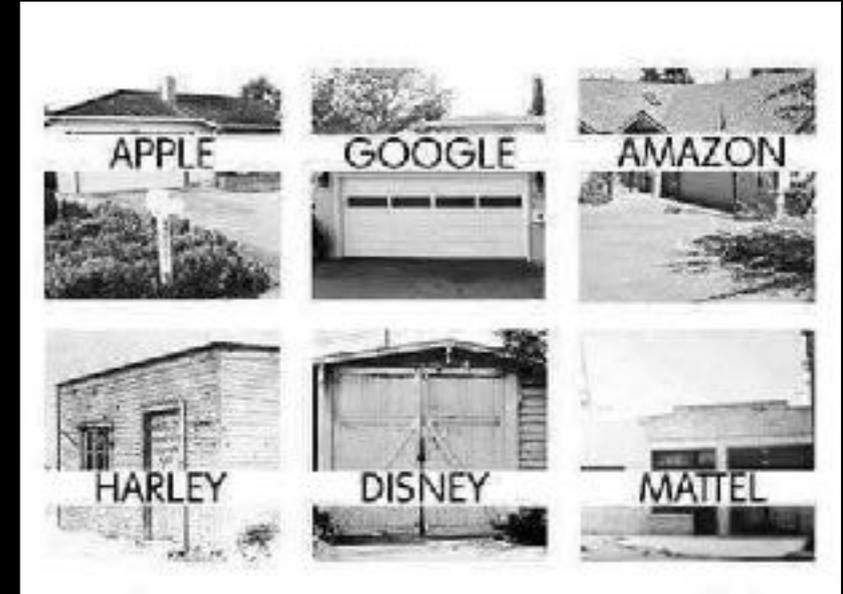
${}^3C_2 = \frac{3!}{2!(3-2)!} = 6$

Combinations - order doesn't matter

$n = 3$ colors to choose from
 $r = 2$ to choose

Permutation with repetition? $3^2 = 9$

21 combinations





With the set of 12 there are no “like colors” on a BLOX, (i.e. blue shape / blue shape). Most times a player or player (s) can create a looping pattern in the set of 12.

COLORBLOX

Multi-player

Enjoyed by young and old folks.

It can be played with 2-4 players.



First of all COLORBLOX are

put face down. Each player chooses same number of BLOX which they hide. Then the first player places a COLORBLOX down and the others follow in turn making the pattern. If a player doesn't have a match, they pass and the game continues until someone has no COLORBLOX left. That player is declared the first winner and the other players may continue trying to complete the pattern until all COLORBLOX are used up.

Sometimes in this game, there is no winner, but valuable lessons can be learned nonetheless. Various strategies are implemented in order to block plays. Creative and higher level thinking skills come in to play here.

**Activities available to allow students to master multi-disciplinary common core standards for all elementary grades

Question for COLORBLOX (21 Set)

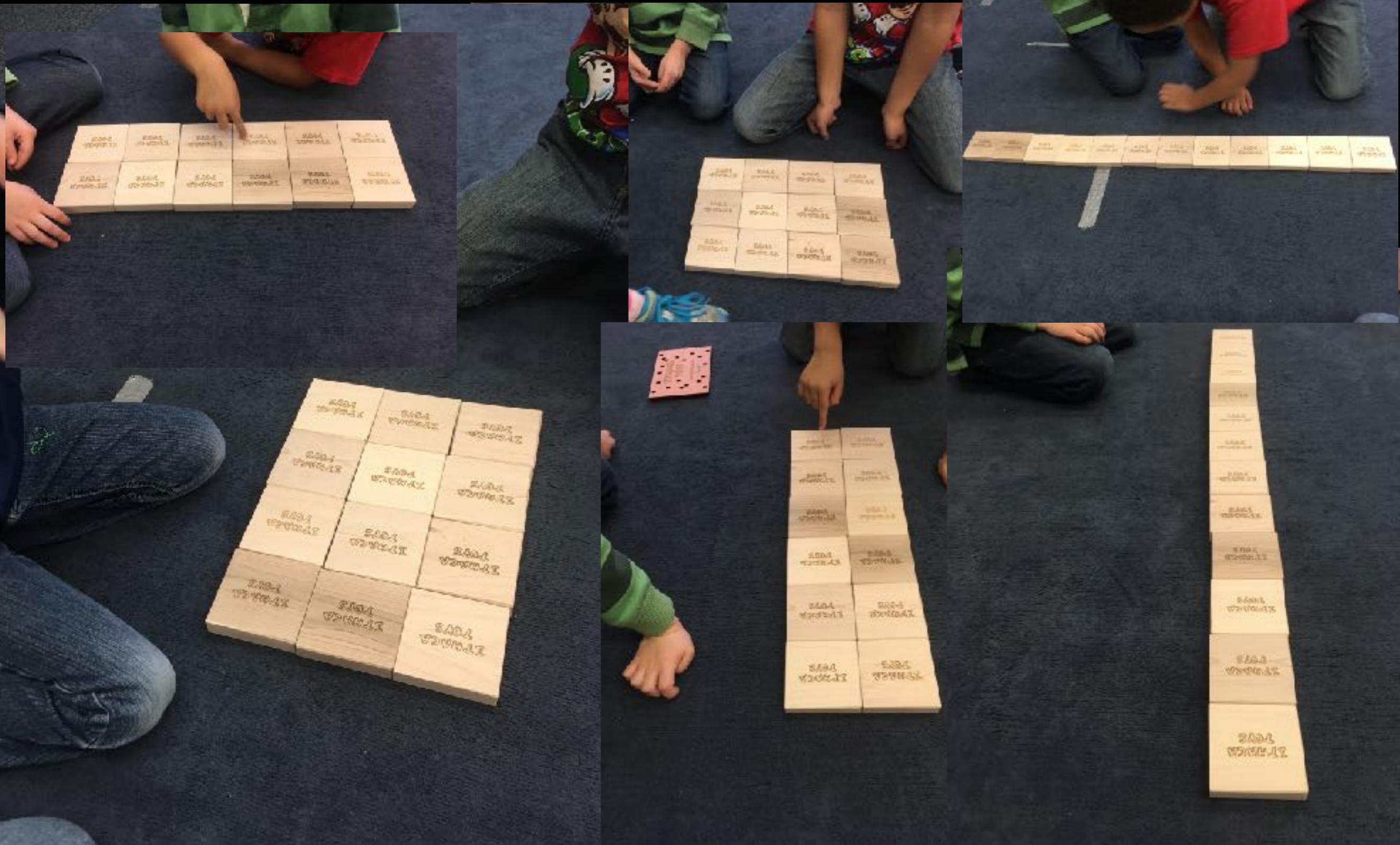
Is there a looping pattern for the complete set (21)? Why or why not?

If there were two sets of complete sets (21) together, would there be a looping pattern?

How could we figure this out?



How many different ways can you make the area of 12?
Is making a rectangle the only way to do it?



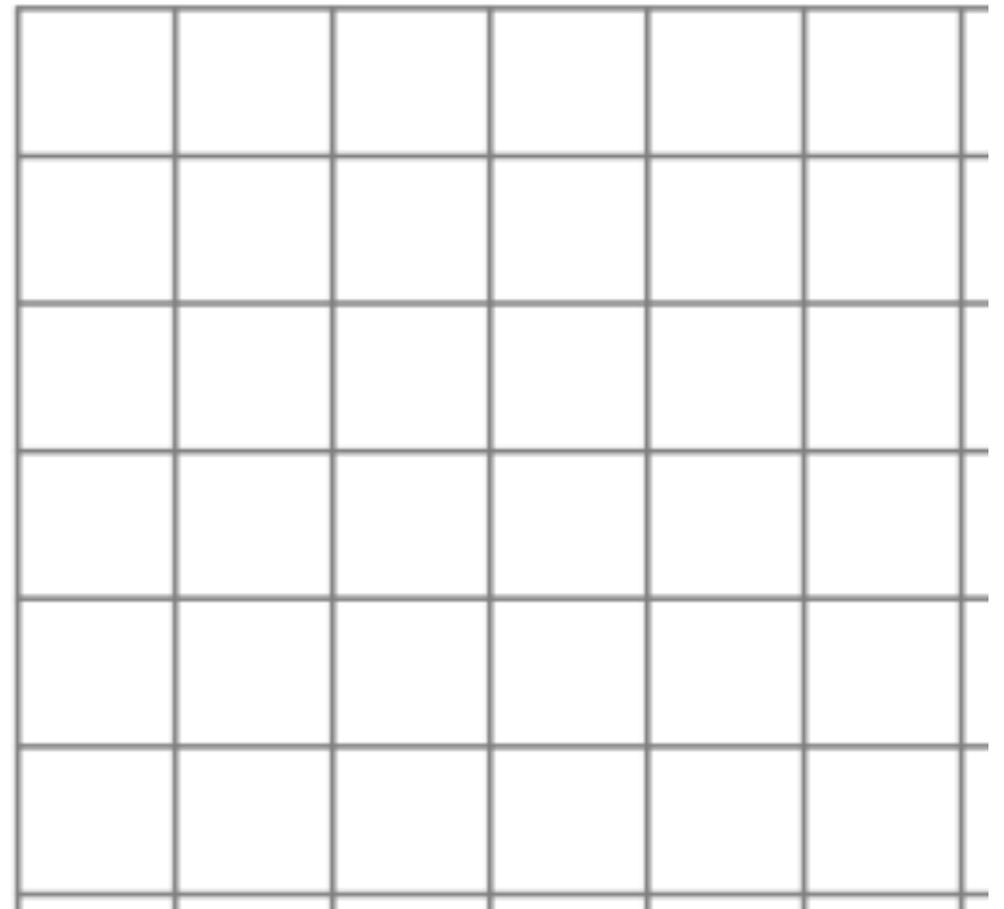
PuzzleBLOX

- Putting BLOX together can create visual languages
- This activity is a hands on lesson to learn area while integrating art



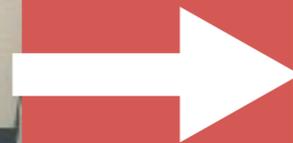
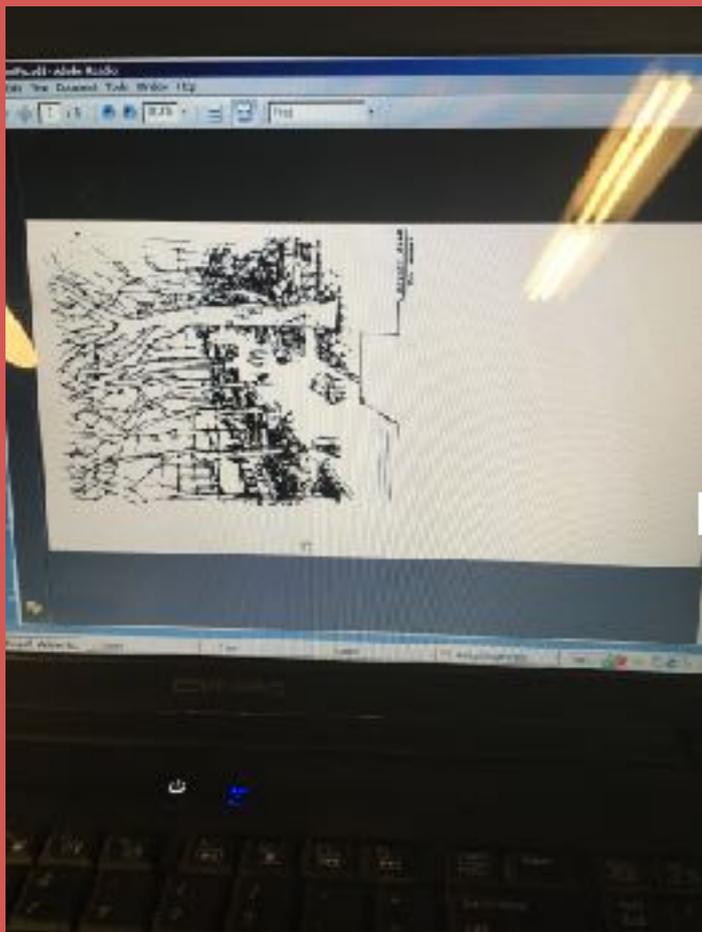
How is area used to create an art image which can make a puzzle?

- Choose an area of 12 units (at a minimum a dimension needs to be 2 units). Why did you choose that area?
- Cut out area
- Flip over paper and draw an image to fit inside area (only use one color and you must erase all marks as best as you can)
- Sign the image



PuzzleBLOX

The process of manufacturing the product.



What dimensions would you make your box to hold your 12 PuzzleBLOX? Why did you choose that configuration?

Explain how you came up with that.

*This is a hands on lesson for Volume



*BLOX measurements are 3.5 inches x 3.5 inches x 3/4 inch

How do you assemble a box?

*The net gives a hands on lesson for surface area





Any questions, please contact me at lee@school.me.
Also visit ithacatoys.com

