BLUEBIRD MATH CIRCLE
Alliance of Indigenous Math Circles

Issue 39: Square to Square

Share your problems, solutions, models, stories, and art:
https://aimathcircles.org/Bluebird

"It is better to have less thunder in the mouth and more lightning in the hand."

–Apache proverb

NEWSFLASH

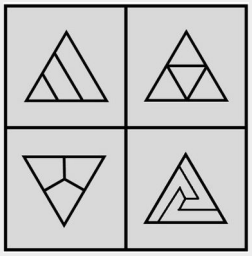
Join LIVE Bluebird Math Circle to work on these activities together with friends and family.

Wednesday November 16, 4-5 PM MST online.

Sign up at
https://aimathcircles.org/Bluebird

MATH PUZZLE

Which one does not belong?

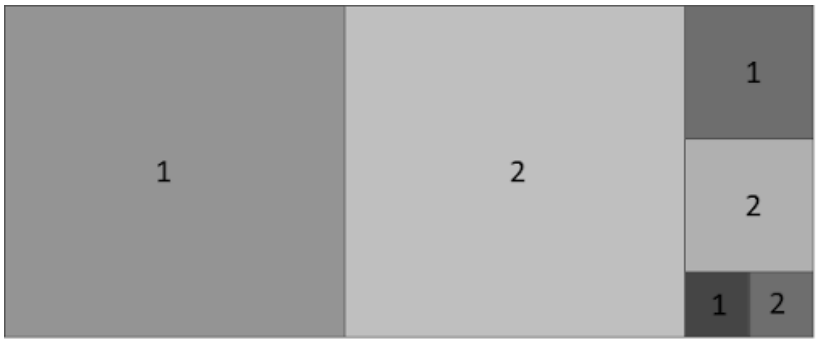


Warm-up Activity

The people in the Land of Squares live in square houses with square rooms. Consider a 7-by-7 square grid and make square rooms to fill it up. How many different sizes of square rooms can you have in the house? What if all the rooms must be 2-by-2 or 3-by-3? Which size houses can be filled with only these types of rooms? What if you can mix 2-by-2 and 3-by-3 rooms in the house? The app at **https://jrmathfestival.github.io/SquarelandArchitect/** may be useful to experiment.

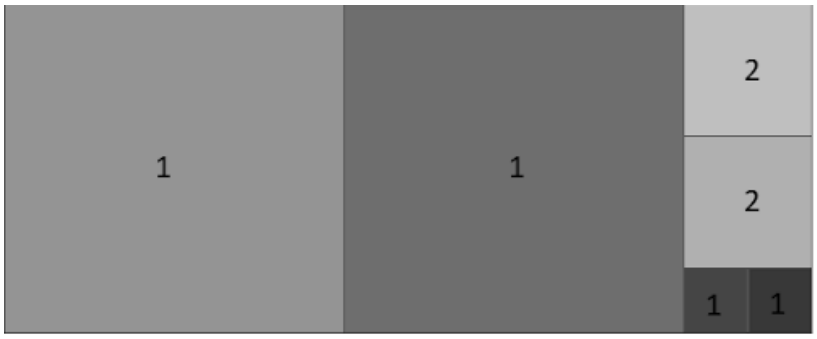
Family Circle: Square game

Game 1
The starting player draws a rectangle on a grid. The sides of the rectangle lie on gridlines (so the lengths of the sides are integers). The second player then colors in the largest square possible that has a side flush with the left side of the original rectangle, so that a smaller rectangle remains. The players then alternate turns coloring in the largest square possible that touches a previous square and leaves a smaller rectangle. (All squares must have integer sides.) The game ends when the initial rectangle is filled with squares, and the person who colors in the last square wins. In the figure player 2 wins.



Game 2
Same rules, but now as a player draws in the largest possible square, if it is possible to fit several such squares into the rectangle, the player should do so. The same game is now won by Player 1. Questions: Can Player 1 choose the dimensions of the rectangle to ensure a win in Game 1? What about Game 2? Are there dimensions that work for only one or the other game?

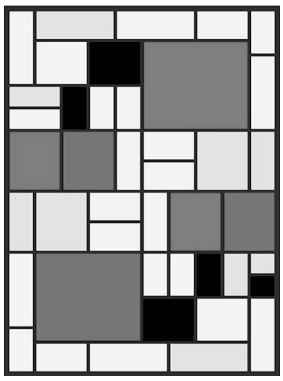
Reference: *Mathematics is Beautiful* by Heinz Klaus Strick, Springer, 2021

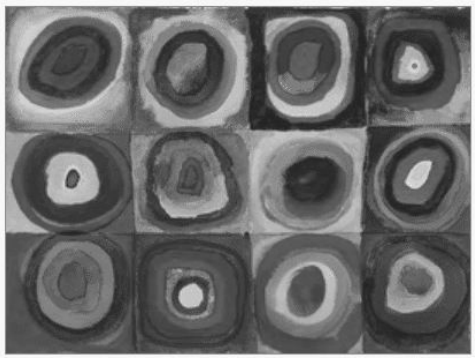


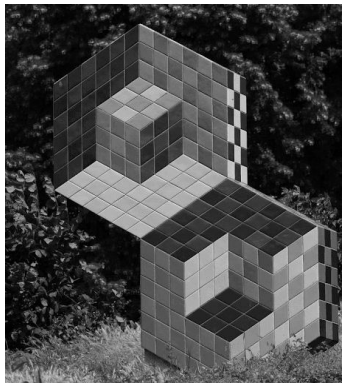
Ask Bluebird

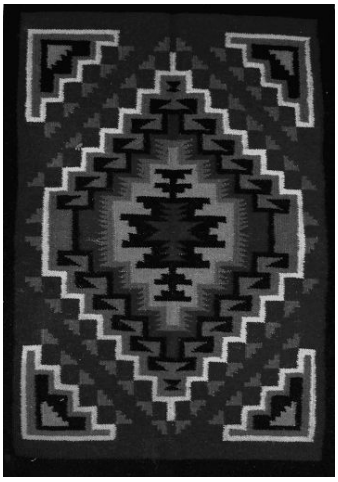
QUESTION—*What art do people make using fractions?*—from an anonymous student

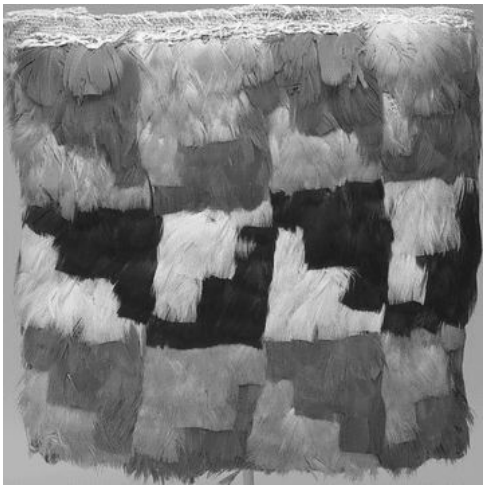
BLUEBIRD SAYS—Fractions break up a whole into parts. Art puts parts back into a whole and, according to a statement sometimes attributed to Aristotle, "The whole is greater than the sum of its parts." This has been interpreted in many artworks, sometimes in obscure ways. You can readily see that fractions influenced the works below by Piet Mondrian, Wassily Kandinsky and Victor Vasarely (from left to right).











Indigeneous textiles also show the geometric influence in their design and fractions are prominent in the different colored and shaped regions. *Images by MetMuseum and HoliTOMoli*

FUN FACT OF THE FORTNIGHT

Are there at least two people in your city or area who have the same number of hairs on their head? Well, if a city is large enough you can be sure of this. How large? It is estimated that people have less than 150,000 hairs on their head. This means that if the city has at least 150,001 people then you can always find at least two of them who have the same number of hairs. Why is this? Let's think about it - if everybody had a different number of hairs, then someone can have 0,1,2, and so on, up to 149,999 hairs. But this is only 150,000 possibilities (remember, we started at 0), and we have 150,0001 people, so they can't all have a different number of hairs - at least two have to share a number! This is an example of what is called the Pigeonhole Principle in math. If you want to learn more about it see https://en.wikipedia.org/wiki/Pigeonhole_principle or ask Bluebird!

Image by https://jineralknowledge.com/