



BLUEBIRD MATH CIRCLE

Alliance of Indigenous Math Circles

Issue 54: Partitions

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

It does not require many words to speak the truth.

—Chief Joseph, Nez Perce

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

NEWSFLASH

Wednesday September 27, 12:30-1:30 PM MDT online.

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



MATH COYOTE CORNER

Did you hear about the mathematician who fears negative numbers?

He will stop at nothing to avoid them.

Inspiration: Land Use



Here is a map of the state of California.

It is divided into counties. Every place in the state belongs to some county AND no place in the state belongs to more than one county.

We say that the set of counties *partitions* the state of California.

Image: geology.com

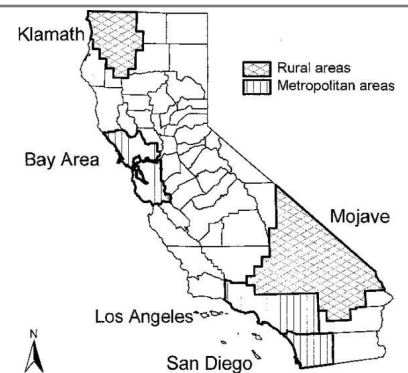
In this map, the places in California are divided up.

Some places are considered rural areas. Some places are considered metropolitan (city) areas.

BUT... Some places are neither.

The sets of rural and metropolitan areas do not cover the state. They *do not form a partition* of the state.

Image: [Mark Schwartz et al.](#)



Here is a close-up of Northern California from a map showing traditional Native American land use. The patches of color indicate lands used by each of the tribes. Notice that some of the patches overlap. These patches *do not partition* the state.

A set is partitioned into subsets if:

i) Every element of the set belongs to one of the subsets.

AND

ii) No element of the set belongs to more than one of the subsets.

Image: <https://native-land.ca/>

Family Circle: Partitions

Even/Odd/Threes Game

Here is a game that several people can play. Players form a line or establish a fixed order. Then they take turns, and the next player gets the next natural number. The player whose turn it is must tell which of the properties the number has:

EVEN if it's even.

ODD if it's odd.

MULTIPLE OF 3 if it's a multiple of 3.

Try playing this quickly! It can get difficult, but various patterns will emerge.

Are the natural numbers partitioned by these two subsets? {SUBSET A: Even numbers} and {SUBSET B: Multiples of 3.}

The Next Step

When you add two even numbers, will you always get another even number? Why or why not?

What kind of number will you get if you add two odd numbers?

What about an odd number and an even number?

What kind of number will you get when you add two multiples of seven?

One way to think about this situation is that we have sorted the natural numbers (*partitioned* them) depending on their relationship to the number 2.

And Another Step

Here are six subsets of the natural numbers {1,2,3,...}. We guarantee that every natural number belongs to one of these subsets. We further guarantee that no natural number belongs to more than one of these subsets.

Can you give a rule for which numbers appear in which subset? For example, where does the number 1000 appear? The number 1003? 2003?

SUBSET A: 1, 100, 101, 102...198, 199 ...

SUBSET B: 2, 3, 10, 12, 13, 20, 21, 22...29, 30, 31, 32...39, 200, 201,202...399 ...

SUBSET C: 4, 5, 14, 15, 40, 41, 42...49, 50, 51, 52...59 ...

SUBSET D: 6, 7, 16, 17, 60, 61, 62...69 ...

SUBSET E: 8, 11, 18, 80, 81, 82...89 ...

SUBSET F: 9, 19, 90, 91, 92...99 ...



It might be useful to read the names aloud, emphasizing the first sound of each name.

Ask Bluebird

QUESTION—*Why is the quadratic formula important?* From Jacki

BLUEBIRD SAYS—Quadratic equations come up in many places. For example, gravity and other laws of physics relate some measurement to the square of another measurement. Computations about gravity thus require us to solve quadratic equations.

When we first solve quadratic equations, we do it by factoring: $x^2 - 5x + 6 = (x-3)(x-2)$. But not all quadratic expressions will factor easily. Then we can use 'completing the square' (which you can look up in any algebra textbook).

The quadratic formula 'encapsulates' the process of completing the square, and allows us to solve any quadratic equation at all. There are similar formulas for third- and fourth-degree equations, but they are much more complicated. And mathematicians have actually proven that a formula for the fifth-degree equation does not exist.



FUN FACT OF THE FORTNIGHT

A number is called self-descriptive if it tells you the number of letters in its name. The only self-descriptive number in English is F-O-U-R.

But what about other languages?

FOUR

Teacher guide: <https://aimathcircles.org/wp-content/uploads/2023/09/Bluebird-MC-Issue-54-Teacher-Guide.pdf>