BLUEBIRD MATH CIRCLE
Alliance of Indigenous Math Circles

Issue 43 Recap
Sets and Subsets

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February 8, 12:30 PM MST online.

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Introduction

Donna Fernandez introduced our math circle. Before we tell you all about it, here are our tools and supplies:

- Newsletter: https://aimathcircles.org/issue-43-sequences-of-subsets-full-color-pdf/

Sequences of Subsets

We first reviewed the notion of a set. A set is any collection of objects. A subset of a set S is another set T, all of whose elements are also in S.

We gave some examples:

1) The set of all students in the room. (They all stood)
2) The set of all boys in the room. (The girls sat down)
3) The set of all girls in the room. (The boys sat down and the girls stood up.)

We first reviewed the notions of a set and its subsets. The following fine points were covered:

The set of all boys in the room is a subset of the set of all students in the room. So is the set of all girls in the room.

Two special subsets need particular mention. One is the set S, which is a subset of itself. *Any* set is a subset of itself.

The other special subset is the set with no elements in it. We can write this set as { } (see how there's nothing in the braces?) or we can write it with the special symbol Ø. We call this set the *null set*, and it counts as a subset of any set. Any element of Ø is also an element of a set S, no matter what the set S consists of.

Why is that? Well, think of any set S. Can you show me an element of Ø which is not in S? No, because you cannot show me any element of any sort in Ø. There are none. .

Finally, we talked about 'singleton' sets, with just one element: {elephant}, {2}, {scissors}. Some singleton sets count as subsets of other sets.

We then looked at the set {a,b} consisting of two elements. We found that it has four subsets:

Ø, {a}, {b}, {a,b}.

(We started writing {ab} to mean the set {a,b}. It didn't cause confusion. We hope it doesn't cause confusion in this recap either.)

We then wrote a list of subsets of the set {abc}. It turns out that there are eight of them. One way to see this is to look at the subsets of {ab}. These must also be subsets of {abc}. And they are ALL the subsets of {abc} that don't include the element c. Those subsets are missing.

So if we insert an element c into each of these subsets, we will recover the missing subsets:

Ø becomes {c}
{a} becomes {ac}
{b} becomes {bc}
{a,b} becomes {abc}.

We have doubled the number of subsets by going from {ab} to {abc}. The set {ab} had four subsets, so the set {abc} has eight subsets.

Some students likewise figured out that the set {abcd} has 16 subsets, and so on.

And these results are not limited to the set {ab} or the set {abc}:
Any set of two elements will have four subsets.
Any set of three elements will have eight subsets.
Any set of four elements will have 16 subsets.

And any set of n elements will have 2^n subsets.

We ran out of time before considering sequences of subsets.

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