Lesson Plan – January 28th

Goal: Students will be able to derive the expression for permutations as well as combinations.

# Warm Up

## Question for the board

How many ways can you pick four different colors from the 10 cubilinks you have?

* If students ask about the order, tell them to explore the idea of “stacks” first and then move into the idea of a ‘handful’.
* Probe students with questions such as:
  + What other activity does the stack problem relate to?
  + How are the two interpretations different? How are they similar?
* How to help students who don’t know how to count how many handfuls:
  + Have them show you what one handful would look like. If they put it on the table rearrange them and ask them if that handful is different or the same (hopefully they will say the same). Then replace one of the four with a new color and say that I could get 7 different handfuls by switching out just one of the blocks. This gets complicated, and I would hope that there is an easier way to think about it… maybe think about a way to get rid of the redundancies?

## Wrap-up for the warm up

To begin discussion, first ask students how many different ‘stacks’ they could make.

Make sure to explain where the 10, 9, 8, and 7 come from.

The multiplicative principle states that if event A can occur in m ways, and each possibility

for A allows for exactly n ways for event B, then the event “A and B” can occur in ways.

We actually call this type of arrangement a permutation and denote it as: or

Now, ask if anyone solved how many handfuls we can get…

If a student does get the answer, ask them to explain. Make sure that the following is mentioned:

* *HOW* they took away the redundancies – how many redundancies should we have? Well, because this is how many different arrangements of the 4 cubes I can have.

If a student does not get the answer (or maybe even if they do), ask them to consider an easier example… First, let’s suppose that we have only 5 cubes. How many different stacks could we get?

Now, how could we find (INTRODUCE NOTATION):

Now, how does this answer relate to the one with stacks? (Multiply/divide by 6) What does this 6 represent?

Talk to each other in your groups about this…?? Depends on if someone gets it or not

This is the number of ways the 3 blocks can be arranged in a stack!

Therefore, how can we use this information to inform our answer for stacks of 4 from the 10 blocks to solve for ? What do we need to find?

So, what we have just done is (in essence) found a formula for the number of combinations

Is there anyway to generalize this idea? That is, could we find a formula that we could use to find any combination of any amount of cubilinks?

TALK TO EACH OTHER

# FOR OSCAR

Connect this to the bit string and sets from yesterday.

* What if I were to number each of these cubes? Then instead of asking for the number of handfuls of four different colors I could get, I could ask how many sets of 4 numbers can I make? Similarly, with the bit string idea – we could line the cubes up and assign them a ‘slot’. So really, what we are trying to find is the .