Description: Clip 5 of 10: Recognizing the Symmetry for the two Colors across the Cases when building Unifix Towers 4-cubes tall **Parent Tape: Early Algebra Ideas About Binomial Expansion, Stephanie's Interview Five of Seven** **Date: 1996-03-13** **Location: Harding Elementary School** **Researcher: Professor Carolyn Maher**	**Transcriber(s): Aboelnaga, Eman** **Verifier(s): Yedman, Madeline** **Date Transcribed: Fall 2010** **Page: 1 of 3**

Time	Line	Speaker	Transcript
0:00	1	R1	So you do get sixteen four-high.
	2	Stephanie	Mm-hmm.
	3	R1	Right?
	4	Stephanie	Yes.
	5	R1	And, um, in all of these, I focused on red. Talked about the positions for red, right?
	6	Stephanie	Mm-hmm.
	7	R1	For these four high, you can imagine these sixteen there. And, of these sixteen, I could say, of these sixteen, there'll be no reds and there's going to be one of those. And there's going to be exactly one red-
	8	Stephanie	And there'd be four of those.
	9	R1	And so forth, right? Um, what about yellows? Don't we have to do the same thing for yellows? So wouldn't that give us 32?
	10	Stephanie	Yeah.
	11	R1	But this thing only produces sixteen. If I were to do the same thing here for yellow, right-
	12	Stephanie	Mm-hmm.
	13	R1	-and if I said, let's now find out how many exactly no yellows, let's find out exactly one yellow out of the four, exactly two yellows out of the four, three yellows out of the four, don't you agree that you'd get another sixteen?
	14	Stephanie	Yeah.
	15	R1	But then 16 and 16 gives you 32, not 16.
	16	Stephanie	But wouldn't it be the same thing? Like, only the opposite way? 'Cause, look, if there's two red, then there's two yellow. [*writing*] And if there's three red, then there's one yellow. And if there's one red, then there's three yellow, so isn't it the same thing?
	17	R1	Is it?
	18	Stephanie	Yeah.
	19	R1	Ok, you're sure of that?

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	20	Stephanie	Yeah.
	21	R1	And-and that's why if you think about that as a strategy, if you've already figured out exactly one, do you know exactly three?
	22	Stephanie	Um?
	23	R1	See this was the exactly one here, right?
	24	Stephanie	Mm-hmm.
	25	R1	Right?
	26	Stephanie	Yes.
	27	R1	That was exactly one red. And when you did exactly three red, I asked you to move one, you also got four.
	28	Stephanie	Yeah, well, I guess it's just the opposite.
	29	R1	Isn't that interesting?
	30	Stephanie	Yeah.
	31	R1	So, it saves you some work.
	32	Stephanie	Yeah.
	33	R1	And that's kind of important to realize. If you know exactly none, right, do you know exactly all?
	34	Stephanie	Yeah, but I mean, I wouldn't have thought of that. Like-
	35	R1	Yeah, well, that kind of pulls some of the ideas together.
	36	Stephanie	Yeah.
	37	R1	I think also if you think about that, it might help you. So if we went, to towers five, it might be interesting to look at some of this, now that you're looking at it from another point of view – combinations or selections – which, by the way, um, is a field of math that's called counting, and counting, um, is a field of math that you study as sort of a prelude to studying things like probability
	38	Stephanie	Mm-hmm.
	39	R1	and statistics. So it's a very important field, and, um, if you start to pick up a book at the college level or advanced high school, and you see all these formulas and you see all this notation, and with the notation, there's formulas.

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25:00 – 29:59	40	Stephanie	Mm-hmm.
	41	R1	There are students who work with this and have no sense of what it means. See, the advantage you're going to have when you get to work with this is if you could think about what this means, you say "Oh, selection, towers."
	42	Stephanie	Yeah.
	43	R1	You know what I'm saying?
	44	Stephanie	Yeah.
	45	R1	That's like exactly one out of the four being this. See what helps is if you can, all the work- all the hard work you've done for years, if you can, in your mind, try to say, "This is like this" or "This is almost like this", then you can build on these ideas and then when you get the formulas, you know, they don't always apply directly. It's like, sort of, the problem you had yesterday with the factoring.
	46	Stephanie	Yeah.
3:59	47	R1	It really was the same problem. You know, sort of tricky, wasn't it? Once you saw it a certain way, you realized it was the same problem. Well that's part of what you have to do. You have to be able to see it, you know, to be able to visualize it, which is part of the strength.