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| **Description: Extending ideas about generating towers 4-cubes tall selecting from green and blue cubes to towers 5-cubes tall with exactly 1 green cube and connecting to Fermat and Pascal**<br>**Parent Tape: Early Algebra Ideas About Binomial Expansion, Stephanie's Interview Six of Seven (student view)**<br>**Date: 1996-03-27**<br>**Location: Union Catholic**<br>**Researcher: Professor Carolyn Maher** | **Transcriber(s): Aboelnaga, Eman**<br>**Verifier(s): DeLeon, Christina**<br>**Date Transcribed: Spring 2009**<br>**Page: 1 of 5** |

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| 1 | R1 | Well, of course the next, the next thing I would want to know is, um, we took this row. Okay? |
| 2 | Stephanie | Um hm. |
| 3 | R1 | And we showed from exactly one green, right? |
| 4 | Stephanie | Um hm. |
| 5 | R1 | And then, if we were to replace a blue, and now had exactly two greens, and so forth. Whatever. Which row was this? Four high? |
| 6 | Stephanie | Um hm. |
| 7 | R1 | Um. We were able to go through this, this process, um, how would it work for the next line? This goes across four lines. Of how does it go for the line of five? |
| 8 | R2 | Can you see the numbers through the towers? |
| 9 | Stephanie | Yeah. |
| 10 | R2 | If not, you're welcome to move. |
| 11 | Stephanie | Um. I'm sure it would probably work the same way, I guess. I mean, like, um, one would be, um, like for five, one would be no greens. And all right… [*Stephanie builds a tower five high of all blues.*] so this would be one. Umm, one like this, well, alright. [*Stephanie finds a tower of five with one green on the bottom and four blue above that.*] You get that from one like this. Or from… |
| 12 | R1 | So, you're going backwards now. |

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| 13 | Stephanie | Um. Yeah. I'm kinda |
| 14 | R1 | But, it, okay |
| 15 | R2 | Well, we have to start somewhere. |
| 16 | R1 | That's fine. |
| 17 | Stephanie | Yeah. |
| 18 | R2 | Yeah. |
| 19 | Stephanie | Um, or one like this. [*the* $\begin{bmatrix} B \\ B \\ B \\ G \\ B \end{bmatrix}$ *tower*] If you're, if you're building with blue this time. |
| 20 | R1 | All right. You can just tell us, if you want to, right. |
| 21 | Stephanie | Yeah, well, you know, the other ones. Like one with a green here [*She indicates the position in the tower* $\begin{bmatrix} B \\ B \\ B \leftarrow \\ G \\ B \end{bmatrix}$ .], one with a green here [*She* |

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| | | *indicates the position in the tower* $\begin{bmatrix} B \\ B \leftarrow \\ B \\ G \\ B \end{bmatrix}$.], or one with a green there. [*She indicates the position in the tower* $\begin{bmatrix} B \leftarrow \\ B \\ B \\ G \\ B \end{bmatrix}$.] Um, so you have – you have one way to do it. Like you have one space left. Wait, I have to think because I'm working |
| 22 | R1 | In that one you have one space left. In that particular one. [*the* $\begin{bmatrix} B \\ B \\ B \\ G \\ B \end{bmatrix}$ *tower*] |
| 23 | Stephanie | I have one |
| 24 | R1 | In that tower. |
| 25 | Stephanie | space to put a ca, um. [*Stephanie sighs.*] A blue tower, a blue cube, so you're multiplying by one. Or, yeah. And, I guess this would kinda be like, um, [*Stephanie sighs again.*] the last one. Not, not five over zero, but five over five, [*She is referring to C(5, 0) and C(5, 5).*] like it would be this one, not the other one. |

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| 26 | R1 | You want to go at the other end now. |
| 27 | R2 | Oh good. Okay. Okay. |
| 28 | Stephanie | Yeah, because otherwise, um, so. Um, and because there's five, you divide by five. And you get one. |
| 29 | R2 | Ah. So you're looking at the numbers we divide by, first. |
| 30 | Stephanie | Yes. |
| 31 | R2 | Okay. so instead of dividing by four at the last step, you divide by five. |
| 32 | Stephanie | Well, if you were building with five. |
| 33 | R1 | And where did the five come from, one more time, Stephanie? |
| 34 | Stephanie | Well, there's these five. [*The five blues in the all blue tower five high.*] Like there's five blue. If there were four blue, it would be, in your final (inaudible) |
| 35 | R2 | Okay. |
| 36 | R1 | Um hm. You know what would be interesting to me, I know it's late and you've worked very, very hard, and um, this, um, problem came out of a dinner conversation we had the night before last with Professor Davis. |
| 37 | Stephanie | Um hm. |
| 38 | R1 | And, um, just, I thought you would be interested in the conversation |
| 39 | Stephanie | Yeah. |
| 40 | R1 | which is why I brought the cubes, lest anyone question why. Of course, Dr. Spieser didn't really know we were going to do this, but since he started it |

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| | | with his conversation |
| 41 | R2 | Yeah, I was expecting to be a silent observer. You know, I'm just as surprised as you. |
| 42 | R1 | He was telling us that… |
| 43 | | |
| 44 | | R1 and R2 explain the history of the problem. Then R1 asks Stephanie to write up her work as if explaining it to her friends back at Harding school. Stephanie does not do any more work in the tape. |