Description: Clip 3 of 5: It is Pascal's Triangle! But why? **Parent Tape: Taxicab Geometry** **Date: 2000-05-05** **Location: David Brearley High School** **Researcher(s): Professor Carolyn Maher**	**Transcriber(s): Powell, Arthur; Milonas, Jeremy** **Verifier(s): McGowan, Will; Brookes, Elijah** **Date Transcribed: Spring 2010** **Page:** 1 **of** 8

1	00:46:46	ROMINA	All right. It's, um, - it's Pascal's triangle. [Looking at the numerical array of the 1-centimeter-grid transparency.]
2		MICHAEL	What is that? Two by three? [Looking and pointing to Brian's inscription on the classroom chalkboard.]
3		JEFF	It is?
4		ROMINA	Yeah.
5		JEFF	Let me see.
6		ROMINA	All right. Yeah it is.
7		MICHAEL	What?
8		ROMINA	It's Pascal's triangle.
9		MICHAEL	Two, three-
10		ROMINA	No, it's not. It doesn't work out.
11		JEFF	See look at- Here, Mike-
12		ROMINA	Because twelve that doesn't-
13		JEFF	Mike look- just look at it in this thing. You got the 6 and the 4 and the 6 are the 10. That should be a 15- //that's should be a 20- [Pointing to the 1-centimeter transparency grid that is in front of Romina.]
14		ROMINA	//But that's not a 15. That is a twelve because he even got the 12.
15		JEFF	Well- that should- that should be a 20 right there. [Pointing to the square † $(6,3)$ on the transparency that contains the datum 15.]
16		ROMINA	Ah, you can [Inaudible] the twenty.
17		MICHAEL	Up to here is been a one, one, one, one and-
18		JEFF	Huh.
19		BRIAN	So what's wrong?
20		MICHAEL	It should be six- fifteen.
21		ROMINA	Do- do a four by two.
22		MICHAEL	Yeah.
23		JEFF	You do the four by two, and it should put us,

			uh, in business.
24		BRIAN	All right.
25		ROMINA	And then- because we'll compare it to all-
26		JEFF	If this comes through it just-
27		ROMINA	If it's Pascal's triangle it'll just give us problems.
28		JEFF	No but it- it's just nice how- you start- like when you start from nothing. You know what I'm saying? Like we have no clue what we're doing. [Putting his hand on his forehead and then waves his hand in the air by his forehead.]
29		ROMINA	But he even got twelve when he did it.
30		MICHAEL	I might be missing two.
31		JEFF	It could be- it's not hard to miss three, right? [Jeff waves his hand in the air.]
32		MICHAEL	Two.
33		JEFF	Three.
34		ROMINA	So for the next one Jeff we missed five?
35		JEFF	It's very easy. I mean, //there's a lot of things going on.
36		MICHAEL	//That's kind of a lot.
37		JEFF	We like blew like a lot of these. You know what I'm saying? [Waving his hand in the air and puts it back on his forehead.]
38		ROMINA	Yeah. I think we, uh, got every single one wrong so far.
39		JEFF	That's what I'm saying. So why- like it wouldn't be totally out of control. [Removing his hand from of his forehead and waving his hand toward the grid.]
40		BRIAN	Oh.
41	00:48:22	ROMINA	Do- do it the other way. Just turn it around. That'll make our life- that- because that's we did. It's the same thing but- [Brian writing rows of numbers silently, this time adding a 4 too.]

42	00:52:30	JEFF	All right. All right, what if we even went- let me know when you're done. All right. Because there's an easier way to [Inaudible]. Listen to me for one sec.
43		MICHAEL	Go ahead.
44		JEFF	All right. If- all right. Say in a situation where it's like, uh a two by four. [Drawing a two-by-four sub-grid on 1-centimeter paper.]
45		MICHAEL	Uh hum.
46		JEFF	All right. If we know that in a four-by-four [really meaning a two-by-two] it's six [shortest routes] if you figure out all the ways to get to the beginning parts of this, this would all just be six different ways to get from here to here. So you figure out all the ways to get there and you could just add six- you know. [Subdividing the two-by-four sub-grid into two two-by-two sub-grids.]
47		MICHAEL	If you have the two, you could find out how many ways to get to here and add that where every two is. [Leaning over to Jeff's paper and pointing.]
48		JEFF	You know what I'm saying? So like from- from-
49		BRIAN	I got fifteen.
50		JEFF	You did?
51		BRIAN	Yeah.
52		JEFF	All right. 'Cause from there to there you have six different ways. And then from there, there's one way. To there there's one way and from there- //
53		BRIAN	//Haaa. Tell me when you're done.
54		JEFF	Sure. one- two- there's three ways. Um-
55		MICHAEL	I got fifteen also.
56		BRIAN	Yeah Mike. [Inaudible]. [Leaving the room.]
57		MICHAEL	So what does that mean?

58		JEFF	It means that it is the triangle. Right here? [Pointing to paper]
59		MICHAEL	Mm hm.
60		JEFF	You have fifteen there?
61		MICHAEL	I got fifteen.
62		JEFF	That's good. Yeah, because then- Yeah. This- then in a three by three it should be twenty. That'll be, uh,- [Pointing to paper and writing a 6 in the lower right hand square.]
63		MICHAEL	Is nine blocks for that one? [Pointing to intersection point (6,3) on the transparency]
64	00:54:30	JEFF	In the nine block it should be twenty. [Jeff writes the numbers 1, 3, and 6 in squares vertically with two 3s to the left of the other 3.] [inaudible]
65	00:56:58	BRIAN	I got fifteen for this one-
66		ROMINA	For which one?
67		MICHAEL	//For-
68		BRIAN	//Four by two.
69		ROMINA	So you did get fifteen? So now it's working? And then the two by four has to be fifteen too. Now if we do three by three and that's twenty, then we're done.
70		BRIAN	That's what he's doing?
71		ROMINA	What?
72		BRIAN	He said he was off by two. [Romina erasing the numbers on the grid transparency then takes a new transparency with a grid on it.] You can just get another one.
73		ROMINA	I'll just turn this around. [Referring to the transparency of a centimeter grid. She then writes 2 and 3 in the squares of the first row of the transparency.]
74		BRIAN	It's only a couple of numbers.
75		ROMINA	I did it again. You got twelve for this one? Fifteen, I mean? [Rewriting the numbers on the

			grid and adds a 15 to the right of the 10 and under the 10.]
76		BRIAN	Yep. Now, what one are you expecting to be twenty? Three by three?
77		BRIAN	I guess I'll do it. Check it out.
78		ROMINA	I don't think- it's here- he has- He was just doing three by three wasn't he? [Looking through her papers.]
79		BRIAN	Yeah. It's no big deal.
80		ROMINA	I'm already stuck. [Brian drawing a three-by-three subgrid on his paper. Romina draws in shortest routes for the "imaginary" three-by-threes on her grid. Romina's pen stops when drawing a route.]
81		JEFF	You shouldn't be. Where you going?
82		ROMINA	Three by three. [Showing the paper to Jeff.]
83		JEFF	You said F making the- the boxes.
84		MICHAEL	Yeah, I got twenty for that one.
85		JEFF	For three by three?
86		MICHAEL	Yeah.
87		JEFF	All right well then- I mean can't we explain why we think- well- all right. [Waving his hand.]
88		MICHAEL	//They're going to ask us-
89		JEFF	//All right then the next question is why- //why
90		ROMINA	//Now-
91		MICHAEL	//How do you know-
92		ROMINA	//Just relate this back to the //blocks. [Pointing to the 1-centimer grid on the transparency with his marker.]
93		JEFF	//Wait- Why is this- why does the Pascal's triangle work for this is the question.
94		ROMINA	//Exactly. Relate it to the blocks.
95		MICHAEL	//Just think first how do you know it's twenty? You know, how do you know it's not nothing else?

96		JEFF	Well F that. If we could explain-
97		ROMINA	Stop saying that.
98		JEFF	Why- why this is the Pascal's triangle up to here [Pointing to the numerical array on the transparency 1-centimeter grid.], we don't need to explain how we're positive this is twenty. //You know what I'm saying?
99		ROMINA	How does it go- this is-
100		JEFF	One-
101		MICHAEL	It should be ones on all the sides. [Jeff writing ones on the outside lines of their numeral array on the transparency 1-centimer grid.]
102		ROMINA	Yeah right. So- [Writing out Pascal's triangle.]
103		JEFF	And that's six-
104		ROMINA	This is just one, two, three. //So-
105		JEFF	//What's that?
106		ROMINA	With one- //there's only one possibility.
107		MICHAEL	//All right, how- //how is he getting them?
108		ROMINA	//Two-
109		MICHAEL	How are you getting yours? Maybe the way you're doing will give us
110		JEFF	Has some kind of- Yeah, we can work something out.
111		BRIAN	[Inaudible].
112		MICHAEL	Do you just like- are you guessing or do you have some kind of pattern?
113		BRIAN	I'm just- doing it man. I'm just- you know-
114		MICHAEL	Ah- [Romina pointing to the numbers on her transparency with a marker.]
115		BRIAN	I know there's a way to make two and get there in two moves. I know there's a way to make it in three moves. Four moves.
116		MICHAEL	So you're going by the moves, right?
117		BRIAN	Yeah.
118		JEFF	Don't use that one.
119		ROMINA	Hold on. For the Pascal's triangle-

120		MICHAEL	Yeah.
121		JEFF	You're making thumbprints again.
122		ROMINA	The one, //two, one-
123		JEFF	//Bringing it back to eighty-six.
124		ROMINA	-that's with what? With?
125		MICHAEL	Um-
126		ROMINA	Two colors- It's, it's two to the *x* like that? [Pointing to the second diagonal "row" of the array of numbers on the 1-centimeter-square transparency, containing the numerals 1, 2, 1.]
127		MICHAEL	Yeah it's two.
128		ROMINA	So it's two colors-
129		MICHAEL	Think of it as zero, one, two- you only have two colors of choices - zero, one, two. Three
130		ROMINA	Huh
131		MICHAEL	Three toppings on a pizza.
132		ROMINA	Yeah, like- so then how could this- this is two what? Two? Two different ways- like- [Pointing to the top numbers on the transparency with her marker.]
133		MICHAEL	Two- Uh- it's the total. One, two, three- That's, that's the total length that you can get, have to get there- to get there. [Pointing at numbers on transparency with marker.]
134		ROMINA	Yeah, okay.
135		MICHAEL	You know?
136		ROMINA	So for this one, the total length is three.
137		MICHAEL	But then this one is one, two, three, four, five and you get ten. You know? [Pointing at the 6 on the transparency grid]
138		ROMINA	But you're in the second row. [Pointing at triangle]
139	01:02:23	MICHAEL	Yeah. [Romina taps her marker on the table.] Right. This is one, two, three- four, five, six and you get twenty. [Pointing at the 20 on the transparency grid.]

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