

<p><b>Description: Early Algebra Ideas About Binomial Expansion, Stephanie's Interview Two of Seven: Clip 4 of 6, Finding the area of the square with side (a+b)</b>  <b>Parent Tape: Early Algebra Ideas About Binomial Expansion, Stephanie's Interview Two of Seven</b>  <b>Date: 1996-01-29</b>  <b>Location: Harding Elementary School</b>  <b>Researcher: Carolyn A. Maher</b></p>	<p><b>Transcriber(s): Aboelnaga, Eman</b>  <b>Verifier(s): Yedman, Madeline</b>  <b>Date Transcribed: Fall 2010</b>  <b>Page: 1 of 5</b></p>
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Line	Time	Speaker	Transcript
1		R1	Okay, so you have here, if we've done this carefully, you have partitioned this square into four pieces.
2		Stephanie	Yes.
3		R1	Isn't that right? And, um, you know how to find the area of a square. How do you find the area of a square?
4		Stephanie	Multiply the two, the length and the width?
5		R1	Yeah. Or a rectangle, you know how to do that, right? So you should be able to find the area of each of these four pieces.
6		Stephanie	Yeah.
7		R1	Go for it! [ <i>Stephanie writes <math>ab</math> in the upper left rectangle, <math>bb</math> in the upper right square, <math>ab</math> in the lower right rectangle and <math>aa</math> in the lower left square.</i> ] Okay. So. What's the area of the square? The big one?
8		Stephanie	[ <i>Stephanie grunts.</i> ]
9		R1	The one you started with?
10		Stephanie	Um. $ab$ times $ab$ .
11		R1	No. What's the
12		Stephanie	Oh. $a$
13		R1	You've done four pieces.
14		Stephanie	plus $b$ times $a$ plus $b$ . Or
15		R1	I'm going to try my question again.
16		Stephanie	Okay.
17		R1	Let's go back to some of these other things. [ <i>sorts through some of the papers on the desk</i> ] Okay. When this was six and this was six
18		Stephanie	Um hm.
19		R1	You found the area inside, right?
20		Stephanie	Um hm.
21		R1	Which was what?
22		Stephanie	Um. Thirty-six. Or
23		R1	How did you get that?
24		Stephanie	How did I get that? I multiplied six times six.

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25		R1	You you really did. You didn't count them. I know you multiplied. You said six is the length of this side
26		Stephanie	Yeah.
27		R1	times the length of this side. And for this one you said the area was
28		Stephanie	Um. Sixteen.
29		R1	Because you took
30		Stephanie	I multiplied
31		R1	(inaudible) And this one you said the area was $a$ squared. Because you took
32		Stephanie	$a$ and I multiplied it by $a$ .
33		R1	Right? So. What's this side here? [ <i>can't tell which</i> ]
34		Stephanie	Um. $ab$ or $a$ plus $b$ .
35		R1	That's what you told me up in the other
36		Stephanie	Yeah. $a$ plus $b$ .
37		R1	Okay. Why don't you write $a$ plus $b$ on top of it, lest not we lose that idea. And what's the side here? [ <i>the left side</i> ]
38		Stephanie	$a$ plus $b$ .
39		R1	Okay. Okay. So
40		Stephanie	So it would be $a$ plus $b$ times $a$ plus $b$ ?
41		R1	Why don't you write that down? $a$ plus $b$ times $a$ plus $b$ . [ <i>Stephanie writes <math>a + b \cdot a + b</math></i> ] Don't you need some parentheses in there? [ <i>Stephanie inserts parentheses so it now reads <math>(a + b) \cdot (a + b)</math></i> ] Does it matter?
42		Stephanie	Mm. I don't know. Um. I guess it just tells you to do that first.
43		R1	Okay. We'll get back to 'do you need them?'
44		Stephanie	Yeah.
45		R1	in a minute. But it's you said $a$ plus $b$ times $a$ plus $b$ , right? Equals
46		Stephanie	Um hm.
47		R1	Put an equal. [ <i>Stephanie does.</i> ] Equals what? If I know the length of this side and I know the length of this side, what part will give me the area?

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48		Stephanie	What part will give you the area?
49		R1	Um hm. What's the area of that square?
50		Stephanie	In other words than $a$ plus $b$ times $a$ plus $b$ .
51		R1	Um hm.
52		Stephanie	Well, doesn't that go back to that? Then it becomes like, if $a$ plus, wouldn't it, wouldn't it just be um $a$ plus $b$ squared?
53		R1	Write that down. [ <i>Stephanie completes the algebra sentence: <math>(a + b) \cdot (a + b) = (a + b)^2</math></i> ] And why is it?
54		Stephanie	Because that's what it was before? Because it's um two $a$ 's and two $b$ ? Like there's two of each?
55		R1	Okay. So. $a$ plus $b$ . I'm not sure – you're not telling me $a$ squared plus $b$ squared. You're saying that this [ <i>points to <math>(a + b)</math></i> ] and this [ <i>points to <math>(a + b)</math></i> ] twice.
56		Stephanie	Yes.
57		R1	All right. But now in this picture, what part of the picture represents this [ $(a + b)^2$ ] piece? I know what part is $a$ plus $b$ . You told me that it's this side.
58		Stephanie	Like the whole thing?
59		R1	The whole thing.
60		Stephanie	Yeah. The whole thing.
61		R1	Okay. So this whole area is what this is equals. Let's write it out. What is the whole thing? You have pieces of it.
62		Stephanie	Um hm.
63		R1	So it's the whole thing. That means, this piece [ <i>the <math>a \cdot a</math></i> ]
64		Stephanie	and this piece [ <i>the top left <math>a \cdot b</math></i> ] and this piece [ <i>the <math>b \cdot b</math></i> ] and this piece [ <i>the bottom right <math>a \cdot b</math></i> ]
65		R1	Okay. So
66		Stephanie	All together.
67		R1	All together, when you
68		Stephanie	Yes.
69		R1	talk about things all together, what do you do?
70		Stephanie	You add them.
71		R1	You add them. So it's this piece, plus this piece, plus this

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			piece, plus this piece. [ <i>indicates the pieces in the same order as before</i> ]
72		Stephanie	You want me to add them.
73		R1	I want you to write this piece, plus this piece, plus
74		Stephanie	Okay.
75		R1	this piece, plus this piece, and not skip any steps. [ <i>Stephanie writes <math>a \cdot a + a \cdot b + b \cdot b + a \cdot b</math>.</i> ] You have four terms?
76		Stephanie	Yes.
77		R1	Okay. Let's simplify them. Equal
78		Stephanie	Just put it like back down here?
79		R1	Just put the equal underneath that and let's simplify.
80		Stephanie	All right.
81		R1	Is there another way you can write $a$ times $a$ ?
82		Stephanie	$a$ squared. [ <i>writes <math>a^2</math></i> ]
83		R1	Okay.
84		Stephanie	Plus it could be $b$ squared, 'cause there's a
85		R1	Put that at the end.
86		Stephanie	Okay. So $a$ squared plus $ab$ (inaudible) plus $b$ squared. [ <i>writes <math>a^2 + a \cdot b + a \cdot b + b^2</math></i> ] And you can simplify that. Couldn't it be $ab$ squared?
87		R1	Okay. So what you have here: $a$ squared plus $ab$
88		Stephanie	Yeah.
89		R1	plus $ab$
90		Stephanie	Um hm.
91		R1	plus $b$ squared.
92		Stephanie	Yes. That would be two $ab$ or
93		R1	You have $ab$ and you have another $ab$
94		Stephanie	Yes.
95		R1	so you have two $ab$ , so write that down.
96		Stephanie	$a$ squared plus two $ab$ plus $b$ squared. [ <i>writes: <math>a^2 + 2ab + b^2</math> while speaking; pause</i> ]
97		R1	Hm. What did you just do?
98		Stephanie	I um simplified it?
99		R1	Okay. So what is this $a$ squared plus two $ab$ plus $b$ squared

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			represent?
100		Stephanie	This. [ <i>puts her hand over the (a + b) square</i> ]
101		R1	The area of the square?
102		Stephanie	Yes.
103		R1	With what side? What length side? [ <i>pause</i> ]
104		Stephanie	Well, it represents like the area of the square.
105		R1	This, what particular square? What is the length of the side of that square?
106		Stephanie	Oh. <i>a plus b</i> .
107		R1	<i>a plus b</i> . Now. <i>a plus b</i> is the length of the side.
108		Stephanie	Um hm.
109		R1	The area you told me in simplified form – you said the area is <i>a plus b</i> quantity squared.
110		Stephanie	Um hm.
111		R1	But didn't we start this whole visit here
112		Stephanie	With (inaudible)
113		R1	to try and figure out what <i>a plus b</i> quantity squared meant?
114		Stephanie	Yes.
115		R1	And now you're telling me it's <i>a</i> squared plus two <i>ab</i> plus <i>b</i> squared.
116		Stephanie	[ <i>hesitantly</i> ] Yeah.
117		R1	Why don't we test these with the numbers you tested before as a start for some numbers. We're getting so organized here, Lynda. I know you're disappointed in me with numbering pages. [ <i>chuckles</i> ]