

<b>Description: Fraction problems: Sharing Candy Bars (Front View)</b> <b>Parent Tape: Fraction problems: Sharing Candy Bars (Front View)</b> <b>Date: 1993-10-29</b> <b>Location: Colts Neck Elementary School</b> <b>Researcher: Professor Carolyn Maher</b>	<b>Transcriber(s): Yankelewitz, Dina</b> <b>Verifier(s): Reid, Adrienne, Farhat, Marcelle</b> <b>Date Transcribed: Spring 2009</b> <b>Page: 1 of 21</b>
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Line	Time	Speaker	Transcript
1.	5:32	T/R 1:	Well, good morning. [students Good morning] What did you do yesterday in math? [students raise hands] Ah, All these people are going to tell me. Amy,
2.		Amy:	We did, we figured out the chocolate, we divided chocolate.
3.		T/R 1:	Oh. Did you all agree?
4.		Students:	Yeah.
5.		T/R 1:	You agreed! Was that an easy decision?
6.		Andrew:	Yeah.
7.		T/R 1:	No discussion, or, or differences?
8.		Andrew:	Well, a little
9.		T/R 1:	How did that work.
10.		Andrew:	Well, we um like divided us into groups, the class into groups and um, and our, in my group, there was like nine people, so each person got like, um one and one ninth.
11.		T/R 1:	How did you decide that? How much did you have to start with?
12.		Andrew:	We had uh ten pieces.
13.		T/R 1:	Ten pieces. I see, how did you do one and one ninth? I'm curious.
14.		Andrew:	Well, we um, we said there was nine people, so we had to give a whole piece of candy to each person and then we had one left over so we would have to, and there's nine people, so if we divided it into ninths there would um be enough, for everyone.
15.		T/R 1:	Is that hard to do?
16.		Andrew:	Yeah, a little.
17.		T/R 1:	But you did it?
18.		Andrew:	Yeah.
19.		T/R 1:	And you all felt good about it?
20.		Graham:	Yeah.
21.		T/R 1:	Oh, and you were in that group too, Graham, huh?
22.		Graham:	Yeah.
23.		T/R 1:	What about another group? What did another group do? You were in a different group? Jessica, what did you do?
24.		Jessica:	Well, my group, we like had uh, eight people in our group, so well, we each got one whole piece and then we had two pieces left over so then we divided each of the two pieces into fourths.

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25.		T/R 1:	And, so, how, how much did each person get?
26.		Jessica:	One and one fourth.
27.		T/R 1:	You got one and one fourth. Did you all think that was fair, in that group? [mmm hmmm] Did the people in Andrew's group get the same amount as the people in Jessica's group? [no] Who got more, the people in Andrew's group or the people in Jessica's group? Michael?
28.		Michael:	The people in Jessica's group.
29.		T/R 1:	The people in Jessica's, now, of course I could ask you how much more, you think you could you figure that out? You don't have to tell me that right now.
30.		Michael:	Yeah
31.	7:53	Meredith:	Yeah, if we got one ninth and they got one fourth, then um, nine minus four equals five, so they got um one fifth bigger, than we...
32.		T/R 1:	Say that again?
33.		Meredith:	See, um, we had, each of us had one and one ninth.
34.		T/R 1:	Let's see, let's see, Andrew's group had nine people, right? Each person,
35.		Andrew:	Got one and one ninth
36.		T/R 1:	And in Jessica's group, eight people and each person got, you said,
37.		Jessica:	One and one fourth
38.		T/R 1:	One and one fourth.
39.		Meredith:	And
40.		T/R 1:	And so, you're telling me,
41.		Jessica:	But there was another group.
42.		T/R 1:	Maybe we'll hear about the other group and we'll come back to this, but I also didn't want to lose what Meredith said, what Meredith said was the people in Jessica's group got more than the people in Andrew's group. [Meredith laughs] and I, I kind of asked how much more
43.		Meredith:	Nine minus four equals five so they got one fifth more.
44.		T/R 1:	So you're claiming, this is Meredith's claim
45.		Meredith:	Yeah.
46.		T/R 1:	[writing on overhead transparency, figure 10-29-01] That each person in Jessica's group got how much more did you say Meredith? Got one fifth more than each person in Andrew's group. How many of you believe that? [all students raise hands]. Ok, you're gonna have to then convince me. But we'll let that hold for a minute. But who's the other group? [there was three groups] Ok, who was, who was in a different

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			group? A group other than Andrew's and Jessica's group? Kimberly? Ahah. How many in your group, Kimberly?
47.		Kimberly:	There, we each got one and one fourth.
48.		T/R 1:	How many people in your group?
49.		Kimberly:	Eight
50.		T/R 1:	Eight people? And in your group got
51.		Kimberly:	One and one fourth.
52.		T/R 1:	One and one fourth. So the people in Jessica and Kimberly's group, right? You're claiming got more. And the difference you claim is
53.		Kimberly:	Five, one fifth.
54.		T/R 1:	Wow, that's a good question. I don't know you got one fifth. Um, it's sort of like saying to me, if I got a half, and Amy got a quarter, right? Who got more? I got more, right? I got a half, ok, and Amy got a quarter, but by your theory, you would tell me that I got, how much more?
55.		Students [including Meredith]:	One fourth
56.		T/R 1:	But you would have told me a half more, think of the way you did that problem.
57.		Meredith:	Oh
58.		T/R 1:	Is that right, Meredith? Right? Did I get a half more [Meredith laughs]. You all know I didn't get a half more. I got how much more?
59.		Meredith:	Oh.
60.		T/R 1:	A quarter more. But if I used your method of figuring out how much more I'd be subtracting the four and the two, and I'd end up with a half more. That sort of doesn't make sense, does it? You still believe that it's a fifth more for sure? How many of you are not so sure? Not so sure [all students raise hands] It's a good question. Hmmm, I don't know. Well, we ought to keep this question in mind and uh, we ought to try to answer it, don't you think? Ok? I guess maybe another way to ask that question might be, might be what? You tell me what you think the question is. What are the fractions that are of interest in this problem? What decides who got more, the people in Andrew's group or the people in Jessica and Kimberly's group? Meredith?
61.	12:40	Meredith:	I know that Jessica and Kimberly's group got more than Andrew's group did.
62.		T/R 1:	We know they got more, right?

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63.		Meredith:	Right.
64.		T/R 1:	And what number tells you?
65.		Meredith:	Well, um, if they, uh, one fourth, and one rod was like, the one rod, and you had ninths and you had fourths, if you had the fourths they would take
66.		T/R 1:	You're talking about ninths and fourths, is that right?
67.		Meredith:	Yeah.
68.		T/R 1:	You all agree that it's ninths and fourths that's at issue here? And it's not the one piece? So let's focus on the ninth, right, and let's focus on the fourth. So which one you're claiming is bigger?
69.		Students:	The one fourth.
70.		T/R 1:	The one ninth is smaller
71.		Students:	Yeah.
72.		T/R 1:	Did you ever see that symbol, smaller than? [Figure 10-29-02]
73.		Students:	Yeah
74.		T/R 1:	One ninth is smaller than one fourth? Ok? So I'm sorry, Meredith.
75.		Meredith:	And, um, if you take a one rod and you divide it into ninths and fourths, the fourths are going to be larger because they're less. So they're going to be larger. So each person is going to be getting a larger piece.
76.		T/R 1:	Ok, so you've convinced me that if I could imagine a rod that I call one, and I imagine four pieces and I think of one of those pieces, that's going to have what number name?
77.		Meredith:	Fourths.
78.		T/R 1:	And if I take that same rod and imagine nine pieces, one of those pieces will have the number name.
79.		Meredith:	Ninths.
80.		T/R 1:	One ninth. And you could imagine in your head without the rods you're telling me that the one ninth is, that the one fourth is
81.		Meredith:	Bigger than
82.		T/R 1:	Bigger than the one ninth, or the one ninth is smaller than the one fourth. The question I'm asking is the difference one fifth? Now, could you imagine the fifth rod, what that looks like?
83.		Meredith:	Um, I think it would be the yellow rod, I'm not sure, I think it was the yellow rod that was the fifth.
84.		T/R 1:	Whatever you're thinking, but you could imagine a fifth, you could imagine a fourth, you could imagine a ninth, and do you imagine in your head, my question, do you imagine in your head that the, if you'd

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			compare the one fourth rod and the one ninth rod, the difference would be the one fifth rod, do you think that, does that make sense to you, as you're imagining this in your head?
85.		Meredith:	Ummm, if you put the four and the five together it would equal up to the ninth rod.
86.		T/R 1:	You think so? [mmm] I think we ought to get out the rods.
87.		CT:	Yeah.
88.	15:09	T/R 1:	I think we ought to get out the rods, what do you think? How many of you want to work on this? How many of you want to know how much more the people in Andrew's and Je- uh, Andrew's group, uh Jessica's group and Kimberly's group got than the people in Andrew's group. [Students raise hands, Dr. Landis enters with rods] Can somebody tell Dr. Landis the problem because she doesn't know any of the story of any of what happened and how this all came to be, could someone be so kind as to tell Dr. Landis the whole story? Kimberly do you want to give it a try? Dr. Landis? Do you want to hear what's going on?
89.		Dr. Landis:	I do want to hear it, yes!
90.	15:46	Jessica:	It's not, it's not going to be an orange
91.		Andrew:	I'm going to make a whole model
92.		Jessica:	It's a yellow, that's a fifth, you don't have to make a whole model.
93.		Andrew:	To figure it out you do. Here's fourths and ninths would be one two three [Andrew's model is an orange and red train, and four light green rods, Figure 10-29-03]
94.		Jessica:	Well that's ninths, cuz it's sixths [Jessica's model is a yellow rod and four white rods, Figure 10-29-04]
95.		Andrew:	What are you doing?
96.		Jessica:	Nothing. [Andrew lines up six red rods, Figure 10-29-05]. This one doesn't show ninths
97.		Andrew:	Gotta make it bigger. Orange and a purple
98.		Jessica:	You do? You have to make it bigger if it doesn't work? Now I need the green.
99.		Andrew:	I need the purples.
100.		Jessica:	I need the purples. [Jessica makes an orange and purple train, first places green rods, then removes them, Figure 10-29-06]
101.		Andrew:	I have to make even bigger!
102.		Jessica:	Wait, first you make it small
103.		Andrew:	Let's try two more bigger. How about the brown, that's good

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104.		Jessica:	Look you can make it like this. And then you have it, look. Andrew.
105.		Andrew:	I don't want to hear it.
106.		Jessica:	Well, it's the same thing as the greens, I think it is. Yeah it's the same thing. Could I have another box? Ok.
107.		Andrew:	One, two, three, four, five, six, seven, eight. [Andrew has built an orange rod next do a dark green rod with eight red rods beside it, Figure 10-29-07] No! Ahh. I'm gonna die! I am really, really, really, really gonna die. You know how far I've gotten up to?
108.		Jessica:	Look at this purple, it looks red. No it doesn't.
109.	19:15	Andrew:	Make it go smaller. We need to do something smaller
110.		Jessica:	This is working, I know what I'm going to do. Like this is more than nine, oh reds.
111.		Andrew:	I can't find the fourths. Maybe these are fourths.
112.		Jessica:	Five, six, seven, eighths, ninths, didn't work.
113.		Andrew:	I have ninths, I have thirds. If there's thirds, there has to be fourths, but I cannot find fourths. [Andrew has an orange next to a brown, nine red rods, and three dark green rods, Figure 10-29-08]
114.		Jessica:	These don't work. There's a million purples. Oh, you just have to add a red.
115.		Andrew:	I'm just doing two oranges and a brown. I've had it!
116.		Jessica:	You're not going to get, oh yeah, you are.
117.		Andrew:	I want fourths. Fourth is going to be the browns. One, two
118.		Jessica:	Fourths. How do you come up with fourths?
119.		Andrew:	Three, four.
120.		Jessica:	Three four
121.		Andrew:	Yes! I have fourths. Fourth are
122.		Jessica:	Brown
123.		Andrew:	No
124.		Jessica:	Blue
125.		Andrew:	No
126.		Jessica:	It could be blue, no
127.		Andrew:	Black. Fourth are blacks. One two three. There's the fourths. [Andrew has two orange rods and a brown rod, with four black rods next to it, Figure 10-29-09] Now, I'm going to find the ninths.
128.		Jessica:	Ninth I think I know what the ninths are
129.		Andrew:	Two four six eight. Four, oh thanks a lot, Jessica. You could use reds to substitute the ninths.
130.		Jessica:	These are one, two three four, these are sevenths. [laughs]

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131.		Andrew:	Oh, good, give me those two in your hand
132.		Jessica:	I need 'em I'm trying something
133.		Andrew:	You don't need 'em
134.		Jessica:	Ok, one. I'm trying to see something.
135.		Andrew:	What are they? Come on, I'll find out for you. Just, fine, have it your way.
136.		Jessica:	If I put reds that's fourteenths.
137.		Andrew:	Do I care? Sevenths, one two three four five six seven. And two more of these, is four of these, and a half, a half, a half
138.		Jessica:	One two three, four, fifths, sixths
139.	23:19	T/R 2:	How's it going? I'm sort of watching what you're doing. What have you tried here?
140.		Andrew:	Well we've tried
141.		Jessica:	Eighths, oh I think I've
142.		Andrew:	like um
143.		Jessica:	got it.
144.		Andrew:	We've tried making models
145.		Jessica:	We're trying to make one model that has
146.		Andrew:	Fourths and
147.		Jessica:	And ninths
148.		Andrew:	Ninths
149.		T/R 2:	And what have you tried? What are some of the things you've tried to call one?
150.		Andrew:	Well we tried to call this one, [orange and red] this [orange and purple,
151.		Jessica:	I think I've got it.
152.		Andrew:	this, and now we're working on this.
153.		T/R 2:	Oh, that's interesting. Ok.
154.		Jessica:	I got, I th- I just got, I thought I got ninths here, the light green, but then I counted one two three four five six seven eighths ninths, and then I have that little space. [Jessica has two orange rods and a brown rod next to four black rods and nine light green rods, Figure 10-29-10]
155.		T/R 2:	Something hanging over there, ok.
156.		Andrew:	So then it's going to be impossible. So then you need
157.		T/R 2:	So you have a plan? What are you going to try next?
158.		Jessica:	Oh, purples. No but I did.
159.		Andrew:	Cut this [the brown rod that is part of the two orange and one brown train] in half this is a purple

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160.		Jessica:	I can add
161.		Andrew:	So let's try a purple
162.		Jessica:	And then put browns there maybe, wait, yes. It's working. Then I could put browns there.
163.		T/R 2:	Ok, I'll let you experiment some more. Let me know if you come up with one that works, ok?
164.	24:41	Jessica:	Ok, so I think I got one. That
165.		Andrew:	How about just two oranges
166.		Jessica:	I'm doing two oranges, a brown, and a white.
167.		Andrew:	Fine.
168.		Jessica:	And I think it's working, wait
169.		Andrew:	Of course it's, oh no it's not going to work
170.		Jessica:	Oh it's not working. [laughs] I just add something every time. Brown, oh it didn't work. Just do two oranges.
171.		Andrew:	Maybe I can find fifths.
172.		Jessica:	I found fifths. Fifths are um purples.
173.		Andrew:	Six [Andrew's model is two orange rods, four yellow rods, and six green rods, Figure 10-29-11] eight nine
174.		Jessica:	Fourths, I think, what are ninths? Maybe greens, are greens ninths?
175.		Andrew:	No.
176.		Jessica:	You added something? I'm just going to take the greens away and try to get ninths.
177.		Andrew:	I found fifths.
178.		Jessica:	I found fifths and fourths
179.		Andrew:	No, no I didn't find fifths.
180.		Jessica:	Fifths are um, purples
181.		Andrew:	Ok.
182.		Jessica:	Ninths. Reds.
183.		Andrew:	I think, no I can't
184.		Jessica:	Oh you can make like two reds one.
185.		Andrew:	So
186.		Jessica:	So then you could do it.
187.	27:20	Andrew:	It's not working. Let's try four oranges
188.		Jessica:	One, two, three, four, five. Fifths. I have two fifths. [Camera goes to James, who has nine purple rods in a row and is trying to match other colors to be the same length, Figure 10-29-12]
189.		Andrew:	I'm just doing an old problem that we made like a year ago.
190.	27:46	T/R 1:	What are you trying to do, Andrew and Jessica? That's interesting.



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191.		Both:	We're trying to figure out
192.		Jessica:	We're trying to figure out a problem that has both of them in it
193.		T/R 1:	That has both of what in it?
194.		Jessica:	Like, um, both one ninth and one fourth.
195.		T/R 1:	Very good.
196.		Jessica:	And we got one fourth
197.		T/R 1:	Ok
198.		Jessica:	We got one fifth and we still, we need one ninth. And I was just trying to count that as one, then one, and one.
199.		T/R 1:	Ok, so that's what you're working on. Ok that's a good thing to work on
200.		Jessica:	And one and one, but that doesn't work, that's this again.
201.		T/R 1:	Ok, ok. Good
202.		Andrew:	One fourth, two fourths,
203.		Jessica:	You're doing that one again? This doesn't work.
204.		Andrew:	Back to the old biggies.
205.		Jessica:	How many oranges was that? Four.
206.		Andrew:	I need. Yippee. Fourths
207.	29:08	Dr. Landis:	Andrew, what are you doing?
208.		Jessica:	It's not working. We're building
209.		Andrew:	I made like this um big model
210.		Jessica:	A long time ago so we're trying it again
211.		Andrew:	A long time ago, I'm trying it again because I want to figure out how much is one ninth, how much is one fourth bigger by, bigger than one ninth.
212.		Dr. Landis:	Ok, ok.
213.		Jessica:	Is there a brown there?
214.		Andrew:	I have the fourths, two of these equal a fourth. [Andrew has four oranges and two purples in the model, and he has six browns lined up next to it, Figure 10-29-13] Two browns I'm putting together and they're fourth. So now
215.		Dr. Landis:	Say that again. Two browns, what are you doing?
216.		Andrew:	Two browns
217.		Dr. Landis:	Yeah

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218.		Andrew:	Like two browns are the fourths, and I remember that I put two of these together, they would be the thirds
219.		Dr. Landis:	Right
220.		Andrew:	So I have thirds but I don't need thirds
221.		Dr. Landis:	Uh huh
222.		Andrew:	These two are one fourth
223.		Dr. Landis:	Oh I see
224.		Andrew:	So how many fourths do you have there?
225.		Andrew:	One two three, I need one more. Two more
226.		Jessica:	We need a lot more browns
227.		Dr. Landis:	Do you think maybe, you're running out of rods, do you think if you work together to build one model that would help?
228.		Jessica:	Yeah 'cause we're running out, I need a lot more.
229.		Andrew:	I need
230.		Jessica:	We have like three boxes
231.		Dr. Landis:	Oh, you have another box? Oh. But it doesn't have the colors? Do you want another box to work separately or do you want to build the same model?
232.		Jessica:	Well, we're building the same one
233.		Dr. Landis:	Ok, I mean do you want to work together to build one model or do you want me to get you some more rods so you can get your own?
234.		Jessica:	Oh there's bags of rods over there.
235.		Dr. Landis:	There are more? Ok.
236.	31:18	Jessica:	[Comes back with rods] I got one
237.		Andrew:	Oh my, I have no browns left. I found a brown! It has beads in it.
238.		Jessica:	I know
239.		Andrew:	You could have just got a bag.
240.		Jessica:	Well this has a lot, the others didn't have any browns.
241.		Andrew:	These were the fourths. Done with that! Done done done!
242.		Andrew:	Yeah I don't need any more.
243.		Dr. Landis:	You have enough, ok?
244.		Andrew:	The browns were the thirds.
245.		Jessica:	Oh the browns were the thirds.

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246.		Dr. Landis:	Do you have enough of what you need to?
247.		Jessica:	Um, yes.
248.		Dr. Landis:	Ok.
249.		Andrew:	Now I need greens.
250.	32:43	Dr. Landis:	You said you needed some more of these colors
251.		Andrew:	Thank you
252.		Dr. Landis:	I'll leave it here.
253.		Jessica:	Ok. Andrew, can you put this on the other side of the desk.
254.		Dr. Landis:	What you can do is you can put this in here and that way you won't have so many containers. How's that? You want to get rid of this?
255.		Jessica:	Um yeah, we don't need one.
256.		Andrew:	Green in half [inaudible]
257.		Jessica:	It didn't work, purples, four browns, three browns and a purple it was.
258.		Andrew:	Three browns and a purple? It was two purple
259.		Jessica:	Oh yeah, something and two purples. Like three oranges and two purples it was
260.		Andrew:	Two purples, two purples equals one brown. And that's not equaling up.
261.		Jessica:	Yeah but that is only three oranges.
262.		Andrew:	Oh!
263.		Jessica:	Does that make sense?
264.		Andrew:	That's why! You took it off.
265.		Jessica:	That was mine
266.		Andrew:	Hey that was mine.
267.		Jessica:	Here's another one.
268.		Andrew:	Oh. Let's move it down this way.
269.		Jessica:	Purples... it was four and two purples, right?
270.		Andrew:	Four and one brown
271.		Jessica:	Or two purples
272.		Andrew:	Or two purples. Just making it look smaller. This doesn't work anyway. It works.
273.		Jessica:	I have no clue.
274.		Andrew:	Alright, we needed sixths, fifths.
275.		Jessica:	Fifths. Um, one two three fourths, um now it's browns.

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276.		Andrew:	Why would browns be fifths?
277.		Jessica:	I don't know.
278.		Andrew:	Regular browns?
279.		Jessica:	What are browns gonna be?
280.		Andrew:	Maybe, maybe.
281.		Jessica:	One
282.		Andrew:	Hey you're taking out of my bin. One, two, three four
283.		Jessica:	Ok, browns are thirds.
284.		Andrew:	Five. No they're not.
285.		Jessica:	Yeah they are.
286.		Andrew:	I'm not counting by two. Count by ones.
287.		Jessica:	Six
288.		Andrew:	Count by ones.
289.		Jessica:	One two three four five six seven eight
290.		Andrew:	Ones
291.		Jessica:	I am.
292.		Andrew:	One two three four five
293.		Jessica:	Six. Ok, so
294.		Andrew:	I can't figure this out.
295.		Jessica:	One two three four five six
296.		Andrew:	We did have sixths
297.		Jessica:	Seven eighths,
298.		Andrew:	We did have twelfths
299.		Jessica:	One two three four five six. Because we were counting by two as one.
300.		Andrew:	Did we have tenths?
301.		Dr. Davis:	Carolyn, you want to bring the mike?
302.		Andrew:	Did we have tenths.
303.		Jessica:	Tenths? Yes reds.
304.		Andrew:	Reds were tenths.
305.		Jessica:	No green. No purples. Purples [mike moves to James]
306.		:	[most of this conversation is inaudible]
307.	38:00	James:	I took the ninths [purples] and yellows So I worked out like this. [inaudible] is bigger than one ninth.
308.		Dr. Davis:	Oh, so what's the answer?
309.		James:	Five whites equal up to a blue and the ninth is the purple and the blue
310.		Dr. Davis:	So the blue is one fourth and the purple is one ninth?
311.		James:	Yeah.
312.		Dr. Davis:	What's the white rod? [inaudible] What you call this?

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313.		James:	Uh, one thirty-sixth.
314.		Dr. Landis:	One thirty-sixth, he said. One thirty-sixth.
315.		:	[another mike is brought over]
316.		Dr. Davis:	Can you explain that again?
317.	39:50	James:	Ok, first I tried nine yellows, and I tried to equal up the orange with the nine yellows, four oranges to equal the nine yellows, and the oranges were too small, so then I put nine purples right here, and then I put this [holds up orange rod] at a lower level in size, and then I took blues, and that equaled up to the nine purples. Then I just had to make a whole and my whole right now is three oranges and a dark green. [Figure 10-29-14]
318.		Dr. Davis:	Alright, that's very nice. And so the white rod is?
319.		James:	One, uh, thirty-sixths. They equal five
320.		Dr. Davis:	And what did you do over here? [pointing to model with a blue rod next to five white rods and a purple rod]
321.		James:	Well, I, I just think that the blue is bigger than the purple by one fifth cuz it takes five whites to equal up to the blue, the one fourth.
322.		Dr. Davis:	Now, let me get this straight. The purple rod is, what name do you give to that?
323.		James:	One ninth.
324.		Dr. Davis:	One ninth, I understand that because nine of them are as long as your [inaudible]
325.		James:	Uh huh.
326.		Dr. Davis:	And what name do you give this?
327.		James:	One fourth because there are four.
328.		Dr. Davis:	One fourth, and what name do you give to the white rods?
329.		James:	One thirty-sixths.
330.		Dr. Davis:	So, then, how much is this? This, this [one of the white rods from the difference model] would be how much?
331.		James:	One thirty-sixth
332.		Dr. Davis:	This would be how much? [adds another white rod]
333.		James:	Two thirty-sixths
334.		Dr. Davis:	Yeah.
335.		James:	Oh, so it's five thirty-sixths.
336.		Dr. Davis:	Sounds right to me. Ok, so you can say did you solve that problem that you set out to do? Say what the problem was again, ok?

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337.		James:	Um, how much bigger is one fourth than one ninth?
338.		Dr. Davis:	Yeah. And your answer is?
339.		James:	Five thirty-sixths.
340.		Dr. Davis:	I think that's gorgeous.
341.		Dr. Landis:	Yeah, I'm impressed too.
342.		T/R 1:	Can you write that up on an overhead for me and draw a picture, James?
343.		James:	Uh, yeah.
344.		Dr. Davis:	Thanks.
345.	42:35	Andrew:	Yes, it fits
346.		Jessica:	But how do you make ninths? With um
347.		Andrew:	Easy, you get a four. Anything but ninths. Hmm [Andrew's model is two orange rods, with four yellow rods beside it] ninth would be
348.		Jessica:	The fifth would be green, right?
349.		Andrew:	Yes it is. [Andrew places down light green rods, Figure 10-29-15]
350.		Jessica:	One two three four five six seven.
351.		Andrew:	We need something, how about red?
352.	43:53		[camera moves to Kelly's desk with a model identical to James' - inaudible]
353.		Kelly:	We know what it is [some talk about copying]
354.		Jessica:	It's for the ninths and the fifths
355.		Erik:	One two three four five six
356.		Michael:	One two three four five six seven eight nine.
357.		Erik:	Wait, one two, I don't like you. One two three four five six seven eight nine one two three four not fair
358.		Michael:	We almost solved that, me and Erik were right at the edge of it, and then we sort of went into space with another idea.
359.		Erik:	[some nasty comments]
360.		Meredith:	Do you have any one rods?
361.		Graham:	Yes.
362.		Meredith:	If you called them, if you made a new model and made them halves, and then
363.		Michael:	Graham you know, can I just use
364.		Graham:	We don't need these, we don't need these
365.	48:41	T/R 1:	How is this model related if at all to these models?
366.		Michael:	I don't know... Oh!
367.		Erik:	Well they don't have fifths, and they don't have this.

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368.		T/R 1:	No, they don't.
369.		Michael:	They have ninths - like that! One two three four five six seven eight nine.
370.		T/R 1:	They're comparing ninths and fourths, Meredith, why do they need fifths. Your theory is they need fifths. Now they're comparing ninths, this is fourths, right? [Lays down blue rod] And this is ninths, is that correct? [Lays down purple rod]
371.		Graham:	Yeah [Figure 10-29-16]
372.		T/R 1:	You're comparing fourths and ninths and it's this, ok? [Graham hands teacher the yellow rod, and she shows that the yellow and purple are the same length as the blue rod]
373.		Meredith:	It's my method
374.		T/R 1:	Well, so what number name are you going to give this? [Talking about the yellow rod]
375.		Graham:	This?
376.		T/R 1:	Wait a minute, let me see what you have here. This is one two three four and this is one two three four five six seven eight nine.
377.		Graham:	What, the white ones? What would we give the white ones?
378.		T/R 1:	You're saying how much is the difference? Do you have any more white ones? Can you get some or borrow some? Ok, let's see. Meredith?
379.		Kelly:	It's bigger by one fifth because you see. [Points to blue rod with one purple and five whites next to it]
380.		T/R 1:	What number name is this?
381.		Graham:	Thirty-fifths, one thirty-fifth.
382.		T/R 1:	Thirty-fifths.
383.		Graham:	Yeah. [T/R 1 straightens out model, Figure 10-29-17]
384.		T/R 1:	One two three four five six seven eight nine. And how many of them are there here? Counting? [Graham counts]
385.		Graham:	Thirty-six.
386.		Meredith:	What?
387.		Graham:	Thirty-six.
388.		Voice:	Thirty-six?
389.		Graham:	Yeah.
390.		Voice:	So what would that white one be?
391.		Graham:	One thirty-six. Ok, he's right.
392.		T/R 1:	So what do you have here? What did you come up with, Kelly?
393.		Kelly:	One thirty-sixth.

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394.		T/R 1:	How many? What's the difference?
395.		Graham:	Well there are thirty-six.
396.		T/R 1:	There are thirty-six of these?
397.		Graham:	Yeah, the whites.
398.		T/R 1:	And what's the difference between the two? How many of the thirty-sixths?
399.		Graham:	Five.
400.		T/R 1:	So the difference between one ninth and one quarter is how much?
401.		Graham:	Five
402.		Kimberly:	Thirty-sixths.
403.		T/R 1:	Five thirty-sixths.
404.		Meredith:	And one fifth.
405.		T/R 1:	Well, where's the one fifth?
406.		Meredith:	Well, if you had one
407.		Kelly:	There's no one fifth.
408.		T/R 1:	Do you think that, do you think this is five thirty-sixths, if you could imagine one fifth in here,
409.		Meredith:	Yeah, uh huh.
410.		T/R 1:	Right? You could imagine one fourth, it's the blue, right? Is this one fifth?
411.		Meredith:	Uh...
412.		T/R 1:	If it were one fifth.
413.		Graham:	It would be too big.
414.		T/R 1:	[places five yellow rods down, <a href="#">Figure 10-29-18</a> ] Would that would be one fifth? Is that big enough to be one fifth?
415.		Kelly:	I don't think it's one fifth.
416.		Meredith:	Well it does have five here [places a yellow rod on the five white rods, <a href="#">Figure 10-29-13</a> ]
417.		T/R 1:	It's this length but this has the number name, what, the yellow has what number name?
418.		Students:	Five thirty-sixths
419.		T/R 1:	Five thirty-sixths. Not one fifth, right?
420.		Meredith:	Uh huh.
421.	53:33	T/R 1:	Think about what is causing the difficulty, ok, Meredith? [to class] Ok, is this a good time maybe to pull together for a few minutes and do some sharing? [no] Is this a good time? [to Kelly] Keep your model here. [to class] Ok. Is it possible, can, can I have your attention



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			for a minute, we have a little bit of extra time thanks to Dr. Landis, uh, she's given us a little extended time, but we have some interesting ideas here and I think it's really important to share our ideas, I see some wonderful models another model here, right, with, um, Mark and Audra, right? You have another model. I guess, um, I was very interested in listening to your ideas as I walked around and I heard um our, does anyone, did anyone change their mind what they thought the difference between, uh, one quarter and a ninth were? Did anybody change their mind? Some of you changed your minds? How many of you still aren't sure about that difference [some students raise their hands]. Ok, so, so we had a theory, let's call it Meredith's theory, but she may have changed her mind she may not have, but Meredith's theory seems to suggest that if you wanted to find the difference between one fourth and one ninth that it's one fifth. That was the theory that we were testing, right? Now, if you used that same theory and I asked you what the difference was between one quarter and a third, and you applied that theory, what would you have said the difference was between a quarter and a third?
422.		Meredith:	A quarter and a third?
423.		T/R 1:	Using that same theory.
424.		Meredith:	A quarter and a third would be, well, how big would the third be.
425.		T/R 1:	Ok, well one of the gentlemen here who have built the models up here, can you all kind of listen for a minute to what Michael and Erik and um James have built
426.		Students:	James?
427.		T/R 1:	I'm sorry, not James, David.
428.	56:12	Michael:	Um, uh, well, what me and Erik, me and Erik started building models like these [Figure 10-29-20] to try and help us figure out how to one fourth and one ninth, and Dr. Ma- and um, and then we were on the edge of trying to find it out and then we had another idea we started just we lost the idea of that was that we had before and
429.		T/R 1:	Do you want to tell us what that idea was?
430.		Michael:	Well, that idea was, try to get, try to um find the number and divide, and, um, divide it and see if it equals nine, then you've got a ninth, but we found that every single one that we tried there wasn't a fourth if there was a ninth, and if there was fourth there wasn't a ninth. So, um, we, we, um, we decided to try a new idea it turns out when we, uh, when we tried the new idea, the first time we tried it we were wrong.
431.		T/R 1:	What was that new idea?

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432.		Michael:	Well, I don't really remember what we were thinking.
433.		T/R 1:	Was it the odd and even?
434.		Michael:	Yeah, I think so, yeah, what I also figured, um, is that you, it's so hard, like if you had you had to make a model with one fourth and one eighth in it, we could make a ton of them, but it's hard to make a model that has an odd number, which is one ninth, and a even number, which is one fourth. So I figured that that was really hard and there was only like two models or so of it and it was really hard to find you would have to make trains or something like that.
435.		T/R 1:	Ok, so where did that leave you. You told me there couldn't be any models when you had an odd and even.
436.		Michael:	I know. But then we figured that it had to be, because there was no other way to do it.
437.		T/R 1:	But you built two models here and you're comparing fractions where, you have an odd and even number on
438.		Michael:	Well, I didn't really, I was just building, I was just trying to get an idea from these old models and I didn't get one, but I guess Dr. Maher did, so she wanted us to come up and say what we were thinking, I was just trying to get an idea from it.
439.		T/R 1:	When you compare this top one, what numbers were you comparing when you built this model here? [Continuing figure 10-29-20]
440.		Michael:	One third and one fourth.
441.		T/R 1:	And what did you find?
442.		Michael:	We found that it worked.
443.		T/R 1:	What worked?
444.		Michael:	That an odd and an even can go into a whole.
445.		T/R 1:	So, you mean you compared a quarter and a third, what did you find to be that difference?
446.		Michael:	The difference would be, the difference would be one twelfth. But in this model with the half and the third it would be one sixth.
447.		T/R 1:	Ok, so you could do that. Ok, um, alright, let's see, now James did James has some idea here let's here what James says and we all know that Graham and, why don't you sit down? Thank you very much, gentlemen. And let's, let's hear what James' idea is and then we'll hear if Graham and Kelly agree. Where did Graham go?
448.		James:	[at OHP] can I take this off?
449.	59:35	T/R 1:	Yeah, sure.
450.		James:	[James put an overhead transparency on OHP, Figure 10-29-21] Well,

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			like, I got a huge model for this problem. First, but by experimenting I tried nine yellows and four oranges, for the ninths and the fourths. and I found out they weren't equal so I tried something else. I lowered its size so orange and uh the orange and the yellow and we got blue as the fourths and purple as the ninths and they were equal. So I just had to find a whole for that and I found out it was I just took three oranges and one dark green so then I had then I put up thirty-six whites on up to the whole and there, it took five whites to make the purple equal to the blue, so I think the answer would be five thirty-sixths.
451.		T/R 1:	Anybody do anything like that?
452.		Erik:	Well I guess I sort of
453.	1:01:35	T/R 1:	Oh, Erin, Jackie, Beth, what did you do? Did you do something like that?
454.		Erin and Beth:	Uh, yes.
455.		T/R 1:	Just tell us about it.
456.		Jackie:	Um, well, we did the same thing we have the same fourths and the same ninths
457.		Beth:	But we have a different whole.
458.		T/R 1:	So you called one and you used different rods to show your one?
459.		Beth:	Yeah.
460.		T/R 1:	Ok, and so, uh, can you move aside a little bit, Erik, so the class can see? Uh, so your model here, it looks very much like James' model
461.		Jackie:	Except we have, instead of three oranges and one dark green we have one dark green, one orange, one red, um, one black, one brown, and a light green.
462.		T/R 1:	Ok, so what rod did you give the number name one quarter?
463.		Erin:	Um blue.
464.		T/R 1:	The dark blue? And what rod did you give the number name one ninth?
465.		Girls:	Purple
466.		T/R 1:	Did you do the same thing?
467.		James:	Yeah.
468.		T/R 1:	Did anybody else do that? You did that and you did that and you did that and you did that? Ok, and so what number name did you give the white one?
469.		Girls:	Thirty-sixths, one thirty sixth.
470.		T/R 1:	One thirty-sixth? And what did you find the difference was between

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			the ninth and the quarter?
471.		Jackie:	Five thirty-sixths.
472.	1:03:08	T/R 1:	How many of you got five thirty-sixths? I see. I see. Ok, what do you think? So, so you can actually see, what makes this problem so hard? What do you think makes it so hard?
473.		Kimberly:	The odd number and the even number.
474.		T/R 1:	Pardon?
475.		Kimberly:	The odd number and the even number.
476.		T/R 1:	The odd and the even number? What about that makes it hard? You have a four and a nine.
477.		Kimberly:	Because it's harder to make a model when you have an even number for one and an odd for the other.
478.		T/R 1:	Ok, now have you learned anything on the models that you've seen today that might help you get some ideas for how to pick that number? If you remember that Erik and Michael when they compared a half and a third, what was your difference?
479.		Michael:	A half and a third?
480.		Erik:	A half and a third was
481.		Michael:	Was one sixth.
482.		T/R 1:	When you compared a half and a third it was one sixth. And when you compared a third and a quarter?
483.		Erik:	It was, it was, one one twelfth.
484.		T/R 1:	It was one twelfth. And when you compared a quarter and a ninth?
485.		Michael:	A quarter and a ninth?
486.		T/R 1:	One fourth and one ninth?
487.		Michael:	Oh.
488.		T/R 1:	It became, who did it here? You did it here, Erin and Beth you got five thirty-sixths.
489.		Michael:	Oh, it sort of went up by six I guess.
490.	1:04:40	T/R 1:	It's something to think about, isn't it? It's something to think about, right? Well we have here, thank you very much, and Kelly and Graham and all of those wonderful models, I'm going to keep this, that's lovely, thank you. How many of you believe the difference is five thirty-sixths, raise your hands. If you don't believe it, if you need to walk over to these models before we put them aside and see what they've done. When, we compared one half and a third, we got one sixth. When we compared a third and a quarter, right? We got one twelfth. When we compared a quarter and a ninth we got five thirty-

<b>Description: Fraction problems: Sharing Candy Bars (Front View)</b> <b>Parent Tape: Fraction problems: Sharing Candy Bars (Front View)</b> <b>Date: 1993-10-29</b> <b>Location: Colts Neck Elementary School</b> <b>Researcher: Professor Carolyn Maher</b>	<b>Transcriber(s): Yankelewitz, Dina</b> <b>Verifier(s): Reid, Adrienne, Farhat, Marcelle</b> <b>Date Transcribed: Spring 2009</b> <b>Page: 21 of 21</b>
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		<p>sixths. [Writes on transparency: <math>1/2 - 1/3 = 1/6</math>, <math>1/3 - 1/4 = 1/12</math>, <math>1/4 - 1/9 = 5/36</math>, <a href="#">Figure 10-29-22</a>.] Is there anything in these numbers that relate to the model you built? That's my question. Well we can think about that. I think we have to stop. If you haven't built the model, I really think we have enough people here, we have Kelly and Graham, we have the table in the back, what do you think? Ok, so we can think about them. But, I'm wondering if there's anything that might give you a clue to building your models in the future. Maybe you ought to try to build some more and study these a little bit. It's something to think about, huh? Ok, well I'm going to see you on Monday, [good!] and we can talk some more. Thank you very much and thank you for staying longer, I appreciate, Mrs. Phillips, the extra time. A really good job.</p>
491.	1:06:33	end of class