Description: Building Large Models to Show Equivalence: An Exploration (classroom view) Date: 1993-10-07 Location: Colts Neck Elementary School Researcher: Professor Carolyn Maher	Transcriber(s): Yankelewitz, Dina Verifier(s): Yedman, Madeline Date Transcribed: Spring 2009 Page: 1 of 24

9.2.1	5:33	T/R 1:	Well, good morning! [students answer good morning]. I saw how hard you were working yesterday, I looked at tapes last night and early this morning, and I feel, uh, very close to you. You had breakfast with me this morning some of you, and you had, um, I guess, some dinner with me and one of my colleagues who was visiting, and it was really wonderful to watch the way you were solving those problems. Um, and I read your papers, so did Dr. Martino, and uh, I was so impressed at how hard you were all working and the wonderful wonderful thinking that you shared with me in the pictures you drew and the models you made. Yesterday I was working with a group of thirty teachers - that's why I couldn't be here - um, Mr. Purdy was there in the afternoon, he was here in the morning, and I was showing them some of your work and weren't they impressed?
9.2.2		Purdy:	They were very impressed.
9.2.3		T/R 1:	They were very impressed, and your teacher Mrs. Phillips knows some of these other teachers and they said "Oh my goodness, those students are doing such wonderful mathematics!" They were so pleased. So I'm glad to be here, today, I need to tell you, I'm going to be gone for a couple of weeks, um, we have to go to a conference in California, Dr. Martino and I, and uh, we're leaving next week. Dr. Martino will be here Monday, and then it will be two weeks before we come back. Um, so while we're gone, and the other mathematics you're doing with Mrs. Phillips, I hope you'll continue to write to me about what you're doing and to Dr. Martino, so, we sort of can still feel close to what's going on when we're not here. So would you do that [Students nod and say Mmm hmmm]? Would you be writing [CT says "Sure"] and then I, we won't be able to wait until we come back. Um, and then we'll be here for a little while again. Ok? Um, I was watching and reading and I was really interested in some of the questions that you were sort of thinking about as you were making your models and I noticed that everyone made a few models in the problems you were solving, isn't that right? You all were making a few models and I know I know Erik was making a model and he's worried about how he can get it one his paper, right? And, cuz it was a large one on his desk, and I'm kind of thinking, um, how are they

			gonna get it one the overhead when they share it with us, right? That's gonna be a problem. But I thought, you know, we can always get a couple of pieces of paper and tape them together if you had to, that's ok. You know, you can fold them or something. So, we'll figure out ways to record even if some of your models do get bigger. Um, what I was going to ask you to think about, um, one of the problems a little bit before we even shared and that was the problem that I think everyone did work on, uh, the second one, which was larger, three quarters or [students say two thirds] two thirds. Did everyone here work on that problem? Somebody might have been ab- raise your hand if you worked on that problem. [All students shown raise their hands] Which is larger, three quarters or two thirds? Ok, and how many of you built more than one model to show a solutions to that problem? [a few students raise their hands]. How many of you built three models? [No hands are raised] Some of you built two models, were working on two models? Yes, I'm really interested in this. Um, do you remember anything about the problem? I know you don't have the rods yet, but I want you to try to imagine in your mind if you can remember what you did when you solved the problem, which is larger three quarters or two thirds? By the way, do you remember which was larger? [students say mmm hmm] You do remember [mmm hmmm, yeah]. How many of you remember which is larger? [some students raise their hands] Can you think about it in your minds, what you built? I'm kind of curious, what helps you remember, Sarah?
9.2.4	9:36	Sarah:	Uh, that two thirds is larger
9.2.5		T/R 1:	She remembers that two thirds is larger. [Erik:I remember something] Erik?
9.2.6		Erik:	I remember that two, wait, three fourths is larger than two thirds by one twelfth or two twenty-fourths.
9.2.7		T/R 1:	Erik remembers it differently. Anybody else? Anybody else remember it? You're not so sure? Michael, what do you remember?
9.2.8		Michael:	I agree with Erik, um, because, that's, I remember three fourths being bigger than it because the four, wait I had three light greens and then only two purples and the three light greens were larger.

9.2.9		T/R 1:	Hmm, it could be we need our rods. It's hard for me to remember these. You think that will help? [students say yes]. Ok. Could you give out these for me, Jackie to the tables? What are you thinking, Meredith, while we're giving these - Erik [inaudible] Alan. [Students distributes sets of Cuisenaire rods]. Meredith?
9.2.10	11:36	Erik:	Ok, what do we need?
9.2.11		Alan:	We need the uh, two oranges and the purple
9.2.12		Erik:	Yeah, I remember, two oranges and the purple. This was our last one, because I remember I was tracing on it,
9.2.13		Alan:	Oh, yeah,
9.2.14		Erik:	Two oranges, one purple, the browns I remember were the thirds.
9.2.15		Alan:	Yeah. And the halves were the
9.2.16		Erik:	We didn't need, we didn't need halves, remember?
9.2.17		Alan:	I know, but we did build em.
9.2.18		Erik:	I think it was the blacks, or the dark greens.
9.2.19	12:08	Alan:	Dark greens fourthed it.
9.2.20		Erik:	Yeah,
9.2.21		CT:	[hands out mats] Put the mats under because it's far too noisy
9.2.22		Alan:	Yeah, Erik, have a mat, it's too noisy. Have a mat.
9.2.23		Erik:	Ok, one purple, brown,
9.2.24		Alan:	Yeah, try the purple, the dark greens did fourth it.
9.2.25		Erik:	They did, I know.
9.2.26		Alan:	Yeah. And then the twenty-
9.2.27		Erik:	No, twelfths were the reds.
9.2.28		Alan:	Twelfths were the reds, and then the whites were the twenty-fourths.
9.2.29		Erik:	Oh, they're copying us, they're doing twenty-fourths!
9.2.30		Alan:	Hey! Somebody's copying.
9.2.31		Erik:	Oh crap, we don't have any more reds! Seven we have eight nine ten, we just need two more
9.2.32		Alan:	[To group of three] Can you spare two red rods? Can we have some? Here we go!
9.2.33		Erik:	Two three four five six.
9.2.34		Alan:	Do you have twenty-four twenty-fourths?
9.2.35		Erik:	Probably not.
9.2.36		Alan:	Oh, I think you overdid it, you overdid it,
9.2.37		Erik:	What?
9.2.38		Alan:	Well, maybe not.
9.2.39		Erik:	What do you mean, overdid it?

9.2.40	Alan:	Well, get out twenty-four ones.
9.2.41	Erik:	I think we need twenty-four ones.
9.2.42	Alan:	Mmm hmm
9.2.43	Erik:	One, two three four five six seven, I'll just take out as many as possible
9.2.44	T/R 1:	[To Erik and Alan] I have a question for both of you. I've watched you do this in the tapes at breakfast this morning, so I feel very close to your solution, Erik, and Alan, but I, I have another question. While you're building this, I'd like you to build the other model you also made.
9.2.45	Erik:	That was
9.2.46	Alan:	Oh, yeah, the two browns, remember?
9.2.47	Erik:	Yeah
9.2.48	Alan:	One brown, two, yeah it was the two
9.2.49	Erik:	One of those
9.2.50	Alan:	Yeah, one
9.2.51	Erik:	Something like that.
9.2.52	T/R 1:	Ok, I'd like you to build the other model, and then I want to ask you a question about your two models. Try to remember what
9.2.53	Alan:	Yeah it was the two browns I think.
9.2.54	T/R 1:	Why do you think it was the two browns?
9.2.55	Alan:	Because two browns, you would be able to third it and fourth it. So, let's see. One, two
9.2.56	Erik:	Don't take any whites, though. Because I need all the whites possible.
9.2.57	Alan:	I know.
9.2.58	T/R 1:	We can get some more.
9.2.59	Erik:	Plus there are probably no whites left in there.
9.2.60	Alan:	Let's see,
9.2.61	Erik:	There are two whites, don't take any of them. I need twenty-four of em. Now we know that there's twenty four...
9.2.62	T/R 1:	Ok, build the other model and then when you're done, call me back.
9.2.63	Erik:	Twenty-eight whites and one fifth.
9.2.64	Alan:	I need the um
9.2.65	Erik:	Yeah, no
9.2.66	Alan:	Give me two dark greens, no, three, make it three, um, blacks that might do it. Yeah, three blacks thirded this.
9.2.67	Erik:	No, no, cuz blacks are bigger than dark greens.
9.2.68	Alan:	Oh yeah, dark greens, get me three dark greens

9.2.69		Erik:	No, dark greens don't work.
9.2.70		Alan:	Those are two browns? Oh yeah.
9.2.71		Erik:	Maybe.
9.2.72		Alan:	Oh I know. Oh, now I remember, it was a train of two browns and a red.
9.2.73		Erik:	Yeah, that's what I remember - don't take a red, no, not from there! [Erik has built a model of an orange and red train, three puple rods, four light green rods, six red rods, and twelve white rods]
9.2.74		Alan:	Greg, can you spare some of the red? Oh never mind. I'll just take it. We don't ask. [laughs]
9.2.75		Erik:	Ok. Here, so brown, two browns, a red, and yellows were the thirds, I think.
9.2.76		Alan:	No, fourths.
9.2.77		Erik:	No.
9.2.78		Alan:	Purples were, no, dark greens thirded it.
9.2.79		Erik:	Maybe, uh yea I guess. Could you spare us three, uh, three dark greens, Greg? We need-
9.2.80		Alan:	I can't get any rods these days. We're low on 'em. We're low. We low on supplies. Oh. Oh great.
9.2.81		Erik:	There's nothing left in the boxes, there's like absolutely nothing in the boxes!
9.2.82		Alan:	There are none up there.
9.2.83		Erik:	Oh, here's another dark green!
9.2.84		Alan:	Oh, good good good
9.2.85		Erik:	We need two.
9.2.86		Alan:	Uh, I think that might do.
9.2.87		Erik:	I don't know. Where's the half?
9.2.88		Alan:	[mimicking] I don't know, know.
9.2.89		T/R 1:	Alen There may be some more boxes in the back.
9.2.90		Erik:	More boxes in the back? Aren't there also some bags?
9.2.91		Alan:	Bags of Cuisenaire rods?
9.2.92		Erik:	We need
9.2.93	17:18	Alan:	Sheesh, we're wasting trees, three pieces of paper? Wow.
9.2.94		Erik:	David, can you spare us three dark greens? Or two, one rather. Got 'em.
9.2.95		Alan:	Got 'em. Oh good, we got three. Let's see if that thirds it. Hey, come on no peeking, no peeking, you have eyeballitis.
9.2.96		Erik:	Yah.
9.2.97		Alan:	Ok, it works.
9.2.98		Erik:	Ok, let's see, fourths should be,

9.2.99	Alan:	Fourth would be the purples.
9.2.100	Erik:	Yeah, that's what I was thinking. Two, three
9.2.101	Alan:	[makes noise]
9.2.102	Erik:	No, ok.
9.2.103	T/R 1:	If you don't have enough of the little rods, you can imagine them, or what you could do, besides imagining them you could take some of them off, once you put twenty-four we believe you, right? Here are some more of them.
9.2.104	Alan:	Now let's see. What fourths this?
9.2.105	Erik:	We're trying to figure out. It wasn't the purple but
9.2.106	Alan:	It can't be. Oh, now I remember the combo.
9.2.107	Erik:	What was it? No way, no way, no!
9.2.108	Alan:	It has to be. The yellows did have some part in this.
9.2.109	T/R 1:	Can I make a suggestion, gentlemen?
9.2.110	Erik:	Uh huh. I think it was one brown plus a red.
9.2.111 19:17, Fig 1		T/R 1: My suggestion is, you have the answer to your question if you carefully study what you built here. If you carefully study this, and study what you did here, you may have the answer to it. If you think about how you built your one here, that should help you, just think about it. [turns attention to another student] Yes, sir.
9.2.112	Alan:	Hold it
9.2.113	Erik:	[makes noise]
9.2.114	Alan:	There. Subtract two from each of those things. What would you get? Two from the purple would be a red, two from an orange would be a blue, two from a brown, would be a
9.2.115	Erik:	A brown.
9.2.116	Alan:	Yeah, Right! So two browns and a red must be the answer, right?
9.2.117	Erik:	No.
9.2.118	Alan:	Oh.
9.2.119 20:12	Erik:	Just try one brown
9.2.120	Alan:	One brown.
9.2.121	Erik:	Let's see what does it, sorry.
9.2.122	Alan:	Oh, wait, wait, wait, wait!
9.2.123	Erik:	Light greens would take a part in it. No, it's one brown and a red. The purples wouldn't take a part. Wait…
9.2.124	Alan:	Fourths, maybe we could try a red? Yeah, exactly!
9.2.125	Erik:	Four Blacks. One, two, three… Let's see, we don't need halves, we need, wait, maybe it was two browns and a red.

			Two browns and a red, then two from a brown would be a black, wouldn't it? No
9.2.126	21:20	Alan:	No, dark green, d.g.
9.2.127		Erik:	Wait, yeah, wait
9.2.128		Alan:	Yeah, dark green, get me three dark greens. Alright
9.2.129		Erik:	We did this already now what's the fourths? Ok, fourths there are dark greens, two from the dark greens would be a, a
9.2.130		Alan:	A light, purple. Purple would fourth this. You see? One, two, three, four.
9.2.131		Erik:	And it's the same, and it's gotta be a - the light green's smaller,
9.2.132		Alan:	Hmmm…Hold it, look at this. Two browns, which would equal up to ten, wouldn't it?
9.2.133		Erik:	No.
9.2.134		Alan:	Yes, two down from uh, the uh brown. So this is ten, twelve. Half of twelve would be six. We need something that, these are four each.
9.2.135		Erik:	Those are six.
9.2.136		Alan:	Right, now all we need to do is divide twelve.
9.2.137		Erik:	It's not twelve, it's not twelve, that is a, that's a, two down from ten would be eight. Eight, twelve,
9.2.138		Alan:	Twenty-two. That's twenty-two
9.2.139		Erik:	It can't be twenty-two.
9.2.140		Alan:	Twenty-two divided into four parts
9.2.141		Erik:	No wait, no wait. Eight sixteen eighteen, it would be eighteen, because eight sixteen, seventeen, eighteen. Eighteen divided by six
9.2.142		Alan:	Would equal
9.2.143		Erik:	Wait
9.2.144		Alan:	Eighteen divided by six would equal two.
9.2.145		Erik:	No, no, no, no, no
9.2.146		Alan:	No, twelve divided by six would equal two.
9.2.147	23:41	Erik:	But,
9.2.148		Alan:	Oh,
9.2.149		Erik:	That's impossible.
9.2.150		Alan:	Impossible? But totally unexpected. B-L-A-C-K-S. Get me blacks.
9.2.151		Erik:	Oh, I have three, or four. [hands blacks to Alan]
9.2.152	24:34, Fig 2	Alan:	There [Alan has buit a model of two browns and a yellow and three black rods]
9.2.153		Erik:	What are you doing? That's not what we…

9.2.154		Alan:	Sure
9.2.155		Erik:	No it was, No, it was two yellows and a red! Remember? It was two yellows and a red?
9.2.156		Alan:	Oh, yeah… No! It was an orange.
9.2.157		Erik:	No it wasn't
9.2.158		Alan:	Look: two yellows and a red would equal an orange and a red.
9.2.159		Erik:	No it wouldn't
9.2.160		Alan:	Yeah it would
9.2.161		Erik:	No it was like that and then the light greens
9.2.162		Alan:	Were the fourths
9.2.163	25:02, Fig 3 & 4	Erik:	Told ya!
9.2.164		Alan:	Hold it, let me see. Look, there's a way you can eliminate these two yellows. There we go! That was an adventure.
9.2.165		Erik:	Just put these along with this. [Erik moves this new model of an orange and red train, four light green rods, and three purple rods, next to his other model]
9.2.166		Alan:	We have this model. You busted it!
9.2.167		Erik:	No I didn't, I can make it again.
9.2.168		Alan:	Well, you'll back the other model, because we might have, we do have enough. Good. Erik, come on, Dr. Maher is here. We done. We done.
9.2.169	26:20	T/R 1:	Gentlemen, gentlemen.
9.2.170		Alan:	Ok, that's the second one.
9.2.171		T/R 1:	Oh, what do we have here? Tell me what we have here.
9.2.172		Both:	An orange and a red
9.2.173		Alan:	And purples for thirds
9.2.174		Erik:	And three purples
9.2.175		Alan:	And light green for fourths.
9.2.176		T/R 1:	Ok, right.
9.2.177		Alan:	And, um, here how I used to figure it out.
9.2.178		Erik:	Twelfths! Oh no, those are singles
9.2.179		T/R 1:	Honestly, Erik, I could imagine if you explained to me what I'm supposed to imagine.
9.2.180		Alan:	Ok.
9.2.181		T/R 1:	Ok? I'll try real hard, but I'll try to imagine
9.2.182		Alan:	Suppose there are twelfths under that.
9.2.183		T/R 1:	I can imagine that.
9.2.184		Alan:	And you took out two of those purples and three light greens
9.2.185		T/R 1:	I could imagine

9.2.186		Alan:	It would take one of those twelfths to fill in the gap between the, between the um um
9.2.187		Erik:	See?
9.2.188		Alan:	Two thirds and three fourths
9.2.189		T/R 1:	I see that.
9.2.190		Erik:	And we came to up here
9.2.191		Alan:	So Three fourths is bigger than two thirds by one twelfth
9.2.192	Fig 5	Erik:	And what we came to up here, two thirds and three fourths, it would be bigger by one twelfth or-
9.2.193		Both:	Two twenty-fourths.
9.2.194		Erik:	Because two of 'em equal up to a red like the orange and the
9.2.195		T/R 1:	Why is it a red here and why is it a white here?
9.2.196		Alan:	Well
9.2.197		Erik:	Well, because, see each model is different
9.2.198		T/R 1:	In what way?
9.2.199		Erik:	Because this model is bigger than this model
9.2.200		Alan:	Erik! You could put the reds on that model and make it sixths!
9.2.201		Erik:	But then it would be- so why would we need sixths on that model?
9.2.202		Alan:	Oh yeah, you're right. So either it's one twelfth or one twenty-fourths
9.2.203		Erik:	Two twenty-fourths
9.2.204		Alan:	Two twenty-fourths on this one. This is probably the only model that can get the twenty-fourths cuz you can't, you'd have to halve each white to get twenty-fourths there.
9.2.205	28:07	Erik:	But what if you get three three, um uh, three oranges together
9.2.206		Alan:	We tried that already
9.2.207		Erik:	No we didn't we could get like fiftieths.
9.2.208		T/R 1:	You think it would be fiftieths if there would be three oranges?
9.2.209		Erik:	Well, I don't know exactly but it would be a lot.
9.2.210		T/R 1:	Do you still expect that you would get the same answer?
9.2.211		Erik:	Well, we can divide it.
9.2.212		Alan:	Looking at this it would not be fiftieths.
9.2.213		T/R 1:	Why not?
9.2.214		Alan:	I'm imagining a this (takes another orange) instead of the purple there.
9.2.215		T/R 1:	Instead of the purple?
9.2.216		Alan:	It would take another six of those so it would only be thirtieths

9.2.217		T/R 1:	I'd like you to try that other model.
9.2.218		Alan:	Three oranges?
9.2.219	28:42	T/R 1:	Well whatever you think it is, um, I'd like you find a third model and I think Dr. Martino said to think big. I'd like you to find a third model thinking big.
9.2.220		Alan:	Ok
9.2.221		Erik:	We could think real big.
9.2.222		T/R 1:	And see what you come up if you work on that.
9.2.223		Erik:	Dr. Martino said the key is think big, so
9.2.224		T/R 1:	Well, maybe, we'll see if it works.
9.2.225		Erik:	So now were gonna think real big!
9.2.226		Alan:	Yeah, four of 'em
9.2.227		Erik:	Three, give me three of these. Let me just put these back…
9.2.228		Alan:	Four of 'em that would be right!
9.2.229	29:07	Erik:	Fiftieths, I told ya.
9.2.230		Alan:	Four of 'em, make four, then it would be two yellows
9.2.231		Erik:	Friar tuck, may I have them? I think Friar Tuck's going to have to go around
9.2.232		Alan:	Two four six eight, there would be eighths
9.2.233		Erik:	Alan, Friar Tuck's have to go around, ok?
9.2.234		Alan:	Uh, what do you need?
9.2.235		Erik:	I'm probably going to need whites.
9.2.236		Alan:	How many?
9.2.237		Erik:	Well, it's going to be fiftieths, and we only have twenty-eight.
9.2.238		Alan:	Ok.
9.2.239		Erik:	So we're going to need about fifty thousand. We're going for three.
9.2.240		Alan:	I think Erik you better go.
9.2.241		Erik:	No
9.2.242		Voice:	You don't need fifty singles. We trust you on that.
9.2.243		Alan:	Ok.
9.2.244		Voice:	Because otherwise no one's going to have any.
9.2.245		Alan:	Right.
9.2.246		Erik:	I know what the thirds are.
9.2.247		Alan:	What?
9.2.248		Erik:	Oranges
9.2.249		Alan:	Oranges?
9.2.250		Jessica:	Are you figuring out the big one again?
9.2.251		Erik:	No
9.2.252		Alan:	No, we're trying to…

9.2.253	Erik:	Three oranges.
9.2.254	Alan	Erik, use the yellows. Think big.
9.2.255	T/R 1:	A suggestion I have, Alan and Erik, if you can find another table who's solving the same problem then maybe you can combine
9.2.256 30:12	Erik:	Well, we need a lot more Cuisenaire Rods. Well, let's work with three and then we'll do four.
9.2.257	Alan:	Right.
9.2.258	Erik:	Ok, what would be the thirds. Thirds would easily be the oranges. One two three.
9.2.259	T/R 1:	Well, just build your big model and we could use Meredith and David's smaller model. And then you could come together to put all your models together.
9.2.260	Alan:	And then show them on the overhead?
9.2.261	T/R 1:	Yes.
9.2.262	Alan:	Ok.
9.2.263	T/R 1:	So work on the big model. See what you can do.
9.2.264	Alan:	Erik,
9.2.265	Erik:	we need oranges. [to next group] Do you have three oranges we can borrow?
9.2.266	T/R 1:	Here
9.2.267	Erik:	Oh, good. I'll just pour them into the little - Ah!
9.2.268	Alan:	Ok,
9.2.269	Erik:	Now we need,
9.2.270	Alan:	Ok, perfect! There are thirds
9.2.271	Erik:	Right, now fourths, would be two smaller than an orange, a brown, no, yeah! Three, no that's too big. Two smaller, what's two smaller than a brown. Not a black, but a yellow, no, not a yellow
9.2.272	Alan:	Yes,
9.2.273	Erik:	No
9.2.274	Alan:	A dark green - look it look it for your answer.
9.2.275	Erik:	The dark green would be the fourths?
9.2.276	Alan:	Mmm hmmm. Believe it or not, they are. They might be the fifths.
9.2.277	Erik:	They're the fifths. Then what would be the-
9.2.278	Alan:	Blues would be the
9.2.279	Erik:	This would only be thirty. This would only be thirty because ten twenty thirty.
9.2.280	Alan:	Thirty plus twelve. Forty-two

9.2.281		Erik:	Wait a minute. Since we got these two packs, couldn't we have, Alan, couldn't we have like, um, Alan, couldn't we have, ten twenty thirty forty fifty sixty, wait, ten twenty thirty forty fifty sixty seventy if we all put them
9.2.282		Alan:	Erik, those aren't tens, those are twelves
9.2.283		Erik:	Yeah those are tens.
9.2.284		Alan:	You know what tens are? The browns.
9.2.285		Erik:	Look at this.
9.2.286		Alan:	Prove it.
9.2.287		Erik:	Look at this
9.2.288		Alan:	Put ten up to that.
9.2.289		Erik:	Ok.
9.2.290	33:03	Alan:	Ten. Put ten. Put ten up to that. [Erik does so] Maybe it is ten. Ok, ten twenty thirty forty fifty, it would have to be ten,
9.2.291		Erik:	Ten twenty thirty forty fifty sixty seventy
9.2.292		Alan:	Here we go again.
9.2.293		Erik:	Let's just start with thirty.
9.2.294		Alan:	Yeah, let's eliminate two of the tens.
9.2.295		Erik:	Ok, what would be the fourths?
9.2.296		Alan:	Fourths of that
9.2.297		Erik:	Brown could be in here somewhere
9.2.298		Alan:	Nope, nnnnope
9.2.299		Erik:	Blues
9.2.300		Alan:	Nope. Too big. Eeew! Erik, wipe those rods off immediately. Erik, you're thinking. Hold it...
9.2.301	34:21	Erik	Blacks
9.2.302		Alan	Blacks blacks blacks blacks, right right right, go go go go go. Yup, told you. They're one short. Oh
9.2.303		Erik:	Four long? No. Hah. Alan. Whoops, never mind, that's a five. We didn't forget how to make a big one. We're just experimenting. Perfect! Now just do that, one two three, [noise] No, one larger than this would be the [noise. Erik has built a model of three oranges and a dark green] I got the fourths.
9.2.304	35:47, Fig 6	Alan:	Now make the thirds.
9.2.305		Erik:	Ok, what if we did this? I bet I could make the thirds
9.2.306		Alan:	I think uh, yo, Erik, I think we were just tipped. Erik, come here, go go go. Go go. Alright.
9.2.307		Erik:	Bigger than a dark green, well, how much bigger do I need it then, how much bigger can it get?
9.2.308		Alan:	Erik, hold it, the thirds.

9.2.309	Erik:	I am trying to do something.
9.2.310	Alan:	Thirds thirds thirds. Wait a second, three oranges would have to be the thirds.
9.2.311 37:00	Erik:	What? What?
9.2.312	Alan:	[looking at model that Jessica and Andrew built] That would be two oranges and a yellow. Two oranges and a purple
9.2.313	Erik:	We already did that.
9.2.314	T/R 1:	How are you gentlemen doing, did you get another new model?
9.2.315	Alan:	Yeah
9.2.316	Erik:	Not exactly, actually. You see
9.2.317	T/R 1:	You might want to study, you might want to study Andrew's model to see what you have to do to make it bigger.
9.2.318	Erik:	Well, that's the exact same thing we did. We did two oranges and a purple.
9.2.319	T/R 1:	Yeah, but I want you to make one bigger than his.
9.2.320	Erik:	We're trying, but we can only divide it into one two three four fi- fifths. I can divide it into thirds, but I can't divide it into fourths.
9.2.321	T/R 1:	Well, maybe you gotta make it bigger. See my problem? This is a good challenge for you two. Study that, yeah.
9.2.322	Erik	Those are twelfths.
9.2.323	Alan:	Make six of those and it would be ten greens.
9.2.324	Erik	We want thirds and fourths, not tens.
9.2.325	T/R 1:	I wonder if Meredith and David made any progress. Meredith and David [walks away]
9.2.326 38:33	Alan:	Thirds. Erik, there's one prob. Using oranges, you can't third. You can't third, look, even if you subtracted two you couldn't third that. Because orange is twelve, there's five.
9.2.327	Erik:	Oranges are tens!
9.2.328	Alan:	I know, tens, you can make it into fourths but you couldn't third it.
9.2.329	Erik:	Wait you gave me, oh no.
9.2.330 39:12	Alan:	You just gave up
9.2.331	Erik	Yup.
9.2.332	Alan	Hold on a sec, look, look, you take that off, you could use that
9.2.333	Erik:	That's way too big, Andrew, I don't think you can divide it into anything

9.2.334		Andrew:	Yeah, if you make two browns, two blues are thirds. If you can make a train for a whole you can make a train for a third and a fourth.
9.2.335		Erik:	Ohhh!
9.2.336			[taken from other view, but can be heard partially here] That's very interesting. That's an interesting theory. Why don't you test the theory with Michael and Alan, I think they would like to hear this theory. Would you like to hear - I think David has a theory - why don't you come over here. They have an interesting -
9.2.337		Erik:	So do they have a theory.
9.2.338		T/R 1:	David has an interesting theory, I don't know if Meredith heard it, tell them his theory, now listen carefully, Jackie, you want to hear this theory? [Andrew has built a model of four oranges and two purples, and six browns.]
9.2.339		Andrew:	[to Jessica] See? Two of these are thirds, and that's a one third, third, third. [Andrew has originally made his train of "one" as two oranges followed by a red and then that pattern repeated. He now moves the reds to the end. He then takes eight green rods and puts them down] Erik, I figured out the thirds, I just need the fourths.
9.2.340	41:21	Erik:	You did? How did you figure out the thirds?
9.2.341		Alan:	Ok, Erik. Get ready for big city play dude, big time.
9.2.342	41:51, Fig 7		Andrew: Erik, I made it!
9.2.343		Erik:	Wow, now divide it into twelfths and see what you can divide by - [Erik joins Andrew. Camera focuses on David, Meredith, Erik and Alan on the floor.]
9.2.344		Alan:	OK, Here are the rods
9.2.345		Erik:	I'm working here. You could do it! You could do it! Andrew did the same, Andrew did the same model. They did the same model. Ok, this is what you do. You do three oranges, you do actually you do three oranges and two purples. Three oranges
9.2.346		Alan:	Four oranges
9.2.347		Erik:	Three oranges!
9.2.348		Alan	Ok
9.2.349		Erik	Three oranges and two purples.
9.2.350		Alan:	Two purples would just be a brown.
9.2.351		Erik:	An then… a brown? No it wouldn't, yeah it would, and then you could make a train for the thirds. [talk about whose mat

			is who's] Ok, and then the browns, two browns would make a train for one third
9.2.352		Alan:	Right,
9.2.353		Erik:	And then,
9.2.354		Alan:	Woo, woo, woo, woo
9.2.355	43:40	Erik:	And then two more browns would make another train for thirds. One, two, I know. No, wait, no, it wouldn't be browns, it would be blacks.
9.2.356		David:	Could I just do what I was thinking of? Could I just
9.2.357		Erik:	No they're not, look, it'd be blue and a purple or a blue and a
9.2.358		David:	Could I just make something?
9.2.359		Alan:	Hey you're robbing me.
9.2.360		Erik:	Everyone's robbing you, remember?
9.2.361		David:	Could I have some
9.2.362		Erik:	Me and David will work together.
9.2.363		David:	Could I have some?
9.2.364		Meredith:	I'm working with Erik.
9.2.365		David:	Can't I just use some of the blocks over there? I brought it over Meredith.
9.2.366		David:	Can I have some?
9.2.367		Alan:	Check it out
9.2.368		Erik:	No, I'm just kidding
9.2.369		Alan:	Check it out.
9.2.370		Erik:	Now divide it into thirds
9.2.371		Alan:	Hmmm
9.2.372		Erik:	You can't
9.2.373		Meredith:	I have and idea.
9.2.374		Alan:	Wow, something just popped into my head
9.2.375		Erik:	Me too
9.2.376		David:	Something just popped into my head.
9.2.377	44:56	Alan:	The bigger you make the model, you can't third it.
9.2.378		Erik:	No no no no no, can I have these?
9.2.379		Alan:	[continuing] You can't third something like this. You'd need colossal rods.
9.2.380		Erik:	Like the ones over there?
9.2.381		David:	I know something, alright?
9.2.382		Alan	Impossible. That'd just like one dark green.
9.2.383		David	Can I um do something?
9.2.384		Erik:	Hold on, let me do something [start fighting over rods] Could I have the blue
9.2.385		Alan:	Erik! You can't third that big orange model.

9.2.386	Erik:	You want to make a bet? I bet I can.
9.2.387	Alan:	You can't
9.2.388	Erik:	I bet I can. Oranges
9.2.389	Alan:	Because if you use more. Using oranges, if you use three oranges, you won't be able to third it. You won't be able to third it!
9.2.390	Erik:	This is what I was thinking. One, two three. Oh contraire… It needs to be, let's see, how much smaller?
9.2.391 46:05	Alan:	Look you can't third it, you fourthed it but you can't third it.
9.2.392	Erik:	Ok, let's see, four one two, easily how you can do it.
9.2.393	Alan:	Third it then.
9.2.394	Erik:	What?
9.2.395	Alan:	Third it then.
9.2.396	Erik:	What do you mean?
9.2.397	David:	Who took my thirds? I was using them.
9.2.398	Erik:	Me! I think, no it wasn't me. It was Alan.
9.2.399	Alan:	Make three blues and train it. Then you could use those
9.2.400	Erik:	What do you think I was thinking of? Give me my rods back. Stop!
9.2.401	David:	Meredith, can I have my rods? I brought them over.
9.2.402	Erik:	Alan, you're stealing from, no no no, Alan you're stealing from us! No.
9.2.403	Meredith:	Oh, oh! Did you just take one of my blues
9.2.404	Alan:	No
9.2.405	Erik:	Yeah. And for the thirds the thirds can easily be done by the blues
9.2.406	David:	I have an idea.
9.2.407	Erik:	I've got a good idea.
9.2.408	David:	I've got a better idea.
9.2.409	Erik:	The thirds, and then how much room do we have left? We have one blue left which is nine. One two three four five six seven eight nine.
9.2.410	David	Just listen out.
9.2.411	Meredith:	Me need a brown rod
9.2.412	Erik:	It all works out.
9.2.413	Alan:	You know what you could try? Use three blues and the light green then use the oranges to third it then you could fourth it easily
9.2.414	Erik:	Now.
9.2.415	David:	I already have a third. See just put down the purple and I took off the green. Here's what I made.

9.2.416		Alan:	Look it. [to Meredith] You have any blues?
9.2.417		Erik:	Yeah but she's not going to give them to you.
9.2.418		Alan:	And the light green. Easily your thirds can be used.
9.2.419		Erik:	Perfect, I did it! Hello Alan, I did it!
9.2.420		Alan:	You fourthed it too?
9.2.421		Erik:	Yup! One two three four
9.2.422		Voice:	Can you third that?
9.2.423		Erik:	I thirded it. One two three and then plus nine other of those, which would be one two three four five six seven eight nine. So it's just like making a new rod.
9.2.424		Alan:	Fourthing it might be.
9.2.425		Voice:	Can you run it by me again? I'm not quite following that.
9.2.426	48:37	Erik:	Ok. I have the three of 'em, and then I put nine other ones which would equal another blue, so if I thirded it, I would add one to there, one to there, and one to there, which would be three. And then four five six seven eight nine. So it's like adding another blue, but I'm making a new rod. [Erik's model is -Three orange rods and a dark green rod, a train of four blue rods, and a train of three blue rods and nine white rods]
9.2.427		Voice:	Ok, can you set that up in a different way?
9.2.428		Erik:	Well, in thirds
9.2.429		Voice:	Use the same pieces, but can you set it up a little differently?
9.2.430		Meredith:	Oh, I have an idea, put the three next to that, and then the three next to that and the three next to that.
9.2.431		Erik:	Huh?
9.2.432		Meredith:	I'll show you what I mean. [Meredith places three white rods after each blue rod.
9.2.433		Erik:	How can we make it bigger than him? He did the exact same thing.
9.2.434		Meredith:	There!
9.2.435		Erik:	Ohhhh!
9.2.436		Meredith:	There! Get it?
9.2.437	49:54	Erik:	Ohhh! see, there are there to that, three to that, and three to that, so it's like, it's a blue plus one would be an orange, plus another would be a new rod, plus another would be a new rod, and if you have another one, it'd, you'd, you're just making new rods. Because if you add one of those to that, it'd be an orange, but then you add another two it'd be bigger than an orange.
9.2.438		Voice:	I got you.
9.2.439	50:25, Fig 8	David:	Told you I got it.

9.2.440		Meredith:	Or you could just take the oranges and do that.
9.2.441		Erik:	No, those were uh
9.2.442		David	You could take out the three six nine
9.2.443		Meredith:	You could take out the orange and use two ones.
9.2.444		Erik:	I think the greens would be sixteenths, not
9.2.445		David	You could take out the three six nine and put a blue in there
9.2.446		Meredith:	Orange and six ones. Oh, wait a second! Aren't these nines? Aren't these nines, right?
9.2.447		Erik:	Yeah the blues are nines.
9.2.448		Meredith:	And these are tens, right?
9.2.449		Erik:	Yes, those are tens.
9.2.450		Meredith:	But, if they're tens, why are they bigger than these?
9.2.451		Erik:	Huh?
9.2.452		Meredith:	See what I mean? You put the, put the four orange
9.2.453		Erik:	You know why the blues bigger than 'em? Because they have the three whites added
9.2.454		Meredith:	But the orange is bigger!
9.2.455		Erik:	Of course, the orange are ten, those are nine.
9.2.456	51:26	CT:	I don't want to break your train of thought, but what's happening here?
9.2.457		Erik:	Well, see, we took the three oranges and the dark green to be one, and then the four blues to be um the fourths, and down here we took three blues and then uh nine whites and we took three whites which would go to that one, so we're making a new rod, because if you add one it would be an orange, but if you add to other ones, it would be bigger than an orange, so we're making a new rod there and we do the same here and the same here, so we're making new rods for thirds.
9.2.458		CT:	Ok.
9.2.459		Erik:	That's basically what we're doing.
9.2.460		CT:	You have to.
9.2.461		Erik:	I don't, I don't really understand what Dave's doing. That's the only problem. Actually, no, I do. He's calling two browns, two blacks, and two blues a one.
9.2.462		Meredith:	Yeah, cuz that was twice the other
9.2.463		Erik:	Yeah, and then the light greens are the twelfths and those
9.2.464		David:	I think that'd be sixteenths though
9.2.465		Erik:	Yeah, and the reds would be the twenty-four- the twenty-fourths. The reds would be the twenty-fourths and the whites would be the forty-eighths. Because he doubled everything.
9.2.466		Meredith:	Where are the thirds? Where are the fourths?

9.2.467		Erik:	Exactly.
9.2.468		David:	I'm just working on this.
9.2.469		Erik:	He's working on that. Ok!
9.2.470		Meredith:	He's just working on the model
9.2.471	52:47	Erik:	Dave, isn't this basically what we came here for?
9.2.472		CT:	[talks to other students]
9.2.473		Erik:	Dave, isn't this basically what we came here for?
9.2.474		David:	Why did you do that, Alan?
9.2.475		Alan:	I'm getting it lined up. Trying to get it lined up.
9.2.476		Erik:	So we don't need this, basically we don't need all this. We can just push that aside and work with Dave's. Isn't this basically what we came here for, David?
9.2.477		David:	Yeah, I know, that's why
9.2.478		Erik:	Everyone's just trying to make another model.
9.2.479		CT:	Basically you came here for what?
9.2.480		Erik:	Basically we came here to discuss David's original model.
9.2.481		CT:	And then you built something else.
9.2.482		Erik:	Yeah.
9.2.483		David:	Yeah, cuz I told everybody and then she said to go over there and build Dave's model, and then
9.2.484		Erik:	We lost the point for some reason.
9.2.485		CT:	Ok, but I don't think David did. Did you?
9.2.486		Erik:	No, David's did, but David's like, here let me do this.
9.2.487		CT:	David, how about you explain to me what you're doing so I can understand your thinking.
9.2.488	53:40	David:	Well, before Meredith built this other thing and then she had the reds were one twelfth and then the whites were one twenty-fourth, but then.
9.2.489		Erik:	We built that, me and Alan built that originally.
9.2.490		David:	Yeah, and Meredith, Meredith did too, and then um, uh, so then she, she thought to think of a bigger model, then I thought that then maybe the greens would be something like one twelfth but I figured out that would be sixteen when I put them up there, and
9.2.491		CT:	Right.
9.2.492		Erik:	No it wouldn't because you still have some room.
9.2.493		David:	No,
9.2.494	54:20	Erik:	I think
9.2.495		David:	No it's just that that piece is hanging out, um, then I thought the reds would be one twenty-fourth and the whites might would one forty-eighth because I just doubled it.

9.2.496		CT:	Did it work out?
9.2.497		David:	What?
9.2.498		CT:	Did it work out? Did you find what you thought you would find?
9.2.499		David:	Um, well, not with the greens, that turned out to be one sixteenth
9.2.500		CT:	The greens turned out to be what, sweetheart?
9.2.501		David:	One sixteenth.
9.2.502		CT:	And the reds came out to?
9.2.503		David:	I'm working on that right now.
9.2.504		CT:	Oh, ok. I'm sorry.
9.2.505		Erik:	What about the purples? The purples, the purples might come out to be
9.2.506		David:	Yeah they might be one-
9.2.507		Erik:	I think the purples would do that.
9.2.508		David:	Maybe it would be something else.
9.2.509	55:03	Erik:	The purples would be one twelfth.
9.2.510		David:	Alright, so now
9.2.511		CT:	This is so interesting, where are you going with this, then?
9.2.512		David:	What?
9.2.513		CT:	Where are you going with it? I mean, this is very interesting, I'm enjoying it very much, you put a lot of work into it.
9.2.514		Alan:	This isn't going to be able to fit on notebook paper.
9.2.515		CT:	We can take, listen, we can take this and paste it together and put your work on it.
9.2.516		Erik:	Well, it barely even fits on this!
9.2.517		CT:	Well, you have more than one piece there, so there's no problem there, don't worry about that.
9.2.518		Erik:	I mean, if it doesn't fit on this, of course it can't fit on a single piece of notebook paper, but if we put a couple of pieces together it'd fit.
9.2.519		CT:	It's ok, we can set up a model. What should we?
9.2.520		David:	I think, maybe I counted wrong but that, but I counted it to be one twenty-third. Maybe I'll count again.
9.2.521		CT:	Ok, let's see. See if you have it even.
9.2.522		Erik:	One two three, four, one two three
9.2.523	55:59	T/R 1:	They don't look lined up to me, David. David, I'm not convinced they're lined up.
9.2.524		Erik:	Eleven twelve thirteen fourteen fifteen sixteen
9.2.525		Alan:	Dave, you have something wrong, you need another
9.2.526		Erik:	Twenty-three. You need to line them up.

9.2.527		Alan:	Here, you've got, yeah, you need another one of that.
9.2.528		T/R 1:	How about a ruler, would that help? A yardstick, behind the board there? A yardstick might help.
9.2.529		Erik:	Yeah [gets up].
9.2.530		T/R 1:	See it over there?
9.2.531		Alan:	Now, push, push, the reds down.
9.2.532		Erik:	Just push em in, and then you can get one more.
9.2.533		Alan:	There.
9.2.534		Erik:	Now put one more on, just put one more on.
9.2.535	56:36, Fig 9	Alan:	Take a yardstick and flatten the whole thing out.
9.2.536		Erik:	What do you mean, flatten it out?
9.2.537		Alan:	It's all wavy.
9.2.538		Meredith:	Yo!!! I just worked [inaudible]
9.2.539		Erik:	No, I mean, it's not ok, cuz, no offense Meredith, but isn't this called the major model we were supposed to be working on?
9.2.540		David:	That's what we're doing. That's why we came over here.
9.2.541		Alan:	Ok. Pointless. Use the purple!
9.2.542		Erik:	One two three four five six seven eight nine, ten, eleven, twelve, thirteen, fourteen fifteen, oops, sorry. I just think that the purples
9.2.543		David:	We need the purples
9.2.544		Alan:	I know, I'm giving them to you. Is that enough?
9.2.545		Erik:	One two three four five six seven eight nine ten
9.2.546		David:	This is going to be twelve. I know it.
9.2.547		Erik:	Eleven Twelve
9.2.548		David:	I know it. The purples
9.2.549		Erik:	Two three four
9.2.550		David:	Ok, let me do it.
9.2.551		Erik:	five six seven eight nine ten eleven twelve. There we go. Now we can just knock all those.
9.2.552	57:52	Meredith:	[Alan begins to straighten the model with the yardstick] No, that side's
9.2.553		Erik:	You don't really need- Wait a minute, now I just gotta do the thirds and the fourths.
9.2.554		David:	Don't touch anything now.
9.2.555		Erik:	One two three four five six
9.2.556	Fig 10	David:	Don't touch anything. You can just count. [David gets up and leaves view of camera for a minute and returns] alright, let's see I think the ones would be one forty-eighth
9.2.557	58:44	Erik:	Wait, four, eight twelve, just count by fours, cuz.

9.2.558	David and Erik:	Two four six eight ten twelve fourteen sixteen eighteen twenty twenty-two twenty-four twenty-six twenty-eight.
9.2.559	David:	Thirty.
9.2.560	Erik:	Two four six eight ten twelve fourteen sixteen eighteen twenty twenty-two twenty-four twenty-six twenty-eight thirty, thirty-two, thirty-four, thirty-six, thirty-eight, forty, forty-two, forty-four, forty-six, forty-eight. Yep, forty-eight.
9.2.561 59:23	T/R 1:	Are you surprised that it's forty-eight?
9.2.562	Erik:	No, not really
9.2.563	David:	No, that's what I thought it would be.
9.2.564	T/R 1:	That's what you guessed? So in other words, you were able to build what you thought, what you predicted. Are you going to be able to write this up?
9.2.565	David:	Um, well, not draw it, maybe not
9.2.566	T/R 1:	Maybe sketch it, maybe you want to take some notes on your diagram before it ends. What do you think, Meredith? You think you made another, you made a different model. Ok, you might want to take some notes to sketch it to you remember what you did. So you can start
9.2.567	Erik:	But how would we sketch it?
9.2.568	David:	Well I was surprised because I thought the greens were the purples one twelfth.
9.2.569	Erik:	So I think what I'm gonna do
9.2.570	T/R 1:	So you think the purple's one twelfth - is there another name for that purple?
9.2.571	Erik:	Um, one, one
9.2.572	T/R 1:	Meredith always like to have other names for these
9.2.573	Erik:	One twelfth
9.2.574	T/R 1:	I know, that's one name, one twelfth. Is there another number name for the purple?
9.2.575	Erik:	One fourth, no. I mean, uh, what's it called. Wait,
9.2.576	T/R 1:	If you were using-
9.2.577	Erik:	One whole!
9.2.578	T/R 1:	If, let me ask you this
9.2.579	Erik:	One whole, one half
9.2.580	T/R 1:	Don't just guess cuz you're gonna have to prove it to me, Erik. This is my question, to, to Meredith, who likes to come up with different number names and Erik sometimes says on the tape, 'I don't know why we have to have more names.' I like to have lots of names, frankly. Um,

9.2.581		David:	Um, wait a minute, um, four twelfths?
9.2.582		T/R 1:	Ok, David thinks four twelfths
9.2.583		Erik:	One twelfth! One twelfth!
9.2.584		T/R 1:	We know it's one twelfth, we agreed it's one twelfth, and you've proved it's one twelfth.
9.2.585		Erik:	Four twenty-eighths. I mean, four forty-eighths.
9.2.586	1:1:50	T/R 1:	You think four forty-eighths?
9.2.587		Erik:	Because the whites would be, the whites would be forty-eighths, and then, and then it takes
9.2.588		David:	[interjecting]-I didn't mean- four twelfths I mean four forty-eighths
9.2.589		Erik:	[continuing] Four whites to equal up
9.2.590		David:	Four twelfths.
9.2.591		Erik:	Four forty-eighths.
9.2.592		T/R 1:	You mean four forty-eighths.
9.2.593		Erik:	I said four forty-eighths.
9.2.594		T/R 1:	Meredith? You think that makes sense?
9.2.595		Erik:	Four forty-eighths or
9.2.596		Meredith:	One twelfth.
9.2.597		Erik:	One twelfth.
9.2.598		T/R 1:	So we have one twelfth, we have four forty-eighths. Any other names?
9.2.599		Erik:	Oh, wait! Oh, yeah! Two, two, two twenty-fourths!
9.2.600		T/R 1:	Two twenty-fourths.
9.2.601		Erik:	Two twenty fourths
9.2.602		T/R 1:	Ok, we have one twelfth, two twenty-fourths, four forty-eighths, anything else? How many different number names and different blocks.
9.2.603	101:27	Erik:	Well, does it have to be the same whole?
9.2.604		T/R 1:	What do you think?
9.2.605		Meredith:	It can also be bigger by, um,
9.2.606		Erik:	Two, or it can be thirds, halves, it could be a
9.2.607		T/R 1:	What are the green called? What's one green?
9.2.608		Erik:	Those are sixteenths.
9.2.609		Meredith:	One sixteenth and one forty-eighth.
9.2.610		T/R 1:	One sixteenth.
9.2.611		Meredith:	And one forty-eighth.
9.2.612		T/R 1:	How did you get sixteenths?
9.2.613		Erik:	Because there are sixteen all lined up to the answer.
9.2.614		Meredith:	One sixteenth
9.2.615		T/R 1:	Show me the sixteen.

9.2.616		Erik and Meredith:	One two three four five six seven eight nine, ten, eleven, twelve, thirteen, fourteen fifteen, sixteen.
9.2.617	1:02:09	T/R 1:	Ok, so the green is one sixteenth. But is the difference between three quarters and two thirds a green?
9.2.618		Erik:	Is the difference between
9.2.619		Meredith:	A green and one forty-eighth.
9.2.620		T/R 1:	So how would, what number name would you give for the differences between
9.2.621		Erik:	Also, the, it also could be it would take two of them to equal up to a brown.
9.2.622		T/R 1:	Well, these are the things I want you to think about and write about. Ok? I think these are good, good questions that are for you. We're up to seventh grade math already so.
9.2.623		Erik:	Seventh?
9.2.624		T/R 1:	So I think you could work it out if you worked hard enough.
9.2.625		Meredith:	Yeah, but I think if you took one sixteenth and one forty - eighth and you put it up to it, it equals
9.2.626		T/R 1:	The difference? Oh, so what number name would you give to that, then?
9.2.627	1:03:01	Meredith:	Uh, one forty eighth [laughs] I don't-
9.2.628		T/R 1:	Well, think about it. [to class] Ok. I think we have to clean up
9.2.629		Class:	Ohhh!
9.2.630		T/R 1:	I know, I'm sorry, I really am, but I hope maybe Mrs. Phillips will let you work on this tomorrow and actually finish writing up what you're doing and describing it for Monday. Is that possible, Mrs. Phillips, that maybe tomorrow they can continue this part of summarizing and write this up?
9.2.631		CT:	Sure.
9.2.632	1:03:45	T/R 1:	Oh, good work! You have to think about that! You have to think hard about it. No guessing, you have to be able to convince me, ok?
9.2.633	1:03:57		End of class.