Description: Clip 1 of 3: Finding the smallest model Parent Tape: Building large models to show equivalence: A generalization Date: 1993-10-11 Location: Colts Neck Elementary School Researcher: Professor Carolyn Maher	Transcriber(s): Yankelewitz, Dina Verifier(s): Yedman, Madeline Date Transcribed: Spring 2009 Page: 1 of 4

11.0.3	T/R 1:	Um, do you remember the problem that, uh, I think everybody in this class has now spent a bit of time working on the problem, which is larger, three quarters or two thirds, and, if you decide which one is larger you were asked, by how much. Do you remember, how- Everybody here has worked on it, isn't that true? Raise your hand if you've worked on that problem? I believe everybody, yeah. Some of you started a new one, but everybody has worked on that. Ok, the question, how many of you have built two models for that problem? For that problem, which is larger, three quarters or two thirds, how many of you built two models? [Some students raise hands] Ok, how many of you have built more than two models? [Three raised hands are seen]. So we have some, you know, really differences here and some time to share, and Gregory you built more than two also and Danielle, you've got two models. Um, how many you think there are? How many models do you think you can build? Michael.
11.0.4	Michael:	Um, if you know what you're doing and you know what strategy, you could probably build, you could probably build one for every single rod.
11.0.5	T/R 1:	What do you mean, one for every single rod, tell me what you mean by that.
11.0.6	Michael:	You could, you could build a thing, you could build fractions of every single rod if you know what you're doing and you have a strategy or a secret that, that you know will work.
11.0.7	T/R 1:	What can be such a secret?
11.0.8	Michael:	That's what I was trying to figure out.
11.0.9	T/R 1:	That's what you were trying to figure out? Does anybody else have any ideas about that? Those of you who built three models, do you think that's all? Can you build more? This table here, Jackie and James, Amy, you think there can be more? [mmm hmm] How many do you think?
11.0.10	Amy:	Well, we got six
11.0.11	T/R 1:	You think that's it?
11.0.12	Jessica, Amy, James:	[Shake heads] No.
11.0.13	T/R 1:	No? Anybody else?Any thoughts? [Meredith raises her hand] Meredith? What do you think?
11.0.14	Meredith:	Well, maybe if you, say you had a white rod, and you divided the white rod, maybe you could make more models that way, if you divided the white rods.
11.0.15	T/R 1:	So you're thinking if you had more, different size rods?
11.0.16	Meredith:	Yeah, yeah.

11.0.17	T/R 1:	Like if you took the white rod and designed one smaller than the white rod? [mmm hmm] Ok. Anybody else, what do you think? There was a theory, I know David's looking at what we built here, David you had a theory that you were testing about uh building some models. There were some models that everyone here built, maybe we should put two of them on the overhead, if you can help me do that, to compare which is bigger three quarters or two thirds. Um, to decide with the rods you have, what was the smallest model you can build? With the rods you had available, not able to cut them or make them different. Did you find- is there a smallest model, when you compared three quarters or two thirds?
11.0.29	T/R 1:	Kelly, you think you have something, you want to come and help? Graham, you can come and help.
11.0.30	Kelly:	I don't have fourths in my one that I made
11.0.31	T/R 1:	You don't have fourths? How about here? Amy? James? Jackie? [Amy James and Jackie come to OHP] Oh we're starting to get think- we're starting thinking now. [Amy, James, and Jackie build the model using orange and red train as one, purple as one third, and light green as one quarter.] Ok, you want to tell the class about what you have there?
11.0.32	James:	Ok, um, well um, we had this model and we uh this is two thirds and three fourths and we think that three fourths is bigger by one twelfth. [He separates two purple rods and three light green rods from the original model to show the comparison].
11.0.33	T/R 1:	Questions, anybody? What's one twelfth?
11.0.34	James:	Because, um, twelve whites equal up to this. Let me show, here. [He puts two white rods on his model]
11.0.35	T/R 1:	Are you all convinced?
11.0.36	Jessica:	But didn't you say to make a smaller one?
11.0.37	T/R 1:	Well I said you make the smallest one you can make?
11.0.38	Jessica:	But I don't think that's the smallest one.
11.0.39	T/R 1:	Can you make a smaller one? It's an interesting question. If you don't think there's a smaller one you should be able to show it, or at least-. [James and his partners continue placing the twelve white rods on the OHP]. What do you think?
11.0.40	James:	[Figure O-15-38] Well, we just put twelve whites on there and it takes one white to equal the two pinks, to the three, oh yeah, purple to the three greens. So that's why we think it's one twelfth.
11.0.41	T/R 1:	How many of you agree with that? How many of you agree with that model? How many of you found that same model when you worked it out? Raise your hand if you found the same model. [All

		students visible raise hands] Ok, it looks as if everyone did. I have a question that Jessica is raising, I'm listening to Jessica next to me. Jessica says she thinks there's a model that you can build that's smaller, now, when I use the word smaller, you use the word smaller, what do you think we mean? What do you think, Erik?
11.0.42	Erik:	Smaller in size-wise? Like size for the thirds, the fourths, and, and the whole. Smaller by size.
11.0.43	T/R 1:	Ok, so what what we called one in this problem was what, what did we call one? Brian?
11.0.44	Brian F:	Well, um, the orange and the red.
11.0.45	T/R 1:	Yeah that train we called one, right? And I guess the question is, that train has a particular length, right? You can see the length of that train? Is it possible to build a model to show the comparison of three quarters and two thirds with a train that has lengths smaller than that, now if you think it isn't, you've gotta convince me with some argument.(Oh I know) Oh, Erik thinks he has an argument to convince me there's not a smaller one because Jessica doesn't believe it. Right, Jessica? Jessica seems to think there's one that can be made with a train that has length shorter than the one up there. So if you think you have an argument, Erik thinks he does, raise your hand. I want you to think about this. You might want to talk to your partner about your argument and see if your partner buys it. You don’t have to talk to your partner. Ok, we'll let you guys go first and Erik is listening to see if he agrees. Ok.
11.0.46	Amy:	We say that there was no more, that you can't get a smaller one because every one you use equals up to an orange and a red, and the secret is that every one has three purples and four greens. And so you can't possibly make one smaller because you won't be able to fit, it won't work because every one you make equals up, equals up to the orange and red.
11.0.47	T/R 1:	So you're telling me the six models that you made
11.0.48	Amy:	Were the same length.
11.0.49	T/R 1:	Were all the same length. In all of your cases, the, the, what you called one had the same length as the orange and red. That's very interesting.
11.0.50	James:	Well, well, we could make another model to show that.
11.0.51	T/R 1:	We believe you. Does anybody need to have that shown, what they would've done? How many of you did that too? You found different ways to show one, that had the same length as orange and red,

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11.0.52	Beth:	Yeah, Sarah just built another model that uses the exact same length as the other one.
11.0.53	T/R 1:	And what did, what was, how did she make her train?
11.0.54	Jessica:	Yeah, that's what I was going to do.
11.0.55	Beth:	Blue, light green, and then the half is dark green, and the third is purple and the fourths were the dark greens- were the light greens.
11.0.56	Jessica:	See, that's what I did, I was gonna make one that was the same exact size.
11.0.57	T/R 1:	Ok, so many of the models you made were really models where your, what you called one, that train, really had the same length as the orange and red. Is that all you can make? How do you know that, that, that there's not one smaller? Erik? I'm still not convinced that there's not one smaller. They didn't convince me. How would you convince me?
11.0.58	Erik:	Well, see, I agree that, that, I agree with them just at the part that there's no, there's no other smaller. I think, because at their model, they use the twelfth as the white ones, and there's no rod smaller than the white rod. So, therefore, if you make it a rod smaller than it, they can't, you can't divide it into twelfths.
11.0.59	T/R 1:	Ok. Did you hear what he said? Yeah!
11.0.60	Erik:	Because the twelfths right here are the smallest rod possible.
11.0.61	T/R 1:	Ok, so
11.0.62	Erik:	Unless you made a new rod.
11.0.63	T/R 1:	So unless we use Meredith's idea of creating new rods that had, that were smaller than the white rods, then you could make a smaller model, Erik?
11.0.64	Erik:	Yeah.
11.0.65	T/R 1:	The rest of you agree with that? So, so then, ok, I'll buy that, how many of you buy that argument? That seems reasonable. So you've made the smallest one already. Jessica, is that reasonable to you?