

Description: Fraction problems: Sharing and Number Lines (Overhead View) Parent Tape: Fraction problems: Sharing and Number Lines Date: 1993-11-01 Location: Colts Neck Elementary School Research: Professor Carolyn Maher	Transcriber(s): Schmeelk, Suzanna Verifier(s): Cann, Matthew; Farhat, Marcelle Date Transcribed: Spring 2009 Page: 1 of 25
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Line	Time	Speaker	OHP View
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1	OHP 12:50	RT1	Well, Good Morning
2		Class	Good Morning
3		RT1	It's Monday. It sounded like that last Monday, too. You know today we have a visitor another visitor. And maybe, Professor Davis can say a few words about our visitor.
4		RT3	Okay. Do you know what country the city of Oslo is in?
5		Student	[Off Camera] Norway
6		RT3	You are Right. Well that is where he is from. Professor Gunnar Gjone is from Oslo, Norway and he is here to see what we are doing.
7		RT1	That's quite a long distance isn't it?
8		Class	Yes.
9		RT1	Okay. Umm it is Monday morning that's true and I know you all had a wonderful weekend . Yes. It was a very special weekend wasn't it?. Too bad it rained but I bet you made the best of it. But it is Monday and I'm wondering if you could think really hard and sort of help me and try to help us remember what we were doing on Friday morning? Do you remember how it all happened? Was it Friday? Something you were doing on Thursday led to something you were doing on Friday. Remember? Oh, look, we have 3 people, 4 people, 5 people remembering what we did on Friday. I know it takes a while. Thinking hard? It's okay to talk with your partner.(chatter) More people are remembering. Okay. There are still some people are not remembering. I can't believe James doesn't remember. I think James remembers. Can someone help James? Are you helping James remember? Oh, he says. Who wants to tell our visitor what happened? Graham, your hand was up first, do you want to tell our visitor what happened?
10	OHP15: 03	Graham	Well, we had a candy bar .. Tuesday.(Inaudible) And then We had to make a problem and use our rods to see who got more and by how much.
11		RT1	Okay, can someone tell us how that story end? Did it?

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			Who got more and who got how much? Who wants to tell us the rest of that story? Mark?
12		Mark	Well, the people that got one fourth got more by five thirty-sixths.
13		RT1	Five thirty-sixths more? How many of you remember that? Five thirty-sixths more.
14		RT1	How many of you believe that?
15		RT1	Okay so, you all seem to believe it, but you don't all quite remember it. But do you remember how you did it? Do you remember how you were able to show that they got more by five thirty-sixths?
16		RT1	Does anyone want to kind of review how you showed that one fourth was larger than one ninth by five thirty-sixths?
17		RT1	Can you kind of remember it in your head without the rods, how that worked, James?
18	OHP 16:28	James	Umm .Well, we had to thirty six whites, And it took five whites to get from one-fourth to one-ninth one ninth, or one ninth to one fourth, so five thirty-sixths to get.. is the answer.
19		RT1	So that's the difference? (James –Yeah)How many of you remember that?
20		RT1	Do you know what I am curious about? Some of you said one fifth. In fact everyone in this class thought the difference would be one fifth before you did the activity. Do you remember that? I asked you.
21		Class	Um-hum.
22		RT1	I'm kind of curious, what made you think one fifth? Brian?
23		Brian	Well, it's the same, well me and Meredith kind of thought that it was the same as nine minus four equals five.
24		RT1	So you were thinking whole numbers.
25		Brian	Yeah
26		RT1	Does it work that way with fractions? What do you think Meredith?

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27		Meredith	Well if you put the blue which has nine ones in it, and the four plus the five rod then you have nine.
28		RT1	You said if you took the blue, and what number name are you giving that?
29		Meredith	Well I'd call it nine
30		RT1	You're going to give it nine, and what was the other rod?
31		Meredith	The four rod which I think was the purple rod
32		RT1	You're calling the purple, four? Is that what you said?
33		Meredith	Yes, and then the yellow would be the five and it would equal up to it. That is what I thought at first.
34		Erik	[<i>Shaking-head, 'NO'</i>] I think that ...
35		RT1	What is wrong with that thinking? [<i>Meredith simultaneously says that was what she thought at first</i>] I mean five plus four is nine, I believe that, does that that work? Erik did you want to say something?
36		Erik	I think that it doesn't make sense because how could the blue rod be one ninth of one model and the purple rod be one fourth when the blue rod is larger than the purple rod? ... Maybe If you made a super gigantic train than maybe the blue rod would be the nine but I would think that the purple rod, more sensibly the purple rod or the yellow rod would probably be the nines and the blue rods would be the fourths..
37		RT1	I heard Meredith call the blue rods
38		Erik	Yeah I know I just don't think the way Meredith explained the way she thought before made a lot of sense..
39		Meredith	I know I changed my answer.
40		Erik	I just think the five rods equals up to the same as five thirty-sixths
41		RT1	So you think that the five thirty-sixths is somehow related.
42		Meredith	Um-hum
43		RT1	That's an interesting idea. Do we have enough of these? How is that, is that better?

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44		RT1	Okay. So that is a start that can get you very confused. Is that right?
45		Class	Yeah
46		RT1	If you call the blue rod nine, then you could say then the white rod is one, pink rod is four, yellow rod is five and you proved five plus four is nine. You actually proved five plus four is nine. You proved it doesn't quite work that way for fractions, does it? What do you think?
47		Class	[<i>Quiet</i>]
48		RT1	Okay. That was very interesting, so, I was just wondering when you saw the big model that was built and you saw that the person that got one quarter of the candy bar got five thirty-sixths more than the person who got the ninth of the candy bar, is that much of a difference do you think?
49		Jessica	No, I think that there is twenty-five people in the class and that is an odd number, so so umm you cannot have all even groups, that is why I think some people got one ninth and one fourth.
50	OHP 21:00	RT1	I wonder if there is a better way and I want you to think of a way, I want you to follow this pattern and I want you to think about, of sharing those three bars of candy so everyone got the same amount exactly. Think about a way, think about that.. [<i>Andrew raises his hand</i>] Andrew, any ideas?
51		Andrew	Well, what I did one day we had to do for homework, that we had to divide equally, so I came up with the answer that everyone got one and one fifth.
52		RT1	How did you do that?
53		Andrew	Well, there were three candy bars and each one had ten rectangles in it. So I took twenty five of them and circled it and put one. Then, the five left, if you divided them up into fives it would be five, ten, fifteen, twenty, twenty five, so each person would get one and one fifth.
54		RT1	That is an interesting conjecture isn't it. Did you hear that what Andrew said? How many of you follow what

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			Andrew said?
55		Class	[<i>Few students raise their hands.</i>]
56		RT1	I wonder if there is a way to test that, that it would have been, uhm, okay. Could you draw us a picture or something to show us your way. Andrew, how did you show that?
57		Andrew	Yeah, well, I made the three candy bars
58		RT1	Can you try to all imagine what he is doing? The three candy bars.
59		Andrew	with the ten pieces in them.
60		RT1	Ten. Ten. Ten. Can you all imagine that?
61		Class	Umm-hum [<i>'Yes'</i>]
62		Andrew	Then, I took two candy bars and five pieces of the other one to make twenty five.
63		RT1	Okay so everyone gets one of those thirty pieces and there are how many left over?
64		Class	Five.
65		RT1	Five. Do you all follow that? How many people follow that so far?
66		Class	[<i>Some students raise their hands.</i>]
67		RT1	So, thirty pieces and everybody got one and five left over. Okay
68		Andrew	Then those five would be just like one candy bar but it would be smaller so you divide them into fifths—five, ten, fifteen, twenty, twenty-five. There are enough people so everyone get one and one fifth.
69		RT1	What do you think about that? Would that have been fairer, do you think? Get one and one fifth compared to some people getting one and one quarter and some people getting one and one ninth.
70		Class	[<i>Mumbles 'Yes'</i>]
71		RT1	What do you think?
72		RT1	Is one and one fifth more or less than one and a quarter? More or less? What do you think?..Is one and one-fifth

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			more or less than one and a quarter? Those of you in the group with one and a quarter now got one and one fifth would you have gotten more or less? One and one fifth more or less?
73		RT1	Danielle?
74	OHP30: 26	Danielle	Less.
75		RT1	Okay. How many think it's less?
76		Class	[<i>Some students raise their hands.</i>]
77		RT1	Why?
78		Danielle	Because that's [<i>five</i>] a bigger number, so when you have a bigger number, you get less.
79		RT1	Which is the bigger number?
80		Danielle	Five
81		RT1	Five. Okay. What do you think about that? What do you think? Brian?
82		Brian	Well, I agree with her. If you have a bigger number than you need to take like say, see its one and one fifth. If it is one fifth, then there has to be five of them in one whole. And If there is one fourth, And If they are quarters, then you only need four of them to go into one whole, so five is a bigger number and so it needs more to fill up one whole. So its so it's less.
83		RT1	[<i>Writes one half, one third, one fourth and one fifth</i>] So, if I were to say things, like one half, one third, one fourth, one fifth, right? If I were talking about these numbers then would you know which are bigger and which are smaller? How many think you know which of these numbers are bigger and which are smaller? Who could explain why? Can you imagine the model?
84		Class	[<i>Many students raise their hands.</i>]

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85		RT1	David, what do you think?
86	OHP32: 06	David	Well I think that like if you have about this big then one half would be right in the middle [<i>motions ½ on a imaginary unit</i>] then one third that would be kind of smaller [<i>motions to where one third would cut on a unit</i>] because you have to fit three pieces in there and then one fourth would be even smaller than one-third.
87		RT1	Want to come draw that for me? You all hear what David is saying?
88		David	[<i>Walks up to OHP in front of the room.</i>]
89		RT1	Sure, Want to draw your one. Call something one and draw it?
90		David	Umm Maybe umm the orange
91		RT1	Just sketch it ...Sure
92		David	Umm like If this is the one here
93			... then one half would be there...and then you
94		RT1	Can you mark one half right where you put it, like put it right underneath so we can see it?
95		David	What do you mean?
96		RT1	Just draw the number one half . Put one half where you want to show one half.
97		David	One half, Then, one third.
98			Then one fourth.
99	OHP28: 03	RT1	Then, one fifth. Thank you very much. Does anyone have a question to ask David before he sits down about what he has done? Can you imagine this with the rods? Thank you, David. Where do you think one fifth would be Meredith?
100		Meredith	The whole would be divided into fifths.
101		RT1	So do you think it would be to the right of a quarter or to the left of a quarter?

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102		Meredith	Left.
103		RT1	To the left, So somewhere like this maybe?
104		RT1	I'm going to do this. I'm going to call this zero and I'm going to call this one. I wonder who would like to come up here and mark where the number one half would be? Michael?
105		Michael	<i>[Walks up to OHP in front of the room.]</i>
106		RT1	Do you Want to mark one-half underneath where I put the zero and the one.
107		Michael	<i>[Places the number midway between 0 and 1.]</i>
108		RT1	Thank you, Michael. How many of you agree with that? You would put it in the same place.
109		RT1	What do you think the next question will be?
110		Class	<i>[Inaudible]</i>
111		RT1	So, where do you put one third and one fourth? Would you call on someone? Erik?
112		Erik	<i>[Walks up to OHP in front of the room.]</i>
113		RT1	You got to watch because if you don't agree you've got to say it. Approximate is okay, Erik.
114		Erik	Approximate <i>[Places the number one third to left of one half.]</i>
115		RT1	How many of you agree with that?
116		Class	<i>[Camera shows students raising their hands.]</i>
117		RT1	Does anyone disagree?
118		Class	<i>[Camera shows students raising their hands.]</i>
119		RT1	Don't go away, Erik, what's the next question? Somebody disagrees. Andrew. Do you agree? ANDREW_ - NO RT1- Andrew disagrees. What do you disagree with?
120		Andrew	The one third approximately needs to be a little more over because the one fourth has to be half of the one half. So, if you put one fourth half of that <i>[placement of</i>

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			<i>one third</i>] it would be on the left of the one third.
121		Erik	I know. I didn't, I didn't put the one third. The one third, if it was one fourth it probably be about here right. So it's not, it's just approximate cause I don't think
122		RT1	Okay, Do you want to call on Andrew to put in the one quarter? Now do you agree with all this Andrew?
123		Andrew	[Laughs. Walks up to OHP in front of the room. Places a one fourth to left of one third.]
124		Andrew	Yeah. Should I call on someone to place one fifth?
125		RT1	Okay. How many of you agree with what's up there?
126		Class	[Several students raise their hands.]
127		RT1	Does Anyone disagree? [No students raise hand]
128		RT1	Okay. What about the one fifth? Want to call on someone? Brian.
129		Brian	[Walks up to OHP in front of the room and places one fifth to left of one fourth.]
130		RT1	How many agree with that?
131		Class	[A few students raise their hands.]
132		RT1	Now suppose I asked you to put one tenth up there. Where do you think it would go? Think about it for a minute and tell me where you think it would go. One tenth. Beth, is your hand up or you just thinking? [Beth remains quiet] Where to put one tenth. What do you think?
133		RT1	Any ideas? Erin? Mark?
134		Mark	[Walks up to the OHP and writes one tenth to the left of one fifth]
135		RT1	Ok im going to ask you all one one-hundredth... What do you think?.
136		Erik	I disagree.
137		RT1	Erik, disagree? James? It's getting hard. Brian? I know this is getting hard right?. Jakki, you disagree? Why?
138		Jakki	Well, if one fifth is next to the end. Then five plus five

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			equals up to ten, so it would be like in the half.
139		RT1	OH Jakki thinks one tenth should go in the middle.
140		Students	[mumble no]
141		RT1	You disagree. James?
142		James	I think it should go more towards zero.
143		Students	[mumbles yeah]
144		RT1	More towards zero?..David? Alan?
145		Alan	I think that the one tenth should be moved over just a tiny bit.
146		RT1	It's getting hard to do this, isn't it?
147		Alan	Yeah, Up there you have a whole, you are dividing it into tenths and you have a half mark. So you have to use this as a guideline, you'd have five tenths on one side and five tenths on the other side. Now, up there, if you took that little space between the zero and the one fifth, and you use that five times it wouldn't reach the half way mark.
148		Mark	[Inaudible gesturing on number line]
149		RT1	What do you think? Brian?
150		Brian	I agree with Mark. It is a little far back. I think the third should be moved up, then the fourth should be moved up. Because that why I thought the fifth was wrong when I did it because everything was moved back.
151	OHP 35:24	RT1	Know what I would like you to do? Maybe the problem is there isn't a lot of space; when you use the overhead pen it takes a lot of space. I would like you all to make your own number line between zero and one at your seats. I would like to see if you could place fractions between zero and one. I'd like you to place all the fractions, one half, one third, one fourth, one fifth, one sixth, one seventh, one eighth, one ninth and one tenth, with your partner. Jakki?
152		Jakki	[Whispers to RT1]
153		RT1	Sure. You can put your papers the long way if you'd like. No problem.
154	OHP [37:05]		

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155		RT1	(walking) I wonder where one one-hundredth would go?
156		Students	One one-hundredth? One one-hundredth would be like over here.
157		RT1	What about one one-thousandth?
158		Erik	[<i>Off camera</i>] one one-thousandth would be at the window.
159		RT1	Would it be That's a very good question, Erik. Would it be somewhere on this line or somewhere near the window? because that's a good question.
160		Erik	[<i>Off camera</i>] You would have to make the line bigger.
161		RT1	but If you had a microscope you could get it on .Would it still be on the line?
162		Students including Erik	(inaudible talking responding to RT1 question) one one-thousandth would be...
163		BREAK HERE	
164		Andrew,	[<i>The camera focus on group consisting of Jessica and Andrew.</i>] One fifth. one tenth
165		Andrew	One tenth would be one, two, three, four, five, sixth, ... one, two, three, four, five, sixth, seven, eight, nine, ten [<i>counts out 10 spaces</i>]
166		Andrew	It would be right about there ...one tenth right
167		Andrew	One hundredth?
168		Jessica	One one-hundredth
169		Andrew	Would be right here
170		Jessica	That would be like on top of the zero almost.
171		Andrew	And, then, one thousandth would be right there [<i>points closer still to zero</i>]
172		Jessica	On top of it Like one one-hundredths and one one-thousands, well like one one-hundredth would be right there and One thousandths would be right on the zero.
173		RT1	Then, where would one ten-thousandths be?
174		Jessica	You would have to have a bigger thing. I think..
175			Well, if you squish it together, I think. Then you could put it all together.

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176		Andrew	Well, it does depend onWell..
177		Jessica	It sort of does depends how big,.....
178		Andrew	No, not really, because
179		Jessica	Otherwise you would have to squish it all in ...
180		RT1	You were saying Andrew?
181		Andrew	It would be like something you really cannot see. Actually you would need something like a stop watch to figure it out. It does not matter what size it is, because you will still have to have one half and a one third would still take up as much room as anything else, so.
182		Jessica	I wonder where one one-thousandth would go? Oh, I know where one one-thousandths would go; that's easy. I think it would be one, one-hundredth, one one-thousandths and one one-tenthousandths. [shows work to RT1]
183		RT1	Okay [moves away]
184		Jessica	Dr. Maher I think I have one-one hundredth, one one-thousandth and one one umm ten thousandth or Then, you could do, one one-hundred-thousandths and one one-millionths.
185		Danielle	[to Jessica] How high are we supposed to go?
186		Andrew	I went to one one-hundredth.
187		Jessica	Up to, one one-hundredth.
188		Andrew	[Camera focuses on Andrew](whispers counting to self,) Fifty should; be here on the one hundredth so its like.. (starts counting quietly)
189		RT1 to Class	Okay. If you're done and you're waiting for other people to finish, could you mark on your line where three would be?
190		Andrew	Three fourths?
191		Jessica	[Off camera] One third one fourth, Three fourths would probably be in the middle.
192		Andrew	Hum.
193		Jessica	Well, three fourths would probably be in the middle

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			of one fourth and one third.
194		RT2	So Andrew look up. How are you all doing here? [stands over Andrew]
195		Andrew	Good
196		RT2	You're doing well?
197		Jessica	I mean Three fourths? Oh. [off camera] I think it would be between them.
198		Andrew	Here [motions to either side of 1/2] and there next to the one-half.
199	OHP 42:58	RT2	[to Andrew] Can I ask you a question?
200		RT2	I see one third here and I see one third, here
201		Andrew	Yeah, I did it on both sides.
202		Jessica	[off camera] Yeah, I did it on both sides.
203		RT2	How does that work?
204		Andrew	Well, you see, it does not matter because I just did it on both sides so that it this doesn't like work.
205		Jessica	[off camera] Yeah, that is what I did, I did it on both sides.
206		Andrew	You could go by that way [motions from the right]
207		Andrew	Or you could go by that way [motions from the left]
208		RT2	Oh, I see. Okay. So you just sort have done it a mirror image both ways
209		Andrew	Yeah
210		Jessica	[Off camera] Yeah, you could just you could just do it like that [folds paper in half off camera]
211	43:34	RT2	So if I fold it in half, then I would have enough information to talk with. I see.
212		Jessica	[Off camera] Yeah.
213		Andrew	[Follows Jessica and folds paper]
214		RT2	Okay. That is interesting. I see you put one one-hundredth right there
215		Andrew	Yeah
216		RT2	That's interesting.
217		Andrew	What I thought was that I was trying to estimate,

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			count all the way up to one half because
218		RT2	How many times did you have to count?
219		Andrew	Like, if you wanted to put the exact one hundredth, you would have to make it the length
220		Jessica	[<i>Off camera</i>] All even
221		Andrew	The length, to count all the way up to fifty by one half, then the other fifty in the other one half.
222		RT2	Oh.
223		Jessica	[<i>Jessica off camera</i>] So, you would have to imagine the length
224		RT2	What do you think if you were going from zero to one tenth, how many times would you have to count to place one hundredth?
225	44:30	Andrew	Well, zero to one tenth, you would have to place one hundredth about ten times because ten,
226		Andrew	Fifteen
227		Andrew	Twenty
228		Andrew	Thirty
229		Andrew	Forty, Fifty
230		Andrew	Well, yeah, I think it would be like ten times.
231		RT2	Okay. So if you took this little piece,
232		RT2	And then you could divide it into ten pieces.
233		Andrew	Yeah. About ten times.
234		RT2	Yeah. That's interesting. Okay [<i>nods head up and down 'yes'</i>]! Alright, Looks good.
235		Andrew and Jessica	(Have side discussion about rulers)
236			[<i>Camera focus on students Caitlin and Brian</i>]
237		RT2	[<i>looking at Brians work</i>] So you've got a half, and a third and fourth and a fifth and a tenth and it looks like you've got even spaces in between them. How does that work? [<i>Brian erases his work</i>] What do you think Caitlin? Do you agree with that? Did you do that too?
238		Caitlin	2 line between each one. I thought that the one tenth would go there. Because Dr. Maher said (inaudible words) rods. Inaudible.. and she said to see where it ends and ten rods.. it ends

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239		RT2	I see and that's why you put the one tenth over at zero then. What I am curious' about if this really works, what Brian's doing with these equal spaces between these.. What happens if I have a new fraction?
240		Brian	(Inaudible)I don't think it would really work
241		RT2	Why not
242		Brian	Because each one would be a different size rod
243		RT2	Okay you're picturing the rods now. Well that's interesting. Okay so you got one half here supposedly in the center in the number line. You are putting one-fifth over here. Why are you putting one-fifth over here?
244		Brian	I think that's how they work. I think a third would be here
245		RT2	Okay and why do you think that? Are you imagining something? I don't understand . I think you are on to something here.
246		Brian	Whenever you put a different fraction each number.. it would get smaller each time. If you did five of these it would have to be smaller.
247		RT2	Okay. If you are doing five I think is what you are saying that would make it smaller and if you are doing a third..
248			[Brian places numbers on his number line] [Camera focuses back onto Andrew and Jessica]
249		RT1	Well, this side doesn't make sense because it's supposed to be getting bigger. See what I'm saying? [<i>camera crew inserts microphone</i>]
250		Jessica	This side doesn't make sense because you would have to be getting smaller?
251		RT1	Smaller or bigger?
252		Jessica	No I mean bigger.
253		RT1	[<i>To Jessica</i>] Where would three quarters go?
254		Jessica	[<i>To Andrew</i>] We have to figure out where three fourths goes.

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255		Andrew	No kidding Sherlock.
256		RT1	[<i>To Class</i>] Okay so Are you ready Alan? Are we just about ready to discuss? How many of you are about ready to discuss? Okay almost four of you are ready to discuss. Maybe in a minute we will wrap up and have some good discussion. [<i>Alan raises his hand.</i>]
257		RT1	I would like to um ask you to um sort of stop placing your very careful placement of numbers. And I know you have not all finished, but I would like to spend the last few minutes in discussion and bring your attention to a few things I've noticed. I know it's hard when you are in the middle of something to stop. [<i>Places transparency on OHP.</i>]
258		RT1	How many of you have ever used a number line before?
259		RT1	Have you placed numbers on the number line before?
260		RT1	How about putting whole number on the line. If that were zero and this were a one.
261		RT1	Where would I put two? You know where I would put David?
262		David	Ohm. Over there. [<i>RT1 draws line from 0 to 2 with a continuing arrow.</i>]
263		RT1	Over there? About where, over here somewhere.
264		David	Yeah
265		RT1	Where would I put three?
266		David	Further over.
267		RT1	Do you know where you would put four and five? Do you all see that? How many of you have done that before? You made a number line and placed the numbers on the line?
268		Class	[<i>Many students in camera view raise their hands.</i>]
269		RT1	You could imagine that number line? You could

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			mark zero, one, two, three, and four? Where would you put a thousand? Where would a thousand be on that number line? Can you imagine that? How many of you can imagine where a thousand would be? Would it be in the building?
270		Class	[mumbles no]
271		RT1	Would it be outside the building?
272		Class	[Giggles yes]
273		Alan	You'd be all the way to Pittsburg, Pennsylvania.
274		RT1	You think that far huh. So you remember how to do those number lines, right? Okay. I bet when you did number lines before you didn't place numbers between zero and one, did you?
275		Class	[mumbles no]
276		RT1	Is that right? You didn't place numbers between zero and one when you made your whole number line. Do you see the difference in what we are doing now? Now we are sort of looking at other pieces of the number line. Now Alan is going to share with us his piece of the number line between zero and one. He is going to talk about it so I would like for you to listen. Because I see some interesting questions out of here. [Alan walks up to the OHP in the front of the room.]
277		Alan	Now about the one one hundredths. I think.
278		RT1	Let's talk about the other ones first.
279		Alan	Well, between zero and one you can divide it into those fractions. Three fourths would go there [motions to half way between $\frac{1}{2}$ and 1] because you would have the one third there, and then you would place one fourth there. And, it would take three of those [motions to $\frac{1}{4}$] to get up to that mark. The one half you could use as guideline. The others, one tenth, one one-hundredth, and one one-thousandth.
280		Alan	Now I made another [points to an enlarged portion of the top number line] because you couldn't really

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			see it on the other [<i>top number line</i>] That is where the one thousandth would go. You couldn't really make anything bigger than that because it would be too hard to see.
281		RT1	Leave that up there, Alan. I want you to stay up there for a minute. (inaudible) Some people made their number line where they took one third and they had one third to the right of where you placed one half. How many of you have that on your number line where you have one third to the right of one half?
282		Class	[<i>Some students raise their hands.</i>]
283		RT1	I'd like to have a discussion because enough of you did that and enough of you didn't do that and we had some differences and I'd like to discuss. Some of you put one third in two places. Do you all know what I am saying? Some of you had the one third where Alan has it and some of you also put one third on the other side of one half. What do you think about that? Alan?
284		Alan	You could put basically the one third in any place, in any three places of that number line because you could have the third going either way. I mean, you could take it out from there, you could take it out from there, or you could take it out from there. It really doesn't matter. So you really could put it in three different places.
285		RT1	Do you all agree? So where would a second place for that one third be?
286		Alan	The second place for that one third would be ..it would be somewhere it would be up here approximately [<i>points to the right of one half</i>]
287		RT1	Where would you put two thirds?
288		Alan	Two thirds would go right there [<i>motions to same location of where said a 1/3 would go.</i>]
289		Alan	Because, if you have thirds you would be dividing that into three parts so you could put it in three

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			different places.
290		RT1	Well I'm not clear. So you are saying you could put one third in the second place. And you're saying..where..How are you comparing the places where you put the second one third and the two thirds?
291		Alan	Well If you use the rods to sort of bracket like this.
292		RT1	Let's do that.
293		Alan	Here you'd have thirds. [Puts rods on OHP – 1 green and 3 reds]
294		RT1	Okay so let me just sketch this if you don't mind. So I'm going to do something like this right? This is going to be my number line right? This is going to be my zero this is going to be my one okay so here ..is that okay?[marks 0 and 1 on OHP along the green rod. and marks the lengths from the three red rods.] I'm asking you to mark one third; but, remember where I marked zero and one with respect to where I marked my zero and one.
295		Alan	You could mark the one third here [first tick mark]
296		Alan	or you could mark it between here [second tick mark]
297		Alan	or you could mark it here [on top of the 1]
298		RT1	So place the number one third on that number line.
299		Alan	The number one third would go here. [first tick mark]
300		RT1	Okay. Let's stop for a minute. How many of you agree that one third goes up there where Alan is placing it?

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301		RT5	Move to side, honey so we can see.
302		RT1	See what he did? He took the green rod and is calling it one and he took the three red rods and he marked off the spot at the end of the red rod he put a one third. Do you all see that? How many of you agree with that? He put the one third above?
303		RT5	Is it a third? Is it or isn't it?
304		Class	[<i>Many students in view raise their hands.</i>]
305		RT1	How many of you believe it is something else?
306		Class	[<i>Few students in view raise their hands.</i>]
307		RT1	This is my next question; it's an important question. Alan is saying, and some of you are saying, that where I also have that other little mark I can also put one third. I'm asking you then how/where would I mark two thirds? That's my question to you. Where would I put two thirds? I guess I get a little confused when you tell me they are both one third. I'm kind of wondering what you are thinking.
308		Mark	[<i>Walks up to OHP in front of the room.</i>] Well, I would put it there [<i>puts it over 2nd tick mark</i>]
309		RT1	Mark would put it there. How many of you would put two thirds there also? [<i>Off camera</i>] You all would do that. Where would you put three thirds? Danielle, you want to come put three thirds somewhere?
310		Danielle	[<i>Walks up to OHP in front of the room. OFF CRT2ERA. Places 3/3 above the third tick mark or I</i>]
311		RT1	Where would you put zero thirds? Andrew? Stay there Alan. I'm not finished.
312		Andrew	[<i>Walks up to OHP in front of the room. OFF CRT2ERA. Places 0/3 above the first tick mar, or 0</i>]

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313		RT1	Okay. zero thirds, one thirds, two thirds, three thirds or zero, one third, two thirds, one. Do you agree with that? Does that make sense? Is it okay to put one third where you have two thirds if that is your number line and not rods anymore?
314		Alan	Well, basically, what you can do is this space could be one third, and that space could be one third.
315		RT1	That's true. I believe that. You proved it when you put the red rods there.
316		Alan	Basically, what comes to mind when you think about fractions is that you cannot always think about the first one
317		Alan	because you could put it here [<i>motions to first space</i>],
318		Alan	here [<i>motions to second space</i>]
319		Alan	or here [<i>motions to third space</i>]
320			and it would still be one third. But, you could put one third,
321			two thirds,
322			or three thirds.
323		Alan	You could put it in any one of those three places but you could still go one third [<i>motions to first place</i>],
324		Alan	one third [<i>motions to 2nd place</i>]
325		Alan	or one third [<i>motions to third space</i>].
326		RT1	Does that really work? I'm curious? Andrew?
327		Andrew	I don't think it would work because if you just put red in the middle and call that one third, then if you put on the left side of it three thirds then on the right side of it two thirds then you would be reading it

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			two thirds, one third, three thirds. So, ohm, where ever you put it in that space, you always are going to have to start from zero because you cannot go from one down to zero because that [is when you stay there] because if you start it like that then you are just switching the zero and one.
328		Alan	Right. It's true you can put one third in any one of these places but basically what comes to mind once you think of fractions is that you always think of the first one it could go in any one of these.
329		RT1	So you are saying the length of all of those rods happen to all be one third. Is that what you are telling me? The length of all of those rods are all one third and you are marking off the rods the lengths of one third, right?
330		Alan	Yeah
331		RT1	But, when you mark off the rods, you mark off where you place the numbers, is it okay then to make all those numbers equal to one third?
332		Alan	Yeah. You could put that there it would be equal to one third.
333		RT1	Yeah. That length is equal to one third but when you place your numbers on the number line can you write them all as one third?
334		Alan	No. You can put that in the beginning on the number line; but, when you think of fractions you can put it in any one of these places as long as like you are not basically trying to divide put another rod in there like this [view blocked as Alan wrote on OHP]
335		Alan	then you would have to put something through there. But, you could put the third in any one of those but they are all the same length each so they still have the same fraction value of one third.
336		RT1	It is sort of like you are making a ruler. Andrew?
337		Andrew	Yeah, but you see, if you put it in the middle, right, then the one on the left is blank so they would think it needs to be filled in so they would fill it in and it would be two thirds because they mostly have

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			spaces because you take zero to one hundred. You can't go one third would be next to one hundred it would be three thirds next to one hundred because if you divide zero to one hundred into thirds you can't go from one third. Then, by the zero it would be three thirds.
338		RT1	Let me ask you a question. If I were making a rule with whole numbers and I decided that I was going to mark off inches, right? Would it be Okay on my ruler, once I decided an inch, you know what an inch is, like that would be one third? Is it Okay to say when I make my marking, Okay this is one and I mark another one and say this is one again and I mark my ruler again and say this is one and mark my ruler again and say this is one. So it's true, they are all one inches in length aren't they, but would that be an Okay way to make a ruler? Would that be helpful? Why not?
339		Sarah	It's not the way to put... A ruler has the different numbers that you count by so if you have all these 1s and you don't have the numbers that they belong to, then....
340		RT1	Well, Alan, would argue, I think, maybe not, that this is one inch and this is the same length one inch and this is the same length one inch, so why can't we mark these all one?
341		Alan	They are the same length, but you could take three more of these.
342		RT1	How do I mark my ruler? I'm making a ruler here for fractions?
343		Alan	Right, but if you say you wanted to divide it. A ruler shows you how long something is like up here [points to OHP] the red is one inch, one inch,
344		Alan	and if you add another one inch on there then that

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			would be two inches
345		Alan	and you add another inch on there it would be three inches.
346		RT1	So what would I mark where the one inch ended. What number would I give it? What number would I put here if I were making a number line or ruler?
347		Alan	You'd put one there [<i>put first red rod down</i>],
348		Alan	Two there [<i>puts second red rod down</i>]
349		Alan	and three there [<i>puts third red rod down</i>]
350		Alan	because that would be one inch and that would be two inches and that would be three inches.
351		RT1	And of course it agrees with what you said each of these are an inch in length. David you were going to say something?
352	Brian 1:08:17	David	Well, I was just going to say that ohm, they may be all the same thing but when you're measuring something then you know that if it is an inch you know how many instead of just counting all of them.
353		RT1	I know our time is up and this is a really good discussion. Alan, thank you, I may want you to talk about your other one a little bit more tomorrow. [<i>to class</i>] I'd like you to think about the little number line you made, the fraction number line between zero and one. I want you to hand in the one you have, but I want you to make me another one, Okay? I'd like to see what you can do between zero and two for homework? See what fractions you know and what whole numbers you know between zero and two. Okay? Is that Okay Mrs. Phillips?
354	Brian 1:09:15	RT5	That's fine. Take out your assignment pad.