

Description: Working with Ribbons and Bows (side view) Date: 1993-12-09 Location: Colts Neck Elementary School Researcher: Professor Carolyn Maher	Transcriber(s): Yankelwitz, Dina Verifier(s): Yedman, Madeline Date Transcribed: Spring 2009 Page: 1 of 25
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Line	Time	Speaker	Transcript
15.1.1	00:07:27	T/R 1:	<p>Here's what we are trying to do today. If you notice we have some displays and this is thanks to Mrs. Demming who is actually in the Cedar school right now doing another kind of filming and she made these displays for us. Maybe the best way is to consider the activity we have for you, of a problem, that we're going to ask you to help us to solve. So let me tell you a little bit about the problem then I am going to say go to it- right? That is what you like to do. We have just received a shipment of ribbon that are going to be used to make bows for the holiday. Ok? You are to consider this examples of your shipment of ribbon. [Holds up ribbon.] Now what's interesting about this ribbon is you'll notice that this ribbon comes in different lengths. On your yellow paper you can see that red ribbon comes in packages of length that is what do you see? 6 meters. Do you all see that? [Students agree]. Gold ribbon? What's the length of gold ribbon? 3 meters. What about blue ribbon? [students answer] 2 meters. White ribbon? [students answer] 1 meter. Ok. Now from these bows, from this ribbon we can make bows and depending upon how much ribbon we use the bows you see can the bows can be different sizes, they can be different shapes, right? Now your problem is going to be to find out how many bows of certain lengths that we can make from the ribbon that's in your package. That's what you have to figure out. Now before you start figuring it out, let me just point out a few things to you. If you need to try to figure out these bows, the lengths of these bows, you might not at first want to cut up your ribbon. You might want to use your ribbon so that you know how much you have to deal with. You might want to cut up the string so you can test your ideas. And if you need to do that you might have to take the string, you might have to measure it, of the length of that ribbon that you have to figure out your problems. Now, now look at the first problem, see the first problem? Do you think you understand what the first problem is asking? How many of you think you understand? You want to talk to your partner for a minute to</p>

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- be sure you understand what the first problem is asking?
Chat with your partner. [Students given 20 seconds to talk]
Ok, we have a question. Someone is asking a question.
Where is the first problem? Who can help answer the question- where is the first problem? Andrew you want to give it a try? Ok, let's see what Andrew has to say.
- 15.1.2 00:10:30 Andrew: By the number one, it says white ribbon it has one meter, and one meter on the bottom where it says. And then it says make a ribbon length of bows and number of bows. So you have to find out look under the ribbon length of bow so it will be one meter and one half how many bows can you get out of one half a meter. So you would have to figure out that.
- 15.1.3 00:10:59 T/R 1: So if you were to take your white ribbon, can you imagine the white ribbon being this long? Can you imagine that? [Holds ribbon up] You might test it if you don't believe it. You might take your white ribbon to see if it's this long. One meter right? Ok, but now with the white ribbon the first question can you see Danielle on there, the white ribbon? What is the length of ribbon you are going to use to make your bow? What does it say on the chart?
- 15.1.4 00:11:26 Michael: You have to use ribbon length of the bow. You have to use one half of a meter.
- 15.1.5 00:11:31 T/R 1: One half of a meter to make your first bow. Right? Now, if you are making your meter, I don't want you to answer out, if you are making your ribbon from a bow one half of a meter in length, I want to know how many bows you could make? Ok, think about it. This is the length of your white ribbon. [holds ribbon] Ok.
- 15.1.6 00:11:54 Erik: One ribbon is a half a meter
- 15.1.7 00:11:55 T/R 1: One ribbon is a half a meter.
- 15.1.8 00:11:57 Erik: And then you have to figure out how many bows, how many of those bows you make?
- 15.1.9 00:12:03 T/R 1: That's right. From one meter ribbon and each bow is a half meter in length.
- 15.1.10 00:12:06 Erik: And how many bows of that kind.
- 15.1.11 00:12:11 T/R 1: Now our guests will walk about and chat with you if you have any questions. They might, they might not ask you questions, they might ask you a question instead. That's the

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- kind of visitors we have. But they might come around so if you aren't clear about something, you might want to chat with them. Ok? So go to it. [12:27] [Students getting materials, etc]
- 15.1.12 00:13:00 V1: What are you guys doing? [student say something] How long is that one?
- 15.1.13 00:13:05 Brian: The blue ribbon is about 2 meters.
- 15.1.14 00:13:10 V1: How long is the white one supposed to be?
- 15.1.15 00:13:11 Danielle: One meter.
- 15.1.16 00:13:13 V1: Is that one meter?
- 15.1.17 00:13:16 Danielle: I don't know.
- 15.1.18 00:13:18 V1: How can you tell? [kid 4 leaves seat]
- 15.1.19 00:13:23 V1: Do you know how big a meter is supposed to be?
- 15.1.20 00:13:25 Brian: Three feet [can't understand]
- 15.1.21 00:13:28 V1: Well, not quite 3 feet is it? It's near 3 feet- but feet and meters are different. You know how they are different?
- 15.1.22 00:14:22 Andrew: [is measuring] 99, well actually 100
- 15.1.23 00:15:02 Dr. Landis: What are you trying to figure out guys?
- 15.1.24 00:15:03 Andrew: We're trying to figure out the second problem in number one. One meter is three thirds. So we have to find three thirds of this one meter ribbon and then we'll know how much bows we can make. I think I know already.
- 15.1.25 00:15:24 Dr. Landis: What do you think you know?
- 15.1.26 00:15:25 Andrew: I think its three because when you divide thirds up it's one-third, two-thirds, three-thirds. So it would be like one ribbon, one ribbon, one ribbon [cannot understand but pointing to ribbon.] so divide it into thirds but we need to make sure.
- 15.1.27 00:15:53 Dr. Landis: What do you think of what Andrew said?
- 15.1.28 00:15:56 James: Yeah, I agree with that but we're just making sure.
- 15.1.29 00:15:59 Dr. Landis: Ok, you think it makes sense, but you're just kind of checking it.
- 15.1.30 James: Yeah.
- 15.1.31 00:16:10 Andrew: I know that fourths is 25. It would be right here. 28, 40, 42
- 15.1.32 00:16:30 James: I think I got 30 and a half. [reading off measurements to Andrew]
- 15.1.33 00:16:33 Andrew: According to him [measuring] 30 and a half? 30 60, 61, plus 30 is only 91 and a half. What did you get? 30 and a half? I think its 32. 32 and 32 is 64. Then 32 is 90.

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- 15.1.34 00:17:43 James: 32 and half. So there will be 65. 32 and 65 is 97. 33. 33, 66, 99, 8 and half. So it would be 100. 33.
- 15.1.35 00:17:43 V2: What was the question?
- 15.1.36 00:17:50 Andrew: We want three bows.
- 15.1.37 00:17:53 V2: You were doing something very interesting just now. What was the number you came up with?
- 15.1.38 00:17:57 Andrew:, James: 33
- 15.1.39 00:17:59 V2: What was that? What was it?
- 15.1.40 James: Centimeters
- 15.1.41 00:18:05 Andrew: Well, Rutgers usually makes us prove what our answer is. So we had to do three, divided the ribbon into thirds, first third would be there, second would be there, and third
- 15.1.42 00:18:21 V2: So what was that though actually-this 33 that you came up with?
- 15.1.43 Andrew: One third.
- 15.1.44 00:18:27 James: One third, yeah, one third of a
- 15.1.45 Andrew: That's sixty fi- sixty-
- 15.1.46 00:18:33 V2: What's one third—what was it? Like, here are the answers you gave- you can make 3 bows. That 33-what was it?
- 15.1.47 00:18:40 James: That was like in centimeters.
- 15.1.48 00:18:42 V2: Right, but what was that number? You're telling me its 33 centimeters. Well what is that?
- 15.1.49 00:18:48 Andrew: We're proving. We are proving that, we wanted to make sure that when you divide it into thirds, there's no left over or anything so we can actually [break in video 19:01]
- 15.1.50 00:19:43 V1: [camera focuses on V1 with Brian and Danielle] So which one do you want to do next? You can do anyone you want.
- 15.1.51 00:19:55 Brian I'm doing this one. Three meters and I used this. I got 39 plus 39 plus 39 and.
- 15.1.52 00:20:07 V1: Although, is that really accurate? Is that exact?
- 15.1.53 00:20:16 Brian: Two meters?
- 15.1.54 00:20:17 V1: Is it exactly 114 inches?
- 15.1.55 00:20:25 Danielle: Would this be 4?
- 15.1.56 00:20:30 V1: Yeah, explain, is it four? Does that make sense?
- 15.1.57 00:20:39 Danielle: Yeah
- 15.1.58 00:20:40 V1: So Brian, Danielle just said if you have 2 meters of ribbon and it has to be a half meter length bow, she says there's 4 ribbons, 4 bows to make. Do you buy that?
- 15.1.59 00:20:55 Brian: Uh, well, which one is she doing?

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- 15.1.60 00:20:57 V1: Blue ribbon, the first one
- 15.1.61 00:21:10 Brian: 4. Yeah, 4.
- 15.1.62 00:21:12 V1: Do you see why?
- 15.1.63 00:21:15 Brian: Oh, yeah, I know why. I think I know why.
- 15.1.64 00:21:18 V1: Yeah, why?
- 15.1.65 00:21:21 Brian: Well, one meter is say approximately three feet without any inches. Say it was just plain 3 feet then, and if there was, two meters would be, two meters would be, approximately about 12 feet, no, 6 feet, 6 feet put together.
- 15.1.66 00:21:46 V1: Approximately.
- 15.1.67 00:21:48 Brian: Yeah approximately, not exactly. And if it was 6 feet and each one was a half, then it'd be, then half of three would just be like saying one and a half, another one and a half, and that'll fill up three. Then for the other three, one and a half, one and a half.
- 15.1.68 00:22:07 V1: So how many is that all together?
- 15.1.69 00:22:09 Brian: 4
- 15.1.70 00:22:10 V1: Is that the way you did it? Is that the way you thought about it?
- 15.1.71 00:22:12 Danielle: No.
- 15.1.72 00:22:13 V1: How did you do it?
- 15.1.73 00:22:14 Danielle: I just thought if it is two meters and each is a half, two halves are in a whole.
- 15.1.74 00:22:22 V1: So two halves make a whole?
- 15.1.75 00:22:23 Danielle: Yeah. And then there's 2 meters so I got 4.
- 15.1.76 00:22:29 V1: So you have two wholes. Now, do you see what she did? You went one extra step. You went to feet, then you did it with feet, then you came back. Do you have to do that?
- 15.1.77 00:22:41 Brian: No.
- 15.1.78 00:22:44 V1: Yeah, do you see how to do it more quickly? Try it for the gold ribbon
- 15.1.79 00:22:52 Brian: It would be six. Six. No, wait, it'd be eight.
- 15.1.80 00:22:59 Danielle: But it says there's two, four, six.
- 15.1.81 00:23:03 Brian: Yeah, it'd be six. Six meters.
- 15.1.82 00:23:06 V1: Make sense? [nods]
- 15.1.83 00:23:08 Brian: Yeah, I get it. Six meters.
- 15.1.84 00:23:13 Danielle: What about the rest of it?
- 15.1.85 00:23:17 V1: You'll get to that. You're on a roll now.
- 15.1.86 00:23:21 Brian: It'd be twelve.

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- 15.1.87 00:23:26 V1: So, is there, is there a rule here?
- 15.1.88 00:23:30 Brian: There's two in one meter, which is approximately three feet, there are two halves. In another one there are two halves. Another one there are two halves, etc. And so if you keep counting by two up to six meters, that's be twelve meters.
- 15.1.89 00:23:49 V1: That makes sense. Ready to go on?
- 15.1.90 Jessica: [Jessica rolls out the blue ribbon with Laura] This keeps going.
- 15.1.91 00:24:25 V3: Aha, so how do you do that? It's one, so it's one.
- 15.1.92 00:24:32 Jessica: One meter, and it's two meters.
- 15.1.93 00:24:34 V3: How do you know if it's true or not?
- 15.1.94 00:24:36 Jessica: Well it says two meters but do we have to get another one of these?
- 15.1.95 00:24:42 V3: Do you need to? Can you just use this one to measure?
- 15.1.96 00:24:46 Jessica: This you could....
- 15.1.97 00:24:49 V3: Can you find some way to do that?
- 15.1.98 00:24:49 Jessica: Yes, I think.
- 15.1.99 00:24:54 V3: Ok, I hold this. [measuring blue ribbon] Ok. I think its short but this one is too long. But it's not tight. Ok let's put together and then you try to stretch it.
- 15.1.100 00:25:24 Jessica: It's three [cannot understand]. We'll have to pretend that's right.
- 15.1.101 00:25:33 V3: Yes, ok, now we have two meters.
- 15.1.102 00:25:38 Jessica: Ok so ..
- 15.1.103 00:25:39 V3: So the first questions is
- 15.1.104 00:25:41 Jessica: One half of a meter. One half of one meter or two meters?
- 15.1.105 00:25:47 V3: So now we use one half meter we can make how many bows we can make?
- 15.1.106 00:25:52 Jessica: Two, well, would it be four?
- 15.1.107 00:25:56 V3: Compare with the answer in the first question. Last time we had-
- 15.1.108 Jessica: Two.
- 15.1.109 V3: -one meter we can make two. Now we have two meters.
- 15.1.110 00:26:06 Laura: Four, yeah.
- 15.1.111 00:26:11 V3: The reason being?
- 15.1.112 00:26:14 Jessica: Well you have to double that because now that there's double that now it's two meters so
- 15.1.113 00:26:21 V3: And in two meters how many half meter we have?

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- 15.1.114 00:26:25 Jessica: A half meter we have two
- 15.1.115 00:26:30 V3: In one meter, how many half meters we have?
- 15.1.116 00:26:35 Jessica: Well we can make two, we have one [measuring]
- 15.1.117 00:26:41 V3: I said in one meter, how many half meters we have?
- 15.1.118 00:26:47 Jessica: Is that like?
- 15.1.119 00:26:50 V3: Half meter, 50
- 15.1.120 00:26:54 Jessica: [gesturing with hands] One, two, one, no that would be two
- 15.1.121 00:27:00 V3: Good. Now in two meters, how many half meters we have?
- 15.1.122 00:27:05 Jessica: Four.
- 15.1.123 00:27:06 V3: Good. So that's why. That's exactly. In the first case we only have one meter. Now we have two meters right?
- 15.1.124 00:27:13 Jessica: Yup
- 15.1.125 00:27:15 V3: So the answer is four. [writing on papers] What about the second one? The one we spent lots of time last time.
- 15.1.126 00:27:23 Jessica: Three meter. That would be, I think that would be five...
- 15.1.127 00:27:29 V3: Why five?
- 15.1.128 00:27:32 Jessica: Well, because we just added one bow to that side, oh, no, now it'd be six
- 15.1.129 00:27:36 Laura: Six!
- 15.1.130 00:27:37 V3: Ok, so why's that?
- 15.1.131 00:27:41 Jessica: Because you're doubling, you're doubling, like last time was three, and three plus three is six. And now I think that would be 8, the next one. And that would be 10.
- 15.1.132 00:28:07 V3: What about the last one?
- 15.1.133 00:28:13 Jessica: Oh they added one this time, so
- 15.1.134 00:28:17 V3: Yeah, so this one says, it needs two-thirds meters to make one. Ok let me ask you Jessica, this is two meters right? [folds ribbon in half] If I fold it this like this and then I measure it like this, this is half of two meters right?
- 15.1.135 00:28:43 Jessica: That would be one meter.
- 15.1.136 00:28:47 V3: Yes. But if I do this, I make into three equal lengths, then I measure it, what that would be?
- 15.1.137 00:28:58 Jessica: I think it'd be a half. Well, it would be... [playing with ribbon]
- 15.1.138 00:29:20 V3: So now you have four folds. Right?
- 15.1.139 00:29:21 Jessica: Four? We need three right?
- 15.1.140 00:29:25 V3: Right, here we say two-thirds.
- 15.1.141 00:29:38 Jessica: How would you make three? That's four.

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- 15.1.142 00:29:46 V3: That's right. Suppose, let's just use this because this is one meter, right? [folding white ribbon] So here's one meter if I do this. This is not very easy to do but what I mean is. Can you hold one end? Just hold this. Ok, now roughly we have three. We have cut one meter into three equal lengths, right?
- 15.1.143 00:30:18 Jessica: Put it up against this and see what it would come to. Not exactly.
- 15.1.144 00:30:28 V3: Yeah, but roughly.
- 15.1.145 00:30:29 Jessica: Thirty-three?
- 15.1.146 00:30:30 V3: Remember what we did last time about one-third of a meter.
- 15.1.147 00:30:35 Jessica: Yeah, I don't-
- 15.1.148 00:30:38 V3: Right, right. So see this is exactly what's happening when we did beginning, I mean, like what you did. If you do this by half. This is exactly come to fifty. But then what I just did, a third.
- 15.1.149 Jessica: It would come to thirty-three.
- 15.1.150 V3: It comes to a third. So how can you get two-thirds from here?
- 15.1.151 00:31:09 Jessica: Well that came to --.. so then you get [cannot understand]
- 15.1.152 00:31:23 V3: What is two-thirds?
- 15.1.153 Laura: Two one thirds [inaudible]
- 15.1.154 V3: Add another thirty-three. Very good. So how much we get out of that? We said thirty-three - we said is close to a third. So what is two-thirds? Add them together.
- 15.1.155 00:31:51 Laura: That would be, um, sixty-six.
- 15.1.156 00:31:54 V3: Just what you said right now. Add two one - [cannot understand]
- 15.1.157 00:31:58 Jessica: Sixty-six.
- 15.1.158 00:32:02 V3: Sixty-six right.
- 15.1.159 Jessica: And that would equal up to here.
- 15.1.160 V3: Right, right, exactly.
- 15.1.161 00:32:15 Dr. Landis: [mid-sentence] which is two meters long. Why are you going to get four bows? Because I'm confused. Convince me.
- 15.1.162 00:32:23 Andrew: It's double.
- 15.1.163 00:32:24 James: Its one half meter. This is two meters. [pointing to blue ribbon] so one half of one meter would be two. And this is two meters so another half of a meter would be plus the

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- other half would be four. So that would explain why four bows.
- 15.1.164 00:32:41 Andrew: Yeah, what he's saying is you have this. This acts as four [blue ribbon].
- 15.1.165 00:32:46 Dr. Landis: Why acts as four?
- 15.1.166 00:32:47 Andrew: This.
- 15.1.167 00:32:48 Dr. Landis: Why does this act as four?
- 15.1.168 00:32:50 James: Because, this acts as two [white ribbon].
- 15.1.169 00:32:51 Andrew: Well yeah, this
- 15.1.170 00:32:53 Dr. Landis: Why does this act as two?
- 15.1.171 00:32:55 Andrew: Because we're saying this is a half. You cut this [white ribbon] in half. You have two parts. So you put that up to it and it's two. And then you need – this [white ribbon] is a half of that [blue ribbon]. So you need one more and that's four. So then this can act as three- as cutting it into thirds. Is putting six-thirds up to two-thirds. But this two meters is the whole so actually this. If two meters is the whole then this is the half. This is almost like rods. We don't have every one though. This is the whole. This is the half. We have another one a half.
- 15.1.172 00:33:46 Dr. Landis: Ok, Let me go back cause I think you're telling me a lot of things and I just want to be sure I understand. Um, if you have the blue ribbon and we want to figure out how many bows we could make, and each one is a half a meter how did you figure out first you told me it was two and then you said no, it's four.
- 15.1.173 00:34:07 James: It's four because
- 15.1.174 00:34:08 Andrew: It could be either way.
- 15.1.175 00:34:09 Dr. Landis: It could be either? What do you think about that, James? Could it be either?
- 15.1.176 00:34:10 James: I don't know. That one would be half of two meters.
- 15.1.177 00:34:19 Andrew: So one half of two meters not one half of one meter.
- 15.1.178 00:34:22 Dr. Landis: Ok. I think what it's saying is the ribbon length of the bow is a half a meter so each ribbon is gonna be a half a meter long, ok? And the question is how many bows can you get out of that blue ribbon if each bow is gonna be a half a meter long?
- 15.1.179 00:34:38 James: Four cause this is going to be two meters long.
- 15.1.180 Andrew: But its saying it's a half of two meters.

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- 15.1.181 00:34:41 Dr. Landis: Let me see if I can understand what James is saying.
- 15.1.182 00:34:44 Andrew: But its saying it's a half of two meters because the blue ribbon here is two meters is the whole so then this is half of two meters that would only be two.
- 15.1.183 00:34:54 Dr. Landis: Ok, what does this say to you? What is a half a meter?
- 15.1.184 00:34:59 James: One half of one of these [white ribbons]
- 15.1.185 00:35:03 Andrew: Yes, four. That would be four and this would be
- 15.1.186 00:35:07 James: This would be two. One of these would go up against them. And that would be two halves and another one you put on, and that would be four
- 15.1.187 00:35:19 Dr. Landis: Ok, so you're saying if you took your white ribbon. Let me see if I know what you're saying. If you took your white ribbon and cut it in half, how long would each bow be?
- 15.1.188 00:35:30 Andrew: Each bow?
- 15.1.189 00:35:32 Dr. Landis: If you cut the white ribbon in half, how big would each bow be? How long is that white ribbon?
- 15.1.190 00:35:40 Andrew: 100 meters so it would be 50 [hold up white ribbon]
- 15.1.191 00:35:42 James: 100 centimeters
- 15.1.192 00:35:44 Andrew: Centimeters [measuring white ribbon] So it would be right.
- 15.1.193 00:35:52 James: From there to there. Then you cut it in half it would be two.
- 15.1.194 00:36:05 Dr. Landis: Ok, if you cut the white ribbon in half it would be two and each one. If this is a meter, how long would each ribbon be?
- 15.1.195 00:36:13 James: It would be 50 centimeters.
- 15.1.196 00:36:14 Dr. Landis: Fifty centimeters, ok. And in terms.
- 15.1.197 00:36:19 Andrew: These two are halves.
- 15.1.198 00:36:21 Dr. Landis: Halves of what?
- 15.1.199 00:36:22 Andrew: Of one meter.
- 15.1.200 00:36:23 Dr. Landis: So each one is a half of a meter. Ok, so now my question.
- 15.1.201 00:36:27 Andrew: You can fit four of them in the blue.
- 15.1.202 00:36:29 Dr. Landis: That's what I was trying to find out. How do you know you can fit four of them in the blue?
- 15.1.203 00:36:33 Andrew: Well you can fit two of these in the blue. Then you cut that in half. That's two. So you have two in one. Then you have the other side. That would be two and two is four.

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- 15.1.204 00:36:47 Dr. Landis: Ok, I, I think I am following what you are saying. Let's see if James agrees.
- 15.1.205 00:36:51 James: Yeah, I do agree. [measuring white ribbon]
- 15.1.206 00:36:53 Dr. Landis: You do agree?
- 15.1.207 00:36:54 James: Yeah.
- 15.1.208 00:36:56 Dr. Landis: What are you just doing now?
- 15.1.209 00:36:57 James: I-
- 15.1.210 00:36:59 Dr. Landis: What did you do?
- 15.1.211 00:37:00 James: I put the – 50 centimeters.
- 15.1.212 00:37:03 Andrew: Yeah, so if you put that up to
- 15.1.213 00:37:06 Dr. Landis: Why don't you show me? Why don't you put it? Ok, why don't you show me what you just did? Because then I'll know how many ribbons you can make out of that blue...out of that blue ribbon. Each ribbon we want to be a half meter long. Right? Let's take a look and see what he's doing there. You might want to help him, James, ok? [laying ribbons on meter stick] Can I hold the other side for you so that it'll stay stretched out?
- 15.1.214 00:37:44 Andrew: Is the dot here, yeah, there's the crease.
- 15.1.215 00:37:52 Dr. Landis: You need another finger here?
- 15.1.216 00:37:58 Andrew: Yeah. So where the crease is, is where it would be cut. So that's two.
- 15.1.217 00:38:00 Dr. Landis: I am following you now. It's making more sense. Let's see.
- 15.1.218 00:38:04 Andrew: It's two.
- 15.1.219 00:38:09 Dr. Landis: Ok so out of this big blue ribbon we can make bows that are a half a meter long and how many bows did you get?
- 15.1.220 00:38:17 James: and Andrew: Four.
- 15.1.221 00:38:18 Dr. Landis: Four. Ok?
- 15.1.222 00:38:21 Andrew: And then with the third we were trying to figure out, to be a third of a bow.
- 15.1.223 Dr. Landis: Yeah.
- 15.1.224 Andrew: We thought it was sixty but.
- 15.1.225 00:38:31 Dr. Landis: Ok, what this is saying again and I think just to understand what it is asking is, they want to know if you start with this big blue ribbon again, how many bows could you make if each bow is a third of a meter long?
- 15.1.226 00:38:46 Andrew: Six.

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- 15.1.227 00:38:46 Dr. Landis: You think six? What do you think?
- 15.1.228 00:38:48 James: Six.
- 15.1.229 00:38:49 Dr. Landis: Tell me why.
- 15.1.230 00:38:51 Andrew: Because there are three, three
- 15.1.231 00:38:53 Dr. Landis: You can tell me. You don't have to do it if you can explain it to me.
- 15.1.232 00:39:57 Andrew: It would be three thirds in this so if you put three [gesturing with the white ribbon] on one side
- 15.1.233 00:39:04 Andrew: and James: and three on the other side
- 15.1.234 00:39:06 Dr. Landis: Ok, so you think you're gonna get six ribbons that are a half of a meter... a third of a meter long, from that big blue ribbon?
- 15.1.235 James: Yeah.
- 15.1.236 Dr. Landis: How about from the blue ribbon if you wanted to make bows that are a quarter of a meter?
- 15.1.237 00:39:21 James: Eight.
- 15.1.238 00:39:23 Andrew: Eight. Because maybe we can, a half of the half is a fourth. Since there's two halves, it'd be two, four, four on one side, four on the other, so it would be eight.
- 15.1.239 00:39:47 James: It would be eight.
- 15.1.240 00:39:48 Dr. Landis: Ok you're both agreeing on that.
- 15.1.241 00:39:51 James: Yes. The same for fifths
- 15.1.242 00:39:54 Dr. Landis: What would be for fifths?
- 15.1.243 Andrew: It would be
- 15.1.244 39:56 Andrew: and James: Ten. Because it would be five on one side and five on the other.
- 15.1.245 40:01 Dr. Landis: Ok, ok, so you're convinced now that these should be different than what you said originally. Ok, you have two meters, you have that blue ribbon. Now you want to cut bows that are two thirds meters long.
- 15.1.246 40:16 Andrew: That's where we were.
- 15.1.247 40:18 Dr. Landis: That's where you were left.
- 15.1.248 40:24 James: Ok, alright, let's try this again.
- 15.1.249 40:32 Andrew: Put that over there.
- 15.1.250 40:33 Dr. Landis: You want me to hold it down here? I'll be your helper? You're gonna hold it for him?
- 15.1.251 40:38 James: I'll hold it right here.
- 15.1.252 40:41 Andrew: We were thinking it has to be somewhere between 71 and 60. Because we tried 60 and we tried 71 and 71 was over

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and 60 was less so we came down and we were trying 69.
So it would be 69.

15.1.253 41:02 James: And then 138. 138 and 69 is? It's over. So we'll try 68

15.1.254 41:17 Andrew: 68 and 68 is 136. 68 is over. Wait no, yeah it over. So, it's about 105.

15.1.255 41:34 Dr. Landis: I'm confused what you're doing. What are you doing now? You are working with these numbers I didn't hear you working with the numbers before.

15.1.256 41:39 Andrew: Yeah. That's because the thirds, We didn't actually find the thirds yet. And this is saying two thirds. So, it's kind of harder. Because, the length of the third is 33. It would be 36. I mean 66. 66.

15.1.257 42:06 James: 32

15.1.258 42:07 Andrew: Yeah, 32. Only 98

15.1.259 42:11 James: 67. 67.

15.1.260 42:16 Andrew: 66 and a half.

15.1.261 42:19 James: 66 and half. 32. 33.

15.1.262 42:25 Andrew: Yeah, 33

15.1.263 42:25 James: 99

15.1.264 42:28 Andrew: Yeah.

15.1.265 42:31 Dr. Landis: What yeah, I'm confused. Confused again.

15.1.266 42:34 James: It's 199 not 200. We want it to be 200, right?

15.1.267 42:39 Andrew: Yeah, but this is 200. We're talking about. We counted this and then 120, 120, 133, plus 60 is 290.

15.1.268 42:56 James: 66 and a half and 33 and that makes 99 and a half.

15.1.269 43:06 Andrew: 199 and a half.

15.1.270 43:09 James: Hold on, let me try 67, 67, 134, yeah.

15.1.271 43:22 Andrew: Yeah, 134

15.1.272 43:24 James: That's 67

15.1.273 43:25 Andrew: It's one over.

15.1.274 43:28 Dr. Landis: What are you trying to figure out?

15.1.275 43:30 Andrew: We're trying to figure out a third of blue.

15.1.276 43:34 Dr. Landis: Tell me, what kind of ribbon are you trying to cut now from this big blue ribbon?

15.1.277 43:41 Andrew: We're trying to cut.

15.1.278 43:44 Dr. Landis: How long is going to be the ribbon you're going to be cutting?

15.1.279 43:47 Andrew: Two thirds of one meter.

15.1.280 43:51 Dr. Landis: Ok and want do we want to find out?

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- 15.1.281 43:53 Andrew: If it's two thirds of one meter, that would be, that would be..
- 15.1.282 44:01 Dr. Landis: Just tell me what the question is so I know that you know what you're working on.
- 15.1.283 44:03 Andrew: It's two thirds of one meter.
- 15.1.284 44:06 Dr. Landis: What's two thirds of a meter?
- 15.1.285 44:07 Andrew: So it's two meters, and two thirds of a meter, the number of bows
- 15.1.286 44:15 Dr. Landis: James what are you trying to find out?
- 15.1.287 44:17 James: I think it's four.
- 15.1.288 44:19 Dr. Landis: You think it's four? But what's the question, just so I know you know what you're working on?
- 15.1.289 44:22 Andrew: It's how many..
- 15.1.290 44:23 James: Two thirds
- 15.1.291 44:25 Andrew: How many two thirds lengths bows can you make of two meters?
- 15.1.292 44:32 Dr. Landis: Ok so how many bows are you going to cut from this blue ribbon if each bow is going to be how big?
- 15.1.293 44:39 James: Two thirds
- 15.1.294 44:40 Dr. Landis: Two thirds of a meter, right?
- 15.1.295 44:42 James: Yeah.
- 15.1.296 Dr. Landis: Ok.
- 15.1.297 44:45 Andrew: So one third is 33,
- 15.1.298 44:49 James: 66
- 15.1.299 44:51 Andrew: 33, 66, so that's two. Three, you actually have two meters left over I mean, two thirds left over.
- 15.1.300 45:07 Dr. Landis: What do you mean, you have two thirds leftover?
- 15.1.301 45:09 Andrew: Because if you want to make, take two thirds and there's three thirds so take two thirds plus two thirds plus one third and one third you have two more thirds.
- 15.1.302 45:19 Dr. Landis: Oh, that's interesting. Say this again and let's see if we can follow him. What did you just say? Say it again.
- 15.1.303 45:24 Andrew: [gesturing with hands] There's three thirds so there's two thirds and one third and one third, that's two thirds and you still have one two thirds left over.
- 15.1.304 45:34 Dr. Landis: Can you kind of show me a picture of that here and I want, James, I want to see if you understand what he's saying. This is real interesting.
- 15.1.305 45:52 Andrew: [while drawing picture] So then there's one third and two thirds is two thirds so then here's the half [of the blue

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- ribbon]. So you only have one third so then you have to get the other third [first third of second meter]. This is two thirds so then you have two more thirds left over.
- 15.1.306 46:13 Dr. Landis: Do you follow what he's saying? What is he... tell me how you're hearing it. I think that's real interesting. What did he just say?
- 15.1.307 46:20 James: He's saying that there's six meters. There are two meters.
- 15.1.308 46:29 Dr. Landis: This blue ribbon is two meters, uh huh,
- 15.1.309 46:31 James: [pointing to picture] Yeah, And there are six meters is in each, and it would be two thirds is one, two thirds is again and two thirds left.
- 15.1.310 46:48 Dr. Landis: Ok. Now, you know what I heard um Andrew saying? This is what I heard him saying. I think I heard you saying that if you took this blue ribbon and again imagined it as two white ribbons is that what you said when you said I'm going to divide it in half, right, ok? And if you had it as two white ribbons. Ok? Can you picture that white ribbon over there if we took it and divided it into thirds?
- 15.1.311 47:19 James: Yeah.
- 15.1.312 47:21 Andrew: And then it would be you divide this. This one and this one around here would be a half. Like right there would be half because this is the whole now. So then it would be one third, two thirds, three thirds.
- 15.1.313 47:46 Dr. Landis: So if I just looked this from here over [the first meter], what would I be looking at? Would I be looking at one of these ribbons? Which ribbon am I looking at?
- 15.1.314 47:56 Andrew: The white.
- 15.1.315 47:59 James: This whole thing is the blue ribbon and this is the white.
- 15.1.316 48:02 Dr. Landis: Can you show it to me with the white and the blue ribbons? Because I think you're onto something that's real interesting. [laying ribbons on meter stick] Ok, I'll put this down here. Ok. So this is kind of what you pictured here, wasn't it Andrew? Where this is the whole blue ribbon and this now is that white ribbon ok and then you actually divided up that white ribbon. What did you divide it into over here?
- 15.1.317 48:42 Andrew: Thirds.
- 15.1.318 48:43 Dr. Landis: Thirds ok.
- 15.1.319 48:45 Andrew: It would be a third of 33, 66, 99.

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- 15.1.320 48:49 Dr. Landis: Ok if you were trying to divide it using little numbers you would but you didn't use any little numbers here. You just divided it into thirds and, what did you end up with over here?
- 15.1.321 48:59 Andrew: Two... I ended up with um two thirds. That would be that would be one and one third but you had two thirds left over.
- 15.1.322 49:12 Dr. Landis: Ok you're saying that if you take that white ribbon and divide it up into thirds how many thirds would you get if you took that white ribbon and divided it into thirds?
- 15.1.323 49:22 Andrew: Three
- 15.1.324 49:25 Dr. Landis: What do you think James?
- 15.1.325 49:26 James: Yeah, three.
- 15.1.326 49:26 Dr. Landis: You think three. And what about from your finger over to here, if you took this white ribbon and divided it up?
- 15.1.327 49:36 James: Three
- 15.1.328 49:39 Dr. Landis: Ok, now but what Andrew was saying which I think is real interesting is ...you're trying to make your bows that are how long?
- 15.1.329 49:48 James: Two thirds of a meter
- 15.1.330 49:50 Dr. Landis: Two thirds of a meter so he's saying this would be $\frac{2}{3}$ of a meter, right? Ok. And then what else... what else over here? How... how many ribbons could you make from this?
- 15.1.331 50:06 James: I have to go.
- 15.1.332 50:07 Dr. Landis: You're going to? Oh. Stay just one minute cause I'm just real interested 'cause I think that you have something down here. How many ribbons were you able to cut from this big blue ribbon?
- 15.1.333 50:21 Andrew: Two
- 15.1.334 50:23 Dr. Landis: You think you could only get two bows that are two thirds?
- 15.1.335 50:25 James: No, three.
- 15.1.336 50:27 Andrew: Four.
- 15.1.337 50:28 James: I think three.
- 15.1.338 50:30 Andrew: Why three if you have two thirds and two thirds?
- 15.1.339 50:32 James: [pointing at drawing] You have two third and two thirds and then there are six and this is two thirds and this is two thirds would be one, two, three, yeah, four. One, two, no, three, one

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- 15.1.340 51:02 Andrew: I know but two thirds.
- 15.1.341 51:04 James: Andrew I know but half is.
- 15.1.342 51:12 Andrew: So two thirds of this, two thirds of the white then you have two thirds of the white ribbon then two thirds of the white ribbon, right? And there if you have one more third and one more third of the white and there if you have one more third and one more third of the white and then you have two thirds left over going that way or going that way.
- 15.1.343 51:37 Dr. Landis: So how many ribbons could you cut that are two thirds long?
- 15.1.344 51:41 Andrew: Four.
- 15.1.345 51:43 Dr. Landis: From this blue ribbon?
- 15.1.346 51:45 James: Yeah.
- 15.1.347 51:47 Dr. Landis: You think four? Think about that again, ok?
- 15.1.348 51:51 T/R 1: What I would us to do is I want to spend time talking about the way you're thinking, about what you discovered about your problems and how you can convince me that you can make so many bows. I'm curious. I think some of you can get some part time jobs working in some wrapping department so that we don't waste ribbons right and we'll know how many bows we can make and we know what to order. We don't want to waste anything. We want to try to have maybe an operation or a company that produces lots of these bows with very little waste. I am interested in the way you're thinking about it. I was walking around listening to all kinds of ideas. How many of you finished problem number one? [students raise hands] With the white ribbon? How many of you are convinced that your answers for number one are correct and can prove it to me? And nobody can persuade you that you're wrong. How many of you are absolutely convinced about that? How many of you still aren't sure you have answers but you're not totally convinced [two hands raised in view]? Looks like we have some work cut out for us, isn't that right? Ok, can someone tell us what that first problem is about in your own words? What we're asked to do in that first problem? And then tell us how you think you can you convince us that your solution is correct? Kelly.

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- 15.1.349 53:23 Kelly: Well, you're supposed to like... there's one meter of white ribbon and then you have to split it into, um, a half so I got, um, two bows.
- 15.1.350 53:38 T/R 1: So you're telling me I have one meter of white ribbon and I split it in half, I have two bows? How many of you agree with that? [students raise hands] Ok, I'm convinced. What about the next one if I have one meter of ribbon and I have to make bows that are one third meter in length, how many of you think you know that answer to that one? And you're sure you have the answer to that one? What do you think is it? How many ribbons can you make? Caitlin.
- 15.1.351 54:08 Caitlin: Three
- 15.1.352 54:09 T/R 1: Caitlin thinks three. How many of you think three? [students raise hands] How many of you think something else [no hands in view raised]? Can you prove it?
- 15.1.353 54:18 Caitlin: Well, we have one meter so you take one and there's two in one.
- 15.1.354 54:30 T/R 1: I see that, how did you do that?
- 15.1.355 54:31 Caitlin: Then it's one third so you divide it into thirds and you would get three.
- 15.1.356 54:36 T/R 1: Can anybody show me that? I was having a little bit of trouble. I was talking to Laura and Jessica a few minutes ago and asking them if they can convince me that if I have a ribbon a meter in length, and I'm making bows from ribbon one third meter in length that I could find three of them. Can someone show me that? Prove it to me? Why don't you- can you do that? Kelly can you come show me? Kelly thinks she can prove that. [Kelly goes to front and uses white ribbon to demonstrate]
- 15.1.357 55:14 T/R 1: Can I hold it for you? [Kelly folds ribbon.] What did Kelly do here? Did you all see what she did? Who can tell me what Kelly did? Kimberly.
- 15.1.358 55:45 Kimberly She folded it three times.
- 15.1.359 55:46 T/R 1: She folded three times. Let's unravel it. Open it. It's three pieces, right? So, She did one fold, right,
- 15.1.360 55:56 Kimberly Two, but it came out..
- 15.1.361 55:57 T/R 1: What do you think Jessica and Laura? See that. You did that and sort of forgot how you did it. How many of you can do that? Can convince me, convince your partner, and

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convince each other that if the ribbon is one meter in length, and you are making bows of a third of a meter, you find how many? You believe that. How many of you absolutely believe that? Is that what you did Jackie? Why don't you go show that to Jackie. Jackie is not convinced. No, Jackie back there.

15.1.362 56:39 T/R 1: That's a neat thing Kelly. Thank you. How many of you discovered that neat folding trick? Kimberly did it do too and Amy did it and I saw some other people. And Jackie.

15.1.363 56:53 Jessica: We did it at first then we forgot how we did it.

15.1.364 56:53 T/R 1: Yes, you can forget it can't you. Caitlin. Ok so how many can you make with they're one third meter in length? Class.

15.1.365 57:01 Class: Three.

15.1.366 57:02 T/R 1: How many of you are absolutely certain, convinced, nobody can persuade you otherwise? [students raise hands] Dr. Fransblau, I didn't see your hand up. Thank you Kelly. Alright. What about a quarter of a meter in length? How many a quarter a meter in length? Here's my meter, how many bows can you make that are a quarter a meter in length? Danielle.

15.1.367 57:32 Danielle: Four.

15.1.368 57:33 T/R 1: Four. Can you convince me? You're absolutely sure? You want to come up here? How about the rest of you in your seats? Can you convince me you're absolutely sure? [Danielle folds white ribbon in front of class.] Ok, neat. How many times did you fold it, Danielle?

15.1.369 58:04 Danielle: Twice.

15.1.370 58:05 T/R 1: Once, and then twice. What do you think Jessica? The quarters are easy, huh? Yeah. How many of you did that? See that? Gregory you did the same thing? Ok, great. So how many can you make if you have bows, Dr. Pearl?

15.1.371 58:24 V2: Is it really a quarter of a meter when it's folded?

15.1.372 58:27 T/R 1: She's not convinced.

15.1.373 58:28 V2: I'm not sure.

15.1.374 58:30 T/R 1: How can we convince her that it's a quarter of a meter once it's folded? Kelly, what do you think?

15.1.375 58:35 Kelly: We can measure it.

15.1.376 58:36 T/R 1: You can measure it. And what would you do to measure it? How would you convince Dr. Pearl? Graham.

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- 15.1.377 58:43 Graham: Well, you could take four of these [holds up white ribbons and folds] and put them up together on a meter stick and see if they fit together.
- 15.1.378 58:50 T/R 1: Can you see that Dr. Pearl? How many of you think that's fair if she took four of these and put it on a meter stick that would convince you? How many can you make that are a quarter meter in length? Class.
- 15.1.379 59:03 Class: Four.
- 15.1.380 59:04 T/R 1: How many of you are absolutely convinced? [students raise hands] Ok, we have a new visitor here. This is Dr. Golden who works also with us at Rutgers. And boy, you are going to have to convince him. Pardon?
- 15.1.381 59:15 Dr. Landis: Dr. Houser is here too.
- 15.1.382 59:16 T/R 1: Dr. Houser. You all know him, don't you? He is a good friend of ours. Let's see if we can convince them. If you're making your bows now $\frac{1}{5}$ m in length from a meter of ribbon, how many bows can you make? How many of you think you know? Erin.
- 15.1.383 59:38 Erin: Five.
- 15.1.384 59:39 T/R 1: Five. Erin thinks five. How many of you think it's something else? How many think five? What's happening here? What do you think? Any ideas? Brian. Caitlin?
- 15.1.385 59:55 Caitlin: I think that each time it goes up one. Like one, two, it went up one for one meter. Then so two would be three, and three would be four and four would be five.
- 15.1.386 1:00: T/R 1: What do you think Brian?
- 15.1.387 1:00:18 Brian2: How I got them was I divided all of them by one. And I got mostly when it said one third, I got three bows.
- 15.1.388 1:00:32 T/R 1: You're telling me from what you said. Let me be sure I understand what you are saying. You're telling me if you have one meter and if you're dividing it by one half, what did you get?
- 15.1.389 1:00:52 Brian2: I'd get two bows.
- 15.1.390 1:00:54 T/R 1: You got two bows. [writes on overhead] If you had one meter length and divided it by one third, what did you get?
- 15.1.391 1:00:59 Brian2: Three bows.
- 15.1.392 And what was the next one class?
- 15.1.393 1:01:01 T/R 1: And what was the next one class?
- 15.1.394 1:01:03 Class One fourth.

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- 15.1.395 1:01:05 T/R 1: One divided by one quarter was?
- 15.1.396 1:01:07 Class: Four [Dr. Maher has written four equations on the overhead.
- $$1 \div \frac{1}{2} = 2 \quad 1 \div \frac{1}{3} = 3 \quad 1 \div \frac{1}{4} = 4 \quad 1 \div \frac{1}{5} = 5$$
- 15.1.397 1:01:09 T/R 1: And what was the last one? [cannot understand] That's very interesting. What do you think, Kelly?
- 15.1.398 1:01:17 Kelly There's a pattern.
- 15.1.399 1:01:18 T/R 1: What do you mean?
- 15.1.400 1:01:20 Kelly: Well, each time you have one that like one half came out to two, then one third came out to three, one fourth came out... came out to four and one fifth came out to five so there's like a pattern because with the ones and so you like, you look over here and you could see because the one and the two you could really see that it comes out to two bows.
- 15.1.401 1:01:50 T/R 1: So what would you predict if were making bows that were one tenth of a meter in length from ribbon that was one meter long? Graham?
- 15.1.402 1:01:59 Graham: Maybe ten?
- 15.1.403 1:02:00 T/R 1: Graham would predict that if I had one divided by one tenth that would be ten. What do you think? Do you agree with his prediction, or not? Kimberly?
- 15.1.404 1:02:10 Kimberly I think that it would be ten but they would be very, very tiny.
- 15.1.405 1:02:14 T/R 1: They'd be very tiny? Anybody else, what do you think? Does anybody disagree with that idea? That's an interesting idea. Let's continue with the next step and see what we have. Did you finish the two meter ribbon? What's the two meter ribbon? So if we're making bows a half meter length from two meter ribbon, what do you think? Andrew.
- 15.1.406 1:02:50 Andrew: Well I think if you're making one half of a meter and two meters, there would be four bows.
- 15.1.407 1:02:57 T/R 1: How can you convince me that that's true?
- 15.1.408 1:02:59 Andrew: Well, the reason why it would be four bows, is because it says one half of one meter and there's two meters and so you have the blue rod and you take, see, you put a white rod up to it, I mean ribbon, and you put two, you put one white ribbon up to it and it equals one half.[holding up blue and white ribbons together] And then another one and it equals

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the other half so two whites go into a blue. So then, since this is one meter and it's asking one half of one meter and so you have a half of it is two on one half of the blue and then two on the other half side of the blue so that's four bows.

15.1.409 1:03:54 T/R 1: What do you think? How many of you agree with what Andrew says? [students raise hands] Did anybody think about it of it in another way? Is there anybody who disagrees? Is there anybody who isn't sure? You're all sure? Wow. Well, what about so, you're telling me that two divided by one half--what did you say Andrew?

15.1.410 1:04:17 Andrew: Four.

15.1.411 1:04:18 T/R 1: You're saying two divided by one half is four. How many of you got that? [students raise hand] Two divided by one half is four? What about two divided by a third? What about that one? Two divided by one third. Brian.

15.1.412 1:04:30 Brian: Six.

15.1.413 1:04:31 T/R 1: How did you get six?

15.1.414 1:04:3 Brian: Well, there's two meters and in one meter there are three thirds and in the other meter there are three thirds. In the other meter there are three thirds. So you add them. In one meter there are three third and the other meter there are three thirds. If you add the two meters together it'd be three thirds and three thirds which is six.

15.1.415 1:04:46 T/R 1: What do you think? Do you all understand what Brian said - how many of you understood what Brian said? [students raise hands] Can someone try to say it one time for me so I understand it? I have to be sure because Dr. Goldin needs to hear it a few times. Right Dr. Goldin? Can someone help him with this? He just came in late. He hasn't been cutting ribbons. Who wants to.. that's an interesting way. Who else wants to say it for him? Andrew, it sounded very much like the way you did the other one.

15.1.416 1:05:13 Andrew: Yeah.

15.1.417 1:05:14 T/R 1: Let's hear someone else say it for me. Can someone else try to say it for me? Can we hear from someone else? Who wants to try? Well, how many of you believe that two divided by one third is six...is six? [students raise hands]

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- Someone want to give a try saying it again? Good for you, Brian.
- 15.1.418 1:05:37 Brian2: I did the same thing on all of them like I did on the white. I would times the two by whatever, like the one third. Say two times three is six.
- 15.1.419 1:05:44 T/R 1: So you're telling me you got that because two times three is six.
- 15.1.420 1:05:47 Brian2: Right
- 15.1.421 1:05:49 T/R 1: You're seeing a pattern here you're telling me. What do you think –how many of you think there's some pattern here? If that's a pattern, how would do two divided by two thirds? By the way, how many ribbons can you make that two thirds of a meter long if you start with two meters of ribbon? How many of you have an answer for that one that you believe? Two divided by two thirds? How many of you have an answer for that? That you believe. Let's hear what some of the answers are. Erin.
- 15.1.422 Erin I got three bows.
- 15.1.423 T/R 1: Erin has three bows. Anybody have something else? Andrew.
- 15.1.424 1:06:06 Andrew: I got four.
- 15.1.425 1:06:07 T/R 1: Ok, so we have one answer of three. One answer of four. Anybody else? Brian?
- 15.1.426 1:06:15 Brian: I have three.
- 15.1.427 1:06:17 T/R 1: How many of you have three? How many of you have four? [students raise hands] How many of you have something else? How many of you aren't sure? Oh, we have a lot of unsure people here. Let's hear why you think three. Who's gonna tell me? Kelly.
- 15.1.428 1:06:30 Kelly: Well I think three because well, it's just the same as the other one. You like, you take this and you divide it in three pieces [holding up blue ribbon] and you get three.
- 15.1.429 1:07:13 T/R 1: You took that and divided it into three pieces. What's the length of each of those pieces?
- 15.1.430 1:07:24 Kelly: Two thirds.
- 15.1.431 1:07:28 T/R 1: How- are you all convinced of that? How can you convince us each piece is two thirds?
- 15.1.432 1:07:35 Kelly: You can measure it.

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- 15.1.433 1:07:38 T/R 1: You can measure it. Anybody else? How else? What do you think?
- 15.1.434 1:07:44 Mark: If this is two thirds, it would be right here. [measuring blue ribbon] This is one third and that's two thirds, then three thirds.
- 15.1.435 1:08:12 T/R 1: Gregory, you like that Gregory?
- 15.1.436 1:08:20 Mark: One, then two, wait, hold on.
- 15.1.437 1:08:41 T/R 1: Maybe this is the place we should stop because we're running out of time. I guess what I would like you all to think about for the next time we come is how you can convince me, if you think you can, what two divided by two thirds is. Is that where we left off? In fact, I would like you to write me a little explanation of why you think it's three, or four, or whatever you think it is and how you could convince somebody of your answers. Ok? Do you want to continue working with this to finish the sheets? How many of you would like to continue working with this? How many of you want to make bows? [students raise hands] Ok, we can maybe figure out how much it would cost to make some of these bows because maybe what we can do is maybe sell them and donate it to some wonderful cause for the holidays. And we can figure out how much we spend for materials and then how much we can send them for so maybe cover our costs and donate our profits? What do you think? Would you like to do that? Ok, sounds wonderful. I want to thank you all and if you could put all your materials in your little plastic bags and, um, and put your names on your papers. Yes, thank you very much.
- 15.1.438 1:10:26 Andrew: You have the blue, and you have, this is, and you take, you have a white
- 15.1.439 1:10:33 T/R 1: Ok this is two meters, right?
- 15.1.440 1:10:34 Andrew: Yeah, you have a white, so that is half of this.
- 15.1.441 1:10:37 T/R 1: Ok, right, I got that.
- 15.1.442 1:10:38 Andrew: The white is three and then the other white is three. So it's asking you how many two thirds of one meter, you would take a third [holding blue ribbon]
- 15.1.443 1:10:50 T/R 1: You have six one third meters here. You have six one third meters, so how many two third meters do you have?
- 15.1.444 1:10:56 Andrew: Well we have, so you have two meters,

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- 15.1.445 1:11:02 T/R 1: Let's see. Now imagine, this is the one. You have a one third, another one third, and another one third. Show me where two thirds would be.
- 15.1.446 1:11:09 Andrew: Right there [points to ribbon]
- 15.1.447 1:11:10 T/R 1: So where would be the next two thirds?
- 15.1.448 1:11:12 Andrew: There.
- 15.1.449 1:11:14 T/R 1: Where would be the last two thirds? Would you get three or four?
- 15.1.450 1:11:18 Andrew: You get, so it would be one, [pointing to ribbon] two, wait, there's one, two, and three.
- 15.1.451 1:11:37 T/R 1: You think three.
- 15.1.452 1:11:38 Andrew: I thought, you see what I thought?
- 15.1.453 1:11:40 T/R 1: I think you counted wrong. What did you think?
- 15.1.454 1:11:42 Andrew: No, I thought two thirds, I thought you had to get two thirds. So you have two thirds, two thirds, so that's, um. I didn't count the last two thirds.
- 15.1.455 1:12:03 T/R 1: But you got four, now you're saying three. So you counted an extra two thirds.
- 15.1.456 1:12:06 Andrew: Yeah.
- 15.1.457 1:12:08 T/R 1: Ok, you're convinced of that?
- 15.1.458 1:12:10 Andrew: Yeah.
- 15.1.459 1:12:11 T/R 1: Can you do it carefully to be sure that you can explain it maybe?
- 15.1.460 1:12:13 Andrew: Yes.
- 15.1.461 1:12:14 T/R 1: Ok, great. Thank you [end of video]