

MALLORY WILLIAMSON: The second thing I'm now going to show you is more information. And from this, what I want you to do, is I want you to use this piece of information to then create another estimate. The first estimate is based on just on looking at something and reasoning through it. The second estimate I give you is actually something where you're going to go a little bit deeper. Okay? So, you're going to have to take a look at it, and I'm going to show it to you twice so that you can record any information as you go. Okay?

MALLORY WILLIAMSON: Okay (laugh). I'll play it again and this time I'll pause it briefly because I know it happens fast [inaudible]. Okay, write down any information you need.

STUDENT: 6, yes it is. So maybe we can [inaudible 00:01:18], which is 18. So that's one row [inaudible] 3 times 6. Well that's just one row. Imagine how much can fit in like 5 rows.

MALLORY WILLIAMSON: Well instead of calling it row because it's at the front, when you call it top, we call it a layer. So, if that's in the front layer, which is three times 16, which is what?

STUDENT: 18.

MALLORY WILLIAMSON: 18, so if we say there is 18 in a layer, then you have to start thinking about well how many layers does it create in order to fit equally inside that box. [inaudible] So that's where your brain's got to start going. So how many layers do you think there are to fit inside that box? Six or seven? What do you guys think?

STUDENT: I wanna say maybe eight. Like eight or seven or six.

MALLORY WILLIAMSON: And in this particular session, it's okay to be in agreement. Like it's okay, if you say six or seven or eight, or if he says six or seven, go with the seven. Like the middle number because either way it's still going to be an estimate. Like that way you guys all can reason through what you think that final volume's going to be. Okay?

STUDENT: It's like three sugar cubes, um, like, wide.

MALLORY WILLIAMSON: Okay.

STUDENT: And six sugar cubes, um, long ways.

MALLORY WILLIAMSON: Okay, so how many cubes do you see facing us?

STUDENT: 18.

STUDENT: 18.

MALLORY WILLIAMSON: 18. So we're going to use that amount and then we have to decide, what next? So, what do we need to discover now in order to figure out the rest of the volume?

STUDENT: How many sugar cubes tall.

STUDENT: How many sets of 18.

MALLORY WILLIAMSON: How many sets of 18?

STUDENT: Or how, how many sugar cubes high it is.

MALLORY WILLIAMSON: Yeah, and when we're looking at it this way, it would probably be how tall the height, how high it is, or the height of the box. Okay? So, you could do sets of 18, but also trying to figure out, okay, what would be a reasonable estimate for my height, and then apply it to the 18 that we see.

STUDENT: 90 to 108?

MALLORY WILLIAMSON: So how many sets do you think there might be?

STUDENT: About like five or six.

MALLORY WILLIAMSON: Five or six. Want to agree on one number, we'll say six?

STUDENT: Yeah.

MALLORY WILLIAMSON: Okay.

STUDENT: I agree on five.

MALLORY WILLIAMSON: Five? You want to do five cubes?

STUDENT: Sounds more reasonable than [inaudible].

MALLORY WILLIAMSON: You're pretty close. (laugh) 'Cause either way it's not going to be an accurate answer because we don't know for sure. So, either way, whether you go with five or six, it's still an estimate. Okay?

MALLORY WILLIAMSON: What do you mean by the bottom?

STUDENT: We think it's 100.

STUDENT: Oh, that's a top.

MALLORY WILLIAMSON: Right that is a top, we're seeing only the front top. So, when you say bottom, are you saying what's behind it?

STUDENT: Yeah, I think there's 18.

STUDENT: What if there's nothing behind it?

STUDENT: But 18 makes no sense.

MALLORY WILLIAMSON: Well, you saw the box. So there has to be, the top, the sugar cubes can't necessarily float on top, there's got to be something there.

STUDENT: I know.

MALLORY WILLIAMSON: It's not a trick question.

STUDENT: It's 180 because, like we said before, our estimate would be like 10 that going up so and, and since, since three times six is 18 and then you add the zero from the 10, would be 180...

MALLORY WILLIAMSON: So, from here what you could say is your next estimate is about 180.

STUDENT: Yes.

MALLORY WILLIAMSON: And I haven't given you any like guaranteed measurements. Okay, it's just an estimate. Okay? But if that's what you guys think you can go ahead and write that down. That you think the height, that the height is, about 10? So, there might be around 180 cubes?

MALLORY WILLIAMSON: What are you thinking, Ayla?

STUDENT: I don't know.

MALLORY WILLIAMSON: That's because you don't see it in real life. It's a picture that you're trying to reason through a space.

STUDENT: The height is 10.

MALLORY WILLIAMSON: Possibly, about. All right, anything from you guys [inaudible].

STUDENT: I think it's—I think it's gonna be, I don't think it's gonna...

MALLORY WILLIAMSON: Let's let, let's see if your groups teammates can figure out how you get 18.

STUDENT: It's 18 cubes because you can multiply six by three.

MALLORY WILLIAMSON: Okay, so the height that we're looking at is three and the length on that is six so that's where he's getting 18. And why did you call it a layer?

STUDENT: Um, because I have a feeling that there, that is not the only place where there's sugar cubes, there's more layers. Like, this is a layer of sugar cubes then on top of it is another layer of three by six, and another layer of three by six.

MALLORY WILLIAMSON: Right, so when we see the front view, we know that when we buy the box, that front layer of sugar cubes, there's got to be something underneath it. Or else those sugar cubes would fall to the bottom. So, we have to understand, maybe how many sections or layers of 18 there are behind that front view to, in order to figure out how many total sugar cubes there are. Okay? So now, how can you use this information to come up with a new estimate? If there's 18 cubes in a layer, how many total sugar cubes do you think there are?

STUDENT: If one cube is one inch and if the box could be like a foot tall, and you could just multiply. Because, 12 inches equals a foot, 12 times 18...

MALLORY WILLIAMSON: We're not doing feet, we're still doing, we're, I haven't given you any measurements so we're just using sugar cubes as a unit. So, if you're saying, do you think the box is four tall? Four sugar cubes tall?

STUDENT: No, 12.

MALLORY WILLIAMSON: 12? Okay, so you could do 18, which is what we counted in the layer, times it by 12 and see maybe that's our next estimate that we're going to. Okay?

STUDENT: These two are saying it's like 80 or 90.

STUDENT: I'm saying it too.

STUDENT: No, you said 180.

STUDENT: You said 180.

MALLORY WILLIAMSON: Okay, so let's go back. We have 18 on the front layer, right?

STUDENT: Mm-hmm (affirmative).

STUDENT: Yeah.

MALLORY WILLIAMSON: We need to all agree on what's a reasonable estimate for the height of the box. So how many sugar cubes will equal the height of the box?

STUDENT: 10, we're saying about 10.

MALLORY WILLIAMSON: We can say just the general 10. Which is okay.

STUDENT: We don't know what's behind it though.

STUDENT: But I feel like 180 is just...

MALLORY WILLIAMSON: There is more behind it, I promise.

STUDENT: But like we don't know if it's all the way to the top.

STUDENT: It is.

MALLORY WILLIAMSON: It is, that's the front layer of the box. So, these are on top. If we opened up a box and this is what was being shown in the front. This is the top layer. So, if you say the height's about 10, you can then say 18 times 10 is 180.

STUDENT: But I don't think there's like it's 180.

MALLORY WILLIAMSON: It's a first estimate so it doesn't have to be right or wrong. You have to remember that. It's okay if it's 180 and it's an estimate and then if I give you more information you can alter that answer. Okay? I think you guys are afraid of being wrong and that's okay.

STUDENT: No.

MALLORY WILLIAMSON: You can have another estimate and when I give you more information you can change or edit it as you go. Okay?

STUDENT: Uh-huh (affirmative).

MALLORY WILLIAMSON: All right.