Clinical Interview — Grayson Wheatley

Transcript, Part 4: Large and small cubes

("G" is Grayson Wheatley; "S" is the student.)

G – Now here's one. Want to read this one please?

S – Blocks measure 1-1/2 inches on each edge. A cube 1 foot high, 1 foot wide, and 1 foot deep is made with these cubes. How many little blocks are in the large cube of blocks.

G – So, how large are each of these small ones?

S – 1-1/2 inches on each edge.

G – And the big one?

S – The cube which would be 1 foot high, 1 foot wide, and 1 foot deep… (Drawing cube)

G – Yep.

S – is made with these cubes. So I need to find out how many 1-1/2 inches of these blocks can go. Let's try another one.

G – This is one of the cubes now.

S – Yes, so 1-1/2 on each edge.

G – And, the picture helps you think about this.

S – OK, So I need to find out how many little ones will go inside. So, first I need to se, to find, the volume of these to find out the volume of that, to see….

G – So, what would you do once you knew which of these?

S – I would just keep on adding the cubes until I would get …..

G – OK, so let's try that.

S – And just divide.

G – So, you want to know how many of these little cubes will fit in this large one.

S – So, let's see. I will have to do the volume. What is volume? Volume equals length times width time height, right?

G – It sure does. OK, so you say 1-1/2 times 1-1/2 is and now tell us how you came to 3 times 1 and -1/2. How did you get this?

S – Cause there's a length to find the area of the base.

G – Now where did your 3 come from?

S – Doing computations

G – OK, so now you are going to multiply 3 times 1-1/2.

S – Right, 3-1/2

G – 3-1/2 . So you are then saying that the volume of the cube is 3-1/2. What units would that be?

S – Inches.

G – Inches, OK. How are you going to use that to decide how many of these little cubes would fit into this larger one?

S – I need to find (unintelligible). That one doesn't seem right.

G – What doesn't seem right to you?

S – My multiplication of the fractions. It has been a while.

G – OK, Let's go back and look at that then. You multiply 1-1/2 times 1-1/2. What's another name?

J - .5

G – That would be another name for one half. How about 1 and a half? What is another way we could write that?

S – We could do 1.5 or we could just change the fraction. We could make it into an improper one.

G – And, what would that be?

S – It would be 3 over 2.

G – um hmm.

S – That would be….

G – Could it be 9 halves?

S – um hmm.

G – OK now, let's look at this problem from another point of view. So, we see what you have done here and you can follow through. If you were going to line these up, you had say

this is the base of this 1 foot and you wanted to line up the cubes, how many would fit along that base?

S – For 1 foot. If this was 1 foot?

G – Yes.

S – Then you would do 9 halves. Then that would be 2…. If these were _ marks. This would be one big… and keep going. (drawing) Can I make it longer?

G – Sure. In fact we can slip another piece of paper along side of it if you'd like.

S – Yeah.

G – Tell me what you are thinking.

S – Cause if it is 9 halves, use 1/2 out of 1, so 1 and then to the half mark 2 to half the second, three, four, five, six, seven, eight, nine.

G – So, how many would it take to fit along the, if this is a foot, how many of these cubes can we line up along there?

S – If…Say that again?

G – Yes. So what I have here, say this is a foot, and we want to line these cubes up along here, 1 and 1/2 on the base, how many of those, based on what you did here, how many would fit along there? Let's do it this way. Suppose we just have 3 inches. See, this is three inches, OK? Now how many cubes could we line up, could we place in here? (drawing) Here's a cube and how many could we line up along here?

S – If we use this?

G – Yes, using that. This is 3 inches. How many would fit in that space?

S – 2

G – 2. How did you decide that?

S – 1 1/2 and 1 1/2.

G – OK. How many could you line up?

S – OK, so you are asking me?

G – Yeah. So, see we wanted to negotiate what I was asking. So now I think I have made myself a little clearer. What are you going to try? So we will just do it this way to get the exact…. So you are writing 1 1/2 and 1 1/2 .

S – Yeah. So just do 1 1/2 times 9.

G – Where did the nine come from?

S – Well, the nine is how many you would need to go….
G – Was that from the work that you did before, that you decided that? Or was it from looking down here?

S – From looking here.

G – Tell me how you got nine.

S – Because if you have 1 1/2 for your base, then you need, your going to go across for 12. I need something else, a 12 that's it.

G – OK, we will go to 12.

S – OK, you need an 8.

G – How did you decide that?

S – Cause if there's those halves and you need, if this is 1 1/12….

G – Let's go back here for a moment. Tell me. I saw you going down like this. Tell me what you were thinking as you were doing that.

S – Just adding.

G – Yes, but, tell us what your thinking was. I am real interested in what you were doing there.

S – I was just adding the ones first….1, 2, 3, 4, 5, 6, 7, 8 and then 1/2 and 1/2 is 9, 10,11, 12. So that equals 12. Then I found out how many. 1, 2, 3, 4, 5, 6, 7, 8.

G – This is very clear and so 8 would fit across. All right, now let's take a look back. We know that 8 of those cubes will fit along the base. Now could help us decide how many cubes would fill this?

S – Yeah, cause that would give us. Say that again cause I had it there and I jus lost it.

G – Sure, 8 of them will fit across here. So, will that help us to decide how many cubes it takes to fill this cube, since 8 of them fit along the bottom.

S – We can do 8 times 1 1/2 and that would give us how may inches are in your bottom.

G – And that would be 12 and that is 12 inches so that checks out with the one foot.

S – Right. Wouldn't you just try to find the volume of this? 12 times 12 times 12? Cause if they are all one foot they are all going to be 12 inches. But…

G – They are 1 1/2 rather than 1.

S – So I would have to go back and so 1 1/2 times 8, wouldn't I?

G – That will give you 12. 1-1/2 times 8 will give you twelve. So that sort of confirms that 8 of them will fit along that base. Now, how many would fit along here?

S – 8

G – How many would fit along here?

S – 8

G – OK, how many could you get in the box all together? I might redraw this box a little bigger here so we have something to work on. OK, so how many fit along here?

S – 8

G – How many fit along here?

S – 8

G – And here?

S – 8. So, I just need to find the volume of it.

G – So what would that be?

S – 8 times 8 is…. I used to know all this. It has been so long.

G – I understand. How could you figure it out? What is 4 time 8?

S – 4 Times 8 is 32 and 5 is 40. So then 48 is 6, 56 is 7, 64 is 8. Then 64 times 8….8 times 4 is 32 and 8 times 6 is 48.

G – 512. So, that would say, based on your work that you did here, 512 if those little cubes in this 1 foot by 1 foot by 1 foot.

S – Yeah.

G – OK. That seems reasonable to me. You really did a lot of work to explain that so clearly. It really helped me a lot to understand just what you were thinking. That was great.