Clinical Interview — Grayson Wheatley
Transcript

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

Part 1: Mental arithmetic

G – OK, so Julia, I am interested in how you think about mathematics. So, I would like for you to talk to me a little bit about a couple of problems. Let me just start with: What would 21 + 19 be?

S – 40

G – How did you think about that?

S – I just did 20 and then 10 and 9 and 1.

G – Where did that 20 come from that you used?

S – 21

G – So you took the 20 from the 21 and what did you do next?

S – I took the 20 and the 10 from the 19 and put the 9 and the 1 together.

G – OK, great. See, I am interested in how you are thinking about that. What would 32 and 18 be?

S – 50

G – And how did you think about that?

S – 30 and the 10 would be 40 and then the 8 and the 2.

G – What would 100 minus 65 be?

S – 40 no 35.

G – And how did you think about that?

S – I subtracted.

G – And how did you subtract?

S – I added 65 to 100.

G – So you have 100. Did you start with 100? And, then what did you do next?

S – I started with 60. I went up to 100.

G – So you built up.

S – And then I went back 5.

G – So when you start at 60 and said up to 100 was?

S – 40 and then subtracted.

G – Interesting way of ding it. There are many ways to approaching the problem, but that is really a neat way of thinking about it. Lets see… 105 minus 12.

S – 92

G – Tell me how you thought about it.

S – I took the 12 and I minused from the 105…

G - So started from the 102.

S – You said 105.

G – Oh, so you started with the 105 and what did you do next?

S – Subtracted 10 from that.

G – OK, you subtracted 10 and that gave you…

S – 10 from 105…95 and then minus 2.

G- OK, so you broke that up and subtracted the 10 and then the 2. Interesting way of thinking about it.

Part 2: Photo enlargement problem

G. Here is a problem. If you would just read this aloud.

S – A photograph that is 6 inches on the base and 8 inches high is to be enlarged so that the new base is to be 15 inches. What will the height of the enlargement be?

G – And so here we have…You take this into the store, this photograph, and you say "I want you to blow it up and my new picture frame is 15 across the bottom." How high would it be?

S – I would do a proportion.

G – All right, you want to go ahead and solve it?

S – I multiply the 8 and the 15 and divide by 6.

G – OK, and what would you get?

S – And, I would divide that by 6.

G – So what answer did you get?

S – X equals 25.

G. – OK, so that would be your solution to the problem. So now, on here, when you get your photograph back it would be 2.5.

S – No, that is wrong.

G – Why doesn't that work?

S – Because it is smaller.

G – About what would you expect that to be? Just sort of glancing at it.

S – 18 or 20.

G – OK, so let's go back and think about it. So, you set up 8 over 6 is equal to x over 15. And your next step is you multiplied 8 times 5 and divided by 6. So this 8 times 15, Lets check out the multiplication.

S – 45, no 40. That's wrong.

G – 40. Why don't you move it over here?

S – Then 8 times 1 equals 8 plus 4. 120. And divide that by 6 goes into 12 twice, subtract 0. 20.

G – 20. Now does that seem reasonable?

S – Yes.

G – OK. You like that better than 2.5?

S – Yes

G – I was using this problem with another student and they said the answer was 17. Can you think how they might have gotten 17 as the answer to that problem?

S – They could have just estimated.

G – Actually what they did when they explained it to me is they said "Well, this 15 is 9 more than 6 so I need a number that is 9 more than 8. So that is how I get 17." So, what do you think about that reasoning?

S – I think it could work….but, I don't think it could work on any problem.

G – You had an answer of 20. So do you think your 20 is correct or the 17 that this person gave? Which would you go with?

S – I would go with the 20.

G – All right. Instead of 15, suppose this number was 24. Now would, without going through your procedure here, would there be a way of reasoning what this height would be?

S – Like if you just stuck in a 24, just like estimated it?

G – OK, let's see. This is 24 so this 6 now has instead of a 6 a 24 base. How high would it be? There's some way we could just think about that rather than using the proportion, which works very well.

S – We could do 6 times 4 and 8 times 4.

G – And that would give 32. So that would be another way you could think about that problem. Could you use that line of reasoning with 15?

S – Well, 6 doesn't go into 15.

G - OK, What if you do divide 15 by 6, what do you get?

S – 2, 3, 4

G – OK, 2 times 6 is 12

S – Right

G- And what is left over?

S – Like 3. So it would be 2.3?

G – So it would be 2.3. OK, so you have seen several ways of doing it. 20 makes a lot of sense to me. And I really appreciate the way you explain your thinking so clearly for us.

Part 3: Pool/walkway problem

G – Let's look at this problem. If you would read this one here please.

S – A swimming pool in the shape of a rectangle is surrounded by 3 feet of walkway. The pool is 23 feet wide and 32 feet long. How long would the fence be that just encloses the walkway and the pool?

G – Take your time to think what it means.

S – I'll draw a rectangle and 3 feet wide surrounded by 3 feet wide walkway and then the pool is 23 feet wide and 32 feet long. So they just want to know how long it is.

G – I'm going to a hardware store to buy a fence and I want to know how much fence to order.

S – OK

G – Tell us what you have done here.

S – I was trying to find the area of the rectangle which is the pool.

G – And you did that by multiplying 23 times 32 and you came up with 736. OK.

S – And then, I am not sure, just 3 times 3 equal 9.

G – Just try anything you like. So, where is the fence that we are going to build in terms of your picture here? Where would the fence be?

S – It would be around the outside.

G – Yeah, that's where it would be and we want to know how much fencing to buy.

S – OK, lets try 23 plus 3, 26, and 32 plus 3 cause it is all the way around. The let's to that instead. OK, let's try about…OK, I took the 23 and added the 3 and the 32 and added the 3 and I multiplied the sums and got 850.

G – Yes.

S – So I think that's…

G – So when I go to the hardware store, I should order 850 feet of fencing and that would just do it.

S – I think so.

G – OK, so 850 feet would be the distance around the pool. I understand just how you thought about it. Thanks a lot.

Part 4: Large and small cubes

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.

Part 5: Visualizing halves

G – I have a page here and would you tell me which of these show a half? Let's just talk about…yes…tell me which ones show half.

S – That's a half, that's a half, that's a half….

G – You skipped over this one.

S – Yes.

G – It doesn't show a half?

S – No

G – Go ahead.

S – Half, half, half

G – OK now. You skipped over this one. You said this one is not t half.

S – Right

G – OK. Why not?

S – Because those are equal and those are equal, but the area of that is not going to be the area of that.

G – I understand. OK, how about his one and why is it not half?

S – It would have been a half if that one was on a slant with it. But, it was straight so…

G – So, this side has more?

S – Yes.

G – OK, let's look at this one now. I am real interested in why you'd want to…So that does not have a half?

S – Yeah it does. When I glanced at it I didn't…

G – OK, so tell me how did you decide?

S – If I were to slide the…if I were to translate the blank side over it would make a triangle the same size as that.

G – Oh, so moving that over, it sort of inverted the triangle this way. What about this one?

S – That one….it almost looks like it could be.

G – Any way you could….

S – Cause that's the square and a square. It is hard to tell that is really…

G – OK

S – It doesn't look like it if it were just to be that. It looks like that the blank has more area.

G – More area than this piece?

J – Yeah, more area than just his part in there.

G – OK. Now over here you just took the square.

S – Yeah

G- So

S – Well, yeah it does. If there was a line right there. So, that is too.

G – So that is a half also. How about this one?

S – No

G – Why not?

S – Because this side has more area. Because if it were on a slant like that one…or like that , you know.

G – Um hmm. Very helpful. Yes, very nice.

Part 6: Toy cars problem

G – I would like for you to look at this one. Read that top problem, please.

S – 6 toy cars can be parked in a row 16 inches long. How many cars can be parked in a row 64 inches long? And, then 240 inches long.

G – First just…

J- So 6 could be parked…

G – OK, so you set up 6 over 16

J - and x over 64. Then I would do 6 times 4, 24, and just do…6 times 6 equals 36, 6 time times 3 is 6 times 4 is 18.

G – Let’s say with 64 on the top and 6 on the bottom.

S – 4 6’s, 18

G – 24

S – 736

G – OK, you got…

S – 384

G – Yes and that is the result of multiplying 6 times 64.

S – And, then we would do 384 divided by 16.

G – OK, we won't carry that out, but then this result you would get would be…your answer is to how many cars we could park. Just looking at that, estimate how many we could park.

S – 2 or 3.

G – 2 or 3 cars?

S – um hmm.

G – Oh, well we have some other questions, so we won't carry this out.

S – Well actually you've got that then. How would you be…16, 14

G – 16 or 14. OK so it would be about 16 or 14 cars that could be parked in there. OK, good.

Part 7: Fractions and decimals

G – Next question. Can you write 2, 3 decimals between 6 and 3/10. If you would write 6 and 3/10 then and over here 6 and 5/10. Can you write 3 decimal numbers between those that are larger than this and less than this?

S – 6.4, 6.45, 6.468.

G – So you could throw in 3 digits. OK. Great. What would I have to add to 17 _ (write that down, if you like) 1711/2 to get 20 1/4.

S – 20 and _

G – Yes. See you have written this as a decimal. OK.

S – So what was your question?

G – My question was, what would I have to add to 17 1/2 to get 20 1/4 ?

S – If I do 20 divided by…20 minus 17…5. OK, I would do 17 minus 5 is 7, 2, 1. 12.5. I'll go back, check 17.5 and 12.75.

G – What do you think? What did you get when you added those?

S – I have 10 too much.

G – Uh huh. So what would the answer be if you have 10 too much?

S – 2.75. I forgot to cross out the 2 from the 1.

G – Uh huh, so you just want to write that over here?

S – It would be 20.25 minus 17.5 and that would be 2.75.

G – OK, and just how you did it. Now if we think in fractions now. If we are at 17 1/2 , what would we have to add to get 20? Just mentally what would we have to add to get from 171/2 to get up to 20?

S – 3 1/2.

G – Let's see….

S – 2 1/2.

G – 2 1/2, OK how much more do we have to add to get 20 1/4?

S – 1/4, so it will be 2 3/4 to get….

G – So 2 3/4 and you wrote 2 3/4 in decimal form. Makes good sense to me.

Part 8 (not used)

G – Just one more problem for us to look at, and let me locate that. Yeah. Let's read this top problem. This will be our last one.

S – It says a square piece of paper is folded in half to form a rectangle with the perimeter of 12 centimeters. What is the area of the original square? So a square folded in half… So, the total perimeter amount is 20.

G – OK.

S – What is the area of the original square?

G – What is this the perimeter of?

S – Perimeter? That is just of this half.

G – OK.
S – So, the total perimeter would be 24 centimeters of the whole.

G – How did you decide that?

S – Well if it is a square, so…

G – So the perimeter of this half is what?

S – 12.

G – And so, the perimeter of the whole thing is going to be?

S – 24.

G – 24.

S – So, I have to find the, what is going to equal the base and the height to multiply to get the area. So, 24, we'll just do….

G – So, It is 24 all the way around. What is the base going to be?

S – OK, if they are both going….

G – So we have a 6 here. So what do you then…

S – Well, I could do a 6 and a 4 to equal 24.

G – Now it is going to be a square.

S – So they would have to be equal.

G – This whole distance has to be the same as this whole distance.

S – So, I would have to do what times what that is the same number equals 24.

G – Well, that is going to be a little tricky to do. So, then let's see, you are saying then the perimeter of this square is 24 centimeters. OK, I think we will just stop right there because we are out of time and that will certainly tell us a good deal once we have found that perimeter and we get the area from that. So, Julie, thank you so much. We have just learned a tremendous amount from you.