THE BRAILLISTS FOUNDATION

AN INTRODUCTION TO THE ABACUS

Matthew Horspool: This episode of BrailleCast Extra is made possible thanks to a grant from the Winston Churchill Memorial Trust. For more information about the Trust, visit its website at wcmt.org.uk.

Welcome back to the final episode of BrailleCast Extra for 2020. May I wish you on behalf of the entire BrailleCast team a very happy Christmas and a prosperous 2021. Coming up on this episode, a recording of a session entitled An Introduction To The Abacus. This session took place on Tuesday, the 8th of December, 2020 and is introduced by Holly Scott-Gardener.

Holly Scott-Gardner: Yes, it's great to have everyone here for our session on the abacus which I'm personally quite excited about because I have an abacus and I don't actually know how to use it. Just so everyone knows, this event is running in line with our moderation policy which you can find on our website at braillists.org. We are recording it and the recording will be made available after the event. We will keep everyone muted. However at any point feel free to ask questions and you can raise your hand, if you're on Windows, hit alt-Y, option Y on a Mac, star nine if you're calling in and on the iPhone app, you'll find the More button in the bottom right and then the raise hand button. We are going to be running some other events. We have several events that run weekly. Our book club runs on Thursdays, our open forum on Fridays and we will be having a Christmas quiz on the 18th of December. In January we will be starting a new Braille For Beginnings course. I know lots of people have been excited about that. That will be starting on the 11th of January and details about registering for that will be released this week. So look out for our newsletter this week and next week for more information. We'll also be starting a more advanced Braille course relating to using Braille at university and in the workplace, exploring various different topics and again we'll be releasing registration info for that this week.

So we have James Bowden here today who has ran several sessions for us on music and on using the slate and stylus and he's back to teach us how to use the abacus. So, hello, James.

James Bowden: Good evening. How are you?

Holly Scott-Gardner: Good. How are you?

James Bowden: I'm surviving, yes. Busy, very busy.

Holly Scott-Gardner: Good. Well, busy can be good at times. So, yes, I'm happy for people to just ask questions as we go along, if that sounds okay with you.

James Bowden: Sounds great, yes.

Holly Scott-Gardner: Whenever you'd like to get started, then feel free.

James Bowden: Thank you very much, Holly. So, welcome, everyone, to this Braillists session on An Introduction To Using A Tactile Abacus. So, many of us probably remember an abacus from schooldays. It was a thing with beads on it which slid up and down columns and so on and you were told, well, you count on it and so on. But that's not particularly advanced, necessarily, and it was an interesting thing and then you moved on to other stuff. But an abacus actually is a serious arithmetic device. For hundreds if not thousands of years, it has been used and you can also if you like just use it as a numerical notepad. You could record a telephone number on it and so on. Or you could just use it in place of a calculator just to keep your mind alert. It's all sorts of possibilities. You could use it to write down the current date so you never forget what the current day is. I first bought my abacus when I was much younger than I am now and I bought it originally to keep scores for games without having to write things down on paper etc, so an interesting device.

I'm just conscious that my microphone is making some nasty noises so I'm going to go on mute and try and sort that out a moment and then I'll be right back.

Holly Scott-Gardner: Okay, no problem.

Matthew Horspool: That's fine. We're not actually getting nasty noises here.

James Bowden: Nobody's getting any nasty noises and now I've fixed it.

Matthew Horspool: Okay.

James Bowden: So let's start with a description of the abacus. I'm hoping you've all kind of got the similar kind of thing to me. It's a plastic frame and inside are lots of columns of beads. This one has 15 columns and there's four beads in one group and one single bead in another group. So you hold the abacus long side towards you with the four beads closest to you and the one bead away from you. Now kind of about maybe three-quarters of the way up, there's a horizontal bar which goes right the way across, dividing those columns into those two sections and we call that the bar. Nothing to do with drink, it is just a horizontal bar and it is the place where those beads get their value. More on that later. If you feel across the bar, on mine there are little sort of plastic points every three columns and they have absolutely their usual meaning dividing numbers into groups of three digits. So you've got millions and thousands and billions and so on and so forth. But we won't probably use numbers that huge to start with. Well, at least not to start with. So first thing to do then is to learn the meaning of the beads. Some of you may well have worked this out already. The four beads below the bar are each worth one and the single bead above the bar is worth five. Beads gain their value when they're touching the bar.

So start by clearing your abacus so move all the beads in every column away from the bar. So the four beads go to the bottom and the single bead at the top goes to the top. So I'll give you just a couple of seconds to do that just in case it needs doing and hopefully we might get lots of lovely clicky sounds, that kind of sound.

Okay, so with everything away from the bar, that is the value zero. I should have mentioned as well, to the back of the columns is a foam sheet just to give a little resistance to the movement of the beads. That's deliberate so the beads don't slip and slide when you're not touching them. Right, so I'm going to start on the left-hand column, just because it's easier for now. It's not the way you'll write numbers in the end but on the left-hand column, move one bead from the bottom up towards the bar. So that's one bead from underneath and no beads on top. That is the value 1. In the next column move two beads to the bar, value 2. In the third column, three beads and that's the value 3. And in the fourth column move all four of the lower beads towards the bar and that's the value 4.

So far so good. In the next column we need to make the value 5, so slide the bead from the top downwards towards the bar and keep all those lower beads away from the bar so they're at the bottom as well. So that's the value 5.

6 is 5 + 1 so that's the top bead down and one of the bottom beads up. 7 is the top bead down and two of the bottom beads up. Likewise 8 is the top bead down and three bottom beads up and 9 is all the beads towards the bar so that's the top bead down and all four of the bottom beads up.

So we've made the digits 1, 2, 3, 4, 5, 6, 7, 8, 9 and then there's lots of zeroes after it. One, two, three, four, five, six zeroes after it. I thought it would be easier to start on the left-hand end, otherwise we've got to start counting backwards and so on.

So just take a moment now to re-read the number 123456789000000, which is a humungous number but we can do it.

Okay. So let's start mutilating the number, see if we can work out what's going on. So in the first column on the left, it currently has a 1. I want you to slide two more beads up from the bottom and one bead down from the top and that gives the number 8. The next column, take one of those beads away from the bar and hopefully you recognise the number 1. This really is random. Don't worry. The third column, put one bead up and the top bead down and that hopefully gives the number 9. Fourth column, take two beads off and put the top bead down, that should be the number 7. They're just random numbers. So hopefully now you can read 819756789000000.

Hopefully that's okay. Right, so a bit of practice. I would like you to note down your telephone number on the abacus. Don't tell me what it is but we'll just make a fictitious one up. 016143952. No, I'd better not go any further because it might be somebody's real number. I learned an interesting fact. Apparently 01632 not a real valid UK code but I'm not going to try it.

So just write down your telephone number on the abacus just as a bit of practice for noting numbers. I'm going to do my mobile number.

Okay. Does anybody need more time? Just have a go at reading it back to see if you can read it back. 01 or 07, etc, etc.

And just as a bit of a brain stretch, write your phone number starting in the extreme right-hand column so you're effectively writing it backwards but it's going to be on the right-hand side, just as a bit of exercise. I could have asked you just to shift it right. There we are. So now you should have several zeroes at the left.

So when you're doing arithmetic on the abacus, you tend to use the columns on the right for addition. So by writing your telephone number on the right, you've written rather a large number. If you're just using it as a notepad, you might start it on the left because then you know exactly where it starts and of course if you write double zero, in the UK, you'll dial an international number instead of a local number so it's a good idea to know whether they're on the start or finish. Most phone numbers in the UK have 11 digits so we know how many columns to expect.

Okay. Is everyone happy so far? Any questions?

Matthew Horspool: Either you can raise your hand by pressing alt-1 on Windows, option Y on Mac, star nine if you're dialling in through your phone or if you're using the IOS app by the More button in the bottom right-hand of your screen and find the Raise Hand button. We'll give people a couple more seconds to think of any questions they may have but we don't appear to have any quite yet.

James Bowden: Okay, so you're all up for some arithmetic then.

Matthew Horspool: It's getting a little bit late but I think we can just about try some maths, yes.

James Bowden: Try some maths.

Matthew Horspool: If our brain's engaged.

James Bowden: This is where the abacus takes the strain. So I'm going to start with what we call a simple sum. Simple in the fact that it won't contain any complications. So the sum is 21 + 68. So that's moderately difficult to do in your head but on the abacus, it's really straightforward. So on the right-hand two columns, first of all, set the number 21. So it's 1 in the extreme right-hand column and 2 to the left of it. Check you're happy with that number to start with. Then all we do to add 68 is remember that 6 is the top bead and one more bottom bead so just add those on. Then 8 is a top bead and three bottom beads, just add them on. Immediately you have the answer 89 and it didn't really require much mental effort.

Let's go through that again. Starting with 21, put 2 on the second to last column and 1 on the very last column on the right and I'm going to add 68, 6 is the top bead down and one more bottom bead up. Then 8 on the last column is the top bead down and three more beads up from the bottom and immediately the answer of 89 is displayed.

So far, brilliant. Let's try a slightly harder sum. Again if you were doing this in your head, you'd think, "Ooh, hang on a moment," but on the abacus, it's quite straightforward. So the sum is 315 + 163, which sounds quite nasty but on the abacus, let's give it a go. So on the three right-hand columns now, we write the number 315. I'll give you a couple of seconds to do that.

So that's three beads in the third column to the end, one bead in the second column and then the last column just has the top bead come down.

I want to add to that 163. So it's 315 + 163. So again all I'm going to do is I'm going to add one more bead in the third column, 6 in the second column, top bead down, one of the bottom ones up and 3 in the rightmost column and immediately the answer of 478 is displayed.

Let's do that one again but we'll do it the other way round this time, just for fun. So 163, so that's 1 in the third column from the end, 6 second column from the end and 3 in the very right-hand column, 163 and I'm going to add 315 so just three more beads from the third column, one more bead in the second column and the top one down in the very last column. And the answer 478 is displayed.

So far, that's looking really straightforward. But as with paper arithmetic, sometimes you get overflows and carries. Remember those horrible days in primary school when you got given 100 sums and you were told to finish them all before the end of the lesson. Well, it's again you still have to do carries and so on but it's a lot easier on the abacus.

If, for example, we have the number 9 so putting all the beads towards the bar in the right-hand column, number 9. I want to add 1 to that. Well, I can't. I haven't got any more beads left. So to add 1, you take away 9 and add 10. Does that make sense? To add 1, you take away 9 and add 10. So I'm going to clear that 9 from the right-hand cell and I'm going to add 1 to the column on the left and there's the answer 10.

Well, that may have been obvious but when we get into bigger numbers, it's a bit more of letting the abacus taking the strain. So similarly if we had the number 1 so I'm putting up one bead in the right-hand column now and I want to add 9. Well, I haven't got nine beads there so instead of adding 9, you take away 1 and add 10. So you just take one bead down and put one bead up on the column to the left.

If you like, we can say in a bit of a shorthand, to add 9, you clear one and set one left. It's a very kind of geeky way of saying, take one bead away from the column you're on and add one bead to the column on the left. The important thing to notice is that 9 and 1 kind of go together. Similarly if we want to, say, add 2 and there's already 8 in a column so I'm setting 8 in the right-hand column so that's a top bead down and three beads up from the bottom and I need to add 2. Well, I can't add 2, there's not enough beads. So instead of adding 2, you take away 8 and put 1 on the column on the left. 8 plus 2 is 10. So far, easy.

Likewise if I had 2 in a column so I'm now putting 2 on the right-hand column and I need to add 8, well, I can't, there's not enough beads. So instead of adding 8, you take away 2 and put 1 in the column on the left. So to add 8, you clear 2 and set one left.

So 9 and 1 go together, 8 and 2 go together and you've probably spotted the pattern, 7 and 3 go together, 6 and 4 go together and 5 is on its own because 5 + 5 is 10.

Hopefully I haven't actually confused anybody particularly hard. It's easier to illustrate with an example. So the sum I have here is 43 + 78. So let's put 43 on the two rightmost columns, 4 in the second to last and 3 in the last column. We need to add 78. So let's start with the right-hand column, 3 plus 8. Well, I can't add 8 to 3, overflows. 8 goes with 2 so you take 2 away and add 1 to the column on the left, 4 becomes 5. So far we now have 51. Now we need to add the 7 in the second column. You can't add 7 to 5 without an overflow so instead of adding 7, you take 3 and add 1 on the column on the left and our final answer is hopefully displayed, 121, 121.

Let's do that again. 43, starting value, 43 and I need to add 78. So I'm working from the right. 3 plus 8 can't be done, 8 goes with 2, so take 2, add 1 left, 4 becomes the 5. Then the second column, we're adding 78 so it's 7 we need to add here. 5 and 7 would overflow. 7 is the number we need to add, 7 goes with 3 so subtract 3 and set one left, giving a three-digit number of 121.

Is everybody okay so far?

Matthew Horspool: No hands so I think we're all following, yes.

James Bowden: Oh, good. Either that or I've frazzled everbody's brains already. Alright, now let's do the sum the other way around. 78 + 43. Let's see what that looks like. So 78 is what we need to put on the last two column, 7 and 8. So it's the top bead down and two beads up for the second to last column and the top bead and three beads up on the last column, 78. We're adding 43. Okay. We can't add 3 to the last column. There aren't enough beads. 3 goes with 7 so we need to subtract 7 and add one left, gives us 81. In the second to last column, it's 43 we're adding so 4. You can't add 4 to 8, 4 goes with 6, so you subtract 6 and set one left and, yes, our answer of 121 has come back. That's brilliant.

Now the interesting thing is I've done all that right to left, a little bit like you would do on paper but with the abacus you can do addition going left to right or right to left, it really, really doesn't matter, which is great. So I could have done the 7 + 4 bit first or I could have done the 8 + 3 bit first or I could- whichever way round you feel comfortable with.

Let's try another sum. This is a bigger one. 456 + 789. Now that's one I wouldn't really like to do in my head unless I needed to do but let's try it with the abacus. 456 + 789. So I'm putting 456 on the three rightmost columns. Notice the little bit just to the left of the 4 gives you a good clue you're in the right place. 456. I need to add 789. This time I'm going to do it from left to right just to prove it works the other way round as well.

So first thing we need to do is the 400 and the 700. That doesn't go. We have an overflow case. 7 is the number we need to add, 7 goes with 3 so instead of adding 7, I'm going to subtract 3 and set one left. Now that brings in the fourth column. Okay. So far it should now be reading 1156. In the second column we are writing 5 + 8. It was 456 + 789. So 5 + 8, again we have an overflow case. The rule for 8, 8 goes with 2, so we subtract 2 and set one left. The final column, it's 6 + 9, we can't add a 9 so you subtract 1 and set one left and hopefully you've arrived at the correct answer of 1,245.

Let's do that sum again but we'll do it the other way round. 789, so set 7, 8 and 9 on the last three columns. We're going to add 456. In fact there's loads of spare columns so if you ever get stuck on what the two numbers are, there's plenty of room, you can put the second number down as a reminder if you wanted to, on the left.

So I'm going to start by adding the 4 and the 7, 4 to the 7. We can't do that so the rule for 4, 4 goes with 6 so you subtract 6 and set one left. Next one, 8 + 5. We can't add 5 so you just take 5 off and set one left. The last one is 9 + 6. You can't add 6, 6 goes with 4, subtract 4 and set one left. Amazingly, 1,245 comes up.

Is everybody comfortable so far?

Matthew Horspool: We've got a question from Harry. So just coming to you now. There you are, Harry, you're good to go.

James Bowden: Hi, Harry.

Harry: Hello, there. Can you hear me?

James Bowden: Yes.

Harry: Oh, great. Right, now, my brain is completely fried by that and it's partly because I'm doing it on the right-hand side and then when you say the first number and that's easy to get in my head and get on the abacus and then you say the second number and because I'm trying to hold three numbers in my head, the second number, and do the bits of adding at the same time, by the time I've done one column, I've entirely forgotten what the other numbers were.

So that's part of the explanation, apart from the fact my brain's not working all that well. But what I keep finding myself doing and I don't know if this is acceptable, you see, is say you've got 6 on the first column on the right, then you want to add 17 to it. What I'm doing is, I've got 6 there so 17, 7, 6 and 7 is 13 so then I need 3 in that column and then 1 in the next one and then there's 1 from 13 so I add another 1 and then I end up with 23.

Now is that an acceptable way of running an abacus?

James Bowden: It is acceptable, certainly, because you've come out with the right answer and that's the most important thing. The only thing I would say is you've actually had to remember a little bit more than you need to by learning all these additional things like 8 + 7 is 15 and 6 + 7 is 13 and so on. All you actually need to remember is that 9 goes with 1, 8 goes with 2, 7 goes with 3 and 6 goes with 4 and 5 is on its own. That's the only kind of things you have to remember. The rest is totally up to you.

Harry: Right. Right. Those rules, they stay there sort of vaguely floating in my head but they don't make any particular sense, apart from the fact that they are things that sum up to 10.

James Bowden: Exactly. That's exactly all it is. That's all it is, things that add up to 10.

Harry: Right.

James Bowden: Yes, very, very simple. Now you also asked about the second number and how to remember it. Well, these abacuses have got 15 columns and even with a five-digit sum, if I asked you to add, I don't know, 12,345 plus 42,169. Now I wouldn't expect anybody to remember that in their head. There's plenty of room that you could 12,345 on the right-hand side and you could set 42,169 on the left-hand side.

Harry: Ah, yes. Yes.

James Bowden: So there's plenty of room so let's actually do that calculation. 4 + 1, that's easy, 2 + 2, that's easy, 3 + 1, that's easy. 4 + 6, ah, overflow, here we go. 4 goes with 6 so it's actually subtract 4 and add another one to the left. Then 5 + 9, again we subtract 1 and add one left. I've got a final answer of 54,514. Anybody can tell me I've got it wrong, afterwards.

Harry: Right, great, thank you, yeah.

James Bowden: You're very welcome.

Matthew Horspool: While Harry's unmuted, I wonder if I could just make an observation. I find this very interesting because as a blind person learning maths in a blind school, I was taught linear addition and linear subtraction in which case I would think that those rules that you were talking about would be quite useful. I'm wondering whether people who were taught on column addition and column subtraction might be thinking in terms of column addition and column subtraction and therefore the rules might not be so helpful because they've already learned to memorise how to add in columns whereas I certainly haven't learned how to do that. I wondered if, Harry, whether you're one of these people that learned column addition?

Harry: I must have been because I didn't lose my sight until much later in life, you see. So I just learned the standard way, whatever it was for doing that at school.

Matthew Horspool: So I think there might be a difference in thought process between people who learned standard column addition and people who learned blind school linear addition.

Harry: Yes, that makes sense.

James Bowden: Cool. So as I said earlier on, I first bought this abacus so I could keep scores on games so you've got plenty of columns. Let's assume that each player could have up to three columns each. That'll give you up to a score of 1,000, which is pretty high for most games and you can just keep the scores. They'll stay there and addition is fairly reliable and it's quite easy to do. So if a player had a score of 31 and the next hand they receive 178, you just click, click, click and off you go. Wonderful.

Any more questions before we move on?

Matthew Horspool: Two more questions. Right on cue we have a question from Chris. Hey, Chris, you're good to go.

Chris: Hello. It isn't actually a question so much as an observation. I think this is amazing. I was given this abacus the other day, just because my dad found it lying around and thought it would be entertaining and actually it's brilliant. I really appreciate you showing me the actual maths rather than just me messing around with it so thank you for that.

James Bowden: You're very welcome.

Alright, so the opposite of addition is subtraction. This is almost equally easy. So let's start with a sum, basically instead of moving beads towards the bar, for subtraction you move them away from the bar. That's basically all it is.

Let's start with an easy one, 84 - 31. 84 - 31. So I'm putting 8 and 4 on the right-hand two columns and, yes, if you like you can set 31 on the left-hand columns so you don't forget it.

All we do, if we take three beads away from the second column and one bead away from the last column and there's our answer, 53. That was straightforward.

We can't do it the other way, that would give us a negative number so let's not do that. Negative numbers are more difficult. We will not cover them tonight.

Let's do a more difficult one. Just like addition, in subtraction you have borrows and underflows. So let's do the sum 72 - 29. 72 -29. So I'm putting 72 in the last two columns and for those who want to, you can put 29 on the very left-hand columns. Now then 7 - 2, that's easy. 2 - 9 can't be done. But remember from addition that 9 goes with 1 so now you add 1 and clear one left. So it's just the opposite of addition. And you end up with the answer 43.

Do that again. 72 - 29. Do it the other way round this time. So I'm going to first of all take the 9 away from the 2 in the right-hand column. You can't take 9 from 2. 9 goes with 1 in the addition rules so all you do is you add 1 and take 1 from the left-hand column. In the second column, we have to subtract 20 which we can do normally and the answer is 43.

Is everybody okay or have I fried people's heads?

Okay. So the last thing I wanted to share tonight-

Matthew Horspool: I'm so sorry, James. Just as I said that, we've got a question from Tina. Hey, Tina.

James Bowden: Tina, go for it.

Matthew Horspool: You should have a little box that you may have to confirm.

Tina: Can you hear me?

James Bowden: Hello, yes.

Tina: Oh, good. I like doing a lot of knitting and I was just wondering, supposing I've got, say, a knitting pattern and I can remember what I've got to do with the stitches for example. Right, I have to increase one at each end every fourth row or something like that and then I might have to repeat it five more times or whatever. Would you be able to do that on the abacus?

James Bowden: So that's really using the abacus as a counter or as a notepad and you can certainly, if you want to, keep your row count on the abacus. Just make sure to increase the count each time you do a row.

Tina: Yes.

James Bowden: Then you have to pick up your knitting needles again so be a little bit careful of doing that but it's definitely possible to use the abacus as a numerical notepad, yes.

Tina: So then once you've done a row, you could clear that column, sort of thing.

James Bowden: Yes, yes.

Tina: You could have four rows of three so you'd have 12 lots, wouldn't you?

James Bowden: Or you could just use one column, whichever's easiest. I would say just use one column.

Tina: But the thing is, to repeat it, you'd need to have a blank column and then you could have that again.

James Bowden: Okay, so you could put four columns of four up if you needed to repeat something four times and then just take one bead away each time, you could do that.

Tina: Yes, you could do it like that. If you had to do it five times, you've got-

James Bowden: Yes, just use five columns.

Tina: That's five times. I suppose every time you've done the four, you could just add one from the top.

James Bowden: You could do that, yes. Keep it simple is what I would suggest, keep it simple.

Tina: Then you've got five along the top then you'd know you'd done that set.

James Bowden: Yes, but I would say keep it simple. That's the key, keep it simple.

Tina: Yes. Where can you get them from?

James Bowden: The abacus? Holly will tell you. The Braillists are giving them away.

Holly Scott-Gardner: I will tell you, yes.

Tina: Yes, I know but they're to borrow.

Holly Scott-Gardner: No, they're to keep.

Tina: Are they?

Holly Scott-Gardner: Yes. Any equipment we're giving away, unless you don't want it, in which case we'd love it back but all equipment that we're giving out is to keep unless you decide you don't need it, in which case we'd love to be able to give it to someone else.

Tina: I got the impression you didn't have it to keep but you borrowed it and then when you'd finished using it, you sent it back.

Holly Scott-Gardner: By finish, we literally mean if you decide, "I never want this again in my life, this is terrible," but so long as you feel like you may have a use for it in the future, we're happy for people to keep as long as they want.

Tina: Oh, right.

James Bowden: There you go.

Matthew Horspool: Thanks for that, Tina. Couple more hands. We've got Ed Rogers with his hand up and so we're going to come to you next, Ed.

Tina: Thank you.

Matthew Horspool: After you, Ed, we're going to come to Marion. Hey, Ed, you're good to go.

James Bowden: Hi, Ed.

Ed Rogers: Thanks, Ben. Thanks, James. I should say at the start that my abacus hasn't actually arrived yet which means I'm doing this with a mental model of an abacus in my head so I've not got it quite so well. I just thought it was interesting what Matthew came in to say after Harry asked his question which is that I find I'm also doing, as I've learned to do it by column, I'm also basically just doing mental maths and translating it back onto the abacus. I am trying to not do that but somehow I can't. Anyway there's not really a question there, it's just an observation that to ping up on what Matthew said. I'm definitely going to have to listen to this a few times. I know we've already mentioned it's recorded but for anyone else who's going to have to listen to this a few times, it's going to go on the Braillists website.

James Bowden: And that website for the recording is braillists.org/media.

Ed Rogers: Yes. Thanks, James.

James Bowden: I'm getting Stephanie [PHONETIC: Sargent] lowering her hand about five times.

Ed Rogers: Steph is the one who distributes equipment so if you write it, it'll be Steph who gets your request.

Matthew Horspool: So we are going to come to Marion next and then after Marion, we're going to come to Steph. So, hey, Marion.

Marion: Oh, hello.

James Bowden: Hello, Marion.

Marion: Hi, there. My brain's a bit fried up at the moment but I just wondered, James, please could you just recap the beginning? I was moving my abacus beads about and I think I might have got them in the wrong positions. So if you've got time, please could you just recap the first part where the beads are set. At the moment I've got all my beads set right at the top of the abacus.

James Bowden: Okay. So just to recap then, the central bar on the abacus across the middle, about three-quarters of the way up, underneath it there are four beads and above it, there's one bead. The four beads are each worth one and the top bead is worth five.

Marion: Oh, right. Okay, yes.

James Bowden: The beads gain their value when they're touching the bar in the middle.

Marion: Oh, I see, okay.

James Bowden: So to set the value zero, to clear your abacus, move all the four beads down to the bottom edge and all the single beads up to the top edge so that nothing is touching the bar.

Marion: Thank you.

James Bowden: That's zero.

Marion: That's zero. So that's your base line?

James Bowden: That's your base line, if you like. Then we'll set the numbers 1 to 9 across. Bit of practice for everybody else so move one bead up and that's number 1, two beads up, that's number 2, three beads up, that's number 3, all four beads up, that's number 4. Then the top bead towards the bar is number 5. Top bead down and one bead up is number 6. Top bead down and two beads up is number 7. Top bead down and three beads up is number 8. And then everything towards the bar, one top bead down and four top beads up, is number 9.

Marion: Okay, thank you.

James Bowden: You're very welcome. So have a practice setting a few numbers. You might want to try your telephone number or your date of birth or most of your credit number. It won't quite fit. But any number you want then have a quick read, see if you can do it back. Okay?

Marion: Thank you very much, James.

James Bowden: You're very welcome.

Matthew Horspool: No more hands after Steph but, Steph, you're good to go.

Stephanie: Thank you.

James Bowden: Hi, Steph.

Stephanie: Hi. Tina, you'll need to send me your address, please, so I can post things to you and do you want an A4 hand frame and a small frame as well? And a letter-forming cube and a word-forming cube?

Matthew Horspool: Good shout there, Steph. So I guess, I don't know, Holly, if we want to plug that address at the end of the session but maybe email in to Steph and we can take it from there.

Holly Scott-Gardner: Yes. I'll go over everything at the end but, yes, definitely communicate by email. It's a lot easier and we can get everything sent to you. Steph handles that, as she just said.

James Bowden: Okay. Is everyone suitably refreshed after a little break from the maths?

Last part of this session, I want to introduce multiplication. We're only going to do short multiplication today but you can equally well do long multiplications of sums as difficult as you like. You've got 15 columns and so technically you can multiply a seven-digit number by a seven-digit number and you can still get an answer which is quite amazing.

So, this is where school and abacus do collide. You need your multiplication or times tables. Remember once two is two, two twos are four and three twos are six and all that kind of stuff. So what you do for a multiplication sum is you set the first number two columns to the left of where you want the answer to appear and then we do the multiplication digit by digit and hopefully we get the right answer.

Multiplication is really a rapid form of addition because you're adding the same number over and over and over again but we're doing it in a very rapid way.

So we'll start with a simple one. 17 x 4. 17 x 4. If you want to, you can put the 4 on the very, very left and I'm going to set 17 with one bead up in the fourth column from the end and 7 is one bead down and two beads up in the third column from the end, leaving two blank cells or columns on the right. So technically it reads 1,700 but we're not worried about that quite yet.

So it's 17 x 4. The first multiplication is 7 x 4 which times tables tell us is 28 so I'm now going to add 28 onto the last two columns and you finish with the 7, so clear that 7. So now it looks like you've got 1,028 written there. Then 4 x 1, that's 4 so we just add 4 to the second column and there's our answer, 68.

Let's do a slightly harder one. 296, 296, so set that on the fifth, fourth and third columns from the end, two beads up, all the beads up and one down and then one up, one down, 296 and then two blank columns at the extreme right. We're multiplying that by 3 so if you want to you can put 3 on the extreme left just as a reminder.

Okay. So 6 x 3 is the first one, 18 so put 18 on the very right-hand two columns and clear the 6. Move left a position. 9 x 3 is 27 so put 27 next to the 9 and clear the 9. Then 3 x 2 is 06 so writing 6 in the third column and there's our answer, 888. Which if you wanted to check, is the right answer because if you like 296 is four away from 300. 300 x 3 is 900 and 4 x 3 is 12 so it actually is 12 away from 900 which is 888. It is the right answer.

That's about it, folks. Are there any questions?

Matthew Horspool: We'll give people a moment or two to raise their hands if anyone's struggling to do that or if anyone's forgotten. It's interesting. We've been talking about raising hands for ages but sometimes with all the tech we have to deal with, we sometimes forget, don't we? So it's alt-Y on Windows, option Y on Mac and star-nine if you're dialling in on a phone and if you're using the IOS app, it's the More button in the bottom-right and then find the Raise Hand button. So we've got a couple of hands. We're going to come to Rita first and after Rita, we're going to come to Ed again. So, Rita, I am just going to see if you can unmute yourself. You may be able to. There you are, you're good to go.

James Bowden: Hi, Rita.

Rita: Hi, I just wondered if you could do a simple multiplication one more slowly. I got left behind a bit.

James Bowden: Okay. Would you like to give me a sum?

Rita: Ooh, 27 x 5.

James Bowden: Okay, 27 x 5. So we're setting 2 and 7 on the fourth and third columns from the end. Then we leave the last two columns blank and if you want to, you can put the 5 on the extreme left as a reminder. The first digit we're going to do is 7 x 5 so you work from the right. 7 x 5 is 35 so let's put the 35 in those two columns. You finish with the 7 so clear the 7. Now you've got 2 x 5 which is 10 so put one and then zero, well, is nothing and remove the 2 so hopefully we have the right answer, 135.

Rita: I got lost with that last bit. Which columns am I putting the 10 in?

James Bowden: So it's always the two to the right of the one you're multiplying by. So let's do it again from the beginning. You've got 27. Okay? There's two columns to the right of the 7. So we're going to write 35 in there, 5 x 7. Clear the 7. The next one we're going to do is 2 x 5 which is 10. So you write 10 next to the 2, which if you like is the third and the second column from the end and then clear the 2.

Rita: Right, yes. I'm with it now.

James Bowden: You've got 135.

Rita: Yes, thank you very much.

James Bowden: You're very welcome.

Matthew Horspool: Alright, Rita. Ed has lowered his hand so I don't believe he has a question anymore. That is, for now, all the questions that we have.

James Bowden: There we are. So it is possible to do division as well. Short division is easier than long division and it almost works in reverse, just like subtraction was reverse addition. Division is like a reverse multiplication and you set the one number on the right and it works two columns to the left, just the same, only in reverse.

So there we go, introduction to the abacus.

Holly Scott-Gardner: Thank you. This has been really, really helpful. I know I've learned a lot. I did not know how to use the abacus beforehand. Now I feel like I'm on my way to really getting started which is a good thing. I'll probably listen to the recording of this again just because I'll need to go over it a couple more time but that's one great thing about having the recording. We will also be putting some text-based notes up alongside the audio recording. Just in case people haven't seen our media page before, we do feel many of our events include text-based resources as well. So we'll be doing that and, yes, this was really, really wonderful so thank you for coming along and talking to us today again.

James Bowden: You're very welcome.

Holly Scott-Gardner: Yes, so we do, as I mentioned, at the beginning and during the session, have some equipment on offer. This equipment is being given out to anyone who feels like they may want to attend some of our master classes. If you've been today, then you obviously have an interest so that's great. We're giving away Braille writing frames, a few samples of paper, styluses to go with the writing frames, a learning block and an abacus. We also have some events coming up. We have our book club on Thursdays, our open forum on Fridays and a quiz on the 18th plus our January course which will be going out in the newsletter. So to check our events you go to braillists.org/events and you can also find our newsletter sign-up on our website as well.

So thank you, everybody, for joining us today and I really hope you found it useful.