[MUSIC PLAYING]

KAREN FOLEY: Hello, and welcome to the Student Hub Live. My name's Karen Foley, and I'm a lecturer here at the Open University. And I'm also a tutor. And we have developed a really fun session today, which is all about maths for non-maths students.

Now, you should see some interactive widgets popping up on your screen very soon. And we'd like to know a little bit about you. So we'd like to know where you are. So there's a map. And if you're watching the Watch and Engage option, you'll be able to select that. So you can tell us where in the country you are. You can also tell us how you're feeling right now, what level you're studying, which subjects you're studying, and whether or not you've been to a Student Hub Live event before.

Now, if you can't see those widgets, you're probably in the Watch Only option, which is good as well, but you won't be able to enjoy the chat, ask questions, and talk to other students. So if that's you, you can go back to the website, which is studenthublive.kmi.open.ac.uk, and select the Watch and Engage. And then, just sign in using your student or your staff ID. So your name and your password that you normally sign into your OU account with, and then you should be able to access the chat and the widgets and see what's going on in that way.

If you're not an OU student, that's absolutely fine. Everyone is welcome to these events. And you can just get a free Open University Computer user name. So there's a Frequently Asked Questions section on the website where you can find out more about how to do that.

We've also just shown you a little video before the session, if you were an early bird, about how to use the interface. And from that, we showed you how you could adjust the size of the screen and the widgets with the different view options. And also, we talked about the pin. Now, the chat can move quite quickly. So if you'd like to slow that down, just press the pin icon, which is at the top of the chat. And then you can pause it and have a scroll through to see what sorts of things people are saying.

I'll know very soon where you are and what you're doing. And whether you're new to the Student Hub Live. But before we start looking at that, I'd like to introduce Evaghn and HJ. Welcome to the studio, you two.

HJ: Thank you.

KAREN FOLEY: Evaghn and HJ are going to be on our hot desk. They're going to be feeding all your comments and doing a range of stuff throughout the session.

Now, Evaghn. You haven't been with us before. And you're studying business, aren't you?

EVAGHN: Yes, I'm doing the post-grad with the OU.

KAREN FOLEY: Brilliant. Excellent. Well, welcome to the Student Hub Live.

EVAGHN: Thank you.

KAREN FOLEY: And HJ, you've been a regular here as well for some time. What sorts of things are people talking about?

HJ: I think we're just saying hi to each other. I think a lot of people like me haven't done maths in a while. So I may need some help. I think this is why though, we don't have Sophie on. So she can't help me today. Because she's a math student, isn't she? Yes. But we're very excited. And if there's any questions, thought, or comments anyone has, we're here just to chat to you, put them to the studio. And we'll try and get some problems solved today.

KAREN FOLEY: Excellent. No, indeed, we will. We've got a lot of problems to solve. And so those widgets really are going to be quite useful. As we go through and solve some of them, we'll be asking you what you think about things.

But like I said, before this is about students who may be using maths, but who aren't actually studying maths. Hence, Sophie is banned. She's off counting something somewhere, I think.

But what we're going to do is we're going to be taking a look at some of the content that's available on OpenLearn. And this is called Maths Help

Now, there are a range of modules within Maths Help. And what we thought we'd do was cover the first six of them, which are very useful to students who are not studying maths.

Now, often when you're studying, you can think about seeing figures, or charts, or tables, or things that are mathematically-related. And these can be a really valuable source of information that you can write about in your assignments. But if you don't know how to interpret those tables or data, or how to maybe put them in perspective, it can be a bit tricky to

get the most out of them. And that's one of the key things that we're hoping to do today. But what we're going to do is start very basically by taking a look at numbers and units and basic aspects of arithmetic. And thinking about some real-life examples. Because of course, we do maths every day. And sometimes, it can really raise our confidence levels just to think about how much maths we are doing. And that we are actually quite skilled in it.

So Susanne Schwenzer is going to be my first guest coming along from the Science Department. And she's going to be talking about all of those aspects.

We're then going to talk to Charlotte Webb about ratio, proportion, percentages, square roots, and powers. So some slightly more complex terms. But again, things that are really going to apply if you're a non-math student.

And then we're going to end with Sue Polley, who's going to be taking a look at a variety of charts and diagrams. And we're going to talk about how to interpret those and how to get the most out of that data. So that's the plan for the next two hours.

As I said before, you've got the watch and engage and the watch only options. And welcome those of you who are just joining the session also.

That's not the only way that you can connect with us. We also are collating all of the data from Twitter. So our hashtag is #studenthublive17. You can email the studio, which is @student oh, sorry. Our handle is @studenthublive. And you can email studenthub@open.ac.uk.

And we may be asking for some selfies and pictures and things of you, which is always nice to see where you are and what you're doing. So if you've got anything you'd like to send us, take a picture on your phone, upload it on the email, studenthub@open.ac.uk.

All right. I think I've gone through pretty much everything, but I'm a bit worried, actually, because my next guest isn't quite here yet. And we're nearly on

SUSANNE SCHWENZER: Sorry.

KAREN FOLEY: Ah, Susanne. Susanne, this is a maths session.

SUSANNE SCHWENZER: Oh. Let's put this down. I don't think we need this today.

KAREN FOLEY: Where were you going?

SUSANNE SCHWENZER: Well, I'm going to the field looking at some rocks, as geologists do.

KAREN FOLEY: Ah. I see. So why have you got a hammer?

SUSANNE SCHWENZER: Well, because we need the hammer to break up rocks. But we also use the hammer as a scale.

So if you take a photo of some rocks, and you are out in the field, the first thing you do is you put your hammer there because everyone knows at least every geologist knows how big these things are.

And if we are doing maths today, I'm sure we are talking about scales and units. And so that's a big a widely-used scale in geology.

KAREN FOLEY: Yes I was just going to say, I knew it was wrong to involve the Science Department in all of this. But actually, you make a good point. Excellent.

Well, thank you for coming along, Susanne. You're actually very interesting because you're a planetary scientist. And so you do a lot of things with very, very small things and very, very big things, don't you?

SUSANNE SCHWENZER: Yes.

KAREN FOLEY: When you're not investigating life on Mars and various other aspects.

SUSANNE SCHWENZER: Right. But you count, you look at things, you look at scales. You look at numbers, categories, everything.

KAREN FOLEY: Absolutely. So what are we going to do today? We're going to take a look at some basic numbers first. And that we've got some various props here. Some food-based props to take a look at as well. And we've got pizza. We've got various clementines we've been sectioning up and counting the segments.

Do you know that they don't all have eight segments in them?

SUSANNE No, I didn't know that.

SCHWENZER:

KAREN FOLEY: Some have nine. I know, it's quite interesting. And it wasn't necessarily the biggest one that had a different number of segments. We can eat some later.

So we're going to take a look at some various things within Maths Help. And this is quite a teaching-led session. So please, do ask questions as we're going through. And HJ And Evaghn will let us know when they'd like to feed anything in.

So if you want to ask Susanne anything about Mars, for example. Or numbers, units, and arithmetic, then do put those questions in the chat. And we'll do our very, very best to answer those as we're going through. But we've got quite a lot to crack on.

I've brought some technical equipment here.

SUSANNE SCHWENZER: Yes.

KAREN FOLEY: Yes, I have.

SUSANNE SCHWENZER: You've got a very high-tech gear here.

KAREN FOLEY: I have, yes. There we go. So I brought a number line because I thought that would be quite useful to talk about where the decimal place goes. Because I often get a little bit confused with some of these things, and how we divide things up. And I guess with maths the whole idea with maths, isn't it, is that it's very structured. There's a way of doing things.

SUSANNE SCHWENZER: Yes. And there is a way. To me, maths is about sitting down and just looking at it. And if you just look at this, which you nicely wrote down before, we've got the units. So if we have a 1 here, that's what we all know. 1 thumb, there we are. And then, you go along this line and you add a 0 behind that. So you've got the tens. You add two zeros, you've got the hundreds. The thousands with another zero. And you just keep adding a zero along this line. So it's very structured.

And once you get over your fear about all these numbers, you can see beautiful patterns there.

KAREN FOLEY: And this is quite good as well for decimal places and sort of hopping along the decimal places as you're converting.

When would students be mainly using decimal place? I mean, when would a non-maths students be taking a look at something and say, wanting to round it to something else?

SUSANNE SCHWENZER: Well, if you go shopping for example, you have prices that are round numbers. You might pay 2 pounds for it. But you might also have you pay 2 pounds for one item and you pay 5 pounds 50 for three.

So here you go. You're doing everyday math just when you go shopping. Because you need to figure out whether this is really a good deal.

KAREN FOLEY: No, absolutely. And we're going to be talking about good deals in the supermarket a little bit later. So we can have all of these numbers. But of course, whilst we've got our units of 1, we can have smaller things other than units, can't we? We can have 0.5 of something.

Do you think that that can be quite conceptually difficult for people? In particular, if maybe they're not studying maths, to flit between the two? To think about things in terms of percentages or halves, or aspects of things in decimal places as opposed to fractions? They're two quite different things.

And I often think people can think either pictorially or visionary. And so sometimes, having a pizza or doing things very physically can really, really help people make sense of something. But the decimal places can sometimes be another concept entirely. How do you deal with overlapping those sorts of aspects where you might think, oh, I'm a very logical unit-based person. 0.5 is absolutely fine for me. Whereas, I'd rather think of something in a half.

SUSANNE SCHWENZER: Well first of all, these are the same things. And it doesn't matter whether you think of a half. Like whether you think you've got half a litre of milk there or whether I think I've got 0.5 litres of milk there. We need to understand these are the same things. They are synonyms, if you want. And that makes it easier because there is no right or wrong way to think about these things.

And then, the 0.5 looks less scary if you know what it is.

KAREN FOLEY: Yeah. No, OK. This is all very good.

My producers just let us know that we've got a few video streaming problems out there. So if you're having problems with the video, we are working on it. And you can just refresh your screen at any one time, but bear with us if anything is going wrong. We are aware of it and we're trying to sort that out as soon as possible.

So how do you make sense of some of this? Are you a more linear person or a more pictorial person as a scientist?

SUSANNE SCHWENZER: I am actually an earth scientist. And earth scientists are observational people. So if we are talking about fractions, I can still see a millimetre quite well. But a tenth of a millimetre, how do I see a tenth of a millimetre?

Well, we geologists, we carry items. This is a hand lens, which actually magnifies things.

So if I look through that hand lens, I can needs a tenth of a millimetre. So these things are visual for me as well.

KAREN FOLEY: Yeah.

SUSANNE SCHWENZER: And you need to just look at them in an everyday context.

KAREN FOLEY: Excellent. Could we talk a little bit about translating then some of this sort of decimal units and things into fractions, for example? We know fractions I mean, I don't know if you want to talk about the denominator. I always get those two mixed up the wrong way. You've got one at the top and one at the bottom. And how do, broadly, those fractions work then?

SUSANNE SCHWENZER: Well, if you think about a whole thing, you've got some nice, little food items here. If you think about this pizza. So it's one. But you can divide it. And you would naturally divide it to serve it to your guests.

So you've divided it into 16 pieces as I see here.

KAREN FOLEY: Yes, I think it's 8. It might be.

SUSANNE SCHWENZER: It's 8? Yeah, sorry. It's 8. 1, 2, 3, 4, 5, 6, 7, 8. Sorry.

KAREN FOLEY: We've divided the cake into 16 because it was a lot bigger. 16ths were just too tiny, even for

children. But we could.

SUSANNE SCHWENZER: You could. So you just would have to fraction each piece once more. And that's, again, the same logic that applies here. You can do it again and again and again. And in this case, you get smaller and smaller and smaller fractions.

So what you do here is you have the one.

KAREN FOLEY: If you show it up a little bit, then people can see our fabulous, rather uncooked pizza.

SUSANNE SCHWENZER: Well, I hope it sticks to the plate. So what we do here is we've got the one. And that's the number on the top . And you've divided it by eight. And so now if you divide that, you divide it first once. You slice it once. And you have it divided by 2. So that's 1 divided by 2.

And then you take another slice. Then you've got 1 divided by 4. So you just keep doing this. And you basically put the whole on the top and the pieces you do on the bottom of your fraction.

KAREN FOLEY: It's an interesting way of doing things. I often remember the slash when you're doing sums in Excel now is quite nice because you're going 2 divided by 4, or something. And so I guess all it is is a principle of division, isn't it?

But sometimes, if you're stuck on things, it can be useful to think about them as parts of a whole. And visually, draw them out, et cetera. OK, brilliant.

So we've got our top number of our numerator and the bottom number is the denominator, which is why I guess there's the phrase the lowest common denominator within the section.

If we're looking and you'll see, by the way, there's some widgets coming up on the screen because we've got a couple of problems that we'd like you to solve.

And also, if you are just joining the session and you haven't told us where you are, it would be great to keep those widgets up there so that we can see the map and whether you're new to the Student Hub Live. And what you're studying and at what level as well. That would be very, very useful to know.

You just select the button, by the way, that applies to you. And then you can put things in.

So if you're studying science, for example, you can just press that button. And then let us

know. And then, that widget will feed in. And then you can also see what everyone else is doing.

And the word cloud is where we say three words about something. If you can't think of three, you just put a full stop, and then it will allow you to send those responses also. So you'll see some diagrams we've got here.

But Susanne, we've also got this tray bake here with these flapjacks, which we've cut into 16 pieces. So how would this then work? Because whilst eight pieces is fairly OK. I mean, we're used to pizzas and working on things. But sometimes working on things that seem uneasy to naturally divide can be challenging for people.

And again, if you just lift it up a little bit. That's not going anywhere, that flapjack. Not even with your hammer.

So if, say, for example, we wanted to divide this in a different way other than we might normally do. You can sort of see halves and quarters coming there. But if we were to look at a third, we might not get an equal number out of 16. So what might we do then?

SUSANNE SCHWENZER: Well, we do have to do the fractioning again.

So if you think about a third or a quarter in this case because if you want to think about a third, we would have to divide at least one of these pieces even further. But if you think about a quarter, since we have 16 pieces, then you can do this in different ways.

You could slice one, like one strip. But you could also take a square root of 4, or any other shape that you wanted, as long as you have the four pieces which make the quarter. It's basically 4 divided by 16. And because these numbers have you can divide them by the same number. You can just divide both by 4. It tells you if you divide the 4 and the 16 by 4, you again, have 1/4. And that's what you need.

KAREN FOLEY: Perfect. Excellent. We're going to be dividing some sweets a little bit later using ratio with Charlotte. I'm looking forward to that as well. OK.

But now, let's go to see Evaghn and HJ are talking about.

HJ: Well, we've had a few problems. And Alvin's kindly reminded me that I needed to put 50 p in

the metre, which we've done. But if you're having problems and you can't see the video, we've popped a link in the chat box. And if you click on that, it will go to the video for you.

And if you keep the chat room open, so you can chat to us while you're watching that video. And you can access the widgets as well. But we are sorry that we're having problems. And we are glad that you can get that video back up for you. Yes. But otherwise, we've still got some people.

Beverly is looking forward to this. But Paula thinks math is her nemesis. But hopefully not after this.

EVAGHN: Yeah. It seems like nobody..

HJ: Hopefully we can get through this together.

EVAGHN: Yeah.

HJ: This will be an experience for all of us.

EVAGHN: Everyone's in the same boat.

HJ: Chantelle, you still love maths, but lost confidence in the subject. So we'll do some confidence building with this one. I think we'll up-skill with this one, definitely.

EVAGHN: And if she gets confident enough, she said she's going to take up a maths degree.

HJ: Oh, there we go.

KAREN FOLEY: Good Chantelle. Really? And what does confidence look like? How confident do we need to feel?

EVAGHN: I don't know. She said she was pretty good at it before. So we try and get her back to where that is, whatever that looks like. But we'll see what she says at the end.

HJ: We'll see after this. Yes.

KAREN FOLEY: Is this a common theme then, this whole idea of confidence, you think, Evaghn and HJ, that people are sort of experiencing? Because ultimately I mean, none of this stuff I can't do yet. We've got a lot to go. But how much of this is actually thinking about conceptually, math seems really hard? And then thinking, yeah. Well, when you put it like that, I can do it.

EVAGHN: I think that's a good point. I think people are, like me, scared of numbers. And unless you actually engage with it and take it on, you'll never really get past that. But once people actually get into it, I think when confidence builds up, then they can do they realise they can do this stuff. So I think you're right. Yeah, confidence is a really big thing here.

KAREN FOLEY: Brilliant. Yeah. And that's one thing we're going to tackle as well.

So I think we've resolved some of the technical things. Keep watching us on the live stream. And you can still use the widgets and chat to each other using the Watch and Engage. But I think the video part of the stadium isn't feeling very well today. So you can have the two on. And that way, you can also have the live stream there and chat to each other. And let us know where you're on, what you're thinking. And hopefully, solve some of the problems that we've got as well. Lovely.

All right. Well, let's move this. Now, we've also got a diagram, Susanne, of some interesting things that you look at in scale. So I wonder if we could look at things. And naturally, these are to do with work for you.

SUSANNE SCHWENZER: Yes. What we have here is a whole range of different scales. And you saw the rock hammer earlier as a scale because it's on that picture. But if we go through this from the top around here, what we have here is, first of all, a silicon atom, which is very, very tiny. You would never be able to see it.

So what we do is, if we want to express it in metres, we have to use what's called a prefix. We have to tell people that you have to measure this in a very, very, very, very tiny fraction of a metre. A picometer. It doesn't matter what this is for the minute. But just to go through the concept, you can put a prefix in front of the word "metre," which is a length scale we all know. And then you tell people, it's very, very tiny.

And then we go to maybe this quartz crystal, which you would measure in centimetres. We all know the centimetres from the ruler. And now, you go to the decimeters. I had my hammer before. And so you see these rocks and all the structures. And you have the hammer here as a scale.

But then you go to even larger scale. That would now be the metre scale. You won't need any prefix for that.

However, the moment you step back a little and see the whole mountain back there, then of course, you need kilometres. You go the other way. You need to express that this is much, much bigger than a metre.

Map scale. And finally, the Earth, which has a diameter of about 6,370 kilometres. So you need much bigger scales there. And you use prefixes to do that.

KAREN FOLEY: Excellent. And we've got an example of some of them here.

One of the things about these, Susanne, is sometimes it's important to know what things are. And sometimes, it's important to know that if ever you need to find it, you know it's there. So we're not expecting everyone to memorise this and testing them. But it's just important

SUSANNE SCHWENZER: These tables, they are actually out there. And the prefix symbols, they are all out there. And I measured the kilo in kilometres. So 1 kilometre is 1,000 metres. And we kind of know this from driving around the country and from everyday life, the centimetre as well, if you use a ruler. Or I think in this country, it's more about inches and feet. But it's the same concept. You have a certain word for a certain quantity.

KAREN FOLEY: Excellent. And these are all outlined in the Maths Help first module as well. So if you want to take a look through and work through that, it's really a great resource. And it really does build your confidence because it's got loads of different examples that you can try out. It will teach you things and then say, right. Have a go yourself at doing it. And this is available on OpenLearn, so anybody can access any material on OpenLearn for that matter. So do have a go at this first module of Maths Help if you'd like to. OK.

So this is important. And it's also important, I guess, when we're returning back to this idea of ratios as well. So we can then start to think about how these relate two things. So a centimetre, for example, could be 1/100 of a metre. Although, we wouldn't express it like that. So it's about, I guess, understanding some of these conventions. And also, recognising that if, for example, you did need to look at metres in that context, like if you were making all these triangles for example, you might then need to sort of adjust your scale so you were looking at something larger as part of the whole. And then you'd be flipping those back into fractions, wouldn't you?

SUSANNE SCHWENZER: Yes. And it's, in a way, like learning a language. And that might be a lot less scary for a lot of people because knowing that centi is 0.01, or 1/100, is like learning a language. You need to

know these vocabulary of mathematics. And once you know them, things become a lot easier.

So don't get scared. Just learn the vocabulary and that will get you over that initial hurdle.

KAREN FOLEY: And it's very, very important. It's a language, I think, we're all very interested in. And as I keep saying to my daughter, you need to do your math, so you don't get ripped off in the shop and you can count your change properly.

SUSANNE SCHWENZER: Yes.

KAREN FOLEY: No, absolutely. OK. So we've been converting money in units as well as part of this. And we've got pounds and pence and things. And we're going to talk a little bit later as well, Susanne, with one of my future guests about how we can not get I don't know whether we're doing that. Not getting ripped off on holiday.

Because when I go on holiday, I can deal with the converting all of this stuff. But as soon as I'm then translating things into other currencies, especially multiple times, it can get a bit confusing. And sometimes, you think things are a real bargain and they're not.

SUSANNE SCHWENZER: Well, you need to do the math there again. And quite often, people get bogged down because if you look up a conversion rate, you've got a number that has, usually, a decimal point and lots and lots and lots of figures back there. But you can round them up. And you can say, if some conversion rate is 0.47689 whatever. You can say it's roughly 0.5. And then you have a much easier math multiplication to do than if you really tried to do it with all these digits.

KAREN FOLEY: Absolutely. HJ and Evaghn, how is this making sense to everybody?

EVAGHN: I think everyone's trying to sort of the screen stuff at the moment. But yeah, we've got a way forward. Some people are splitting the screens. Some people are just switching between the two.

KAREN FOLEY: Brilliant.

EVAGHN: So hopefully, everyone's kind of tuning in and out.

KAREN FOLEY: Excellent.

HJ: I think Adele, though, is interested in knowing if it matters about interchanging numbers. She

wants to delve more into that point if we haven't hit it already. Perhaps.

KAREN FOLEY: Well, I'm glad you're all sorting out the problems because you'll need to be able to use the widgets in a minute. And we're going to be asking about your feedback on that. And well done sorting it out. This is also available on Catch Up. So if you do want to re-watch some of it later, you can do that. It will be available immediately after this session's finished. So you can watch the video stream later, but thanks for bearing with us.

Susanne, would you like to answer Adele's question?

SUSANNE SCHWENZER: Well, interchanging numbers is something that you need to think about very carefully. Because you need to think about, which mathematical operation do you actually want to do?

If I take these pens, and I have 2 and I add 1, it doesn't matter if I say I have 1 and I add 2. It's 3. If I have 2 and add 1, it's 3 again. So for certain mathematical operations, like adding numbers and for multiplications, it doesn't matter.

But for other mathematical operations, it does matter. For example, if you have a succession of subtractions and additions, it might matter whether you subtract first, and then add.

If you do more complex things, like subtracting or adding, and then multiplying, it might matter as well. And again, mathematics is a language. So there are rules for how you do it.

And if you want to do it differently, then the normal basic rules say, we have the brackets that you can put around and tell someone you need to add first, and then multiply. While the normal rule would say you first perform the multiplication, and then the addition.

KAREN FOLEY: I wonder how many people use Excel and regularly do calculations. That would be interesting to know. Because often when I'm doing things on Excel, it makes it very clear in a way that sort of takes me back to my days of doing maths, where you need to put things in brackets to get those calculations to perform.

So for example, you'll need to bracket something when you're adding something before you're multiplying. But broadly speaking, how would you remember when those rules matter? When does it matter when you can do things, like the brackets? Is it just for division and multiplication that you need to be bracketing things? In context, how do you remember them or make sense of them?

SUSANNE SCHWENZER: Well, the easiest is if you have a simple calculation, you try it both ways. And if your result is differently, then you better go and look up the rules.

KAREN FOLEY: A heuristic. I like it. That's what I often do. That's why I like [INAUDIBLE] and things because I often put things into Excel and think, does that sort of make sense? If I can just translate that broadly and think 1/3 of 100 is around 33% or so, then I can just sort of think about it logically.

But we've got various things. So we've got one widget about whether it matters if you interchange numbers. So we've got some examples here. And these are all on Maths Help.

If you multiply 3 by 365, that will give you the number of days in 3 years. But then if you divide 366 by 3, to find out how many days in a term, then that could be slightly different, couldn't it?

SUSANNE SCHWENZER: Yes. And there is a good example why things are not interchangeable. Because if you have the big number, the 366, and divide it by 3, then you get a number that's roughly 100-something. But if you turn them around and divide 3 by 366, you get a number that's a lot smaller than 1. And so that tells you it does matter. Just from thinking about it, you don't have to do this exactly. You can just think about the quantity of 666 days, or whatever, and 3. And how these numbers relate to each other.

KAREN FOLEY: Absolutely So dividing 3 by 366 is not the same as dividing 366 by 3. So it depends which order you're putting things in, in particular for division.

SUSANNE SCHWENZER: Yes.

KAREN FOLEY: But would it matter the same with multiplication? If you've got 365 times 3, or 3 times 365, that doesn't matter as much, does it?

SUSANNE SCHWENZER: That doesn't matter.

KAREN FOLEY: Because you're still increasing things. But when you're dividing things, the order really matters. Again, because we had the denominator and the numerator. So because they're in such different places, that's why there's such a difference between the two.

SUSANNE SCHWENZER: Yes. And you can, again, think about our cake or pizza. The one thing that you have first is your thing that you are going to divide by the other number. And if you flip that around, it just

doesn't work anymore.

KAREN FOLEY: No. Yeah. No, absolutely. And I think you're just going back to this idea about Excel. Once you start pushing those things in and you can look at these calculations quite quickly and get the answers, it can make sense of some of these numbers also. Which I guess was one of the main things that non-math students use it for.

Kate and Libby and Andrea and HJ are all avid Excel users, I am told. So I hope that this makes sense. And it'd be interesting to see if this is how you do some of those calculations.

And even if refreshing some of these for Excel would help you do more calculations. Because it can be quite an interesting way to divide things. I often have an Excel document open when I'm doing something completely unrelated, just to divide things up. If I'm doing a budget, I'll be working things out. And it can be a really quick and easy way of doing things other than using a calculator.

SUSANNE SCHWENZER: And you can track what you are doing. If you have any table calculation programme, you can track what you are doing. You see the numbers still in front of you.

When you use a calculator, that's gone. You only see the result. But you can track back. And you can actually see what you were doing.

KAREN FOLEY: Alvin wants to know about the order of things, like brackets. Which is brilliant actually, Alvin, because that's our next section that we want to cover. So I wanted to talk to you about brackets, because these are things that we see. And we've touched on some of these before, in particular when you're using Excel. So sometimes, you might say 5 plus 3. And you'd have the brackets around them. I don't know if you want to use my technical

SUSANNE SCHWENZER: Yeah, probably.

KAREN FOLEY: My technical chart. We can do some sums to explain this to Alvin. Voila.

SUSANNE SCHWENZER: That's actually a good idea. I love high-tech.

KAREN FOLEY: It is. It's very good, isn't it? Yes.

SUSANNE What was the task?

SCHWENZER:

KAREN FOLEY: OK. So we can use calculations in brackets, which mean, ultimately, do this first, don't they? So sometimes, we want to make some calculations and a variety of succession. So if we wanted to add 12 and 7 and 13, that makes no difference because we're adding.

SUSANNE SCHWENZER: Let's write the numbers down.

KAREN FOLEY: So 12.

SUSANNE SCHWENZER: 12.

KAREN FOLEY: And 7.

SUSANNE SCHWENZER: 13 and 7. So that's our numbers.

KAREN FOLEY: So that's fine. So if we added well, you've put them in the wrong order. Ha-ha. It doesn't matter, does it? So if we're adding 12 and 7 and 13, we're always going to get 32. If we add 12 and 7 together first, and then add 13. Or add those two together, it doesn't matter. We're always going to end up at 32. So we can do it either which ways. But the brackets can mean do things first.

So if we bracketed something, then that may make a difference in some situations, not all. Because if we're adding, we can ultimately bracket 12 and 13 or 12 and 7. And we get the same, wouldn't we? Because we we've just done, it doesn't matter.

12 and 13 plus 7.

SUSANNE SCHWENZER: And you say

KAREN FOLEY: That's still 32.

SUSANNE SCHWENZER: Yes.

KAREN FOLEY: And it doesn't matter if we bracket this or we bracket it that way. Because ultimately, we're

adding all of the things together.

But if we were looking at division sorry, not division. If we were looking at subtraction, it might matter which bracket we were doing. Because we're getting a whole. And then ultimately, we would have two different halves of that.

So if we're adding 12 and 13 together first, and then take away 7, that would be different. So shall we try 12 and 13 take away 7? And we'll change the brackets.

SUSANNE SCHWENZER: So you want 12.

KAREN FOLEY: And 13.

SUSANNE SCHWENZER: Plus 13.

KAREN FOLEY: Minus 7.

SUSANNE SCHWENZER: Minus 7. So that's 25. Minus 7 is 18.

KAREN FOLEY: And that's when the brackets are here, isn't it? Because we're doing that first, and then we're taking away 7.

But then, if we were changing that, it wouldn't be the same. If we were having 7 minus the 12 plus 13.

SUSANNE SCHWENZER: 7 minus 12 plus 13.

KAREN FOLEY: Having the brackets here. So 12 plus 13, which is 25.

SUSANNE SCHWENZER: That's 25. So we can work it

KAREN FOLEY: Ah, then it is the same, this one. 7 minus 25.

SUSANNE SCHWENZER: We are actually getting into negative numbers here.

KAREN FOLEY: Yes.

SUSANNE SCHWENZER: We are at minus 18 here.

KAREN FOLEY: Yes.

SUSANNE SCHWENZER: So yes, it does matter.

KAREN FOLEY: So we're transferring that number line almost then, where we were looking at units very early on. And we only had positive units from that. But we can get negative units.

So with certain things, the brackets do matter. And broadly speaking, the brackets mean do that first. So in these equations, we would be looking at doing this one first or doing that one first, and then taking the answer from that aspect. And then doing the sum that we were looking at.

SUSANNE SCHWENZER: And that's basically what I did here. Let me get a blue pen. So that's what I did here. Do that first, and then do the rest. And that's a lot what you need to do when you do maths. You need to be very systematic and think about it. And go step by step. Never try to do 15 things at once.

KAREN FOLEY: OK, brilliant. So Alvin, does that answer your question then about the brackets? And where to put those and where to do them first? So basically, if for example, we had more of these together. So we had three or four brackets. We would do everything in the brackets first, and then we would take the equation systematically and go through it like such.

SUSANNE SCHWENZER: Like I did it here, just with more of them.

KAREN FOLEY: But where it might matter if we were designing some of those equations is not necessarily with addition, but with some of the other ways of doing things. If we were adding things in order, then the order, other than just a straightforward addition, would impact. And that's when we might need to consider putting brackets, to think about exactly what we're trying to do and when. So it's almost like commas in sentences. They can massively impact on the meaning that we've got. And they're our way of accenting stuff in maths, isn't it?

SUSANNE SCHWENZER: So we are, again, back to that mathematics is a language.

KAREN FOLEY: So Chantelle says she uses the acronym BODMAS. Does that make sense to you?

SUSANNE SCHWENZER: She uses the

KAREN FOLEY: BODMAS. Chantelle, what is BODMAS I haven't heard of that one.

SUSANNE SCHWENZER: I haven't heard of that, either.

KAREN FOLEY: Evaghn, what is it?

EVAGHN: Well, I've got it here. It's Brackets Of, as in power of, Division, Multiplication, Addition, and then Subtraction.

KAREN FOLEY: Ah, brilliant.

EVAGHN: So that's the order. This is Chantelle, who I think is probably going to be taking up that degree.

KAREN FOLEY: Is this Chantelle, who has definitely said that if she gets more

EVAGHN: Yes. She's helping everyone out. And I think Andrea also said, yep. I was taught BODMAS in school. And this is the order I remember it in.

SUSANNE SCHWENZER: OK. Maybe the reason that I'm not remembering this is because I learned my school math in German.

KAREN FOLEY: It wouldn't make sense, would it? Excellent. Well, I'm looking forward to hearing how your signing up for your degree goes, Chantelle. So yeah. And thanks for helping everyone. Right.

We're going to need to move on quickly because we're running out of time as we always do. We talked briefly about negative numbers. And I just wanted to mention briefly some of those types of things. Again, to do with order effect. So we've got some examples to do with values of washing machines and things. And talking about how negative numbers can occur in financial matters. So we've got a few problems. Again, all of these are on the Maths Help section.

So we've got if a value of a painting increases by 20 pounds a year and it's worth 20 pounds today, how much is it worth in a year's time? And how much is it worth a year ago?

What I've noticed with these is they all start fairly easily. And you can get a false sense of confidence when you're going through them.

SUSANNE SCHWENZER: Yes.

KAREN FOLEY: So we would go 200 plus 20 equals 220. And if we were looking at reducing the value of the painting, we would go 200 minus 20, which is 180. So we can't argue with any of that sort of thing.

But if we were going to start looking at these constant annual increases of things and the current value, then we would need to subtract an annual increase from a current value. So we would say, well, OK. If this painting is worth so and so, and then this is how much it increases each year, like the latter example, we would go 200. And if it's increasing, a year ago it would have been worth 180 pounds. So we can sort of make sense of those ideas. But often with math, it can get a little bit more tricky because you've got various other things that are happening as well with those numbers, like how much that money's worth.

I mean, when I was born, 20 pounds was worth a lot more than it is now, so to speak. So we've got all of those differences as well.

Then, we've also got things about negative increases. So if you regard a decrease as a negative increase, does your answer then apply to the washing machine?

So if we've got this 20 pound decrease or increase, is that the same sort of thing? And I think just sort of thinking through some of this, the answer is that it is if we're looking in real time, isn't it?

SUSANNE SCHWENZER: Yes. Because what you are doing here is, if you say the washing machine is worth 200 pounds at this moment. And you calculate a decrease, what you do is you basically subtract the 20 pounds. And you can do this in two ways.

You can either say, OK, I'm just subtracting these 20 pounds. Or you can think about the decrease as a negative number. So let me just say we've got the 200 pounds here. And we want to think about the decrease. And the decrease is 20 pounds. So what we can do is we

can simply say we have the 200 pounds here. And we subtract the 20 pounds. But we can also think about the decrease as a negative number and at that negative number. So that is basically the same as saying I've got the 200 pounds here and I am adding a decrease. And now I am putting a bracket around here to make it a bit more clear of this negative number of minus 20. So these two are equivalent. They are the same. And you are thinking about it as a decrease. I need to subtract something. But the decrease in itself is a negative number. And so these two are equivalent.

KAREN FOLEY: Excellent. Susanne, thank you so much. We're just out of time now. I just wanted to end by asking your advice on something I know students get very stuck with, which is just about rounding. How many decimal places for non-math students do you think one should go into?

SUSANNE SCHWENZER: It depends on what your original number had. So if you measure a temperature and you measure 20.5 degrees. And you do any mathematical operation. For example, to convert it into Fahrenheit. The 0.5, that significant figure does not change. Just because your calculator or Excel spits out these 20 things after the decimal point, your significant figures of the original measurement do not change. So if you go by the number of what we call significant figures on your original measurement, you can't go wrong.

KAREN FOLEY: OK. So it's not less accurate, it's just more appropriate in terms of how you might round it to present it to somebody?

SUSANNE SCHWENZER: Yes.

KAREN FOLEY: Excellent. Susanne, thank you very much. I hope your rock hunting goes well today.

SUSANNE SCHWENZER: Thank you. I am going now.

KAREN FOLEY: Don't forget to take your hammer. And thank you so much for explaining all those basics to us. That's been a really useful session. Thank you.

SUSANNE SCHWENZER: My pleasure.

KAREN FOLEY: All right. We'll see you very soon.

SUSANNE SCHWENZER: Thank you very much.

KAREN FOLEY: Thank you, Susanne.

Evaghn and HJ, how's everyone getting on? How did we enjoy that first session?

HJ: I think it went well, yes. We were just talking though, about whether it's BIDMAS or BODMAS. But Kate tells me that it's basically the same thing. And it's just like using a different dialect of the same language, which is good. And we had a little chat about calculators as well. I know you always thought that I relied on them too much, which is why I'm finding problems with maths now. But Kerry says she recently changed her calculator and it blew her mind the amount of stuff that it could do. I thought that was quite cool. She'll have to tell us what calculator she's using.

EVAGHN: Yeah, definitely.

KAREN FOLEY: And tell me, what sort of students have we got out there? What sort of level and what are they studying?

HJ: It seems to be lots of people at level 1, which is good. So are you starting in February, or doing your module now? That would be good to know.

A few people at level 2. I think the post-graduates are just us two on the desk here. But yeah, it would be good to know what you are studying. So if you haven't filled in the widget, just click on the widgets on the left and let us know what you're doing.

Lots of STEM subjects as to be expected in the maths one. I wonder if we do have any more geologists. Is anyone interested in geology? I think Susanne shows that math students isn't just well, maths isn't just for maths students.

KAREN FOLEY: Excellent. Well, do let us know that. And let us know if you're starting your studying journey in February, which is coming up very soon. And we've got a Freshers Fair, which will be on the 31st of January and the 1st of February. And that's going to be a full two days ram-packed, full of loads and loads of stuff as well. So that will be really useful if you're starting your journey and very interesting for those of you who are already working your way through.

[MUSIC PLAYING]