[MUSIC PLAYING]

KAREN: Now, charts and diagrams and figures and all these things will come up in your module materials very, very often. And they're such a great source of information as well.

If you're writing an essay for example, some students will think, well, how can I include this figure? I can't like chuck it in there because my teacher will literally, have something to say about that. I certainly would because you can't include things like that, but they do have a lot of information in them that you can then use.

So, Sue is my next guest. Welcome, Sue. We're going to talk about diagrams, charts, and graphs, which are in the next modules in our Maths Help section. And having a look at really, you know, how we can actually use some of this data, and how we can make sense of it, and how we can write about it confidently.

SUE: Oh, definitely, yes. What you find is, that you find tables and charts and graphs and everything in everything you see. And I've brought you some biscuits.

KAREN: Oh, lovely. I'm so glad you brought my some biscuits.

SUE: I know, it's getting near lunchtime, isn't it? Getting a bit peckish.

KAREN: Oh, and Jaffa cakes.

SUE: Jaffa cakes.

KAREN: They're a Student Hub favourite. Oh, I didn't know we had a Student Hub Live brand of Jaffa cakes now.

SUE: Student Hub Live, everything.

[LAUGHTER]

And what you find is on all foods, as a ...

KAREN: Charlotte was saying, yeah.

SUE: As Charlotte was saying before, you will find tables.

KAREN: Yes.

SUE: And they're really interesting.

KAREN: Because Jaffa cakes are one of the lowest fat biscuits, I find.

SUE: Aren't they? They're a good January staple, you can eat them whenever you want.

KAREN: Brilliant.

SUE: There you go. And so, what you find is you tend to find, the information is in different categories. So you need to actually be really careful when you read the tables as to what you want. So tables can give quite good sets of information.

Looking at a table we've got here.

KAREN: Yeah, if you just forward.

SUE: There we go.

KAREN: There we are.

SUE: Fantastic. There we go. We've got a table here of the change of sizes of the households in Great Britain over a period of 30 years. So they're looking at the different number of peoples in the house every 10 years. OK.

So what we have the tables for is really just so we can look at the information and see what we can get from it, and then we can write something about it. So what do you think, Karen? If you looked at this table of information, what do you see from it? What's the most important thing you see, first of all? What would you say?

KAREN: Well, I always look at things and think about the title and I first sort of try and make sense of what this is trying to measure. So, this is about change in households over a period of 30 years. So, I'd start looking at seeing how they've broken things down.

They seem to have done it in pretty much 10-year age groups. Looking at the number of people per house. That all sort of seems to make sense. Number of houses surveyed. I guess that's just to do with the sample, isn't it? So I'd start looking at where the big numbers were

here. This is what I'd do.

But I'm aware that my maths isn't always the right way. So I'd start looking at things and saying, well, most people, I guess, have two or more people in the house. It seems to be a bit bigger than that. So I'd look at how you could section it, I suppose.

SUE: Yeah, that's right. You can do. If you look, for example, at the number of houses with only one person in, you can see actually between 1961 and 1991, there's a definite increase in the number of people. Whereas, number of two people in the house has stayed fairly similar, but has increased slightly.

However, the number of larger households have decreased quite a lot.

KAREN: Yes.

SUE: You can see the number of people with 6 or more in the household has actually gone from 7% down to 2%, and that's quite an interesting figure. And that's a look at the social demographics of the range of the different time eras. And if you think about it, how back in the 1960s, you would stay at home with mum and dad until you got married. And then you'd move out at that point. So there was a lot of households and a lot of less certainly one-bedroom/one-person households. Whereas, nowadays you get a lot higher now.

KAREN: So if you were doing, say, social sciences, where it would be very common to look at this sort of demographic, would you recommend then that people are looking at trends, grouping things? We've been looking at how you can sort of translate data into various sort of other concepts, like ratios or proportions as opposed to the percentages that we have here. How would you suggest that people could make most use of a graph like this? Is it looking at the trends and thinking about how that physically is represented in terms of the population?

SUE: Yeah, I think so. I think you need to look at the numbers and actually work out what information you can pull out of it. So it is really interesting looking at things like, can say that, well, actually, in general, most people are in households of two or one person. So there are still actually quite small households.

Whereas, maybe from the 1960s, there was more likely to be two or three people in the household. So you're looking at mum, dad, one kid maybe. Whereas, nowadays it's more likely just to be two people, flat shares, husband and wife. Maybe even someone on their own is a lot more likely. So you can pull out real bits of information like that and actually write something

just from this data alone.

KAREN: Actually, this is a very good point you make because you're sort of making some assumptions there about who these people might be. And often on the graph, we'll see who is surveyed, or maybe we don't know who is surveyed. So it might be that this is adults. It might be this is, do you know what I mean? So this is number of people. So one might assume then that it was adults and children, or any sort of living person within that household, but sometimes, it can be adults. And it's always important to think about what units people are actually basing some of these on when you're describing them and not making assumptions, but describing what data is actually in the chart as opposed to what you think it might be when you're starting to visualise it. It's that balance, isn't it?

SUE: It is. You've got to be very careful that you don't draw out completely fake information. Or, you don't take an assumption that doesn't work out to be true.

Another thing is, well, you can look at it as well. As we look down here, there's the number of households surveyed, and so in 1961, they surveyed 16.3 million households.

Now, you can actually take that number and use your percentage, and then you can actually work out how many people that actually means.

So for example, if we look at 1991, they surveyed 22.4 million households. OK.

So if we look at, say, the number of, so the number of percentage that actually have 4 people in the house was 16%. OK, so if we want to work out exactly how many people that was, we multiply the number of households surveyed by 16. And that will give us the number of actual households that have four people in them.

What you can then actually do with a little bit of searching on the internet, which is really good, because you can actually use different bits of information. You don't have to rely on just your table. As long as you reference the other information you can use, you can use it.

You actually find that this isn't just the number of household surveyed. This is actually the number of households in Great Britain at the time. So not only are you just looking at a proportion of the population, you can actually then say, not exactly, because obviously, we've averaged the number of households. But we can say approximately, how many households actually had that number of people in them in Great Britain at that time.

KAREN: This is interesting, Sue, because we asked our audience how confident they are with reading data and how confident they are with interpreting data. So there's one small change there in the question.

Now, most of them are saying that they feel quite confident with reading the data, but it's the interpreting the data that they're less confident with.

However, I've noticed that they're very good at maths, and they're very good at making these conversions, and they've been getting everything right. So what is the difficulty then with making these interpretations? Why might some students, do you think, feel less confident about the actual interpreting side of things?

SUE: I think to be honest, it's just very hard to see things. I mean, things like these tables, they're very dry, aren't they? I mean, you look at them and actually, they're just a set of numbers. And you're trying to work out the relationship between these numbers and actually what you're looking at.

So one of the things we can do actually, with looking at numbers and tables, is we can take the information from a table, and we can actually put them into the form of a chart, a graph. Something a lot more visual. Something you can look at and actually get your hands on and see how it feels.

So if we go through, here we go. One of the things we can do with information is we could turn them into a pie chart. We can use this when we want to look at a whole of something and see how it's split up.

KAREN: Now, these are good because we've got quite a lot of students out there who are real Excel wizards. Wizards, is that accurate or not? I'm not sure. But they're using Excel a lot to do calculations. And one of the things I love about Excel is you can just hover over the chart and get all sorts of different charts. So you could type up a table like this and you could look at things in different ways, couldn't you?

SUE: You can do, yeah. What you need to make sure is that from the information you've collected, you're using the correct table. Using the correct chart that actually helps you display that information in the most accurate way. And the most visually helpful way.

KAREN: Yeah. You couldn't just cut and paste that into a pie chart, for example. But you can collate

things and get them into proportions, can't you?

SUE: You can do, yeah. I mean, things with pie charts, the easiest way to look at it is if you want to actually explain how you've split something up. So if you are looking at percentages, so you could take one year of the households that we were looking at earlier and look how each of the different number of people in the households was split up for that one year. And that would be displayed really well in a pie chart and then you could see which sample was the biggest. So which different household had the most number of people in, or sorry, which had the largest proportion of people.

Whereas, you couldn't necessarily explain the information if you were looking at the different years. You would have to use a different sort of chart for that, which we'll come onto later. So at the moment here, we're looking at some pie charts here. And they're really good at showing how you can split things up.

And if you look at this chart here, we can see that on an average weekly spend sampling. Again, Karen, what would you draw from this?

KAREN: Right. OK. I would draw from this: the largest proportion of things is the groceries that people are spending on, followed by the meat and fish. And fruit and vegetables has been sectioned out, so I imagine someone would be talking about that for some reason. But it seems to me as well, that if you're looking at things, and gross alcohol, it's not clear whether that's out or in, but a lot of stuff seems to be, they seem to be spending a lot more in than out. So the meals out is only 12.4%, so 85% of stuff I would assume that was being spent at home or not out, not going out entertaining.

SUE: Yes. Yeah, that's good things to draw out of that.

You can go further than that, though, actually. You can look at it and you can start comparing the sizes. And because these are all drawn in proportion, then it means you can actually look at the size of your wedge and you can actually think about it.

And if you look at the size of the fruit and veg wedge, then you can see it's actually about a third of the grocery wedge. So you could fit one of these fruit and veg wedges, you could fit three of these into your groceries. Can you see that?

KAREN: Yes.

SUE: Is that good?

KAREN: Yes.

SUE: And also, it's not quite, but it's about half the size of the meat and fish. So it's a really good way of visually showing the different sizes of different things. So it's very easy now to say that you spend three times as much on groceries as you would do on fruit and veg.

KAREN: Yeah. You could also, I guess, start looking at those and thinking then about where you would cut them and which distinctions or which categories you might group together to show what people are mainly doing, couldn't you?

SUE: You would do, yeah. Because if you look at it another way actually, you can see there's almost, it's not quite, but it's almost a straight line. Straight down the middle here. So you normally say that actually half of people's spending is on groceries and alcohol. And the other half is being on meals out, fruit and veg, and meat and fish.

KAREN: What are they doing with the meat and fish though? I don't know if it's not in the grocery section.

SUE: I was trying to work out that. You see? And that's another thing that you need to think about when you're drawing these charts, is you need to actually think about how your information is conveyed. Because this is the chart we've picked up off of the Math Help site. And so we only had the information that that Maths Help site gave us. And I sat there trying to work out, what is groceries if it's not fruit and veg, meat and fish?

KAREN: Yeah. I would put alcohol in my groceries.

SUE: Oh, yeah, definitely. You got to hide that bottle of vodka in there somewhere, haven't you?

KAREN: I would always put it out. Mind you, I'd also put it in meals out, so.

SUE: A quick coffee out while you're doing your shopping. That's in the groceries.

KAREN: Yes, exactly. So these categories really matter in terms of how we're spending.

SUE: They do.

KAREN: How we do things, yeah.

SUE: So you always need to look behind the figures as well, just to see how it's all being made up.

I mean, my assumption is things like the groceries are more things like your washing powder and your tinned food and things like that.

KAREN: Yeah. But this, I guess, would be important. And maybe this is one of the reasons that people have sort of, they can read all of this and they can get it, but it's when you're interpreting it, it's being very objective with the information that you've got there and not trying to, as you say, make too many assumptions. So we can't say that they spend more in or out because we don't know whether the alcohol, meat or fish, or fruit and vegetables is in or out. We don't even know what's constituting groceries if it's not those two.

So when we were maybe making discursive or text-based comments about some of these graphs, what might some of the things that we could accurately say about this chart?

SUE: It's one of those things, isn't it? They say, there's lies, lies, and statistics, don't they? So, you know, so you do have to be really careful what you say.

So what could we say about this chart? I mean, there are the very basic things like we were looking at to start with. That groceries is about a third of the average cost. And then again, we can look, again, like we said about how things are made up but you can stick to very number-based discussion. So you can say that obviously, you need to spend more on groceries because that's how people spend it.

KAREN: Yeah.

SUE: And less on meat and fish.

If you have a look at the next chart, and there's not the numbers that were involved here, and then you start actually looking at the sizes of things.

KAREN: HJ and Evaghn are you getting to grips with this pie chart idea?

HJ: I think we are.

EVAGHN: Yeah. We kind of work on it. So if you look at this pie over here, the brown bit is with reference to Libby's, the pie that I have not eaten. And the silver bit in the middle is the small bit I have eaten.

KAREN: All right.

EVAGHN: But I will be working on it the rest of the afternoon, so.

KAREN: Working on it as in eating more of it?

EVAGHN: Yeah. You could say that.

KAREN: That's a very nice pie chart. OK. Well, that's another way of looking at things, I suppose. Thank you, Evaghn.

SUE: We have pizza down here, which is a good way of looking at things here.

KAREN: It is, yes.

SUE: And the pizza has each been divided into equal-sized segments. So you can look at starting about how the segments can combine to make up wholes. So what about this one here then? Karen, on the spot again.

KAREN: Proportions are, I don't know, I'm frazzled after doing all these. Proportions of people living in different kinds of accommodations in a particular town. Interpret what the pie chart indicates by estimating the percentage of people in each category.

So we're making inferences here, aren't we? Because we're starting to look at who might live in one of these things and what might happen. We could say a detached house might have a family in it because they're really good if you like screaming at your children. Whereas, a terrace house may suit more urban people, it may suit couples.

But I don't know, I am very conscious that I'm making lots of assumptions. And actually, I don't really think many of them hold because some people live in a detached house on their own.

SUE: So let's pare it back again and look at the figures. OK. So what can we say from this pie chart?

What we can say is about a third of people live in some detached housing.

KAREN: Yeah. Because if you section it like this, it's about a third, isn't it?

SUE: Yeah. Because if you look at, there's kind of three main segments. So, semi-detached housing, there's the terrace housing, and then, there's the other three. And they're all about roughly split into thirds. So we can start making some rough assumptions. About a third of

people will live in semi-detached housing and probably about a third of people live in terraced housing.

KAREN: Yes.

SUE: So obviously, there's a lot more semi-detached housing around than there are terraced housing.

KAREN: Yes.

SUE: Because there's a lot more people that live in them. And then we look at the other three. And we try and work out, so going back to Charlotte's percentages. We got about 33% that live in semi-detached housing. Probably slightly less in terraced housing. So maybe about 30%, but still roughly a third. And then we're looking at the other three, we want to think about how these wedges are split up. Any guesses? Which one looks bigger? Which one looks smallest?

KAREN: Well, the smallest is the other to me. I was just thinking, I completely misread that question as well, by the way. Yeah. So yeah, the smallest seems to be, in order of appearance, it seems to be the other, then the purpose-built maisonette, the the detached house, then terrace, the semi-detached. And also, split in half, you've got the detached and semi-detached. So houses could be one side whereas more smaller accommodation could be half as well.

SUE: Yeah. That's a very good interpretation.

If we look at just the red, the yellow, and the green here, the three that we've left in our last third that we haven't really looked at yet, having a look I'd say probably the detached housing takes up almost half of that proportion.

KAREN: OK. Yeah, I'd go with that.

SUE: So yeah.

KAREN: Maybe a bit under, but yeah.

SUE: Maybe a bit under. So we're looking at these two roughly take up about a third each. So slightly about, so maybe that takes up roughly about 6% each. So if we're looking at this last section here, it takes up about 40%. This is more or less half the size of it. So that would be about 20%?

KAREN: 20%, yeah.

SUE: And then we got split between the last two. And so maybe we're looking at, we got to split the last 20% between the last two, so, what you recon, about 7 and 13 maybe?

KAREN: Yeah, I'd go with that,

SUE: Something like that. Yeah?

KAREN: Yeah.

SUE: Yeah. So we're looking at definitely the largest. Then, this next. Down, down, and then the smallest. And so we can then start building up a look at the sorts of houses people live in. That the other houses are very small and the most popular houses are semi-detached. And that's one form of drawing a pie chart.

KAREN: So if we were describing this discursively, we might then start to look at some of this data and make comparisons or groups between things. We've been looking at sort of trying to attribute a numerical figure to each of these because there aren't the numbers indicated on there. How important would that be? Or, you know, if you, for instance, met a graph like this in your studies, would you try to do that?

SUE: Walking down the street.

KAREN: Oh, yes. Or yeah, so, or a bungalow. In your bungalow, if you found a graph like this, what would you do? So would you need to sort of necessarily think about that? Or could you just do it very heuristically and just sort of say, most people, or followed by this, or about half? Or how would you sort of start to work with that?

SUE: I think it depends very much on what you need to say, really. I mean, you can talk very descriptively about, like you said, most people live in semi-detached housing or terraced housing. But it's sometimes nicer just to start building in just a few numbers, a few figures, just so you can actually picture what that "most" means.

KAREN: And if you weren't sure, because we've been looking at different ways of saying the same thing. So if you weren't sure whether that was 7%, for example. You could start using maybe fractions or something that was a little bit more vague, couldn't you?

SUE: Yeah, or you could, you can just easily say approximately, or this is the least, this is the

smallest portion.

KAREN: Just under half of this section, or whatever.

SUE: Yeah. Just under half. You use the language that you feel familiar with, that you feel happy with. And if you're not happy using percentages and you're happy using fractions, then you can talk about the biggest wedges. That the semi-detached housing is three times the size of the other housing. You know, and you can talk about things like that a lot more. You can talk about, I mean, it's the great game of Trivial Pursuits as well.

KAREN: Yeah. Just thinking about the just under half, it brings me back to the whole Brexit thing, where just under half actually meant a huge thing.

SUE: Yes. It can mean everything in terms of voting, where it's all or nothing.

KAREN: Absolutely. But a nice way to describe pie charts nonetheless.

SUE: Oh, yes. Definitely.

KAREN: OK, excellent. So we've had a various look at some of those things. And we've also been asking people which age range they're in. So if you haven't had a chance to tell us which age bracket you're in, then do do that because we're going to take a look at some bar charts, aren't we, as well?

SUE: We are, yes. So as we were saying earlier, pie charts are brilliant when you want to show how things are split up, when you've got whole and you want to split it up into different segments. But if you actually want to look at something like, I don't know, comparing how far different planets are away from the Earth, or something like that, well then, that's not. You can't split that up in any way because it had different sets of data, you'll say that one planet is x miles away and another planet is further. And so you need to find a way of showing that graphically, because it's so much easier to see in a chart than if you've just got the numbers written down.

KAREN: Yeah.

SUE: And if we do things like that, we can actually start using charts. Here's one I prepared earlier.

KAREN: OK.

SUE: LEGO.

KAREN: OK, brilliant. Excellent. So we asked people which percentage age range they were and we've got a chart. So let's see what people at home said in terms of the age ranges.

So we've got some 18 to 24, we've got 13%. 25 to 34, we've got 20%. 35 to 45 is 27%. 45 to 55 is 27%, and 55 plus is 13%. I don't like that 55-plus because it seems very broad, doesn't it? And progressively closer.

SUE: The ladies never disclose our true age.

KAREN: No, exactly.

SUE: We're all 25, really, aren't we?

KAREN: Indeed. So we've got this sort of nice spread, nice sort of bell-shaped curve. Yes, which is very nice. Very representative.

SUE: It is. So from our charts, we can actually look at it. So we're going to have to approximate because obviously, we've only got bricks.

KAREN: Yes. They've got a nice thing underneath. I see they've labelled clearly for each thing, so that's good.

SUE: 18 to 24 age. We said that was about 13%?

KAREN: That's about 13%, yes.

SUE: OK. So let's think. So if we use that to be...

KAREN: I've written them down. Clever.

SUE: And I thought it was your memory.

KAREN: No. I'm focused on the pizza, I'm afraid.

SUE: I know, it's lingering there in the corner, isn't it? And we're doing pizza. Right, so we have a block that's 18 to 24%.

KAREN: Yes.

SUE: So if we use just one block to indicate about every 10%.

KAREN: Perfect. I think that's a good idea.

So So 13% is closest to 10.

KAREN: We're rounding.

SUE: We're rounding, yeah. You did that one earlier, didn't you?

KAREN: Yeah, a little bit.

SUE: So we're going to round to 10%. So our 18 to 24's are in 10%.

KAREN: OK.

SUE: So we're actually..

KAREN: Then we have 25 to 34, which is 20%.

SUE: 20%. Oh, that's easy. That will be our two bricks.

KAREN: Perfect. Then 35 to 45 is 27. So that's three I think.

SUE: Yeah, I might go for three, yeah, about 27 is closer to 30, isn't it?

KAREN: And again, rounding up to three bricks for 45 to 55, 27. This is interesting, actually. Do you know that we've got so many..

SUE: We're missing an age range here?

KAREN: Are we? Oh, dear.

SUE: Right.

KAREN: Use a different colour, maybe.

SUE: We'll have to use this colour.

KAREN: Yeah.

SUE: Right. That's brilliant because they're not touching, then we can use the same colour again.

KAREN: Yes, you can, can't you?

SUE: So there we go, what was that? 45?

KAREN: OK. So that's 27 again, 45 to 55. And then, 55 is 13, so maybe one block for that.

SUE: And then so we're back down to our 55, which is 1 block.

KAREN: You know, OU students are getting a lot younger and a lot more in full-time work at the moment as well.

SUE: They are.

KAREN: So our demographics are shifting massively, which is again, why it's important to look at these things.

SUE: Yeah, definitely. I mean, over the years I've been teaching, when I started teaching, you'd have, you'd definitely have a larger demographic in that 55-plus bracket.

KAREN: Yeah.

SUE: And now we're moving down a lot more and we're seeing a lot more people that are looking for changes of career.

KAREN: Yeah, absolutely. OK, so we've made a nice bar chart, very easily.

SUE: We have made a nice bar chart, which means that now we've got our bar chart here. You can very easily see how they step up, and then they drop off very suddenly at the end.

Whereas, maybe from the figures, that wouldn't be quite so apparent how big a jump it is between the last two age ranges. So just by displaying it very physically, you can actually get a lot more information from it.

KAREN: Yeah.

SUE: You can say whereas from the 18-year-olds, they tail up quite nicely, and then, there's this sudden drop.

And as you'll notice, I've squinched these tables together, all these bars together. And that's because what we've got is we've got a set of continuous data because somebody is always so old. You know, you can't, much as we'd like to miss out a few, you can't. Go back a bit. So what you mean is because the data follows on from the other, then if we push them all

together, then this is an indication that this is then displaying everybody's age.

KAREN: And of course, you've done this for your point of view and as we know, normally when we shift things around, they're the same. But in this case, because you've done it to your side and turned it around, they're on a slightly different way for the viewers, which is fine. We're used to transformations.

SUE: Oh, sorry. Was I punching the wrong buttons?

KAREN: It's fine. It's just not consecutive, but it is still continuous, just the wrong way.

SUE: Yes.

KAREN: That's fine. So the youngsters and the old ones are the wrong way. There we are, see?

SUE: There you go.

KAREN: It's a lot easier to do when you're not in Excel, isn't it?

SUE: It is. Yes.

KAREN: OK.

SUE: I haven't quite worked out the mirror presentation yet.

KAREN: No. I know. Neither have I. Anyway, it's fine. Good. OK. So a nice way to be able to demonstrate things.

And again, bar graphs would be very common. Sometimes, there were gaps between them. Is that when it's not continuous data?

SUE: Yeah. You tend to use the gaps between them when you're actually representing different things.

So for example, if you've got children at home and you want to use a reward chart, then a really good way, normally, a lot of people draw a nice, little chart out and they get the little stars. And every time a child has done something good, they can stick a star on their chart. And then each child can compare how long their line of stars are.

You can do it with LEGO as well. Each set of LEGO represents one child. And then you can look at how good the child's been. And every time they've done something good, they can add

on another block of LEGO onto their table.

Then, you can get dear, old Johnny going, I've been better than you have.

KAREN: Yeah.

SUE: My tower's higher. And because they represent one child here and one child there, then you leave a gap down the middle, and this is what's called discrete data.

KAREN: OK.

SUE: So you can still use the bar chart to compare sizes of things. But because it's not straight across the board and there's not some continuous link between the two, because they're separated, then you just put a separation between the bars, and that indicates that.

KAREN: I mean, when you're talking about representing things visually, I think in particular for children, when they get a sense of scale and being able to transfer those for maybe a reward or something, it can be a very nice way to do things. That's brilliant. Top idea. Excellent. OK.

So we've got those, but we've also got other ways of looking at data. And we've only got about seven minutes left till we end, so we need to plough on through. And I really want to cover scatter plots, because these are another very interesting sort of way of interpreting data. And often, another way of describing populations and trends. So a very common thing that students might see.

SUE: Well, so far, we've looked at the pie charts that we use that we can split things up with. Then, we looked at bar charts we've used, where we can describe different amounts of things.

KAREN: Yeah.

SUE: Scatter plots look at something completely different.

KAREN: Right.

SUE: Imagine you've got some information on, maybe you're selling something on eBay, or something. And you'd want to look at how much you've sold each week.

And so on week 1, you may have sold 5 handbags. And in week 2, you may have sold 6 handbags. And in the week 3, you might have sold 4. And you want to look at how that is.

So week 1 is 5, week 2 is 6. This is what we call paired data. The only way they work is the two bits go together. It's like you know, one without the other doesn't mean anything. So you need to find a way of describing them so they can stay linked. And that's when we use something like a scatterplot. Because that way, we can produce a linked plot.

So over here, not a very nice thing to talk about, but very topical for this time of year.

KAREN: Yes, flu.

SUE: We look at the number of reported influenza cases. Along the bottom, we have the number of weeks. Along the side, we have the number of cases reported. So in week 2, we've had, what's that look like? I don't know, about 20 cases reported?

KAREN: Yeah.

SUE: And then it gets slightly higher for week 3. So we've obviously had a few more cases reported. Week 4, we go up a bit.

And if we look, these are all the numbers, the data. So these are the data that we've actually calculated. And we looked. And saying in week 2, we've had this number reported.

KAREN: So we're looking at a relationship, I guess, between the two. Something is happening as the weeks are going on.

SUE: Yeah. So what you find is as the weeks go on, the number of reported cases... What would you say?

KAREN: OK. So as the weeks go on, there are more influenza cases reported with the number of weeks. Yeah.

SUE: That sounds good.

KAREN: Yep.

SUE: Yep. So that's what we can say from looking at the dots. And that's really all we can say looking at them. But you might go, OK. So we now know how many cases were reported in week 6. But what happens if you want to know halfway through week 6 how many cases there were? Could we use this to report it? Could we use it to guess?

KAREN: I bet there's a statistical way of modelling some of this. Because I bet you can't just join the

lines up. Because if you did, you're sort of saying that there is definitely a relationship between the two and there may not be.

SUE: You can say that. There may not be a relationship. But the likelihood is looking at the pattern that is formed, you can definitely say there is some sort of link. So what we can do is we can draw a rough line through them and say, this won't be exact. And it's one of the few times you'll get a mathematician to say, it won't be exact. So this is only a rough idea as to how the number of influenza cases that are reported increases throughout the time period.

KAREN: OK.

SUE: So now we can say, well, on about the Wednesday of week 7, we've had about 150 cases reported. And because it's continually going up all the time, because obviously, the number of cases will always increase. Then, it's just an averaging out, really, throughout each week.

KAREN: And this is called the line of best fit, is it?

SUE: It's called the line of best fit, yes. Or, if you want to be really posh and cool, things like regression lines, things like that. But it's a line of best fit.

I mean, you can't really draw a line from dot to dot because that wouldn't be very realistic. However, because we can look at trends, which is quite a nice thing to look at, really. If you look at trends, you can say there is this upwardly progression on the trend.

KAREN: Now, we've got a widget here for people to fill in. So the question that Sue has for you is, could we protect the cases in week 30? So let us know what you think the answer is, either yes or no. And we'll come to the answer for that in a second.

Before we do, I just wondered if you could touch on a couple of things. Because often, you've got your x- and y-axes and there's a certain way that you can put dependent variables, or things that are changing and things that are not changing. Just for the record, what is the correct way of doing it? And which is which?

SUE: Right. You mentioned it briefly, actually. So we all know you've been studying math somewhere.

KAREN: Well, not really. But I've been told off about putting things on the wrong axes.

SUE: And what you tend to have is you tend to have what you call a dependent variable. And that's something you can't change. Is often time. And that always goes on the x-axis. So that's the thing that steadily progresses, no matter what. And the other thing is influenced by that.

KAREN: So that's the independent variable?

SUE: Yeah. So for example, my weight would be influenced by the number of cakes I eat.

KAREN: Yes.

SUE: So if that was the case, tracking the number of cakes I've eaten against my weight. Topic of January. The number of cakes I eat would go along the bottom. And my weight would go along the y-axis.

KAREN: Because the weight is varying.

SUE: Because that will increase.

KAREN: So that way, we're looking at the trend. Whereas, if we plotted these on the other axes, we might not get such a good shift over time.

SUE: You would see exactly the same shape because you're still plotting the same numbers. You're just plotting them the wrong way around. But you need to think about which goes on regardless and which is dependent on it.

So for example, if you're walking through the fields, say you want to work out how far you've walked in a set period of time. Well, the time carries on regardless. And how far you've walked depends on how long you've been walking. So you'd write the time along the bottom. And you'd write how far you've walked along the side.

KAREN: OK, good. So you mentioned then that this is modelling, or a way of regression, which is a statistical technique. And your question then is whether we could predict the cases like double down the line. And I'm just beginning to suspect that because you're looking at trends, trends are trying to predict futures, aren't they?

SUE: Yeah. That's what you're doing.

KAREN: But it's going up really massive, dramatically almost around that sort of point.

SUE: Yeah.

KAREN: So could we predict the cases in week 30? Let's see what people said. So that's the question.

87% Said yes, they do think we could. 13% said no.

SUE: Really? So like you said, if we thought about this graph here. Here, it's very easy to predict what happened in between the points where we have it marked. But do you remember going back to what we talked about? And you said very much about how you can't draw inferences that we don't know about?

KAREN: Yeah.

SUE: Well, this is week 12. This So week 12 was the last date we recurred. Well, maybe this is March. And you know, by week 30, we're into June/July. And so there won't be as many cases recorded. So you don't know what external factors can relate past the time. So you've got the date.

You're here. So what you can say is you can say with some certainty what occurs here. But after this point where we've stopped actually recording what happens, we don't know what's going to happen.

KAREN: We don't know if it will peak and drop down.

SUE: Yeah. So certainly, with many things. So somethings, you can go a little bit further. But week 30? Not a chance. You can't say with any certainty what would happen by then.

KAREN: So we could predict it theoretically? In terms of we could follow this line, but it wouldn't be accurate?

SUE: No. You simply really cannot predict at all, really. Because there are so many external influences.

We use a great one actually when we teach a lot. It talks about, I've produced a wonderful chart here that says your mathematical ability depends on the size of your shoes, shoe size. And they worked out that the bigger your shoe size was, the better you are at math. So those people with small feet can't be any good at math. Does that seem fair?

KAREN: No. Completely unfair.

SUE: However, what it was was they did this test on schoolchildren. And so basically, what happened was the smaller their feet were, the younger the child was. And that was the influence. That was the actual link between the two.

KAREN: A confounding variable.

SUE: It was simply that the children were younger. And so they couldn't do math as well. And it had nothing to do with the size of your feet whatsoever. So you're fine.

KAREN: Oh, good. Excellent. Well, I like my shoes, so I'm very pleased about that. Well, Sue, that's all we've got time for in today's session. We're going to have to end it there. And it means that we haven't been able to look at the coffee example that I know that we'd planned. But I hope that everyone at home is feeling a lot more confident with their maths.

Now, we've been working through these modules. So we've pretty much given people a synopses of modules 1 to 6. You've been looking through these doing it. What's your experience of going to some of this stuff which is on OpenLearn and this is the website there that people can go to.

SUE: It's really interesting stuff. All of the information that we've got is linked to real-life problems. So you can look at it and you can take parts of your own study.

So if you are doing psychology or sociology, then you can look at parts of these different sections. And you can actually take it into your own individual study. So it's really good to go through.

And if we're just giving you a little taste, a little interest, a little excitement. Then, go and have a look Maths Help pages. And you can really get some really good stuff that you can use in your further studies.

KAREN: And there's also, whoever had the calculator, there's also one on using a scientific calculator. So if that's you and you want to know what buttons you can press and how they all work, then that will be a good idea.

Sue, thank you so much for coming and talking to us about that all today. I would just like to end the show with a final few bits of information. Which is again, just go and check out that Maths Help. The resources are available on the website. So you can just click on the link on the Student Hub Live web page. That's studenthublive.kmi.open.ac.uk.

Click on those Maths Help. There's also a load of material on OpenLearn. And we've put lots and lots of resources on the Resources page of the website that you can have a look at. But I hope that we've shown you that maths is very accessible. There are different ways of doing it. And that spending a little bit of time can really enhance your understanding of things. And you can then use some of that data in your essays and making sense of some of those points that are in the module materials as well.

Evaghn and HJ, just before we end, would you like to say anything to our students before we have a break?

EVAGHN: Yes. Just come back and join us after lunch. Everyone's really happy, saying thank you very much. Elizabeth is starting a degree and she says she can't wait to do it now.

KAREN: Oh, she is now?

EVAGHN: No, that was Chantelle before. This is another lady. But she said, yep, she's starting a degree soon.

KAREN: And what about Chantelle?

EVAGHN: She's gone to do a shop.

KAREN: She's gone to the shop?

HJ: She said she's going to put everything she's learned into practise while she's at the shop. So that's good to hear.

KAREN: Good. She'll be buying bargain value things and looking at proportions and percentages. Good. Excellent.

HJ: And yeah, just quickly. Kate says she's a lot more confident, which is great to hear. And we posted the links in the chat as well for the Maths Help website [INAUDIBLE].

KAREN: Brilliant. Excellent. Well, thank you all so much. We've got a couple of widgets there, which are just sort of seeing how you found the experience. So if you just let us know what you've thought, that would be brilliant. Just for us to know. We won't show those on-screen, but do let us know what you thought of the session.

If you want to put any comments in the chat, that would be brilliant. If you've got anything, you

can email us. Do that, studenthub@open.ac.uk.

There's a Count me In button as well. So you can add your name to our mailing list, and then we'll let you know when we've got future events on. And as I said earlier, for those of you who were here, we have a big event for our Freshers Fair, which is on the 31st of January and the 1st of February. That's covering loads and loads of stuff, including lots more maths. So do join us for that.

But what we're going to do now is we're going to break the stream, which means the video will stop. And then you just refresh it to start. And we're going to go and have some lunch here in the studio and eat a lot of proportions of things. And then, we're going to come back in an hour where we're going to be doing a boot camp on dealing with feedback from your TMAs.

But while we're doing that, we're going to leave the chat open so you can talk to each other. And we're going to show you a couple of things. And those are a session by some of our lovely colleagues, Katie and Sally, from the Maths Department. And they looked at some maths puzzles, which was a lot of fun. And then we're going to look at something on being a reflective learner as well, which will lead into our session for this afternoon, which is between 1:00 and 3:00.

So I hope you can kick around, but do make some time to get some lunch. This is available on the catch up afterwards. So if there's something that you've missed, you can pop back and view it a little bit later. But I will see you back here at 1 o'clock with Evaghn and HJ and a whole selection of new guests to talk about making the most from your TMA feedback.

So thank you for watching. Thank you for engaging, and we will see you very soon.

[MUSIC PLAYING]