

[watch?v=hMnhZWfW2Ms&feature=youtu.be](https://www.youtube.com/watch?v=hMnhZWfW2Ms&feature=youtu.be)

KAREN: Hello, and welcome back to the Student Hub Live, where we've been having a fantastic event so far with lots of questions from people who are new to the Open University and also joined by some students who are very regular here, as well. Don't forget that if you are in the Watch Only section of the website, you can come into the Watch and Engage. Just get back to the website, studenthublive.kml.open.ac.uk. Watch and Engage.

And then you can see all of the chat that's going on and also engage with the interactive widgets, which are very important for this session because, I don't if you know, but it's been brainteaser month. So we've got some puzzles. And I'm joined by Katie and Sally from the math department, who have some really exciting toys in the studio. So we're going to be looking at some things. And also, an app that's been being developed as well.

Now you two are always advocating this idea that math is fun and I'm not convinced, although I do like the idea about what we've got planned for today. So Katie and Sally, you've organised some brainteasers for us to engage with. And you'll see those widgets coming up on your screen as well. There are a lot of questions, which you won't be able to obviously answer until we go through them. Things like what's the least amount of time they can all across the bridge and et cetera. So we will fill those and as we're working through the programme today.

So tell us about this perplex thing. This sounds very interesting. Yeah this comes from this idea that you say that me and Sally have been really banging on about, that math is actually fun. And there's no real way of just telling someone math is fun. You really have to let get them to do it. It's not a spectator sport. They have to have a go.

So the idea behind this app, and there will also be a website as well, is that the OU and the UK math trusts have come together to put together some interactive math puzzles for people to dive in and really have a go at math. It's puzzles where you don't need any background knowledge, just, do you like brainteasers, do you like a bit of a challenge, then have a go at this app.

And within the app, there are little teases, little challenges. But there's also, behind every single puzzle, there's a story of the math behind it. And it will tell you about where the math you've just been doing has been used in cutting edge industry or science and where it's used today. So you see a bit where the math come from and a bit where the math is applied. But most of all, you get the sense that this is something you can do and you might enjoy doing. So it's to get you in. It's a hook. We're trying to reel you in, Karen.

KAREN: It's quite addictive, actually. Because you can start doing things, like sectioning things in certain ways. And it does get a bit addictive. And you've got like bits that you can do each day, don't you?

KATIE: Yeah, that's right. So we'll have a look at the app in a second. In fact, perhaps you should go in. And there are six big puzzles that you can interact with. And then on top of that, there's a bank of daily challenges. So today, we're going to go through a couple of the big puzzles and leave the others for the viewers to do in their own time. And they're going to take

how one or two of the daily challenges that they would encounter later and have a play with those as well.

KAREN: And these can be really good, especially if you're not studying math. Just to sort of keep you wired up and thinking more laterally, can't they? So it would be a good thing for people who, well, any student really, to take advantage of instead of maybe playing Candy Crush.

SALLY: I think that's a really, really good point, Karen, actually. Because it's well known, there's lots of research in neuropsychology at the moment, that the key to good mental health is to try something new. So even if you think you're not a puzzle person, you're not a math person, and quite a lot of people think they aren't math people, although they absolutely can be, then trying it is really, really good for your mental, your brain health.

KAREN: It's an exercise for you brain.

SALLY: It absolutely is.

KAREN: And I think people would prefer this than going for a run.

SALLY: Definitely, you can do that as well as going for a run. You can think of the answers when you're running.

KAREN: But they are using things like this in terms of treatment for dementia, well, not treatment, but ways of keeping brains that may be having atrophy problems healthy. So it is good to get in there while you,

SALLY: Absolutely, are Karen.

KATIE: It's all in your brain and. It's all about realising that your brain, it can exercise, it can grow, you can have success, you can have achievement. And it's just a case of getting started and believing you can grow.

Now, you'll see that will show you a couple of the apps. So a couple of the interactivities here. And you'll see that you can't unlock some of the later interactivities until you solve the earlier ones. So we will use some of our props to talk you through some of the other ones.

So if I can just show you the first one. So we've got Robot Repair here. Sorry, it's because I don't like using Apple Macs.

KAREN: Don't say Apple. You mean the fruit, I take it.

KATIE: Right, OK. So I'm used to this. So this first puzzle, it doesn't look particularly mathematical. But what you have to do here is you have to join up the network so you've got one complete network. So in order to solve this, you've kind of got a mixture, it's got some links to Sudoku and it's got some logic behind it. So if you want the whole network to link up, this box in the bottom left corner certainly can't be sticking out towards the edge. It's got to turn inwards.

So you can do a little bit of lateral thinking. And sometimes trying things out with a bit of guesswork. But also, deduce, step by step, how you could join this up.

SALLY: it doesn't matter if you get it wrong. You can just keep going. You can keep playing it.

KATIE: You just have a go. And because this sits on same math as Sudoku, it sits on the math which we call Latin squares, which is where you're trying to have, let's say, a copy of every item in every row and every column. You know, like in Sudoku. You need a 1 in every column, every row, and every box.

And this is very important in statistical trials where you try and to have every kind of strength of medicine with every kind of patient in every kind of situation. So actually, it's a nice bit of fun. But it does go back to something a bit more serious. Something that you can use in the real world. So as well as having the mathematics for you to have a go up there, it will explain a bit of that to you as well.

Beyond that, it's just telling me because I didn't try and go win some stars there. Then we have one, this is very visual. This will appeal to people who think visually. In this kind of puzzle, what we're trying to do is colour the whole space but so that no two adjoining areas are coloured by the same colour. And this rests on a piece of math called the Four Colour Math Theorem. And it is actually the first theorem ever proved by a computer rather than a person. So it's quite historically significant.

But whatever map you've got, you only need four colours to colour it properly without two things adjoining, coming the same way. Now, this is actually quite easy because you've got to be able to do on a tiny phone. So I think if I gave you just about a minute or two, you'd be able to fill this in so you hadn't accidentally put two things together.

KAREN: So a multicoloured multi-petaled flower.

KATIE: Yeah. And it's just a case of you can play around with it. It's not hard, but what's underlying it is some really useful mathematics in networks and this sort of thing.

KAREN: Sophie, you're a math student. Is any of this relevant to your module materials?

SOPHIE: It Is. It's quite nice to finally be here for a math session. I missed the last one. So yeah, there are things that I've seen and I'm like, oh, I just do that in my spare time. Got app games. So it is. It is really good. I'm currently doing a math and its learning course. And we were talking in the green room because my actual next two modules go back to education, which are essay-based. So it's whether I want to carry on doing math and actual math sort of assignments or if I want to go back to essays. So it's tricky. But it's really good. I'm really enjoying the website. I will definitely be checking that out later.

KAREN: I wonder why you went to get some free career advice in the green room, Sophie. Very clever, very resourceful.

KATIE: So can we hop onto one of the widgets and see how people got on with our Narrow Bridge.

KAREN: OK, The Narrow Bridge. So this is the widget with, what is the least time they can all cross the bridge in. OK. So they won't know the answer to this yet.

KATIE: No, but I hope they've had to think about it. I mean, would they like to? Have people being filling it in? Would we like see how people have gone so far?

KAREN: Well, I think we need to read the question with it. Because they can only see the answer. So it might be multi-choice at the moment.

KATIE: Right. OK.

KAREN: So can we remember the question then in terms of the bridge one?

KATIE: Yeah. Would you want to go ahead and read that and I'll get my guys ready.

KAREN: So this is four people come to a river at night. I'll read it like a story, OK? Four people come to a river in the night. There was a narrow bridge, but it can only hold two people at a time. They have one torch and because it's night, the torch has to be used when crossing the bridge. Person A can cross the bridge in one minute. B in two minutes. C in five minutes. And D in eight minutes. When two people cross the bridge together, they must move at the slower person's pace. So the question is, what is the least amount of time they can cross the bridge in? And the choices are 20 minutes, 19 minutes, 15 minutes, and 35 minutes.

So I'll just give you those again. Person A is one minute. B, two minutes. C, five minutes. And D, eight minutes.

KATIE: OK, so this is from a branch of math which is basically operational research. And it's all about doing things in the most efficient way, the most logistical way, and obviously, a lot of what we do depends on it. So it's a nice puzzle, but it leads into fairly big topics.

Now the key thing here, I don't really like diving in and giving people the answers, but we've got a short space of time so we'll just go ahead.

KAREN: Well, they voted. So do you want find out [INTERPOSING VOICES] What did you say? Let's see what everyone said.

19 minutes is 100% of the vote.

KATIE: OK. Right now, I'm going to have to help them out a bit here.

KAREN: If you haven't voted, you can still do so.

KATIE: Do have a vote, because I'm going to give you a bit more to say there.

Right. OK, so we have got some Teletubbies to help us out today. Po can do it in one minute and Laa Laa can do it in two minutes. Now in a way, they are our runners because they can do the whole thing as quickly as possible. But when they cross together, they have to cross at the slowest person's speed. OK, so that's going to be Laa Laa's speed.

They're carrying a torch so somebody has to come back to bring the torch back. This little elf is going to be my torch today. Right. So they're going to be our runners. And there's a couple of light tricks, in a way. Now, math doesn't depend on tricks, but I'm just going to give you these as heads up for the future. It's as well to leave a runner on both sides of the bridge, because then they can always fetch the torch back for you.

So I'm going to take both of these guys across. But I need to leave a runner over there. Actually, it doesn't really matter which one I leave. OK, so let's just leave Laa Laa. And Po can run and bring back the torch. OK, so she's my runner.

KAREN: I don't which one Laa Laa is, either.

KATIE: OK, there's some basic knowledge you need to have, guys.

SALLY: Every mathematician knows that.

KAREN: The voting is changing by the second.

SALLY: Oh, fantastic

KATIE: OK guys, so we've got a runner. And Laa Laa is over there waiting. OK, now we've got two slow guys. We've got Tinky-Winky, for your information, who is purple, is eight minutes. More relevant they're eight minutes than they are purple. And Dipsy, who's five minutes. Now, that is slow guys. And ideally, we'd like to couple them together so they're not slowing down our fast guys. And that's really the key to the puzzle.

SALLY: That's the big clue.

KATIE: The big clue. And it might be what you think about when you do an operational research, can I get all my slow stuff at the same time.

SALLY: But if you didn't have the clue, you could come to it by trying lots of different things yourself.

KATIE: Experimentation is definitely a good way in. Use some cases, make a start. So here we go. These two guys have gone over. So let's just recap how much time we've taken. It took two minutes for Laa Laa and Po to get across. A minute for Po to come back. So that was three minutes. Then we had our two slow guys, who went as slow as Tinky-Winky, so that was eight minutes. So we had three on top of eight.

KAREN: 11.

KATIE: OK, we're on 11. And now we come back with Po, which is one to make 12 minutes. Now hang on, I think we might have had a little,

KAREN: Where's the torch?

KATIE: Here's the torch. And has brought the torch back. Oh right, we have missed a step. Because they have the torch. You were right.

SALLY: To send the runner back.

KATIE: I didn't let you have the switch. Sorry.

KAREN: It's an easy mistake to make when it's a troll.

KATIE: So very quickly so that I haven't confused anybody. Step one, Laa Laa and Po. Po brings it back. Three minutes. Step two. Step three, Tinky-Winky and Dipsy. Eight minutes. We're on 11 minutes. Someone has to bring the torch back, which I cheated on.

KAREN: Right. That's the missing bit.

KATIE: Right, so now we're on 13 minutes. And now these guys ought to come back. 15 minutes. And the main way into the puzzle is try and put the slower guys together and try to have a runner on either side of the bridge.

KAREN: So part of it is strategy and really thinking about the best solution. And also like you say, experimenting and thinking about ways around it.

KATIE: Yes. So what you'll be able to do with the app when you get to the unlocking stage of this one is you can fiddle around with the characters, keep trying to learn all different combinations so you can get to that realisation, basically.

KAREN: Excellent.

KATIE: You have to fool around with it.

KAREN: I like that one. That was good. Sophie, what did you think?

SOPHIE: Yes. Obviously, I very much enjoyed it. Obviously. I'm not going to lie, I didn't actually try and get the right answer, though. I should really try for the next one. I'm going to actually have a go.

KAREN: Right. Well, let's have a go at the next one then because we're running short on time.

KATIE: You might want to use some other things as well.

OK, so I think you will have to use [INAUDIBLE] as your prop because we have not unlocked this particular puzzle.

SALLY: OK.

So, the next question is different people saying different things. And we've got Tweedledum and Tweedledee first of all. And you eat more than I do, says Tweedledee to Tweedledum.

KATIE: That's not true, says Tweedledum to Tweedledee.

SALLY: You are both wrong, said Alice to them both.

KATIE: You are right, said the White Rabbit to Alice.

SALLY: And how many of the four statements were true? And that's almost certain to set a bit of a tangle, where you're trying to think about them all at once. Just take a deep breath, remind yourself you can do it, and think what's happening.

You eat more than I do. That is not true. Well first of all, one of them has to be right. So either Tweedledee is right or Tweedledum is right. So that's one thing. And then Alice says, you are both wrong. But they can't both be wrong, because one of them has to be right. So Alice is wrong. And then the White Rabbit over there says, you are right, Alice. But we already have come to the idea that Alice is wrong.

So Alice and the White Rabbit are wrong. So either Tweedledee or Tweedledum is correct. But actually, we don't know which one is correct. We don't know which one ate the pies. So in fact, only one statement is true.

KATIE: So how did we get along with that one?

KAREN: Well, let's see, did people have time to feel that in terms of the statements being true. Let's see if people were filling that in. So that is the widget about the statement being true. Let's see what that people said. So 83% of people said that one statement was true. So that is brilliant. So clearly, we're learning a lot here.

KATIE: I think what upsets people often is that what if they eat the same. Well, if they eat the same, then it's not true that I eat more than you. They are opposite things.

KAREN: Right, right, right, right. Yes.

KATIE: OK, now so we read these out so people can answer, do we? So I will read this next one then.

KAREN: So this is about the statements that she can never say. So we need you to select from the widget there, which of those you think is right from the multi-choice questions. So which of these statements can she never say.

KATIE: OK, so by the time I've read it, you'll have been able to answer the question as well. So the Queen of Spades either always lies for the whole day or she tells the truth for the whole day. And the question is, which of the following statements can she never say. So here we go.

Yesterday, I told the truth. Yesterday, I lied. Today, I tell the truth. Today I lie. Tomorrow, I shall tell the truth. So she's either always telling the truth or she's always lying. So what did the people at home think. What was their answer.

KAREN: Let's have a look and see. Evaghn and Sophie, can you see on the widget there what people are saying?

SOPHIE: A, yesterday I told the truth. B, yesterday I lied.

EVAGHN: So we've got 67% of people, now 50% saying, today I tell the truth. And 25% saying, today, I lie.

KATIE: OK, so if she's on a truthful day, it is true that she says, today, I tell the truth.

KAREN: So she can say that.

KATIE: So she can say that.

But if she's on a truthful day and she says today I lie, that's not true, is it. And if she's on a lying day, she says, today, I lie. That's the truth. She can't tell the truth on her lying day. So this is the one where she can't do it. Today, I lie. It's like a statement saying, this is false, it can never be true.

KAREN: She sounds absolutely unreasonable. I'm glad she's not my tutor.

KATIE: So I don't know how we're doing for time, but like the last two puzzles have really rested on logic, which is the foundation of math. And what you can see within the app when you look under the Logic Games is it explains how logic was the foundation for the invention of computers. So Alan Turing who invented the first theoretical computer but also was part of the invention of the first programmable computer here in Milton Keynes at Bletchley Park. So the first real computer was actually invented just a very short distance from where we sit today. And it was all because of his research into logic. Because basically, they are just logic machines. They run these things through.

So it's quite enjoyable math to do. But it has very relevant applications to computer science and just the general development of computers and a lot of the things that we would do anyway.

KAREN: I think we'll leave those other two questions because I'd like to find out, as I'm sure people do, you mentioned you unlock these as you're going through. As you do more puzzles, you get access to more. And the one thing you mentioned was that people will learn little things as they're going through. So it's not just doing puzzles, but some of it is the application and that bit of background.

KATIE: Yes. If we look at this one, which is quite enjoyable, where you are trying to put the bubbles together to reach the target of 100. You can join 5 at 2 or something. And you've got to burst them all together to eventually get 100 and use all the bubbles. But if you wanted to find out a little bit more about what's behind it, then you can go to the question. And this is where all the information about where you would use this and where the history of this lies is written.

So this depends on Number Theory and the movement of numbers. And Number Theory is within all encryption and lots of other exciting applications. But it just starts with a fun game.

KAREN: And it's so important. Often with my daughter, she's like, why do I have to do this, this, and this. You talk with people about why should I do statistics or calculus and various things without knowing how applicable they are to so many areas of employment. It's easy to sort of see them as just sort of abstract weird things that mathematicians do. But like you say, there's so much application here and it's so important.

We did this math skill builder recently and we're going to be starting some of the replays of that. And actually, one of your colleagues is coming on because she was so brilliant at math that I said to her, look, let's do something for students and talk about shopping on a budget and how we can get the most for our money using math. So she's going to come along and do that with us tomorrow so we can make sure that we're not being had at the supermarket.

KATIE: I do want to say a word in defence of weird math that mathematicians do as well, because that's all so enjoyable and valuable. We don't know if it's going to be the next big breakthrough, but sometimes you fund blue sky research where you don't know where it's going to go, but it turns out to be the invention of the computer or you might stumble across graphene. So you just never know what you're going to find. So people should just explore and dive in.

KAREN: Brilliant. And this is certainly a fun way of doing it and something that people can download. So we've got the link to that on the website and you can make the most of us and get through and unlock some of those boxes as well.

Sally, Katie, thank you so much for coming along and showing us how fun math can be and encouraging us to expand our minds and logical thinking.

KATIE: Thank you very much. Thank you.

KAREN: All right, well, we're going to have another short break now, and then we will be back very soon to hear about some of the things that are going on at the Open University in Wales. But do keep chatting going along in the chat. I know this has been a bit of a puzzle sort of moment, but people have been talking about their tutors and getting access to student home and things and thinking about the right support for them. Anything goes in the chat. So even if we are discussing very complex math problems, please do keep chatting about the things that matter to you when you've popped in here. And Sophie and Evaghn and HJ will do our best to answer those and we can always bring those to our panel when relevant.

And don't forget that we do have lots of sessions on the virtual learning environment on your module home pages and a lot of sessions with tutors talking about how to get the most support for your studies. So we're going to have a little break, grab a cup of tea, we'll see you in five minutes to talk with colleagues about the Open University of Wales. See you then.