Welcome to this short set of videos that we'll go through and discuss how to develop a modelling or problem-solving task for Further Mathematics, the Unit 4 module of matrices.

The idea is to present to you a scenario and then how to develop that scenario into some questions and then an assessment level at the end. So it's a good way of trying to get a thinking style going for these sorts of problem-solving or modelling tasks.

The first few videos, the first few slides that you're going to be looking at go through an introductory level of what problem solving is all about. And certainly in this time, reading through them can give you a sense of where problem solving comes from, the idea of modelling, how to set up these sorts of scenarios and develop questions as we go along.

Matrices module itself has two particular areas that you might like to consider developing a question. One of them has to do with the matrices and the applications, the idea of communication or dominance matrices, maybe just the arithmetic to do with the matrices itself. And then of course, the transition ideas trying to develop one or the other may be a good idea for this particular task rather than trying to introduce both, but certainly there's many different ways of trying to get this information into a question, and a few examples I've just given on this slide as to scenarios that you might like to consider as part of your problem solving or real life context in relation to the matrices.

The modelling process itself along with problem solving is really about trying to find an idea in real-world and then developing into some mathematical components where problems can be discovered, then you might actually go and analyse those problems, investigate them, come up with some conclusions, provide conjectures, et cetera. So really, it's a way of trying to get that thinking into a series of problems. So students can show the development of learning of a particular topic area and then introduce it into these sorts of problems as they go.

Certainly many of the problems and the framework comes from the International Mathematical Modelling Challenge. And there is a website that you can go and visit that's part of this particular PowerPoint. And there's a whole series of thoughts that were introduced into providing one of these contexts. You can see how the development occurs across the problem. Real-world problems found and you apply and formulate some mathematics. You look for some solutions, you might interpret those solutions. Then you might re-evaluate what you've actually found to then try and produce maybe a refined model, something a little bit different to what you had initially come up with to try and investigate that sort of material.

As a diagram it's somewhat of a flow chart, but it's cyclic. The idea of coming up with your problem, as I said, developing the mathematics, applying the mathematics, coming up with some results or solutions, refining it, maybe going back and changing the whole scenario. This task where that cyclic nature occurs of course is restricted to a point in time. This particular task for Further Mathematics we really need it to run from two to three hours. And therefore it's quite short in terms of its application and investigation and that must be part of your consideration when you actually set this particular question up.

In terms of how the structure is going to look, the idea is we will introduce the context, get an idea of what sort of a problem might've come up, look at some smaller or simpler examples then try and develop these examples. Maybe give it a little bit more complexity, get into a little bit more analysis, maybe some investigation and then going and evaluating all of that or possibly refining the problem. Maybe extending it a little bit more. So the three ideas really work through the work particularly in this case of matrices and try to develop those three levels of learning in the task itself.

In this task, we will therefore concentrate on the four areas: the idea of the context, what the questions might be based on that context, setting up the problem, what it might look like, putting it into parts and then devising the assessment scheme at the end. This particular task we are going to look at will be of three parts and we will work our way through each one of those parts.

In terms of this first section then, which is looking at the context and identifying questions of interest, they're the dot points that we will work our way through in terms of developing this particular example of matrices problem-solving or modelling task and then discussing how it was chosen, why it was chosen, some questions, et cetera, as we work our way through.

The context itself was looking at the viability of resources in a gymnasium or a fitness centre. The idea of looking at the different options that are available. When you go into a gymnasium or a fitness centre you will often look around and see that some of the equipment is being used extremely well, it's very popular, whereas other pieces of equipment aren't being used much at all.

So this question was posed in the thought of wondering whether there was a way of getting members to transition between particular activities or options so that possibly there was a viability of these particular areas in the fitness centre making it more popular, making each item useful, being used therefore not being sitting there idle. So that was where the context actually came from. And of course I was just visiting my local fitness centre and looking at these particular programs and pieces of equipment that just seemed to be sitting there.

So it then posed the question of, in this scenario, the transition idea. So some of the questions that were then developed from that was to think about transitioning proportion or set of proportions that might be available with the members so they move from one particular item or piece of equipment or program to another. And whether a set of proportions for transitioning made all of those items viable. Was there a set of transitions that didn't particularly help any of those items being used or programs being utilised?

The allocation of members, was there a particular set of allocations that actually worked? So then in the long-term, these programs, classes, equipment, et cetera, were all viable over time. And then the last part of it was whether an increase in membership could actually then sustain all of these aspects that are linked to the fitness centre as well. Of course, you'll be aware that fitness centres sometimes run a difficult road of getting members in, keeping them interested, making sure the memberships are up, that the equipment's looked after and that that fitness centre then becomes profitable for them.

So that was the context and the questions that were then posed throughout. So based on all that information, this was the beginning of the task. The notion of the fitness centre, thinking about a review of the items, programs, equipment in that fitness centre, how that would then look under a transition model looking at the transitioning levels that are available and can be worked with to move members from one particular option to another and setting up that scenario to be able to then go and investigate in some way. So the idea of the tasks themselves, I suppose was really that basis for the question itself.

So with all of that information then in our thinking we can now move on to actually starting to look at Part One of this task and what it might look like. So that will be information that we will then look at in our next video. So I will see you back shortly. Thank you.

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