In this video, I will discuss how I have developed component 3 of the application task. So this is the third component.

The SAC report states that it must contain variation or further specification of assumption or conditions involved in the context to focus on a particular feature or aspect related to the context. It also must provide the opportunity for a particular feature or aspect of the context or related context to be explored in some depth. This may occur through including additional constraints, or conditions, varying constraints or conditions, or the types of functions and relations, and/or combinations involved.

Well, I thought I will go to varying constraints or conditions. So in this one, you can see students are now required to carry out similar investigation with a function of the form, k over x squared plus a squared, everything to the power of n. Students may start off with a simple case of n = 1 and k = 1 and then move on to varying the values of n and k, one at a time, of course, and explore how changing the values of n and k affect the reduction formula.

Now, in this component, it is open. Students have to think about what they have learned, what they have done in components 1 and 2, and bring that into component 3. Now, of course, we don't have to stay with the reduction formula. We could actually do something a little bit different.

Okay, so in this one here, I actually went into the similar approach. And it's about repeated differentiation of functions. This process is, of course, known as successive differentiation. So for example, I have given students a number of rules. And this one here, you could actually tidy up and just give one rule for students to explore. I mean, that's quite a few options there. It takes a while to actually work it out by the way. And that students need to choose suitable values of a and b. I mean, a and b can stay a and b if that was a case. However, if you want it to be different, get students also to choose their own values of a and b.

They have to then explore the nth derivative of the above functions. Now, they don't have to do every single one of them. They can choose any one of them to do. And then, the next one is then finding the derivative of the product of any of the two above functions. It is quite a bit of work in here.

Now, for this particular part, hopefully, a little bit fun to introduce about the notations. So in your task, you might want to give students a table of the notation. An original function, for example, is y = f. And in kinematics, we call it position or displacement. The first derivative is dy/dx, or df/dx, or f', and that is denoted as velocity. And then, the second derivative is d squared y dx squared, or f'', and that is acceleration.

Now, students may not know this, but when we get to the third derivative, which is d to the power of 3 y dx cubed, or f''', that's actually called a jerk. And then, the fourth derivative is called a snap. And then, the fifth is crackle. And the sixth derivative is called pop. And then, we get to the nth derivative of course. And so to get students, when it's getting to the fourth derivative, usually they write it as f to the power, four inside the bracket, x. So instead of writing with all the dashes... So we don't use that anymore when we get to four, five, six, et cetera.

In this part here, it'll probably be helpful to remind the students about the combinations rule as well. Give them an example or tell them something, so then they can be prepared for that as well. Because the successive differentiation, to tidy up the final functions, having that knowledge, it would be quite nice.

Now this can be open. I could actually change and make it into, scaffold that a little bit. Something like get students to find the first three derivatives of x to the power of n to start off first. That's a little bit easier to do. And then, get them to show that the nth derivative of x to the power of n is, in this case, found to be m factorial over the difference of m and n factorial times x to the power of m minus n.

So similar to components 1 and 2, in this slide, it gives an example of how I mapped the content by topic with dots point from the study design. So from the "Graphs of Rational Functions", I included the features of graphs. In the topic, "Anti-differentiation and Integration", I include apply suitable constraints and conditions, as applicable, to carry out required computations, et cetera.

So this is the end of my discussion of developing component 3. In my next video, I will discuss how to develop task-related rubrics for the assessment criteria using the published VCAA criteria.

[Copyright Victorian Curriculum and Assessment Authority 2021](https://www.vcaa.vic.edu.au/Footer/Pages/Copyright.aspx)