This is the third video of the four-video series that I'm presenting of how to write a SAC in Specialist Maths. Looking at Unit 4, a modelling or problem-solving task. This video focuses on the probability and statistics task. I'm still following the same guided dot points. Identify information and source, or sources. State questions of interest and related analysis. Identify relevant content. Students have already identified the context through routine questions in Part 1 in different scenarios.

So what's next? The open-ended questions or investigation will now come in Part 2 and Part 3. Through Part 1, we hope that students have gained an understanding of the key knowledge and skills of the probability and statistics area of study. In this Part 2, we want to provide an opportunity for students to choose their own values, or variables. However, the values that they have chosen must comply with a number of constraints and conditions given in the question. The task incorporates some flexible elements that actively encourage individual initiative, including exploring possibilities, making inferences, drawing conclusions, explaining results, and communicating mathematically.

The problem starts off with the pumpkins and watermelons which are also grown at the farm. Consider the weights of 10 pumpkins and 10 watermelons on the farm such that the mean weight of the pumpkins is in the range of 4.5 to 6.4 6.5 kilograms, with a standard deviation in the range of 180 to 250 grams. The mean weight of the watermelons is in the range of 8 to 11 kilograms, with a standard deviation in the range of 220 to 265 grams.

Part a, choose the weights of 10 pumpkins and 10 watermelons so that they meet these respective conditions and show that this is the case. So you can see in this question, students are required to transfer their knowledge and skills that they have developed from Part 1 into this question. Students might need to think whether the weight of each pumpkin or watermelon is different, or can they be the same? Students might need to ask themselves is it possible to have 10 pumpkins or 10 watermelons that have exact same weight when you've randomly chosen them from the farm. Students don't just choose the weights of 10 pumpkins and 10 watermelons, but they must show the maths. And to an exemplary student would even briefly discuss the context behind these values.

Part b, use these mean weights and the standard deviations to explore the possible values of b and k, where b, k are elements of N. For which the probability that b times the weight of one randomly chosen pumpkin is less than the weight of k randomly chosen watermelon is between 0.35 to 0.45.

Part c, determine the possible number of pumpkins in a random sample, for which the probability that this random sample number has a mean of at least 5.8 kilograms is greater than 0.75. So you see, these questions provide excellent opportunities for students to use technology, not just effectively but also efficiently and cover several key knowledge and key skills for Outcomes 2 and 3.

Part 3 question is focusing on the hypothesis testing. So here's a question. A fruit and vegetable store manager goes to this farm and inspects the produce. They will buy the produce if the mean weight of the pumpkins and the watermelons exceed 5.5 kilograms and 10 kilograms respectively. A random sample of 25 pumpkins and 25 watermelons were taken. And the mean weight of these pumpkins and these watermelons are 5.65 kilograms and 9.85 kilograms respectively. The population standard deviation of the pumpkins and the watermelons are known to be 34.9 grams and 55.8 grams respectively.

So here's a question, perform a one-sided statistical test at the 1% and 5% level of significance and produce a brief report to assist the fruit and vegetable store manager in making their decision. So this question is getting student to think, okay now I need to present something here to guide the manager to make their decision. A possible challenge is that a percentage level of significance is not given in the question. So this has become quite broad. Students are required to choose their own levels of significance and produce a brief report. This challenge would certainly provide students with opportunity to demonstrate the full range of key knowledge, key skills for the outcomes and the highest level of performance to be achieved.

So you can see that the inclusion of additional open-ended questions in the task would provide the students with opportunities to engage in the problem-solving elements of creating, conjecturing, exploring, testing, verifying and meeting the constraints and conditions provided in the questions.

Now to finish up Parts 2 and 3, again we look at indicative content. So the topic I'm covering in this task, as you already know that it is the probability and statistics with the specific dot points from the study design mainly from the linear combinations of random variables. As you can see on the slide there are three dot points there. And in Parts 2 and 3, I only included also the other part was hypothesis testing for a population mean with sample drawn from a normal distribution of known variance for a large sample. And there are three dot points included.

That concludes video 3. In video 4, 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)