This is the fourth video in the problem-solving and modelling task that is being provided by VCAA on the topic of probability and statistics and this is Task Part 3. So this task that we've written for you has three parts. So this is the third part. In each time or each part we are identifying information on sources, we state questions of interest and related analysis. We identify the relevant content and then I'm going to show you the written version of Part 3.

If you remember Part 1 was about the normal distribution curve and one, two and three standard deviations either side of the mean. Part 2 looked at the normal distribution as an approximation to the binomial distribution and identifying confidence intervals.

So we're now moving into Part 3. So the questions of interest are, and the contents are, we're going to look at discrete data this time. Consider the discrete probability distribution for a group of female students having a measured height of at least 130 centimetres where the random variable H represents the number of students in the group with this measured height. A group of 30 female students is randomly selected from a secondary school population and the probability of any student in this group having a measured height of at least 130 centimetres is approximately 0.25, independent of the measured height of any other student in the group. And the clue word there for your student is independent. And the fact that we are doing measurements at certain times. So this looks like a discrete distribution.

So I first of all started by saying identify the probability distribution. And we're going to use the binomial distribution for this. Find the mean and standard deviation of H and evaluate probability capital H equals little h and probability capital H is less than little h or several different values of h. So the students can use their calculators for this, identifying that this is a binomial distribution and writing it as Bi. And then we will ask the students to graph the probability function for the distribution of H and comment on its key features again using their calculator.

Part c, I suggested we repeat a and b with several different values of the probability. So the probability we gave you is 0.25. It would be interesting to have a probability of a significantly smaller or significantly higher and draw corresponding graphs and comment on the difference between those graphs and repeat a and b this time with several different values of n. So make the size of the group significantly smaller or significantly larger, and see what your probability distribution graph looks like.

Now we could finish there, and that could be enough for a two or three hour task that I've written an alternative ending for questions that are often found very difficult for the binomial distribution. So this can be used or varied as you like or not used.

One of this group of 30 students has her height measured several times with a probability of measuring a height at any time of at least 130 centimetres of approximately 0.25, independent of any other measurement. So we're using the same 130 centimetres before, and the probability of 0.25, but we're looking at one of these groups of students having her height measured several times. So we're twisting the story slightly.

Now teachers will be aware of the confusion that students have with these sorts of questions. If the student's height is measured five times, determine the probability that is less than 130 centimetres. And notice that I've changed that to less than just to change it a bit, because our definition was greater than at the beginning on the first k consecutive measurements in a row. So this isn't necessarily a binomial question. It can be done what I call like a year 11 probability.

Then part b changes it to binomial. Determine the probability that the student's height is measured less than 130 either for exactly or at least k measurements. So you can choose exactly three measurements and of course that can happen the first, the second and the fifth or it can happen second, third, and fourth. So they're going to have to use the binomial distribution for that or at least k measurement. So you can ask the probability for having less than the 130 centimetres or at least three times that this student is measured.

And then to finish, formulate and solve a conditional probability problem related to this context. If this is something that you would like your students to look at, they can actually formulate and make up their own conditional probability problem. And it's wonderful for students to make up their own problems because they have to dig quite deep into what a conditional probability problem looks like, and then how to solve it.

And Part 3, the content we used was discrete variables, binomial distribution, and the probability graph of that, and the main and the variance and the standard deviation for the binomial distribution. And then probability for Bi. And that's useful for those questions where the students are varying n and varying p and then the alternative ending looked at repeated events, events in a row and conditional probability. So that's the end of the three-part task, that the sample tasks that we've written for you.

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