**Mathematics-Advanced
Discrete probability distributions-transcript**

(Duration 3:47)

This is the HSC hub Mathematics curriculum support from the New South Wales Department of Education. My name is Meagan Rodda. This question is from the NESA sample exam and incorporates material from the statistical analysis strand in the Mathematics Advanced course. This question looks at discrete probability distributions.

We acknowledge that there may be different approaches, methods or techniques to answering this question, and we encourage you to discuss and share these with each other. Please take a moment to pause the video and read the question before we continue.

This question is actually asking us to find three things. The value of M, the expected value of X, and the variance of X. Thus the question being worth 3 marks. The first part of the question is asking us to find the value of m. For a discrete probability distribution we know that the probabilities must add up to one. So M will be equal to 0.1. The second part of the question is asking us to find the expected value of X. The expected value of a discrete probability distribution measures the centre of the distribution.

It is the same as finding the mean. To find the expected value, we multiply each value of X by its probability, and then we add all of these values together. So we are going to multiply each value of X by its probability and then add up all of these values. So this gives us 11 multiplied by 0.2 plus 12 multiplied by 0.3 plus 13 multiplied by 0.1 plus 14 multiplied by 0.4, giving us an expected value or mean of 12.7. Checking the reasonableness of our answer 12 and 14 have the highest probabilities, so it makes sense that our expected value lies between these two values.

The last part of the question asks us to find the variance of X. Variance and standard deviation measure the spread of the data by finding how far each value is from the mean. The variance gives the average of the squared differences. We start by finding E of X squared. This is similar to how we have found the expected value of X, except that we square each X value before multiplying it by its probability. Mu is our mean that we calculated previously. We will start off by finding E of X squared. To do this, we will square each X value and multiply it by its probability. So we will get 11 squared times 0.2 plus 12 squared times 0.3 plus 13 squared times 0.1 plus14 squared times 0.4, etc. Giving us an answer of 162.7. We now have everything we need to find the variance of X. Our E of X squared value is 162.7 and we subtracted 12.7 squared which is our mu squared leaving us with the variance of 1.41. Going back and checking the original question, we have found the value of m, the expected value of X and the variance of X. So we have finished answering the question.

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