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So in this module, I have so far introduced into the idea of random variables. And we're focused mostly on what's called discrete random variables. And I've talked about the probabilities using two concepts, the probability mass function, or the PMF, or the cumulative distribution function of the CDF. So now I'll be talking about one of the most important things one talks about when one is talking about the distribution of random variable called expected. So let me begin with an example. So this is the example from the restaurant with five tables that we had before, and said, $\tilde{x}$ was the profit of this restaurant. And the profit was this six levels, either it could be a loss of minus 100, or minus 50, or zero, or it could be making profits of 50, 100, 150. With these probabilities. Now, the owner of this restaurant may be wondering about, if you were to run this restaurant, what is the expected amount of profit that you could expect me. And this is an important decision that businesses have to consider all the time in terms of whether to keep the business open or shut it down, expanded, hire more people, open a second location, so on. So how would one think about calculating what the expected profits from this business so here, there are six possibilities, it's a minus 100, minus 50, zero 50 150. And with the associated probabilities of 0.05, with these two - 0.2 point..over 50.4, with zero 0.2, minus 50 0.1. So now, if you think about it, right, so he's going to get a profit of minus 100, with probability point one, so that means 10% of the time is going to get a profit of minus 100. So that's that, right? 20% of the time, it's going to get a profit of minus 50. That's this 140 or 40% of the time is going to make zero 20% of the time point two is going to make 50. And point two, five, that's 5% of the time is going to be making 100. And another 5% of the time is going to be equal. So if we add all of these up, then these add up all the different possibilities, and the fraction of time that he's likely to make those particular profits. So here's me, the likelihood of making profit of 150 is 5%. Likelihood of making profit 100 is 5%, and so on. Now, if we add all of these up, that was going to be the total expected profits for this restaurant. So in this case, this will be minus 10, this will be minus 10, this will be zero, this will be 10, this will be five, and this will be set. And if I add these up, right, so this is this 10 cancels with this 10 minus 10, and five, that's minus five, and then you add to that 7.5, so total is two. Right? So this is the expected profits that this restaurant owner expects. In general, this is going to be the idea of finding the expected value of a random variable. So more generally, when we are talking about the expected value of a random variable X tilde so it's going to be x times the probability of X and we're going to add

this up over all possible values x . This is called the expected value of X and this is denoted by E of X . This is also called the mean of the random variable. And it's often denoted by this Greek letter. This is μ . So it's denoted by μ . So that's the expected value, extent. But the basic idea is simple. You look at all the possible values of the random variable, multiply them by the corresponding probabilities. And so that's the expected value. So one thing, let me point out, right, so people sometimes say the average right now, this is not the same as the average. So for example, if you're just looking at the average of n numbers, you do this renewed add up all the x 's, and divided one by n . Or another way, you can write it as one by n times x . So but this and this are not the same. The only same if each p of x is equal to one by n , only in that case, where if all the probabilities were all the same, and is equal to one over the number of points, that only in that case, these two things would be the same. Rather, how you should think about this is a better way to think about it is that what you're figuring out is the weighted average, right? So on this, you're putting a weight of point one on this, you're going to put away 2.2, this way, 2.4, and so on. And if you want to relate it to yourself, right, so think of a course in which it has several assignments, right. And this is not all the assignments of the same way. This is the week connected with this assignment. This is the weight connected with this assignment, this is the weight connected with this assignment, so on. So what's your overall mark for the course, it's going to be how much you get in each assignment, multiplied by the weight on it, and you add up, it's a dad gives you the expected value of w . Let's do one more example. So this is of trees in the forest, let's say the diameter of tree trunks in a forest, there are four possibilities either it's one meter, two meter, three meter, four meter. And the probability of it being of one meter is point three, that of two is point four, three is point two, four is point one. So and what we're interested in is what's the meantime two trucks. So the way we'll do is again, like before, one multiplied by the corresponding probability, add to that the next one, which is two multiplied by its corresponding probability, then three multiplied by its corresponding probability. And lastly, four multiplied by its corresponding. So that's point three, plus point eight, plus six, plus four, square these up these two add up to one, the system 1.8 plus point three, that's two point. So that's the mean diameter of tree trunks. But what I want to take you to take away from here is this main idea of expectations of finding expectation is that you take each value of x , multiply it by its corresponding probability and add it up across all the possible problems. Once you do that, that gives you the expected value or mean. As I said, the expected value of unknown variable is one of the first things that people talk about when talking about about a random variable because it gives you an idea about what you can expect from this random variable in terms of taking into account the values and the various probabilities associated, what would you think is the expected outcome? If you if you look at an experiment with random variables, giving the outcome what is the expected outcome that you get from that experiment. So either its profits or anything else expected rainfall expected temperature. What are you looking for is each temperature multiplied by its corresponding probability adding on. So, let me stop here and in the next clip I'll be talking about some properties of this extract.