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So in the last clip, I started this example with two dice rolls. And random variable is the sum of their outcomes, and asked you to try and figure out the probabilities of the different possibilities that extent take. So let's do it. So what's the probability that the sum is two, right? So two can only occur in one way, it both of the dice, come out to be one in one. So the probability of this is one six, the probability of this is one, six, the store independent events, so probability two is one. Similarly, if you're looking at 12, right, so this can only occur in one way, where both of the dice come up to be six and six, so the probability of that is one as well, about three, right, so three can come out, either the first one is a one, and the second one is a two. Or vice versa, that the first is a two, and the second is a one. So what's the probability of this is again, one six, times one, six, so that's one over 36. And there are two such possibilities. So the together, the total probability of a tree coming up is two. So similarly, if we're looking at 11, right, so this can either occur because the first is a five, the second is a six, or vice versa. And again, the probability of that will be two, six. So similarly, you can figure out all these right, so let's do four, right, so four can either be because both of those came out to be two into or it could be one, the first one is three, the second one is one, or the first one is one, the second district. Now, what's the probability that this comes out that both of these two, that's again, one six times one, six, so that's 136. And the similar is the probability of this and this, so the total probability that the sum is four is three quarters. Similarly, if we look at 10. So this can come out because I, that's five and five, six, and four, or four and six, so this will be through. So what's left, there is five. So if we look at five again, this can occur in several ways. Either it's four and one, or one and four, or two and three, and three, and two. So there are four possibilities, how that sum can be five, right? So each of those possibilities are probability one over 36. So that together the probabilities for the same thing for nine. What's left now, if we're looking at six. So six can be either because it's three and three. Or it can be five and one or vice versa. Or it can be two and four, us or two and four, or four and two. So there are five possibilities. Each of these are one of the 36 together, probabilities. 36. Same for eight. And the last one is seven. What are the possible ways in which seven can come and say that can either be six and one, or one and six? Or it can be 5, 2, or 2, 5. Or last is three, four, and four. So that's six possibilities, six, six. So hope you got these answers on your own as well. So this forms the PMF, or the probability mass function of this particular I could do other random

variables here that suppose it's the product of the two. Right? Similarly, you can figure out the various possibilities, the various probe. Now, if you plot this right in a histogram, you'll see that this has like, the bell shaped right, so this is lowest going up here. And so seven, seven has the highest probability of occurring, then comes those of six and eight, and then five and nine. Yeah, other interesting thing is that see, because these are all the together, these are the total possibilities, right? So if we add up all of these probabilities, they should add up the if you look at the sum, they should sum up to one and check on your right so the if you do one plus two plus three, plus four, and so on up to here, right, you'll see, they should all add up to 36 over 36, which is one. So these are examples of random variables, and the probability mass functions. Now, let me do an example of a random variable, which is derived from something. So let me go back to the my original example of restaurant with five tables. Now, of course, the restaurant would probably cares about is the profits ready doesn't really care about the tables are occupied or not, that's good. But what it ultimately cares about is profits. So the question is, can we use the data that we have, in terms of, of occupancy of the tables to figure out what will be the random variable profits? And what will be the probability of the probability mass function profits? So what we know is that let's say the profit per table is \$50. So this inexpensive sort of restaurant. And the restaurant also has some fixed costs of running in terms of the amount of rent, electricity things that has to pay, and those fixed costs are \$100. So let's use it to calculate the profits. So now see, if if no cost if none of the tables are occupied, right, so in fact, still zero. That means the total profit for the restaurant is that it doesn't make anything of the table, but it still has to bear the fixed cost of \$100. So its profit in this case is minus. And what's the probability connected with that this occurs when x tilde is zero. So the probability of that is point. What else can happen? Suppose one table is if I only wanted, right, so in this case, it makes a profit of \$50 on the table, but it has to incur the fixed cost of 100. So overall, its profit is minus. So what's the probability of, of this minus 50? Occuring is the probability that only one table is occupied? So what if two tables are occupied? What if it happens this week, then per table, it makes 50. So together makes \$100 profit, but it has to incur this fixed costs of \$100. So it just breaks even in its overall profits. And again, the probability of that is connected with the probability of two tables being occupied. That's wonderful. Similarly, if you now look at three tables, right, so that's three times 50 is 150, minus the fixed cost of 100. So its profit is 50. So the probability to what a four tables are occupied, then four times 50, that's 200, minus the fixed cost of 100. So its profit is 100. And the probability of that is 0.5. And the best a scenario where all five tables are occupied, it makes profit potential is 50. So 50 times five is 250. But it has to incur the fixed costs of hundreds, its maximum profits, there is one. And that happens when all five tables are full. And the probability of that is zero. So, this is an example of a random variable set tilde, which is derived from another. Now, once you have this sort of things, now you can derive other probabilities as well. Right? So So for example, so in this restaurant, right, so x tilde is the number of tables occupied settled as its total profit. Now, suppose I asked the question, what's the probability that the restaurant is occupied? So the probability that it is unoccupied is this right? So the probability that it is occupied is one minus the probability that there is no one there. So that will be one minus one, which will be now what if I ask the question, what's the probability that the restaurant makes positive profits? Suppose it makes positive profits, in this case, this case in this case. So the total probability is God by adding up the three probabilities here. So it's point two plus 0.05 plus 0.6. So that total? So let me ask you to check your understanding of this using a clicker question. So you may wish to stop the video at this point and try it out. So hope you got the chance to do the trick question. So what it asks is, what is the probability that an order number of tables, right, so what we're looking for is either one, three, or five tables, right? So what's the total probability of that so it's this 1.2 plus this one, which is another point two plus this one, which is point o five. So if you

add these three up, so that so the correct answer to this question is D, which is four. So let me stop the tip here. And in the next clip, I'll be continuing with random variables and give you another example of a derived variable something random variable, which is derived from