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So we're looking at the idea of conditional probability. And they started out with this example, of free throws in the NBA, where success in the first throw affects the probability of success in the second. And what we saw is that the if the first one was a success, then the probability of being successful on the second one is .79 And if you're it's a failure in the first one, then the probability of success on the second is .72. So how can we represent this in an easy to see way? Right? What we use is what's called probability trees. So here's an example of a probability tree. Right? So if you look at in this case, there's a first throw and there's a second throw. So what are the possibilities? The possibility is that the first throw is a success, or it's a failure. And then following the success on the first throw, you take a second one, which could be a successful or failure. And similarly, if the first one is a failure, then the second one could be a success, or it could be a failure. What's important in this probability tree is to write down the probability of the various events. So if you go back, so see, in the first one, the probability of the first throw the probability of success is 73%. So how do we write it here? So if you look at the first one, right, the probability of success is .72. Now, what's the probability of failure is the complimentary even, right? So the probability of failure then is the remaining which is one minus .73, which will be .27. So now, suppose the first one is a success, what's the probability of the second one is a success? So this is the conditional probability. Right? So if we go here, if the first one is a success, the probability of the second being successful is .79. So let's record that here. So this is .79. What's the probability of failure? That's the complementary probability, which is one minus .79. So that's .21. Now similarly, if the first one was a failure, then what's the probability of being successful on the second? Right, so that was .72. So let's record that here. So this is .72. And the probability of failure is the complementary probability, which is .28. So here, you have a probability tree, which tells you all the possible outcomes and the probabilities connected with each. Now once you have this probability tree, now, you can ask lots of different interesting questions. So for example, so for example, you could ask the question, what is the probability that the player makes both free throws? So what you're looking for is, what's the probability that it's a success on the first and the success of the second. Right, so what you're looking for is the probability of this event, which is the first one is a success. Intersection, remember intersection is an, right. So it's first is a success, and second is a success. What is that? Now if we recall from the last module, we know that if these two were independent events, right, then the probability of their intersection is just the product of the probabilities. But here, they're not independent. Right? So what do we do here? So let me introduce you to what's called the general multiplication rule. Now, if you're looking for the probability of A and B, so that's the probability of A intersection B, you can still use the product rule, but with the conditional probability, so what is that? So the probability of A intersection B will be probability of A times the probability of B given A, right. So this is, so earlier in the independence case, the probability of B was not affected by what happened with A, but here it is, right? So here, it's still the product, but it's the product of P of A times the P of B given A. So what how is that? How do we use it in this particular context? Right? So we go back to the probability tree. And now we ask the question, so the probability that player makes both free throws, it's this, and this, right? So this probability is going to be the probability of that the first is a success, times the probability that the second is a success, given that the first is a success. So what it is, is this particular probability, right, so that's the probability of the first being a success, times the probability that the second is a success, given that the first is, right. So that's this probability. It's .73, times .79. And if you use your calculator to, to figure this out, this is .58. And so that means there is a 58% chance that the player makes both free throws. But the important thing here is that we can use this probability tree to figure that out, it's going to be the product of this times this. Can ask other questions, too. So for example, you can ask the question, what's the probability that the player makes only one free throw? So what's the probability that either he makes is successful on the first failure on the second? Or that he is failure on the first and successful on the second? Right? So that's, what's the probability that the player makes only one? Right? So what are the combinations? It could either be success on the first one failure on the second? Right? Or it could be failure on the first and success on the second? Now, so see, how would you calculate the probabilities of this, right? So the probability of this combination, which is success on the first and failure on the second, it's going to be the product of this times this? So it's going to be .73 times .21. Right, so we're looking at one event, or another event. Now these two are disjoint events, there's nothing common between those two, right? Because this is success on the first, this event is failure on the first, right, so we use the third basic axiom of probability that if there are two disjoint events, the probability of the union is just the addition. So addition of the second, what's the probability of this of the second possibility, this failure on the first and successful on the second, that's .27 times .72, so this will be plus .27, times .72. Okay, and again, if you use your calculator to figure these out, this is going to be .153. And this is going to be .194 If you add these two up, that will be .347. Right, so this player has a 34.7% chance that he makes only one free throw exactly one free throw, no more, no less. But the main thing here to take away is that see, even here with dependent events when you're looking at the the intersection of or two events occurring together, right, that's the intersection of the two events is going to be this times this. Right? And what we're interested here is this player only making one free throws. So it could be success on the first times failure on the second. Or it could be failure on the first plus successful on the second. So this is how we use probability trees to figure out probabilities of events that we're interested in. So let me stop the clip here. And in the next clip, I'm going to start out with another example just to get you familiarized with this idea of probability trees, conditional probabilities, and how to figure out probabilities of events through them.