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SPEAKERS

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So in the last clip, we did the addition rule, and did a couple of applications based on that. So in this clip and I'm going to start with the clicker question, which is very similar to what we did with the example of Antoine and the Winterfest. And this also makes use of the addition rule. And just as a reminder, I have written down the addition rule here. So it's probability of A union B is equal to P of A plus P of B minus P of A intersection. Right? So that's this. So what we want to do is stop the video here and attend the clicker question. And once you're done, you can resume the video. So hope you got a chance to do the clicker question. And it wasn't too difficult because it was very, very, very, very similar to what we did with the weather in Ottawa. So this is a question about Toronto on December 25. And whether it has snowed, what's the probability of it snowing and being called Send this case in Toronto I've chosen being less than zero degrees. So if you looked at the past 10 years, two of those years, it did snow on Christmas Day. Of in terms of coldness, four of those years, the temperature was below zero degrees. And in one year, it was both snowy and cold. So what the question asks is, what's the probability of there being Neither snow nor being cold on December 25. So Neither snow nor cold. So firstly, what are we going to do is let's look at the event that there's either snow or cold. Because if we can find the probability of this particular event, then the Neither snow nor being cold, that's the compliment event. So the probability of snow or cold, again, we're going to use the addition rule, it's probability of snow, that's two over 10 plus the probability of cold, which is four over 10 minus the probability of the intersection of snow and cold, that's one over 10. So that's going to be common denominator, two plus four, six minus one, so that's five. So that's the probability of having either snow or cold. So the probability of no snow nor cold will be the complementary probability. So it'll be one minus five over 10. So which is going to be five? So the correct answer to the clicker question here is let me do one other example. So this is, again, a very social science example from immigration into Canada. So this is Canadian immigrants in 2017. So borrow of God, the statistics from Statistics Canada. So if you look at 2017, a total of 300,000 immigrants were admitted to Canada. And, you know, immigrants, if you can immigrate to Canada and have different classes, one of them is the economic class, then there's also Family Class, refugee, and so on. Right? So if you look at the economic class, so 160,000 of the 300,000 that year, immigrated under the economic class. Now, immigrants have different destinations, but a big chunk of them go to Ontario. So in 2017 110,000 of the 300,000 went to Ontario. Now, what about the economic class in the economic class? Who went

to Ontario? That was 50,000? So my question is, what's the probability that if you choose a randomly selected immigrant, A, that immigrant belongs to the economic class and secondly, be that the immigrant is either in the economic class or in Ontario. So first question, right? So what's the probability that this randomly selected immigrant is of the economic class? So if you look at the total number, that's 300,000. How many belong to the economic class? That's 160,000. So that's the probability that a randomly selected immigrant belongs to the size of the economic class, right? It's the number of favorable outcomes divided by the number of possible. So if you cancel these things, this and calculate this. This will be .533. Okay, so basically 53.3% of the immigrants are of the economic class? Or what's the probability that if you choose a randomly selected immigrant, that that's immigrant in 2017 belong to the economic class was .533? I asked the question, what is the probability that this randomly selected immigrant is either in the economic class or headed to Toronto? Or when to Toronto? Right, so this is the union of two events. This is event one, this is the event B, right? So this is like your A, this is like your B. So what we're looking at is the union of A union B. So the term or means it's either belongs here or here or both. So here, we're going to make use of the addition rule. So it's the probability of A so probability of the economic class that's 160,000 over 300,000, plus the probability of B, which is the probability of being in Ontario, right, so what frack so it's 110,000 went to Ontario out of the 300,000 minus the probability of the intersection. So what's the intersection is the economic class and Ontario. So that intersection, so this is the intersection A intersection B, so that's 50,000 out of 300. So that's the probability that this randomly selected immigrant is either a of the economic class or in Ontario. So let's calculate this, all of them have the same denominator 160 plus 110, that's 270 minus 50. That's 220 1000. And if you cancel out these zeros with the zeros and calculate this, that's point seven, three. So what's the probability that a randomly selected immigrant is either of the economic class or in Ontario, it's .733, or 73.3%. So these are all applications of the addition rule. And this is addition rule with just two sets A and B. Now you can extend this idea to more than two sets, and it's very, very similar. So that's what I'm going to show you next. So this is extending the addition rule to three sets A, B, and C. So now, if you wanted look at what's the probability of A union B, union B union C. It's P of A plus P of B plus p of c minus the probability of the intersection of A and B minus the probability of the intersection of B and C minus the probability of the intersection of A and C plus the probability of the intersection all three. So which looks complicated, just right off the bat. But let me try and explain this to you. Right? So what are you really interested in? If you look at this Venn diagram, right, so what you're interested in is the probability of A union B, union C. So what you can do is that, first, let's look at the probability of A then look at the probability of B. Okay, so see, I have this segment in common. Again, if I add now the probability of C I have this segment as common, right. And also this segment is common. So I have to take those out. So so this is P of A P of B plus p of c minus I have to take out the common segment between A and B, which is this part here? Then I have to take out the common segment between B and C, which is this part here. Right, and then I have to take out the the common section, a segment between A and C, which is that here. But see, when I'm taking those out, right, I have taken this out too much. So this was originally included in this A, B and C, but now I've taken it out three times. Right, so I need to restore it. And that's what I do by right? Because initially when I was looking at the intersection of A and B, that this part was included. A and C This was included, right? So I was counting this three times. Now I've taken it out three times. So I now need to restore that and that's this last term here. So it's P of A plus P of B plus p of c minus B of A intersection B, B intersection C to Section C plus that common area A intersection B intersection C