[SQUEAKING]

[RUSTLING]

[CLICKING]

MICHAEL SCOTT ASATO CUTHBERT: This is a short video following up on the unlocking of pitches, where we will unlock duration and note objects in music21. Go ahead and start up your Jupyter Notebook, and let's get programming. Start with durations. So go ahead and from music21 import duration. And that thing we've just imported-- duration-- put a thumbs up if it's an object. Put a thumbs down if you think it's a module

OK. So in this case, it is a module. If you didn't get it right no worries, because there is no way you can actually tell just from that, except for by convention. Python, by convention, we write our modules in lowercase. We can see that it's a module by checking its type. Yay, good. Phew. It'd be terrible if I didn't.

Within the module, there is usually an object with the same name as it. I hit tab and I get, oh, there is a Duration object. So we'll create one, assign it to d. And I'm going to create a duration of 3.0. What I want you to do is open up the chat, and don't yet hit enter on it-- but if you could put what you think 3.0 might represent.

Yep. So we have a lot of beats going on. Some-- I like qualification with some standard of how long a beat is. And we also have dotted half and things like that. Nobody seems to like our favorite thing, milliseconds. Maybe if I had purposely made my thing 3,000, then people would have thought that. But it is a flow. It could be seconds or something.

In this case, we'll figure it out. Well, OK, that doesn't tell us much of anything. And what we can do is, we can get the full name of this and see it is a dotted half, so it could be beats still. I'll just go ahead and say, in music 21, I made the decision to have the number represent the number of quarter notes. Over time, I have sometimes regretted that decision. But they had to be something.

And one of the reasons I decided not to go with beats is that the length-- the representation of a note, in terms of beats, is dependent on something external. And that is the time signature, right? So 2/2 has a different type of beat from 6/8, which has a different type of beat from 4/4. So that's one of the reasons going with this.

So every Duration object has a full name. It also has a type-- half-- and it has dots. It's great. It also has something called quarterLength, which in this case is the number of quarters. And that's not so bad. But that's something you already knew how to do. But maybe we can create a duration in a different way. We'll say type='whole' and dots=4.

And suddenly, the quarter length of this is a little bit harder to compute. Anybody know off the top of their head? Right, you're all too shy to say 7.75. OK, good. Well, I don't know that number. OK, so here are some of the things that we can do. Can we create a triplet? Let's try that.

1/3 of a note-- so what kind of a triplet is that? Somebody shout it out.

AUDIENCE: An eighth note triplet?

MICHAEL SCOTT ASATO CUTHBERT: Let's see. Type-- yay, eighth note triplet. So we can create triplets. Notice-- we'll go back to d here. Notice that some durations are expressed in floats. Some are expressed in rational fractions. And that tells you whether or not you're going to safely be able to add them up and get an exact number. Anything that's a multiple of a power of 2 in binary will be exactly representable. Anything that isn't will be here.

So great. So trip, its type is eighth. So that doesn't tell me anything about it. Its dots, I hope, are 0. There's no dots there. Great. So there is something called tuplets, which a tuplet is a type of-- like, a quadruplet, a quintuplet. Triplet is the one we most know. Great. What I want you to do is, take a second and put in the chat, what kind of object was just returned from dot tuplets?

OK, we have a couple different answers. But most people say it's a tuple-- a tuple of tuplets, which-- try not to say that too many times fast. And you know it's a tuple because it has this comma at the end. So it's an immutable-- a list of it. And that means you can have more than one template. So you might have a triplet within a triplet and so on.

So those are some things we can do. So we can get at that darn tuplet object. I'm just trying to pull it out, pull it out. Oh, right. It's not a graphical environment. So we'll get the first one. We'll call it t.

And we'll see that the tuplet itself is also a complex object. We can dir it. And we can see it has certain things like, tupletMultiplier, which I happen to know is a method. And so we can see that when you throw this tuplet onto a note, that note becomes 2/3 of its previous.

Here are just some of the things you can do. You will learn this in the music 21 user's guide 2 and 3, which we'll get to in a bit. Some of the things you might see are duration-- that, obviously, 4 is a whole.

For people who like these things, 8 is a double whole note, also called a breve, which means short, because there used to be longer notes. And they're still somewhere. And that's the longest possible note, which no longer exists, except that somebody used a double, the longest possible note. But then at a certain point, you can't do it.

Similarly, on the small side, you can go-- oops-- and let's get the type of that. Notice that the type of an eighth note is E-I-G-H-T-H. The type of a 16th note-- I misspelled 16th too many times. So I decided we'd go from here. I don't think I know my fractions below that, so we'll just keep going like that. You can go down pretty far. Let's skip a bit-- oops-- we're at 16.

And you can go down to 1024th notes. Theoretically, notes go on forever. But music21 at a certain point says, this isn't representation music. Great. I want to do one more little exercise. And this is a trick question. So just put your head what you think.

I'm going to sing something to you, and you tell me how many notes I sang.

[SINGS NOTE]

Yes, I sang a eighth note tied to a 32nd note because it was slightly longer than half of a beat in my head. So how do we deal with things like that? Well, let's make it a whole note tied to a quarter note. Let's say the duration was fast. So I'll call that an odd thing. And by the way, thank everybody for saying 1 and not saying 7 because Cuthbert warbles too much. But let's take that eighth note tied to a 32nd note. What is that? 0.125.

So we can see that you can create things. And this says it's complex. It is a duration that has multiple-- what I call components, which there's an eighth and an eighth and a 32nd that are put together. And so what we mean by the length of a note and where a note splits will depend on the context that we want to use it.

So if we're thinking about, hey, he just sang that note in a sound context, in a recording context, obviously, that's one note. There's no other way around it. But if we're thinking about it in a notation context and you're writing something that has to draw notes on a page, you're going to want to say that, well, that's actually two notes. Because there's no way to represent the duration that we heard with just one note.

So some of the things we're going to be working on in this class is, how do we move from one representation to another so that we're always using the representation that is most appropriate for the situation? And so we'll spend a lot of time in this class working on translations among representations.

Remember, you can always take the directory of music21 or any Python object to get some more things about it. But also, in Jupyter, you can put in question mark afterwards and get some docs or look at the docs online. So now you have unlocked pitches, and you have unlocked durations. Let's move on to the last thing that we want that we're going to unlock today. And those are notes.

So there are a million ways we could have called something a note. We could say, a note is the same thing as a pitch. Some people say that. But here's how I have chosen, with my advisors and stuff, how to represent a note. A note takes in a string, just like a pitch, just like you saw in the pitch video.

And it's called a note. It doesn't print the octave, for some reason. And it has a name, just like a pitch does. But also, all those things are in a stored pitch object. So a note has a pitch object. And so you can change that-- n.pitch.octave = 4. And see all that.

But a note also has a duration. And so in this case, the default, all notes start off with a duration of one quarter note. I don't know why I'm privileging quarter notes, but somehow, I have. We can change the quarter length of that-- 3.5. And then, well, it has a fullName. So we can look at this-- 'B-flat in octave 4 Double Dotted Half Note'.

OK, so that's all there. Hopefully this is working. One cool thing that you can do that you can't do with a pitch or duration, really, is, you can show a note. It's weird that the first time, it always takes longer. And then it's later, so here we go. We have a particular note. It figures out some kind of context for it.

Has a couple other things we can do-- we can change the notehead to be an x. We can change the note to be no red. I'm slightly colorblind, so I can't really see the difference. But you can tell me if that works. Yep.

And we can also make it into a complex note. So I think we learned 6.25 couldn't be represented normally. But we can see that music21 will figure out how many notes are necessary to represent it on the staff. There's other miscellaneous things. You can give it a lyric and so on.

So again, everything there is in the-- during it. And you'll see there's a lot of stuff. And we're going to get through a good chunk of learning these things later. No, you will not be ever quizzed on, OK, what does purgeOrphans mean on a note? It's not that kind of class.

But I want you to feel free-- play around with this. Play with anything except, just like with pitch, anything that begins with transpose is off limits, only because it'll make the problem set where we do a lot of things with intervals a lot less fun. Because you're not using it. Anyhow, this is the end of the unlocking for topic 1.