Transcript

Earning Compound Interest

What I want to do in this video is talk a little bit about compounding, compounding interest and then have a little bit of a discussion of a way to quickly, uh, kind of an approximate way to figure out how quickly something compounds and then we'll actually see how good of an approximation this really is.

So, just as a review, let's say I'm running some type of a bank and I tell you that I am offering 10 percent interest that compounds annually, compounds, compounds annually. That's usually not the case in a real bank, you would probably compound continuously but I'm just going to keep it a simple example, compounding annually. There are other videos on compounding continuously. This makes the math a little simpler.

And all that means is that, let's say today, today, you deposit $100 in that bank account. If we wait one year and you just keep that in the bank account, then you'll have your $100, you'll have your $100, plus 10 percent on your $100 deposit, 10 percent of $100 is going to be another $10. So, after a year you're going to have $110, $110. You can just say, I added 10 percent to the $100 and then after two years or a year after that first year, after two years you're going to get 10 percent not just on the $100, you're going to get 10 percent on the $110. So, you get 10 percent on $110, is you're going to get another $11. So, 10 percent on $110 is $11. So, you're going to get $110, that was, you can imagine, your deposit entering your second year, and then you get plus 10 percent on that, not 10 percent on your initial deposit. That's why we say it compounds. You get interest on the interest from previous years. So, $110 plus, now $11. So, every year the amount of interest we're getting if we don't withdraw anything, goes up. So, now we have $100 and, $121.

And I could just keep doing that and the general way to figure out how much you have after, let's say, N years, is you multiply it, so let's say, so let's say my original, I'll, I'll use a little bit of algebra here. So, let's say this is my original deposit or my principal, however you want to view it. After X years, so after one year, you would just multiply it to get, to get to this number right here you multiply it by 1.1, one, actually let me do it this way, I don't want to be too abstract.

So, just to get the math here, so, to get to this number right here we just multiply it, that number right there is 100 times one plus 10 percent, or, you could say, 1.1. Now, this number right here is going to be this 110 times 1.1 again. So, it's this, it's the 100 times 1.1 which was this number right here, and now we're going to multiply that times 1.1 again. And remember, where does the 1.1 come from? 1.1, 1.1 is the same thing as 100 percent, plus another 10 percent, right? That's what we're getting. We have 100 percent of our original deposit, plus another 10 percent. So, we multiplying by 1.1, here we're doing that twice. We multiply it by 1.1 twice.

So, after three years, how much money do we have? It's going to be, so after three years we're going to have 100 times 1.1 to the 1.1 to the third power. After N years, now we're getting a little abstract here, we're going to have 100 times 1.1 to the Nth power. And you can imagine this is not easy to calculate. And this, this is a is , this is all in the situation where we're dealing with 10 percent.

If we were dealing overall, let's say it's seven percent, let's say this is a different reality here or we have seven percent compounding annual interest. Then after one year, one year, we would have 100 times, instead of 1.1 it'd be 100 percent plus seven percent or 1.07, after let's skip, let's go to three years. After three years, I can do two in between, it would be 100 times 1.07 to the third power. 1.07 times itself three times. After N years it would be 1.07 to the Nth power.

So, I, I think you get the sense here that although the idea is reasonably simple to actually calculate compound interest is actually pretty difficult. And, even more, let's say I were to ask you how long does it take, how long does it take to double your money?

So, if you were to just use this math right here, you'd have to say, gee, I would have, to double my money I would have to start with $100 and I'm going to multiply that times, let's say, whatever, let's say it's 10 percent interest, 1.1 or 1.10, depending on how you want to view it, to the X is equal to, well, I'm going to double my money so it's going to have to equal to $200.

And I'm now going to have to solve for X and I'm going to have to do some logarithms here. You can divide both sides by 100, you can get 1.1 to the X is equal to 2. I just divided both sides by 100, and then you could take the logarithm of both sides base 1.1 and you get X. and I'm, and I'm showing you that this is complicated on purpose. And, and I think this is confusing. There is multiple videos on how to solve for these. You get X is equal to log

base 1.1 of two. And most of us cannot do this in our heads. And so, although the idea is simple, how long will it take for me to double my, my money? To actually solve it, uh, to get the exact answer is not an easy thing to do.

You can just keep, uh, if you have a simple calculator you can kind of keep incrementing the number of years until you get a number that's close but no straightforward way to do it and this is with 10 percent. If we're doing it with 9.3 percent it just becomes even, even more difficult.

So, what I'm going to do, I'm going to do in the next video is I'm going to explain something called the rule of 72, which is kind of, an approximate way to figure out how long, to answer this question, how long does it take to double your, I forgot the word, write the most important word, how long does it take to double your money? And we'll see how good of an approximation it is in that next video.