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SPEAKERS

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Hi, welcome to the first module of the course. In this module we'll be covering introduction to algebraic expressions. And my aim here will be to try and introduce you to the idea that mathematical expressions can occur naturally in a diverse set of areas in the social sciences. And to do that, we'll be studying examples from many different areas such as economics, politics, geography, and even sports analytics, and the spread of infections. In this module, we'll not be doing any deep mathematical concepts, those will come later on in the course, but rather, will focus on getting comfortable with how mathematical expressions algebraic expressions can arise naturally, in different situations. And then we can use those expressions to gain a deeper insight into the problem at heart. So it will be a gentle introduction, and I will go rather slow. But then well, what I'll be trying to do is get you used to the idea of variables, and getting used to manipulating those variables to answer relevant questions. We'll also be touching upon how to use Google Sheets or Excel to deal with some of these problems.

So the plan for this module will be to cover five examples. And in the process of covering this examples from economics, politics, and the NBA, where we'll be looking at player efficiency, or in geography and models of, a model of infections. We'll get introduced to the idea of how to write down algebraic expressions how to manipulate them, and and get answers to these questions.

So let's get started with a very simple example from economics, where we're looking at Maya. And her monthly expenditures is on various things. One, she spends \$400 on rent \$300 on food and drinks. And at the same time, she wants to buy some stocks. So she has been really following reddit, and so she decides to buy one Gamestop stock, which is priced at \$170. And at the same time, her uncle tells her also to buy some good solid old fashioned companies such as Ford. And so she also buys 10 Ford stocks which are priced at \$12 each. So to determine Maya's total monthly expenditures, it's relatively simple. So you add up the \$400 that she spends on rent, plus the \$300 that she spends on food and drink. Plus the the Gamestop stock, the the one Gamestop stock that she buys for \$170, and the 10 Ford stocks, which she buys for \$12 each. So that's 120, this is 170. And if we add all of these up that's her total monthly expenditure. If we add these up, so that's 400, 300,

170 from the Gamestop, and the 10 Ford stocks, which are priced at \$12 each, this comes to \$990. So that's simple enough. Now suppose, you know, it's not that every month she buys just one Gamestop stock, right? Some months she may buy five, some months she may buy only two. Same with Ford stocks, it could vary from month to month, right? So if we make this problem a little bit more general, by introducing the idea that if she, that she will buy X Gamestop stocks, and Y Ford stocks. So these are now what's called variables.

So X can be 1, X can be 2, 3, 4. And similarly Y which is the Ford stocks can be 10, 12, 15, and so on. So these are examples of what's called discrete variables because it takes numbers like 1, 2, 3, right? So you you're not going to buy 1.2 Ford stocks. So that'll be what's called a continuous variable. We'll be coming to that. But right now, so these are examples of what's called discrete variables, because it only takes discrete number of values like 0, 1, 2, 3, 4, and so on, right? So now based on this, if we are trying to figure out what is her monthly expenditure, so let's look at this. So she spends \$400 on rent, \$300 on food, right, plus at the same time, so she buys Gamestop stocks, which are priced at \$170 of each. If she buys X of them, her expenditure on those is 170 times X . And on the Ford stocks, these are priced at \$12 each, and she buys Y of them, so that becomes 12 times Y . So her total expenditure then is the 700 plus $170X$ plus $12Y$.

So this is your first algebraic expression in the course. So a couple of things to note. So typically, when I was writing out before I was multiplying, I was multiplying 12 times 10. Right. But here, you see, I have omitted when I'm multiplying 12 times the number of Ford stocks, I have omitted the multiplication sign. And the reason is, because this can get confusing with X . So typically, when we are writing multiplication in algebra, we tend to ignore the multiplication sign. So when it's $12Y$, that means it's 12 multiplied by Y . So now, if you so that's her total monthly expenditure. Now, obviously, there is some income coming in, otherwise how can she spend it. So if her monthly income is 1500, so you better hope that her expenditure is less than or equal to her income.

Otherwise, she is going to get into debt. So this is a constraint that a total expenditure be less than or equal to her income. Right? So this in economics is sometimes called the budget constraint. And what this also introduces you is to the idea of an inequality. So this should be less than or equal to 1500. You could also reverse this question and then say, what's her savings. So her savings will be whatever is left over after spending the money that she is doing, right? So it will be 1500 minus her expenditure, which is 700 plus $170X$ plus $12Y$. So next, if you've been following so far, right, so the next I have a clicker question for you. And you may want to pause the video at this point, do the clicker question and then come back to the video where I'll be solving the clicker question.

So hope you have now done the clicker question. And the clicker question is that if Maya in addition to her Gamestop and Ford stocks also buys some Air Canada stocks. So if she buys Z Air Canada stocks, which are priced at \$30 each, what is her total expenditure. So this is fairly simple to add on, because she was already spending \$700 in rent and food, plus she was spending 170 times X on the Gamestop stocks, 12 times Y on the Ford stocks. And now she's also buying Z amount of Air Canada stocks which are priced at \$30 each. So the new term here is that this is the part that gets added on to her expenditure. So the clicker question, the right answer is D, which is 700 plus $170X$ plus $12Y$ plus $30Z$. So let's stop this video here with this example. And then we'll be moving on next to an example from politics.

