

module1_lecture6

Mon, 12/27 3:42PM 10:27

SUMMARY KEYWORDS

trees, multiply, meters, row, plant, algebraic expressions, tract, land, width, plot, bracket, question, multiplication, how many rows, reiterate, answer, total, how many, opening, remember

SPEAKERS

Sumon Majumdar

So let's do another example, this time from geography. And it's a question about planting trees. So, a green city acquires a tract of land, which is 99 meters wide, and 200 meters long. And it wants to plant some trees. And the question is, how many trees can it plant in this plot of land. Of course, trees cannot be just stacked one on top of another, they need some space between themselves. So, say it decides to plant trees, which each require a spacing of one meter between them. And so the question is, what's the total number of trees that it can plant in this plot of land? So, here's the plot of land. So it's 99 meters wide, 200 meters long. And to answer the question of what's the total number of trees that it can plant, right, so let's start with the simple idea that here's the plot of land, right? How many trees can it plant in a row along the width of the tract, right? So how many trees can it plant along this dimension?

So answer that question. So suppose we started the point zero, right? That's the first tree. The next one is at one, the next one is at two, right, and so on. And the last one is at 99. Remember, the trees have to have one meter spacing among themselves. Right, so the number of trees that it can plant along this row, is starting at zero, that's the first tree, at one that's the second tree, at two that's the third tree, and at 99 is the 100th tree, right? So the total number of trees that it can plant is 99 plus one, which is 100, along this dimension here. So to answer the question, how many trees can it plant in a row along the width of the track? So that's 100 trees. The next question is, obviously, so here is my one set of trees, then I'll have another set of trees here. I'll have another set of trees here, right. So the next question is, how many such rows of trees can it plot. And again, we're going to use exactly the same procedure that we did for the, for the width, remember this was 99, right? And here, it's 200 meters. So we're going to start the first row at this point zero, the second row is going to start at one, that third row is going to start at two, and so on. Right? And the last row is going to come in at 200, right. So how many rows are here? So this is the first row, this is the second row and so on. So the total number of rows here are going to be 201. Right? So it's 200 plus one. So if you're trying to determine what's the total number of trees, that it can plant, so in each in each row, remember it could plant 100, right? And how many rows are there? There are 201 rows, right? So this is the total number of trees that can be planted on this plot of land.

Now suppose we were to generalize it and say that if the tract of land was X meters wide, and Y

meters long, how many trees can you plant here? Now, we're going to use exactly the same way that we did when we had actual numbers 99 and 200. Remember in the case again, if I went back to it right, if there were 90, if the width of this plot of land was 99 meters, then I could plant 99 plus one trees there, right, along the row. And if the length of the tract of land was 200, then I can plant 200 plus one, that's 201 rows. Right. So now, if I generalize this, that how many trees can it plant on this tract of land, which is X meters wide and Y meters long, right. So that means along the along each row, it can plant X plus one trees, right? Remember, you're going to start at zero, then you're going to go to one, and so on, and you're going to end up at X . And similarly, the number of rows, you're going to start at zero, then this is one, and you're going to go up to Y . So the number of rows you'd be able to plan is Y plus one. And this is something I always do if I, if I'm struggling sometimes to figure out what will be the answer in a general case of X and Y . I start with some numbers. I start with an example like here, where I started with the 99 and 200. I figured out what my answer would be. And then once I had that insight, I could generalize it to any X and any Y . So the number so the answer here in this particular case, is what's the total number of trees that it can plant on this tract of land is X plus one times Y plus one.

So a couple of things I want to point out, right, so this is an algebraic expression here. But it has two variables, this has X , and it has Y . Right, so this is an algebraic expression with two variables. Secondly, right, so this is a multiplication of two algebraic expressions, X plus one times Y plus one, right? And in fact, in algebra, if you're multiplying two expressions like this, it's often useful to know the rules for such multiplication. And so let me introduce that here. So this will be so if I'm multiplying X plus one times Y plus one, right, so what I'm going to do is first multiply Y plus one by X , right by this component here. And then I'm going to multiply it by one. So this will be one times Y plus one. So this will then become, if I open up the brackets, it's X times Y plus X plus Y plus one. So this is how you multiply two algebraic expressions. And this rule applies for more general cases. For example, if I had something like this X plus A plus B , multiplying Y , plus C plus D . So this is a lot more complicated than that the first one, but the rules follow exactly the same way. First X is going to multiply all of this, then A is going to multiply all of this, and then B is going to multiply all of this, right. So this will be X times Y plus C plus D plus A times Y plus C plus D plus B times Y plus C plus D . And then you can open up the brackets, so it's going to be a long expression here. Right, that's my first bracket opening up, then the second bracket opening up as this AY plus AC plus AD , and the third bracket opening up as BY plus BC plus BD . But what I'm trying to convey to you here is this way of multiplying two algebraic expressions, and we're going to see more of this later on in the course. But I just wanted to introduce you to this idea. I'm sure all of you probably have seen it and know it, but at least it's important to reiterate it here. So let's stop this example here. And then we'll do the next example will be on the spread of infections.