Transcript for Session 026

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Transcript:

Hey podcast listeners, welcome to another episode of http://chandoo.org/ podcast.

I am really glad to speak to you after a short break. If you are listening to this podcast as a new subscriber then you wouldn't realise that there has been a delay between the last one and this one. My initial plan, when I started the podcasts, was to have at least 3 episodes per month but the last episode (session 25) was on November 6th and today, December 2nd, is the 26th session which I am recording now and it'll probably be launched by December 4th. So there's been a gap of a month. If you're wondering why I've been quiet, there is a reason for it. To begin with, I have been busy with some of the business work of launching Excel dashboard templates which I must tell you have been a stellar success. By far, out of all the products that I have launched on http://chandoo.org/, this one is the one that kind of just took off from the moment we launched it for the public. I'll talk a little bit more about that a little later in the podcast but the main reason why I couldn't launch another episode as soon as possible is that we took a small vacation. It was a road trip to the northern state of Rajasthan. We live in South India and we drove all the way across India to Rajasthan and we really had tremendous fun. We explored castles, old palaces and visited a ton of museums. We went on a camel safari, explored the Thar Desert and had amazing fun. We had good food, the kids loved seeing the different sights, smelling different things, seeing different people and they had a blast exploring the museums and historical sites. When I was there, I set out some time to record one podcast and I did record it but when I loaded the episode on to my laptop, I realised that the audio was terrible because I didn't carry my podcast mike. I recorded the episode on my iPhone and, for some reason, the entire audio was terrible. You couldn't hear what I was saying properly. So, I couldn't upload it and I had to ditch it. I am now recording the same episode again and that's why there has been a delay between the last one and this one. I think that's enough about my personal adventure in Rajasthan!

Let me quickly tell you about the Excel dashboard templates that I was talking about. If you remember in prior sessions of our podcasts, I did talk a little bit about them. When you're working as an Analyst or a Manager, you need to often create a dashboard or balance scorecard or report that gives a clear picture of what's going on with your business and all the important metrics. The process can take anywhere between 1-6 weeks. The first time that I had to create a scorecard when I was working, which is similar to a dashboard, it took me several weeks to conceptualize it and create the first version. I would go back to my boss who would make a lot of suggestions which I would then incorporate. So, the entire thing

took 6-8 weeks before we could arrive at something that was good enough for all of us. I've created a set of Excel templates wherein you can put raw data, select various options about how you want the calculations done and display the output, and the Excel dashboard templates will generate beautiful, informative, easy-to-use and really awesome dashboards within just a few minutes. At most, it'll take 30 minutes to set it up and generate the first dashboard from it. There has been a lot of interest in the product over the last several years that I have been learning about Excel dashboards. I put all of those ideas into practice in this product and launched it on November 13, 2014. In the first 2.5 weeks itself, we've had more than 600 customers! People are really happy to get their hands on it. There has been a tremendous response. I am really glad to see such a positive reaction to this product. If you are interested in taking a look at the dashboards and trying to understand what they can do for you and how you can implement them in your business, please visit http://chandoo.org/session26 where you will find a link to the Excel dashboard templates to go through a detailed explanation and you can get them if you like them. That's enough of a sales pitch; let's get in to the podcast material!

A pretty exciting and critical aspect when somebody starts learning Excel and using it for writing formulas and doing anything other than simple data entry are **Excel operators** which is what we'll talk about today. Operators are the special symbols or keys on your keyboard which you press to invoke certain functionality. An example is the + operator. If you write:
=A1+B1;

it means that you want to add A1 and B1. When we talk about operators, especially when you are starting out with Excel and you haven't paid serious attention to what Excel can do, you might be mistaken and think that there are only 10-15 operators in Excel. But, when I started researching for this podcast, I was really surprised to see that there are more than 25 operators. It is as if every key on your keyboard, other than the alphabets and numbers, has some special functionality in Excel. It's no wonder that Excel has such vast features and so many different possibilities; everything has some functionality in Excel. So, today, we'll talk about operators.

When we talk about operators, it's better to break those operators in to smaller buckets so that we can focus on individual types of operators. We have **arithmetic operators, text operators, reference operators and comparison operators**. These 4 operators are what I consider available in Excel. We're only going to talk about Excel operators; we won't talk about VBA operators. However, in terms of functionality, there are more or less similar things in VBA as well for whatever we learn in Excel operators.

Let's talk about each of the four buckets now. When it comes to **arithmetic operators**, it is the one that most of us are familiar with. We all know our plus, minus, multiplication and division symbols. '+' is for plus, '-' is for subtraction, '*' is for multiplication and '/' is for division. These are standard operators and standard arithmetic symbols that you use all the time. There are a few more that are quite interesting.

The first one is the **percentage operator**. This is essentially dividing a number with 100. If you have a value in A1 and you want to turn it in to A1/100, you could write:
=A1/100,

or you could simply say A1%. Both of them will yield the same result. When used in the context of an arithmetic operation or formula, percentage would behave the same as '/100'. It is a very simple operator. Often, we don't use it as an operator; we use it as part of data entry. When I want to type 75% in a cell, I type 75 and then the % key. But, we can also use the percentage as an operator to divide a value, whether a cell value or a result of a formula, with 100.

The second operator is the **cap operator**, i.e. the ^ operator. This is the operator that you find on the number key 6 on your keyboard. When you hold down Shift and press 6, the cap operator comes up. It is used for calculating values like X^2 or X^3 or X^4 or something like that. If I want to calculate the cube of the value in cell A1, we can write:
=A1*A1*A1

or, we can simply say:
=A1^3

It means A1 raised to the power of 3. Both of them will give the same result.

Likewise, there are 2 more operators that we don't really see as operators but they are very powerful; these are the **open and close bracket operators**. When we calculate some values or arithmetic operation, if we want to impose some order of calculation or a certain priority of calculations then we can use brackets. For example, let's say that you are calculating the result for:
=(A1+B1)*C1

A1 has the sales from the East zone and B1 has the sales from the West zone. I want to combine both the values and then multiply them with the sales commission to calculate the total commission payable. Now, if we write the formula as:
=A1+B1*C1;

it will yield an incorrect result as it will multiply B1 with C1 and add the result to A1. If A1 is 20, B1 is 30 and C1 is 5, then technically we would expect the result to be 20+30 multiplied by 5 which is 250. But, the result of this operation:
=A1+B1*C1
will be 30*5 and added to 20 which is 170.

So, we get an incorrect result. It is because we are not using brackets to tell Excel to first calculate the plus operation and then the multiplication operation. So, to fix that, we will write a formula as follows:
=(A1+B1)*C1

This is the same thing that we learnt back in school, i.e. the BODMAS rule or any of those kinds of things where we learnt that the bracket imposes highest priority of calculation. When Excel sees an arithmetic operation or formula with brackets in it, it'll go and calculate that first.

These arithmetic operators are not really a surprise for most of us. We all know these things. We have been knowingly or unknowingly using them. In fact, most of us wouldn't even pay attention to them; we naturally think of the plus and minus operators any time that we need to do something in Excel.

The next topic is **text operators**. The most important operator in text operators is **ampersand**, i.e. the '&' symbol. This is useful to concatenate two text values. It is similar to addition of numbers but, with this, we want to take the value in cell B1 and append it to the value in cell A1. You would use the ampersand symbol for doing this. You can also use the CONCATENATE formula but I find ampersand to be a shortcut as it yields shorter formulas and it is quicker to write.

Apart from ampersand, there are two other operators that are helpful while dealing with text. One of them is **single quote** and the other is **double quotes**. Double quotes are useful when we want to get some text into our formulas, for example, I might want to do a VLOOKUP to figure out the vendor name and the output formula should be 'Our vendor name is ' followed by the result of the VLOOKUP. In such a case, we will simply write:
="Our vendor name is "&VLOOKUP()

The VLOOKUP formula will return the name as its result and the fixed text will be provided by the double quotes. Double quotes are very useful; I am sure you have read about them or used them quite a few times in your Excel usage so far.

The single quote is useful when we want Excel to treat a cell value as text even when a cell begins with an equal to sign. The moment you type equal to, Excel thinks you're typing a formula and so it won't even let you type 'hello'; it'll go ahead and try to figure out what the formula is and it'll throw up an error. You don't want Excel to treat this as a formula, you want Excel to treat it as a text value that you'll type in to the cell. For this, you need to write it as:
'=

The single quote won't be visible on the screen but it'll force Excel to treat everything else that follows as text values. So, single quote is an operator that you can use to tell Excel that this is text. It is a very useful and interesting way to deal with special situations.

There are two more text operators that are very special and powerful. These are called **wildcards**. Certain special formulas like COUNTIFS, SUMIFS, MATCH, VLOOKUP can work with wildcards. For

example, imagine that you have some data in which you have a bunch of details about various vendors and how much money we need to pay them. And, it so happens that the vendor name for ABC Company is typed in some places as ABC Company and in other places, it is typed as ABC Co. Now, if I want to calculate the total amount to be paid to ABC Company, then we need to sum up all the ABC Company occurrences and all the ABC Co. occurrences and this can be a tedious calculation. So, instead of that, if I can write a formula that returns me the sum where the first 5-6 characters are ABC Co, then our problem is solved very quickly. This kind of behavior is nothing but the use of wildcards. It means that anything can occur after some initial text. Those wildcard characters are '?' and '*'. '?' is used for a single wildcard and '*" is used for a set of wildcards. Trying to understand or visualize how both '?' and '*' would work in a formula is quite tricky when you are just listening to a podcast. So, I will link to an example article on http://chandoo.org/ that explains how the wildcards work. Please visit http://chandoo.org/session26 for a link to the wilcard characters article.

So far we've talked about arithmetic and text operators. The next bucket is **reference operators**. These are the operators that we would use when we need to make references to various values, cells or addresses in Excel. The most obvious reference operators are '$' and ':'. For example, if you are making a reference to cell A1, but you'd like to make it an absolute reference so that even if you move around the formula or copy the formula in multiple places, all of them should still refer to cell A1. In this case, we would write A1 as A1. The $ symbol is a special operator that forces Excel to lock the reference to a particular row or column or both. So, the $ symbol is a special operator when it comes to reference.

The ':' is useful when we are referring to a range of values. Let's say that we want to sum A1 to A10; you don't need to write:
=SUM(A1,A2,A3.....)

You can simply write:
=SUM(A1:A10)

This means that you're asking Excel to take all the values from A1 to A10 and sum them. The ':' is acting as an operator here that is forcing Excel to take an entire range and process it for you. These are the obvious reference operators.

Then we have some **special reference operators** which are useful when you are dealing with tables which is a feature introduced in Excel 2007 and above. Those operators are square brackets and the @ symbol. With the help of the square brackets, you can write a table name and then refer to a particular column in the table. For example, if you have a Sales Table in Excel in which the columns are Sales Person, Month, Product etc. and I want to refer to the Product column for a certain calculation then I would write:
=Sales[Product]

In this way, you're referring to the product column within the sales table. The square brackets really behave like the English word 'of' when we refer to tables.

The @ symbol is useful when we want to refer to the current row in an Excel table. For example, if I want to count the total number of products, I would write a formula as:
=COUNTA(Sales[Product])

This will tell me how many products are there in the product column. But, if I want to write a formula that just checks the product for that particular row and does something on it like extract the first 2 letters of the product then we would write:
=LEFT([@Product],2)

This means that we want to display the first two characters of the current row's product value. This is how the @ symbol is used. It is helpful for us to refer to the current row's item within tables. These are table reference operators - '[]' and '@'.

There are a few more operators that are useful when we are dealing with a list of values. Let's say that we have a list of values in the range A1 to A10. In order to refer to them in a formula, you could simply write A1:A10. But, for some reason, you can't have those values on your worksheet; they are constants and you just want to hard code in to your formula. There can be many situations where you might want to do this. In such cases, you really want to **define an array or list of values** just like a range but purely for formula purposes. In such cases, we'll use the '{'}', ',' and ';'. Let's say that you want to define a range of 10 values or 3 values, for the sake of simplicity, you can write:
{1,2,3}

When you include this in any formula like a SUM, SUMPRODUCT, INDEX or MATCH formula, it will behave like an array or range of three cells and do the calculations. That's how you can use the curly brackets and comma. Now, if you're imagining how you can use the semi-colon, imagine that for some reason you need to create a two dimensional list similar to A1:B3, i.e. you not only have 3 rows but also 2 columns. In such cases, you would again use curly brackets like {1,2,3;4,5,6}. The semi-colon will tell Excel that this is another row or column and hence it needs to construct a two-dimensional array or range. Again, this type of usage of curly brackets, comma and semi-colon is what I would consider quite advanced. In fact, throughout my experience of Excel usage, there are only few occurrences when I have used these. But, there are special situations and cases where you really have no other shorter or simpler alternative than to define these kinds of arrays in memory or in formulas for simple calculations. If you are curious to know how this would really work, I highly encourage you visit our **Formula Forensics page** which I will link to in the show notes as well where we talk about various advanced array formulas and Excel formulas where we end up using these kinds of arrays or list of values defined with curly brackets, comma and semi-colon.

Another thing that I want to remind you about is that depending on your Excel locale - most of us use the US or English version of Excel which uses comma and semi-colon - certain European versions would use them in reverse, i.e. their semi-colon behaves like a comma and the comma behaves like a semi-colon. This is due to locale differences and how the European version of Excel is set up. For best results, please check your Excel operators and Excel version before you use any of these formulas.

That's a little about reference operators. There are two more reference operators that I haven't talked about it. Let me briefly touch upon them. The first one is the '!'. This is useful when you refer to data. For example, if you are writing a formula '=A1', it is assumed that the value is in the same worksheet and so it goes to cell A1 in the same worksheet. But, if I want to go another worksheet tab and get the data from that, then I would write '=Sheet3!A1'. Now, Excel will go to another worksheet to get the data. So, the '!' is helping us differentiate between the worksheet name and the cell reference.

If you are think a little deeply here, you can also see how single quotes can be used as an operator when the sheet names have spaces and special characters and how square brackets can be used when reference are made to another workbook or another file location etc**. The same operators have different meanings in different contexts.**

The other operator that we haven't talked about in reference is space. The **space operator** is really amazing and incredible. The first time that I heard about it was like a light bulb moment. I heard about it and thought, "Wow, Excel can do this". This is most people's reaction when they hear about the space operator. It is the simple space key on your keyboard and when you use it properly, it works as an intersection operator. Understanding this is very difficult in an audio only podcast but let me try my best. Imagine that in a worksheet you have various salespersons names in individual rows and various months in individual columns like a matrix. You have people in various rows in the first column and one month at a time in subsequent columns. You're looking at all this data and you're asking yourself how much sales John made in the month of July. You're basically interested in the intersection of John's row with the July column and you're looking for the value at that intersection. You could write very complex INDEX-MATCH, VLOOKUP-HLOOKUP formulas or any of those combinations or, instead, you could simply use a space formula. You've figured out that John is in row 3 and July if column 7. Now, all you have to do is write a formula that goes like this:
=3:3 G:G

Now, if you're wondering how to ask a different question like what are the Sales for Mariah in the month of August, then you'll end up writing another formula. There is way around this and I will share an example in the show notes which are available at http://chandoo.org/session26. I highly recommend that you check that link because the space operator is really powerful and it has some special uses like this. If you're aiming to learn all the nuts and bolts of Excel then understanding the space operator is something that you can add to your tool chest. So, go through http://chandoo.org/session26 where I will talk about an example article on the space operator.

The final set of operators is **comparison operators** and these are the easiest ones. You have your usual operators, i.e. =, < and >. We can use these to compare one value with another which could be two numbers, two text values, or any of those kinds of things. If we simply say:
=A1=B1

or
=A1<B1

or
=A1>B1

or
=A1>=B1

it will return a boolean value of TRUE or FALSE. This is how comparison operators work. We usually use them in IF formulas or any of the other cases where we need to perform a logical check.

That's about Excel operators in a nutshell. I hope you like what you've learnt so far. Let me do a quick re-cap. We learnt about arithmetic operators (+,-,*,/) and special operators like ^ and %. Then we talked about text operators, i.e. '&' which is like CONCATENATE and we understood the wildcard characters like '?' and '*'. We also understood the single quote operator which can force Excel to treat a cell's value like text rather than a formula. We also talked about reference operators like '$' and ':', square brackets and the '@' symbol. We also talked about curly brackets, comma and semi-colon. Then we talked about the space operator and '!'. Finally, we talked about comparison operators which are the <, > and = operators.

That's about excel operators. If you think about whatever we talked about so far, all of them are the keys that you usually see on your keyboard and it is surprising that every key has certain functionality in Excel.

If you are wondering how come we haven't talked about some of the other keys that have been left out, for example back-quotes, tilde operator or pipe symbols, see what happens if you use them in formulas and shortcuts because Excel is such a vast software that pretty much every key on your keyboards has some meaning or functionality in Excel. Certain keys are used as keyboard shortcuts but most keys have some sort of a meaning or relevance when we are dealing with formulas.

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