



<b>SUBJECT / GRADE</b>	Computer Applications Technology Grade 12	
<b>TERM / WEEK</b>	Term 1 Week 7	
<b>TOPIC</b>	Solution Development: Spreadsheets	
<b>AIMS OF LESSON</b>	In this lesson you will build upon simple functions from Grade 11 to develop your skills in the application of their variations as well as more complex conditional, lookup and subtotal functions and features. You will also learn the functions that simplify date and time calculations. What you learn will help you answer the Spreadsheet questions (Question 3 and Question 4) in an NSC CAT practical paper.	
<b>RESOURCES</b>	<b>Paper-based resources</b>	<b>Digital resources</b>
	Gr. 12 DBE Practical Book: Ch. 4 (p. 60 – 95) (Use school issued textbook for the same content)	Links on the WCED ePortal or the links below: <a href="#">Gr 12 Practical Textbook</a> <i>The e-resources below has the actual URL to the websites</i>
<b>INTRODUCTION</b>	Doing CAT, you may have noticed that functions and formulas help you to do boring tasks much faster in an automated way. It is this automation that must give you a competitive edge when it comes to workplace sometime in the near future, freeing up the time to be really creative at your job.	
<b>CONCEPTS AND SKILLS</b>	<ul style="list-style-type: none"> <li>• Reinforce content, concepts and skills;</li> <li>• More complex functions: <ul style="list-style-type: none"> <li>○ Nested IF,</li> <li>○ Vertical lookup,</li> <li>○ including error indicator #N/A;</li> </ul> </li> <li>• Variations of known functions: <ul style="list-style-type: none"> <li>○ ROUNDUP,</li> <li>○ ROUNDDOWN,</li> <li>○ COUNTIFS,</li> <li>○ SUMIFS;</li> </ul> </li> <li>• Subtotal feature</li> <li>• Basic date and time calculations: <ul style="list-style-type: none"> <li>○ YEAR, MONTH, DAY, DAYS,</li> <li>○ HOUR, MINUTE, SECOND,</li> <li>○ TIME, TODAY, NOW.</li> </ul> </li> </ul>	<p><b>CAN YOU...</b></p> <ul style="list-style-type: none"> <li>• name the arguments (parameters) of a simple IF function?</li> <li>• list as many reasons as possible for a spreadsheet program to display a string starting with “#” in a cell?</li> <li>• give an example of when the ROUND function should be used instead of formatting a cell to display no decimals?</li> <li>• explain the difference between the COUNTIF and SUMIF functions?</li> <li>• guess why a date displays as 44228 instead of 1 February 2021?</li> </ul>

**ACTIVITIES /  
ASSESSMENT**

**Activity 1**

Spreadsheet functions start with an equal sign (=) and have one or more arguments (parameters) that define a specific way in which the function will work. Let us look at the function structure to determine the maximum value in a range:

$$= \text{MAX} (\text{A1:A9})$$

*function name*     *argument*

This function requires only one argument (the range) to do its job.

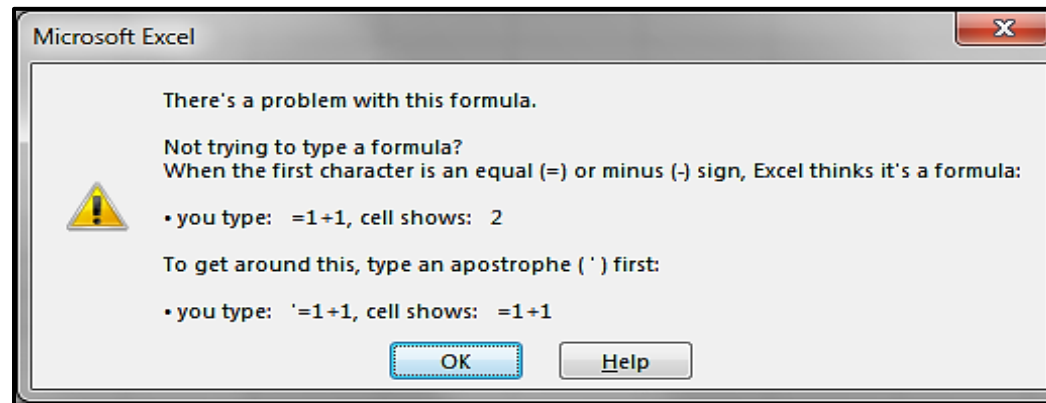
More complex functions require more than one parameter, like the simple IF function in the example below, which displays "Yes" if a cell value is more than 17, and "No" in all other cases:

$$= \text{IF} (\text{A1} > 17, \text{"Yes"}, \text{"No"})$$

*argument 1*     *argument 2*     *argument 3*

This function requires three arguments to work: condition, value if the condition is true, value if the condition is false. The arguments are separated from one another with a comma.

You can try using a semicolon if your computer is refusing to accept your formula with the error message below:



When a spreadsheet accepts a formula but fails to display the value correctly, a cell will display an error value (indicator) starting with “#”.

- Head over to <https://blog.hubspot.com/marketing/common-excel-error-messages> and using the information in the article, complete the “Explanation” and “How to fix” columns for the error indicators in the following table:

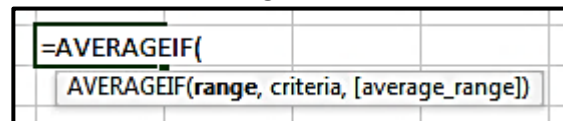
Error	Explanation	How to fix
#####		
#NAME!		
#DIV/0!		
#REF!		
#VALUE!		
#NUM!		
#NULL!		

- Complete the “What it does”, “Number of arguments” and “Explanation of arguments” columns for each function (you are supposed to know them from Grades 10 and 11):

Function	What it does	Number of arguments	Explanation of arguments
SUM			
AVERAGE			
COUNT			
MIN			
MAX			
TODAY			
RAND			
MODE			
MEAN			
COUNTIF			
ROUND			
SMALL			
LARGE			
COUNTA			
COUNTBLANK			

Function	What it does	Number of arguments	Explanation of arguments
SUMIF			
POWER			
RAND			
IF			

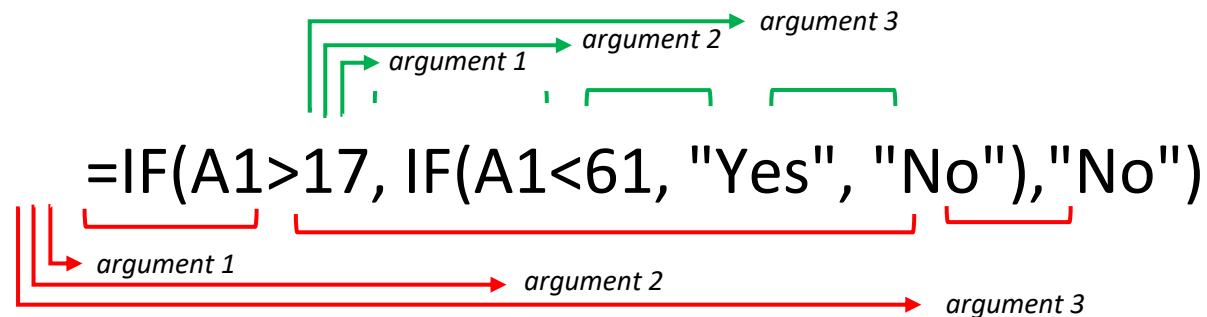
**TIP:** Open a new spreadsheet and start typing each function in a cell to see a HINT about the purpose of the function, the number of arguments and what they mean. You will see something like this:



### Activity 2

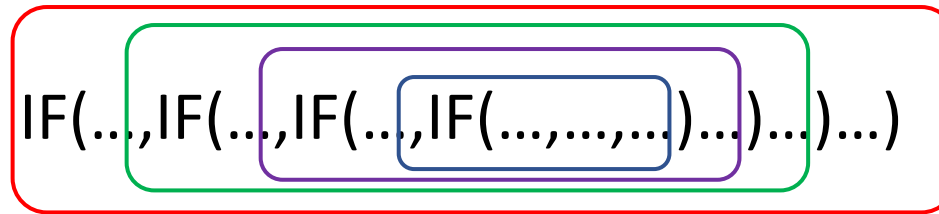
Having looked at the simple IF function in Activity 1, you know how it works. Usually, a simple IF needs only one condition as the first argument, but there are problems you might be asked to solve that will require the use of more than one condition. That is where the Nested IF comes to the rescue.

What if you want the result of your formula to display as “Yes” if a cell value is more than 17 *and* less than 61 at the same time? Let us insert another IF *inside* an existing simple IF function:



Pay special attention to the changes that were necessary to the original function in order to make it a Nested IF, and follow what is going on:

- The new IF function that introduced an additional condition (A1<61) takes the place of argument 2 of the original IF function (display “Yes” if A1 is more than 17)
- The new IF function has only THREE arguments needed to make it work (like any simple IF function).
- The original IF function still has only THREE arguments needed to make it work (like any simple IF function).
- The original IF function kept the last parameter (display “No” if A1 is not more than 17); if we dropped that and ended the formula in “))”, “FALSE” would be displayed for values of 17 or less.
- For every opening bracket “(“ there is a matching closing bracket “)” with each IF function introducing a new pair. In the end, the idea of nesting works similar to HTML where the tags are placed within other pairs of tags, like the rings of an onion; so, if you wanted to nest four IFs in one formula, the pattern of brackets would look like this:



Based on what you learned about the Nested IF, do the following (you do not necessarily need to use a computer for some of the questions):

- Explain why a Nested IF function would display “FALSE” instead of the value you wanted to see, e.g. “No”.
- Identify TWO mistakes in the following Nested IF function: =IF(A1>=18, IF(A1<=60, "Yes", "No")
- Explain the difference between the conditions A1>=18 and A1>17.
- How many opening and closing brackets in total would you expect in a Nested IF formula that consists of six IF statements? Motivate.
- Do the following questions on Nested IFs from the resource at <https://bit.ly/cat2020t2w2>:  
1 Prac booklet → 2. Spreadsheet (Goosen, 2020):
  - 4.4 on page 8
  - 3.7 on page 12

### Activity 3

After you mastered the formidable Nested IF, it is hard to believe that there are ways to solve the same problems in a more elegant or scalable way.

Similar to the Nested IF, the VLOOKUP function displays a value based on the result of multiple conditions. The difference, however, is that neither these conditions nor the possible output values are part of the formula directly. Instead, they are stored in a separate table, called the lookup table or table array.

Using the VLOOKUP function, let us try to achieve the same as the already known to you Nested IF formula =IF(A1>17, IF(A1<61, "Yes", "No"), "No") from Activity 2:

*\$ (absolute reference) fixes the lookup table in place so that it won't "slide down" when the formula is copied down*

*argument 1: value to check*

*argument 2: lookup table*

*argument 3: column number with values to display, e.g. column A is column 1, and B is 2.*

*argument 4: TRUE for range, e.g. from 18 to 60; or FALSE for exact match, e.g. guns – war, flowers – peace.*

**=VLOOKUP(A1, Sheet2!\$A\$1:\$B\$3, 2, TRUE)**

	A	B
1	-999	No
2	18	Yes
3	61	No
4		

- After reading the information and watching the video at <https://exceljet.net/lessons/why-vlookup-is-better-than-nested-ifs>, can you motivate why a Nested IF formula with six IF statements should rather be re-written using a VLOOKUP function?
- Why is does the value -999 appear in A1?
- Why is using -999 in the table array less elegant than the condition from the Nested IF in Activity 2?

- Do THREE (or more) of the following questions on VLOOKUP from the resource at <https://bit.ly/cat2020t2w2>:  
1 Prac booklet → 2. Spreadsheet (Goosen, 2020):

- 4.2 on page 2
- 4.3 on page 4
- 4.3 on page 7
- 4.5 on page 11
- 3.9 on page 12
- 3.3 on page 14
- 4.2 on page 20
- 4.3 on page 23
- 4.4 on page 26

#### Activity 4

You may remember that the function ROUND is changing the actual value in the cell (unlike just formatting the cell) in line with the basic maths rule where the digits 1 to 4 in the final position become 0, and 5 to 9 become 0 while incrementing the digit to the left by 1 at the same time.

There are situations where you do not want to follow that rule, and that is where the functions ROUNDUP and ROUNDDOWN come in handy.

The following table explains what is happening for each of these functions:

	A	B	C
1	<b>Unrounded value</b>	<b>Rounded value</b>	<b>Function</b>
2	3.5	4	=ROUND(A2,0)
3	3.5	4	=ROUNDUP(A3,0)
4	3.5	3	=ROUNDDOWN(A4,0)
5	3.4	3	=ROUND(A6,0)
6	3.4	4	=ROUNDUP(A7,0)
7	3.4	3	=ROUNDDOWN(A8,0)

- What is the difference between the ROUNDUP and ROUNDDOWN functions?
- Do the following questions on rounding from the resource at <https://bit.ly/cat2020t2w2>:  
1 Prac booklet → 2. Spreadsheet (Goosen, 2020):
  - 3.5 on page 9
  - 4.6.1 on page 18
  - 3.4 on page 25

### Activity 5

You must know the COUNT and SUM functions from Grade 10. What if you wanted to count or add up only the values that meet a specific condition? In Grade 11 you further revised the COUNTIF and learned about SUMIF that help you do just that. Finally, what if you needed to count or add up the values based on many conditions? It is exactly when you would use COUNTIFS and SUMIFS.

Besides the fact that these two functions allow for more arguments, the order of the arguments for each condition is swapped, compared to the functions without the “s” at the end. The example below illustrates what is happening for each of the mentioned functions:

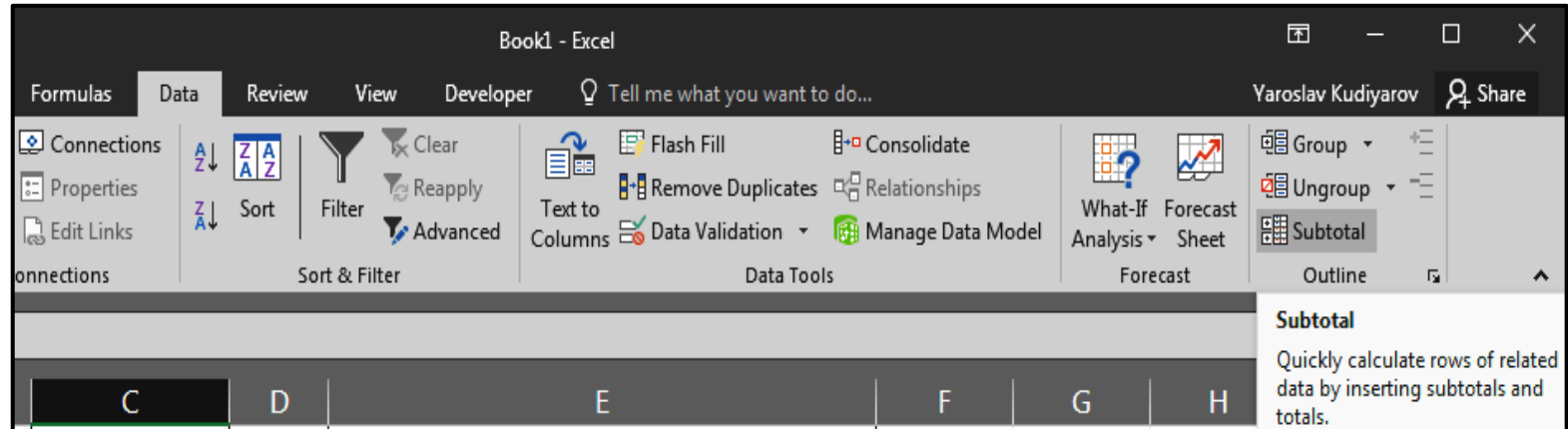
	A	B	C	D	E
		<b>Criteria values set 1</b>	<b>Criteria values set 2</b>	<b>Result</b>	<b>Function</b>
1	Values in range				
2	1	2	Yes	6	=COUNT(A2:A7)
3	1	5	No	12	=SUM(A2:A7)
4	2	5	Yes	4	=COUNTIF(A2:A7,">1")
5	2	7	Yes	8	=SUMIF(B2:B7,">5",A2:A7)
6	3	7	No	2	=COUNTIFS(B2:B7,">2",B2:B7,"<7")
7	3	7	Yes	5	=SUMIFS(A2:A7,B2:B7,">5",C2:C7,"Yes")

- Go to <https://exceljet.net/excel-functions/excel-countifs-function> and <https://exceljet.net/excel-functions/excel-sumifs-function> to see more examples and have a deep dive into COUNTIFS and SUMIFS, if your time allows.
- Do the following questions on COUNTIFS and SUMIFS from the resource at <https://bit.ly/cat2020t2w2>:  
1 Prac booklet → 2. Spreadsheet (Goosen, 2020):
  - 3.3 on page 22
  - 3.5 on page 25

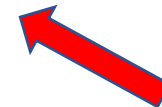


### Activity 6

Instead of manually inserting the functions to calculate the totals for related (grouped) records/data, you can achieve an effect somewhat similar to MS Access database reports by using the Excel's subtotal feature:



- Watch the video at <https://www.youtube.com/watch?v=qBpjECxY2io> to get the feel for how the SUBTOTAL function and the subtotal *feature* work.
- Why do we need the subtotal feature, if we already have the SUBTOTAL function?
- Do the following consolidation question from the resource at <https://bit.ly/cat2020t2w2>:
  - 1 Prac booklet → 2. Spreadsheet (Goosen, 2020):
    - 3.9 on page 28



### Activity 7

In order to display date-and-time-related values correctly, the cell formatting is formatted as Short Date, Long Date, Time or Custom. The value behind a cell formatted in this way is a number of days since 1900-01-01. (Exceljet: Work faster in Excel, n.d.)

To read more on why arithmetic operations with dates are possible, go to <https://exceljet.net/glossary/excel-date>.

- Complete the “What it does”, “Number of arguments” and “Explanation of arguments” columns for each function you are supposed to know for your examination:

Function	What it does	Number of arguments	Explanation of arguments
YEAR			
MONTH			
DAY			
DAYS			
HOUR			
MINUTE			
SECOND			
TIME			
TODAY			
NOW			

**TIP:** Like in Activity 1, open a new spreadsheet and start typing each function in a cell to see a HINT about the purpose of the function, the number of arguments and what they mean. If the tooltips are not clear, do a search for the functions on <https://exceljet.net>.

- Finally, see how date and time questions may be asked in a real NSC paper and do the following from the resource at <https://bit.ly/cat2020t2w2>:  
1 Prac booklet → 2. Spreadsheet (Goosen, 2020):
  - 3.6 on page 1
  - 4.2 on page 10
  - 4.2 on page 15
  - 4.1 on page 20
  - 3.2 on page 3
  - 3.3 on page 11
  - 4.5 on page 18
  - 3.7 on page 25

**CONSOLIDATION**

In this lesson you learned how to use variations of functions you had mastered in Grade 11 as well as more complex conditional, lookup and subtotal functions and features. After this lesson, you must also be able to demonstrate your new skills in performing date and time calculations in an NSC CAT practical paper.

**NOTE:** The questions given with the activities above are used for consolidation purposes.

<b>VALUES</b>	Self-fulfilment, and meaningful participation in society as citizens of a free country. (Where spreadsheet automation skills are an enabling factor in being a productive member of society.)
<b>RESOURCES / E- RESOURCES</b>	Excel Campus. (2020, July 02). <i>How to use the Subtotal Feature and the SUBTOTAL Function in Excel</i> . Retrieved from Youtube.com: <a href="https://www.youtube.com/watch?v=qBpjECxY2io">https://www.youtube.com/watch?v=qBpjECxY2io</a> <i>Exceljet: Work faster in Excel</i> . (n.d.). Retrieved from Exceljet.net: <a href="https://exceljet.net/">https://exceljet.net/</a> Goosen, E. (2020). <i>VRAESTELBOEKIES</i> . Retrieved from <a href="https://bit.ly/cat2020t2w2">https://bit.ly/cat2020t2w2</a> Volovich, K. (n.d.). <i>Excel Error Messages You're Sick of Seeing (And How to Fix Them)</i> . Retrieved from Hubspot.com: <a href="https://blog.hubspot.com/marketing/common-excel-error-messages">https://blog.hubspot.com/marketing/common-excel-error-messages</a>