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Excel
Further Functions

Course objectives:

- Understand and use different functions effectively
- Text Functions
- Date and Time Functions
- Math and Trig Functions
- Lookup and Reference Functions
- Logical Functions
- Statistical Functions

Student and Staff Training and Support

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Exercise document:

Go to https://www.library.uq.edu.au/library-services/training-resources and click on Excel_Further_Functions.xlsx to download.


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Text Functions

Text functions are used when working with cells containing text strings. Some of the many functions available can…change text case, compare cells containing text strings and even split or concatenate (join) text strings.

Exercise 1.	*"PROPER" Function*

This function is used to convert the case of text strings e.g. lower case to Proper Case. Other functions in this class are Lower and Upper. The proper function capitalises the first letter of each word in the selected text.
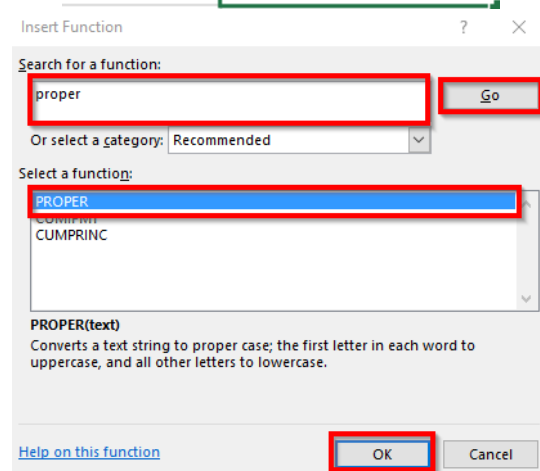
1. Open the **Excel2016_Further_Functions** file and open the **Exams** sheet
2. Select cell **C1**
3. Click on the **Home** tab > **Cells** group
4. Click the dropdown arrow under **Insert**
5. Select **Insert Sheet Columns**

This inserts a new blank column - **C**

6. Select cell **C2**
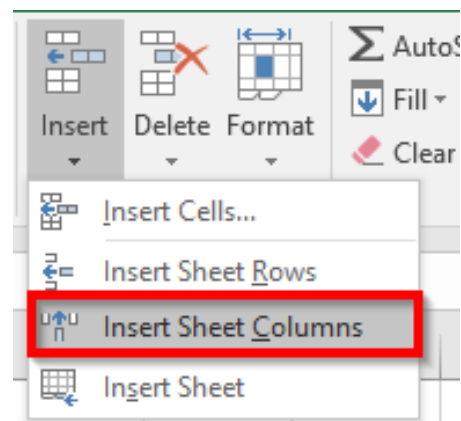
7. Click on **Insert Function** icon to bring up the dialogue box
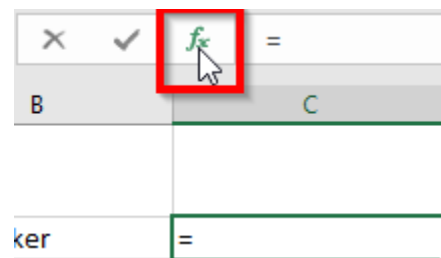
8. In the **Select a Function** area click on **PROPER**

If the function is not in the function list, type the name or description in the **Search for a function** text area and click **Go**

9. Click on **OK** to bring up the function arguments dialogue box.

PROPER(text)
Converts a text string to proper case; the first letter in each word to uppercase, and all other letters to lowercase.

Help on this function

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10. Place your cursor is in the **Text** textbox
11. Click on cell **B2**
12. Click **OK**

"**bruce jones baker**" should now appear as "**Bruce Jones Baker**"

13. Autofill down to change the remaining names to **Proper** case

14. Select cells **C2** to **C62**
15. Select the **Home** tab > **Clipboard** group > **Copy**
    or
    CTRL + C on the keyboard
16. Select cell **B2**
17. Click on the dropdown arrow under **Paste**
18. In the **Paste Values** section click on **Values**
19. Delete the contents from column **C**

Other functions in this class

Upper - Converts all characters in a supplied text string to upper case

Lower - Converts all characters in a supplied text string to lower case

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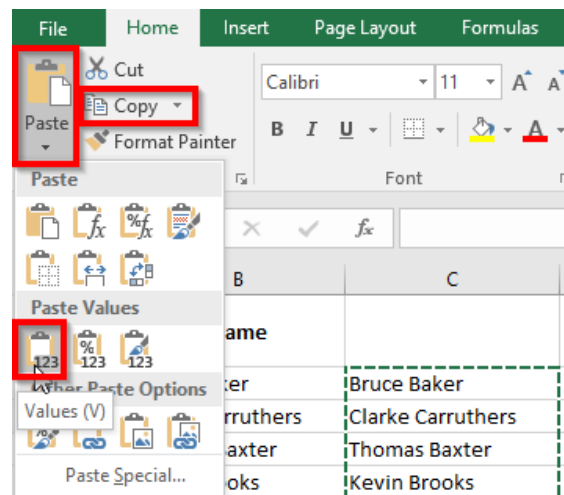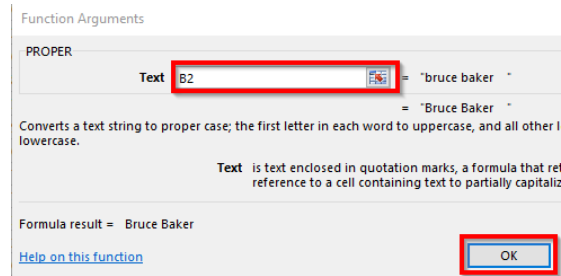
Exercise 2.   *"EXACT" Function*

This function tests if two supplied text strings are exactly the same (Cell to cell comparison). This exercise checks to determine if the list of student names in the Fees worksheet is the same as the list of student names in the Exams worksheet

1. Open the **Exams** sheet
2. Select cell **C2**
3. Click on **Insert Function** icon to bring up the dialogue box

4. In the **Select a Function** area click on **EXACT**

If the function is not in the function list, type the name or description in the **Search for a function** text area and click **Go**

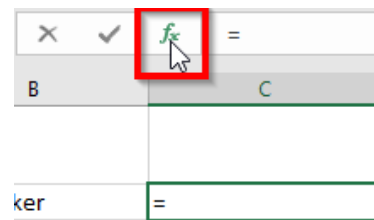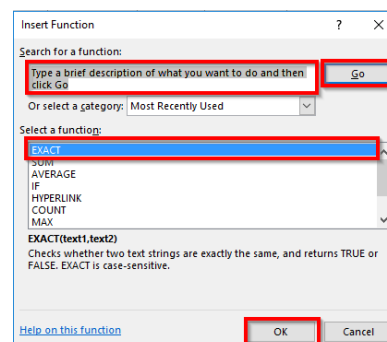5. Click on **OK** to bring up the function arguments dialogue box.

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6. Ensure your cursor is in the **Text1** textbox
7. Click on cell **B2**
8. Place your cursor is in the **Text2** textbox
9. Select the **Fees** tab
10. Click on cell **C2**
11. Click **OK**
12. Cell **C2** of the Exams sheet should now display either:
    - **TRUE** – An exact match exists between the text in the two cells
    - **FALSE** – The text in the two cells do not match exactly
13. Autofill cell **C2** down for the remaining students

Note: The first 3 rows returned false. This shows that although text may look the similar, they may not necessarily be exact. There may be trailing spaces and other non-printing characters that may not be visible.
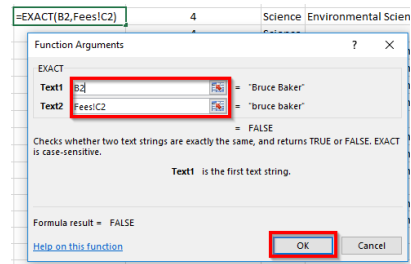
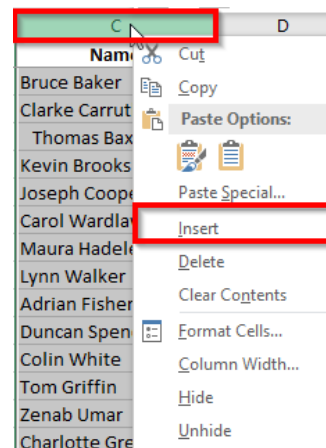| Name	
Bruce Baker	FALSE
Clarke Carruthers	FALSE
Thomas Baxter	FALSE
Kevin Brooks	TRUE
Joseph Cooper	TRUE
Carol Wardlaw	TRUE
Maura Hadeley	TRUE
Lynn Walker	TRUE
Adrian Fisher	TRUE
Duncan Spencer	
Colin White	

Exercise 3.   *"TRIM" Function*

This function removes additional spaces (leading, middle, trailing) from text.

1. Open the **Fees** sheet
2. Move your mouse cursor over the column **C** label
3. **Right click** > **Insert**

This inserts a new blank column **C**

4. Select cell **C2**
5. Click on Insert Function icon to bring up the dialogue box
6. In the **Select a Function** area click on **Trim**

If the function is not in the function list, type the name or description in the **Search for a function** text area and click **Go**

7. Click on **OK** to bring up the function arguments dialogue box.

8. Ensure your cursor is in the **Text** textbox
9. Click on cell **D2**
10. Click **OK**
11. Autofill down to trim the remaining names

12. Select cells **C2** to **C62**
13. Select the **Home** tab > **Clipboard** group > **Copy**
14. Select cell **D2**
15. Click on the dropdown arrow under **Paste**
16. In the **Paste Values** section click on **Values**
17. Right Click column C heading and Delete column **C** from the Fees sheet

NB: The exact function on the Exams sheet should now be true for all names.

Other functions in this class:

Clean - Removes all non-printable characters from a supplied text string. Spaces are not removed.
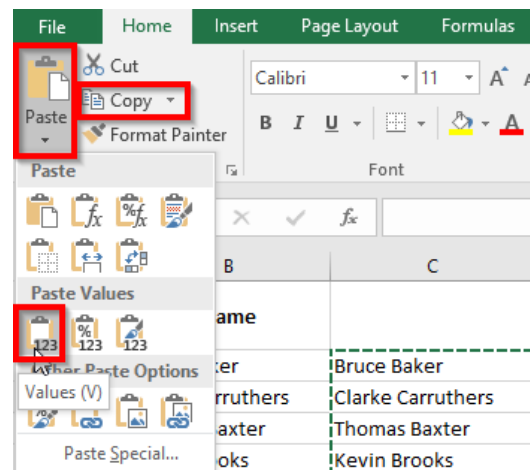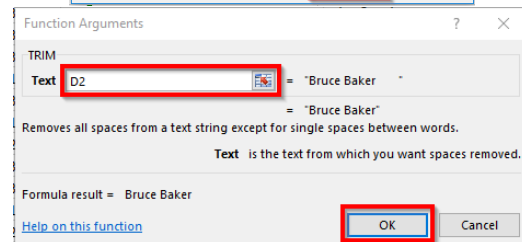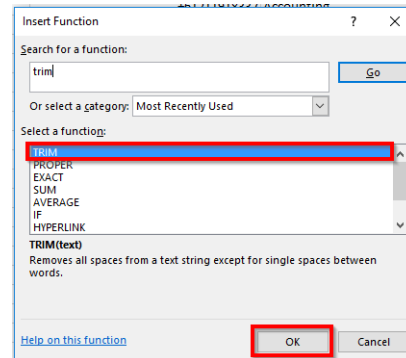
| Exercise 4. | *"CONCATENATE" and "RIGHT" Functions* |

Concatenate is a function used to join two or more text strings together. The **Right** function returns a specified number of characters from the end of a supplied text string. This exercise will remove the country code from students' mobile number and replace it with a zero.

Remove +61 from phone numbers

1. Open the **Fees** sheet
2. Insert a blank column before column **I** and label it **Mobile Number**
3. Select cell **I2**
4. Click on Insert Function icon to bring up the dialogue box
5. Search for the function **Right**
6. Click **Go**
7. In the **Select a Function** area click
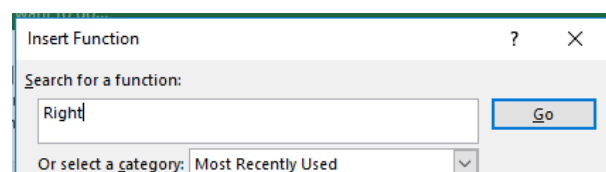
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on **Right**

8. Click on **OK** to bring up the function arguments dialogue box.
9. Ensure your cursor is in the **Text** textbox
10. Click on cell **J2**
11. In the **Num_chars** text box type **9**
12. Click **OK**

You are now left with the phone number which is missing a **Zero (0)**

Add a leading Zero to all numbers

13. Select cell **I2** and modify your formula as follows:
=CONCATENATE(0, RIGHT(J2,9))

Autofill down for the remaining numbers

14. Select cells **I2** to **I62**
15. Select the **Home** tab > **Clipboard** group > **Copy**
16. Select cell **I2**
17. Click on the dropdown arrow under **Paste**
18. In the **Paste Values** section click on **Values**
19. Delete column **J** (Phone Number)

Other functions in this class:

Left - returns a specified number of characters from the beginning of a supplied text string

Mid - returns a specified number of characters from the middle of a supplied text string

Rept – returns a string consisting of a supplied text string, repeated a specified number of times
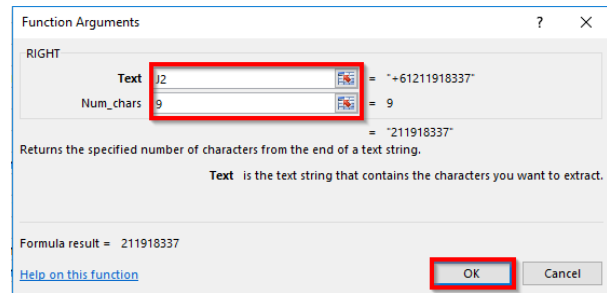
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Exercise 5.   *Flash Fill*

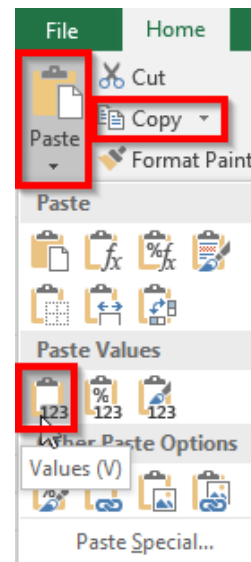This function gives the ability to create new data sets from existing data based on patterns. It can be used to extract, insert, format, concatenate, reverse, etc., different types of data. This exercise will separate student names into **first** and **last** names.

1. Open the **Exams** sheet
2. Delete Column **C**
3. Insert two blank columns before column **B** and label them it **Firstname** and **Lastname**
4. Select cell **B2,** type **Bruce** and press **Enter**
5. Select the **Data** tab > **Data Tools** group > **Flash Fill**
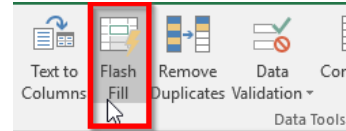
Alternatively, you can use the keyboard shortcut
Control + E
The first names of all students will be automatically populated

1. Select cell **C2** and type **Jones Baker**
2. Select cell **C3** and type in **Carruthers**
3. Select the **Data** tab > **Data Tools** group > **Flash Fill**
4. Delete column **D** (Name)

NB: The last name had to be entered twice to provide an example of each type of surname. This enabled excel to know that some students had two surnames whiles others had one.

App No	Firstname	Lastname	Name
1	Bruce		bruce jones baker
2	Clarke		clarke carruthers
3	Thomas		thomas baxter
4	Kevin		kevin brooks
5	Joseph		joseph cooper
6	Carol		carol james wardlaw
7	Maura		maura hadeley
8	Lynn		lynn walker
9	Adrian		adrian fisher
10	Duncan		duncan spencer
11	Colin		colin white

Firstname	Lastname
Bruce	Jones Baker
Clarke	Carruthers
Thomas	Baxter
Kevin	Brooks
Joseph	Cooper
Carol	James Wardlaw
Maura	Hadeley
Lynn	Walker
Adrian	Fisher
Duncan	Spencer
Colin	White

Date and Time Functions

Exercise 6.   *Exact Date calculations*

The DATEDIF function calculates the number of days, months, or years between two dates. The formula has the syntax **DATEDIF(start_date,end_date,unit)**.
Unit refers to the type of information to be returned. The following units are used in this function.

Y   -   The number of complete years in the period.
M   -   The number of complete months in the period.
D   -   The number of days in the period
MD   -   The difference between the days in start_date and end_date. The months and the years of the dates are ignored
YM   -   The difference between the months in start_date and end_date. The days and the years of the dates are ignored
YD   -   The difference between the days of start_date and end_date. The years of the dates are ignored

In the following exercise the **Today()** function (gives the current date) is being used as the end date criteria. The **&** symbol is used to join/concatenate the result(s) and text.

Notes

Calculate the exact age of the students
1. Select the **Fees** worksheet
2. Select cell **F2**
3. Start the formula by typing
   =DATEDIF(D2,TODAY(),"Y")&" Years, "
4. Press **Enter**

`=DATEDIF(D2,TODAY(),"y")&" years, "`

This calculates the number of complete years and
adds the word years.
5. Click on cell **F2.** The formula will appear in the formula bar
6. Add the following to your formula   **&DATEDIF(D2,TODAY(),"YM")&" Months, "**
7. Press **Enter**
8. This calculates the number of complete years and months.

`=DATEDIF(D2,TODAY(),"y")&" years, "&DATEDIF(D2,TODAY(),"YM")&" Months"`

9. Click on cell **F2.** The formula will appear in the formula bar
10. Add the following to your formula **&DATEDIF(D2,TODAY(),"MD")&" Days "**
11. Press **Enter**
12. This calculates the number of complete years, months and days.
13. Fill down the calculation for the other students

`=DATEDIF(D2,TODAY(),"y")&" years, "&DATEDIF(D2,TODAY(),"YM")&" Months, "&DATEDIF(D2,TODAY(),"md")&" Days"`

Math and Trig Functions
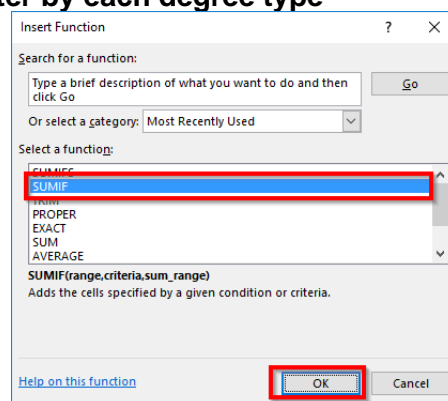
Exercise 7.	*"SUMIF" Function*

The SUMIF function adds data in the cells in a supplied range that satisfy a single criterion

Calculate the amount of fees paid per semester by each degree type
1. Open the **Fees** sheet and select cell **L66**
2. Click on Insert Function icon to bring up the dialogue box
3. In the **Select a Function** area click on **SUMIF**

If the function is not in the function list, type the name or description in the **Search for a function** text area and click **Go**
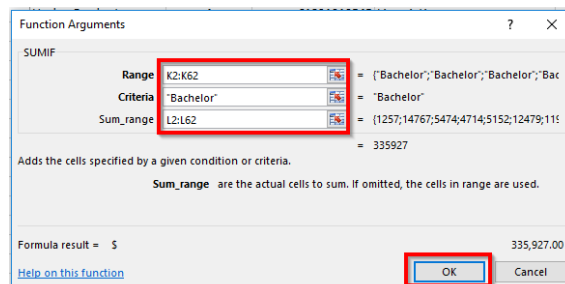
4. Click on **OK** to bring up the function arguments dialogue box.

5. Type in the following arguments:
   - **Range**: $K$2:$K$62
   - **Criteria**: Bachelor
   - **Sum_range**: L2:L62
6. Click on **OK**
7. Autofill to the right to get the values for the other semesters

NB: Use absolute referencing to lock the criteria range before applying Autofill
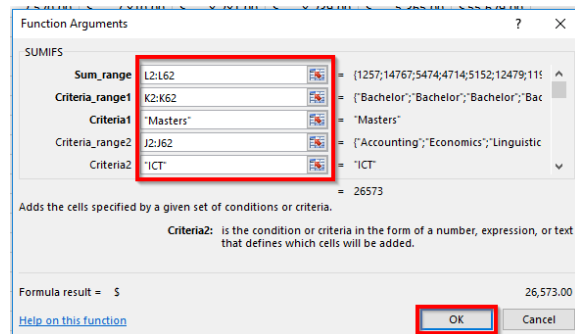
Notes

Other functions in this class:
Averageif – Gives the average of cells in a supplied
range that satisfy a given criterion

Exercise 8.	*"SUMIFS" Function*

The SUMIFS function adds data in the cells in a supplied range,that satisfy multiple criteria.

Calculate the amount of fees paid per semester by Masters students in ICT

1. Open the **Fees** sheet and select cell **L67**
2. Click on the **Insert Function** icon to bring up the dialogue box
3. In the **Select a Function** area click on **SUMIFS** > **OK**
4. Type in the following arguments:
   - **Sum_range**: L2:L62
   - **Criteria_range1**: $K$2:$K$62
   - **Criteria1**: Masters
   - **Criteria_range2**: $J$2:$J$62
   - **Criteria2**: ICT
5. Click on **OK**
6. Autofill to the right to get the values for the other semesters

NB: Use absolute referencing to lock the criteria ranges before applying Autofill

Total Fees - Bachelor	$ 335,927.00	$ 314,658.00	$ 276,081.00
Total Fees - Masters in ICT	$ 26,573.00	$ 27,812.00	$ 16,978.00

Other functions in this class:
Averageifs – Gives the average of cells in a supplied
range that satisfy multiple criteria

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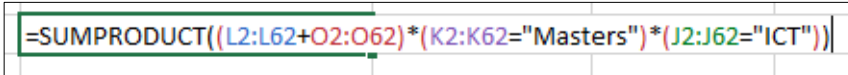
Exercise 9.   *"SUMPRODUCT" Function*

The SUMIFS function has the limitation of being unable to sum multiple ranges for the selected criteria. The Sumproduct function can be used to overcome this. Sumproduct returns the sum of the products of corresponding values in two or more supplied arrays

Calculate the amount of fees paid for sem 1 and sem 4 by Masters students in ICT
1. Open the **Fees** sheet and select cell **L71**
2. Enter the following formula…

=SUMPRODUCT((L2:L62+O2:O62)*(K2:K62="Masters")*(J2:J62="ICT"))

3. Press **Enter**

The function computes the total amount of fees paid by ICT Masters students for Semesters 1 and 4. This saves having to do multiple calculations to achieve the same result.

Lookup and Reference Functions

Exercise 10.   *Dropdown Lists*

Typing existing data into formulas can result in errors. For example, having trailing spaces after a value can cause an error in the evaluation of a formula. Predefined dropdown lists in excel can be used to avoid unnecessary data entry.
1. Open the **Fees** sheet and select cell **L73**
2. Select the **Data** tab > **Data tools** group > **Data Validation**
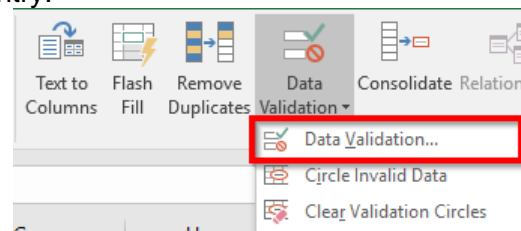
3. On the **Data Validation** dialogue box select the **Settings** tab
4. From the dropdown list under **Allow**, select **List**
5. Tick **Ignore blank** and **In-cell dropdown**
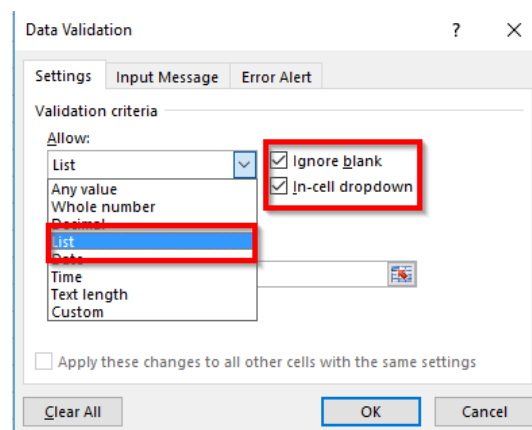
6. Click in the **Source** data field and select cells C2 to C62

Alternatively, you can enter: =$C$2:$C$62 into the source field

7. Click **OK**

A dropdown list of student names is now created in cell **L73**.
Updating the list of students automatically updates the list dropdown list.

8. Select cell **L74**
9. **Repeat** this **exercise** using cells **=$L$1:$T$1** as the **Source** data.
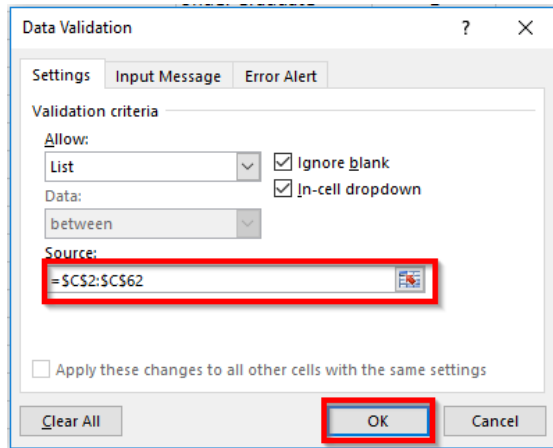
Exercise 11.	*"MATCH" Function*

The MATCH function finds the relative position of a value in a supplied list or array. The value of the MATCH function is not very obvious when used on its own. It is however a very useful function when combined with other functions.

Determine the position of Kevin Brooks
1. Open the **Fees** sheet and select cell **L73**
2. Choose **Kevin Brooks** from the dropdown list
3. Select cell **L77**
4. Click on Insert Function icon to bring up the dialogue box
5. In the **Select a Function** area click on **MATCH**
6. Click on **OK** to bring up the function arguments dialogue box.
7. Type in the following arguments:
   - **Lookup_value**: L73
   - **Lookup_array**: C2:C62
   - **Match_type**: 0
8. Click on **OK**
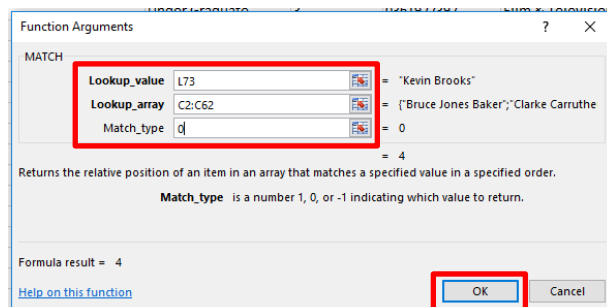
Match Types:
-1 : Greater than
 0 : Exact
 1 : Less than

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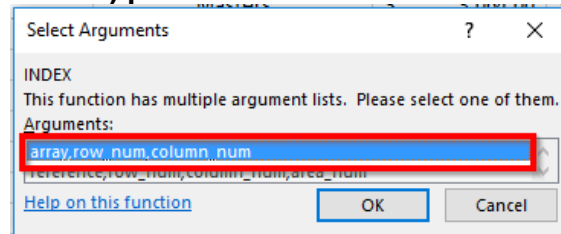- -

Exercise 12. *"INDEX" Function*

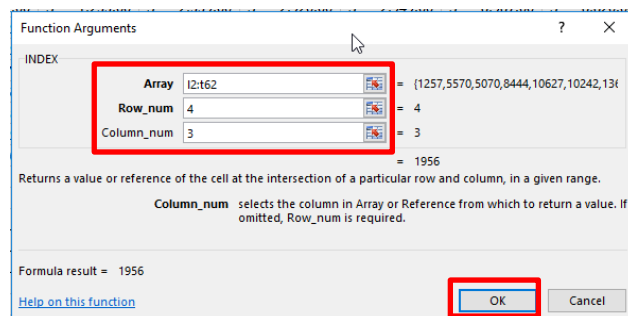The INDEX function returns the data in a cell (or range of cells) for given rows and columns.

Determine how much a student (e.g Kevin Brooks) paid in Sem 3

1. Open the **Fees** sheet and select cell **L78**
2. Click on Insert Function icon to bring up the dialogue box
3. In the **Select a Function** area click on **INDEX**

   If the function is not in the function list, type the name or description in the **Search for a function** text area and click **Go**

4. Click on **OK** to bring up the select arguments dialogue box.
5. Select **array,row_num,column_num**
6. Click **OK**
7. Type in the following arguments:
   - **Array**: L2:t62
   - **Row_num**: 4
   - **Column_num**: 3
8. Click on **OK**

The use of the INDEX function requires the user to know the row and column location of the data to be returned. This can be difficult, especially on large spreadsheets.

The solution to this problem is to use the function together with other functions such as the MATCH function, which automatically identifies the relative row and column of a value.

Exercise 13. *Combining the INDEX and MATCH Functions*

1. Open the **Fees** sheet and select cell **L75**
2. Enter the following formula

   `=index(l2:t62,match(l73,c2:c62,0),Match(l74,l1:t1,0))`

3. Press **Enter**

The MATCH functions will determine the relative positions of the values entered in cells **L73** and **L74**. The INDEX function will then use those positions to output the required data. In this example the result will be how much a particular student owes in a particular semester.

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Logical Functions

Exercise 14.	*"AND" Function*

The **AND** function compares a number of user-defined logical conditions and returns TRUE if **ALL** of the conditions evaluate to true, or FALSE if not. It is useful if you want to check if all values satisfy certain specified criteria. A total of 255 logical conditions can be tested.

Determine which students qualify for RHD candidature

1. Open the **Exams** sheet and select cell **K2**
2. Click on Insert Function icon to bring up the dialogue box
3. In the **Select a Function** area click on **AND**

   If the function is not in the function list, type the name or description in the **Search for a function** text area and click **Go**

4. Click on **OK** to bring up the function arguments dialogue box.

5. Type in the following arguments:
   - **Logical1**: H2="Research"
   - **Logical2**: J2>=6
6. Click on **OK**
7. Fill down to complete the data

The function will test whether the student is a research student and scored a GPA of 6 or more. If both conditions are satisfied the function will evaluate to TRUE, otherwise it will evaluate to FALSE.

Other functions in this class:

OR - Compares a number of user-defined logical conditions and returns TRUE if ANY of the conditions evaluate to true, or FALSE if not.

Notes

Microsoft Excel: Further Functions

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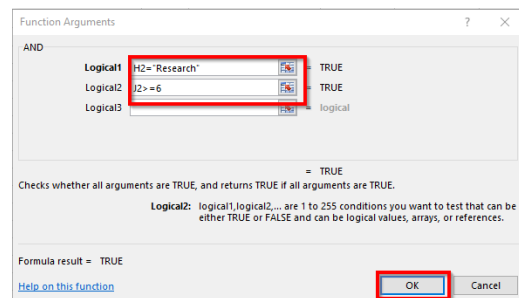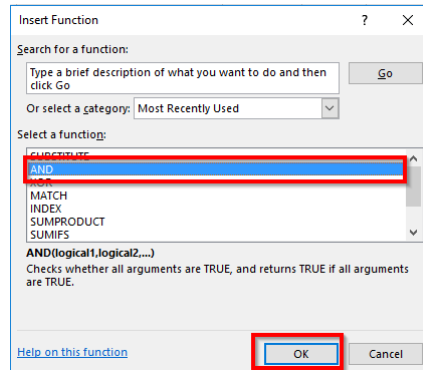
Exercise 15.   *Combining "IF" and "AND" Functions*

The result of an **AND** or **OR** function can be combined with other functions to provide more meaningful results. For example, instead of displaying TRUE/FALSE, explanatory feedback can be provided if you combine the **And** and **IF** functions.

1. Open the **Exams** sheet and select cell **K2**
2. Modify the existing formula to the following:

`=IF(AND(H2="Research",J2>=6),"Qualified","Not Qualified")`

3. Press **Enter**

The formula uses the result of the AND function as the logical test for the IF statement and returns a value of Qualified if TRUE and a value of Not Qualified if FALSE.

4. Fill down to complete the data

Statistical Functions

Exercise 16.   *"COUNTBLANK" Function*

The COUNTBLANK function returns the number of blank cells in a supplied range of cells. It is useful in large spreadsheets with missing values.

Count the number of students with "Field of Study" not provided

1. Open the **Exams** sheet and select cell **O66**
2. Click on Insert Function icon to bring up the dialogue box
3. In the **Select a Function** area click on **COUNTBLANK**

If the function is not in the function list, type the name or description in the **Search for a function** text area and click **Go**

4. Click on **OK** to bring up the function arguments dialogue box.

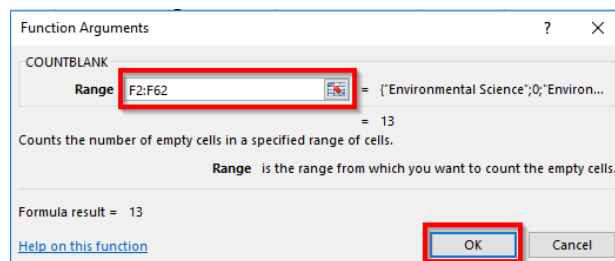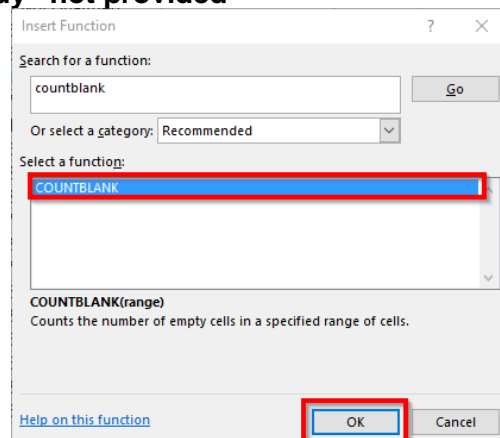5. Type in the following argument:
   Range: F2:F62
6. Click on **OK**
7. The number of blank cells will be displayed

Other functions in this class:
COUNTA – Gives the number of non-blank cells in a supplied range of cells.
COUNT – Gives the number of numerical values in a supplied range of cells

Notes

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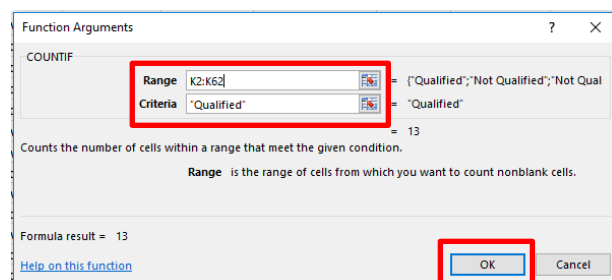
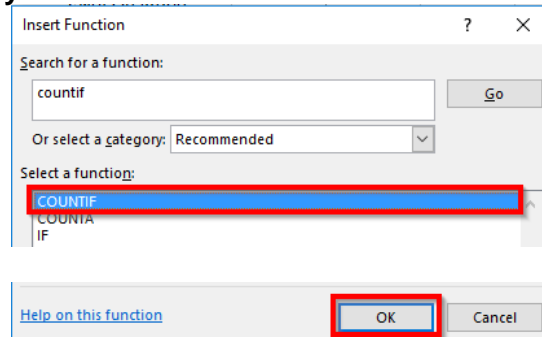## Exercise 17. *"COUNTIF" Function*

The COUNTIF function returns the number of cells in a range, that satisfy a given criterion.

Count the number of students who qualify for RHD candidature

1. Open the **Exams** sheet and select cell **O67**
2. Click on Insert Function icon to bring up the dialogue box
3. In the **Select a Function** area click on **COUNTIF**

If the function is not in the function list, type the name or description in the **Search for a function** text area and click **Go**

4. Click on **OK** to bring up the function arguments dialogue box.
5. Type in the following arguments:
   - **Range**: K2:K62
   - **Criteria**: Qualified
6. Click on **OK**
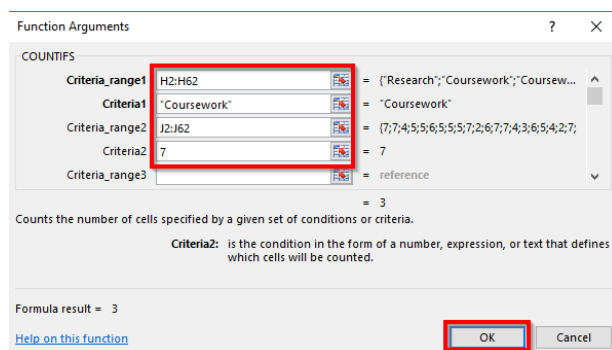7. The number of qualified students will be displayed

Exercise 18. *"COUNTIFS" Function*

The COUNTIFS function returns the number of cells in a range, that satisfy a set of given criteria.

Count the number of coursework students who scored a GPA of 7

1. Open the **Exams** sheet and select cell **O68**
2. Click on the **Insert Function** icon to bring up the dialogue box
3. In the **Select a Function** area click on **COUNTIFS** then **OK**
4. Type in the following arguments:
   - **Criteria_range1**: H2:H62
   - **Criteria1**: Coursework
   - **Criteria_range2**: J2:J62
   - **Criteria2**: 7
5. Click on **OK**
6. The number of students who satisfy the criteria will be displayed

Notes