|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | | | | |
|  | | | | |
|  | | | | |
| Excel 2016  Processing Data | | | | |
|  | | | | |
|  | Course objectives:   1. Use conditional formatting effectively 2. Use IF and VLOOKUP functions for data analysis 3. Use PivotTables for flexible data presentation 4. Use Sort and filter effectively | |  | |
|  | | | | |
|  | | | | |
|  | | | | |
| Student Training and Support | | | | |
| Phone: | | (07) 334 64312 | |
| Email: | | askus@library.uq.edu.au | |
| Web: | | https://web.library.uq.edu.au/library-services/training/ | |
| Service Points | | | | |
| St Lucia: | | Main desk of the SSAH, ARMUS and DHESL libraries | |
| Hospitals: | | Main desk of the PACE, Herston and Mater libraries | |
| Gatton: | | Level 2, UQ Gatton Library | |
|  | | | | |
| Staff Training (Bookings) | | | | |
| Phone | | (07) 3365 2666 | |
| Email | | staffdev@uq.edu.au | |
| Web | | http://www.uq.edu.au/staffdevelopment | |
|  | | | | |
| Staff may contact their trainer with enquiries and feedback related to training content. Please contact Staff Development for booking enquiries or your local I.T. support for general technical enquiries. | | | | |

***Table of Contents***

[Relative & Absolute Cell References 3](#_Toc485816934)

[Exercise 1. Relative cell references 3](#_Toc485816935)

[Exercise 2. Absolute cell references 3](#_Toc485816936)

[Date Calculations and Conditional Formatting 4](#_Toc485816937)

[Exercise 3. Date calculations 4](#_Toc485816938)

[Exercise 4. Apply conditional formatting 4](#_Toc485816939)

[Exercise 5. Apply conditional formatting to a whole row 5](#_Toc485816940)

[‘IF’ Function 6](#_Toc485816941)

[Exercise 6. Using ‘IF’ statements 6](#_Toc485816942)

[Exercise 7. Practice Exercise Basic IF Statements 6](#_Toc485816943)

[VLookup Function 7](#_Toc485816944)

[Exercise 8. Using V lookup 7](#_Toc485816945)

[Exercise 9. Practice Exercise Vlookup 8](#_Toc485816946)

[Pivot Table 8](#_Toc485816947)

[Exercise 10. Create a pivot table 8](#_Toc485816948)

[Exercise 11. Add data to PivotTable 10](#_Toc485816949)

[Exercise 12. Edit PivotTable 10](#_Toc485816950)

[Pivot Table Slicers 11](#_Toc485816951)

[Exercise 13. Practice Exercise Pivot Table Exercise 12](#_Toc485816952)

[Exercise 14. Create a PivotChart 13](#_Toc485816953)

[Extras Sorting & Filtering Lists 14](#_Toc485816954)

[Exercise 15. Sort by single criteria 14](#_Toc485816955)

[Exercise 16. Sort by multiple criteria 14](#_Toc485816956)

[Exercise 17. Filtering with AutoFilter 15](#_Toc485816957)

[Exercise 18. Progressive filtering 16](#_Toc485816958)

[Find Unique Values and Remove Duplicates 16](#_Toc485816959)

[Exercise 19. Find unique values 16](#_Toc485816960)

[Protection 17](#_Toc485816961)

[Exercise 20. Worksheet protection 17](#_Toc485816962)

[Exercise 21. Unprotected cells 18](#_Toc485816963)

[Goal Seek 19](#_Toc485816964)

[Exercise 22. Use ‘Goal Seek’ tool 19](#_Toc485816965)

[Naming Cells 20](#_Toc485816966)

[Exercise 23. Naming cells via ribbon 20](#_Toc485816967)

[Answers 20](#_Toc485816968)

**Exercise document:**

Go to <https://web.library.uq.edu.au/library-services/training/training-resources> and click Excel. Locate and click the **Manipulating Data.xlsx** link. Make sure you are on the **Relative and Absolute Reference** sheet when the workbook opens.

## Relative & Absolute Cell References

1. Relative cell references

**Calculate “% Paid”**

|  |  |
| --- | --- |
| 1. Select cell M2 2. Type in **=L2/K2** 3. Press Enter   **Note**: The numerator and denominator can also be inserted with a mouse click on the required cells. |  |
| 1. Select cell M2 2. Select the **% button** from the **Number** group on the **Home** tab 3. Set 2 decimal places by clicking the **“Increase Decimal”** button |  |
| 1. Use the **Autofill** tool to fill the remaining results in the column.   **Note**: this will also carry down the % formatting. |  |

1. Absolute cell references

**Absolute cell references** – This uses the exact address of a cell regardless of the position of the cell that contains the formula.

|  |  |  |
| --- | --- | --- |
| **Calculate % of Total Fees Paid**   1. Select cell **N2** 2. Type in **=L2/L28** 3. Click the **% button** 4. Click the **increase decimals** button 5. Use the AutoFill tool to fill the remaining results   **Note**: an error will display as Excel will use relative cell references by default. To correct this the dividing cell reference should be a fixed cell or an absolute reference | |  |
| 1. Edit formula in cell **N2** by double clicking. 2. Click in **L28** cell reference 3. Use the function key **F4** to change the formula to an absolute reference **=L2/$L$28** |  | |
| 1. Use **AutoFill** to calculate the remaining results |  | |

## Date Calculations and Conditional Formatting

1. Date calculations

**Display hidden data**

|  |  |
| --- | --- |
| 1. Select column **D** and column **F** 2. Right click on selection 3. Select **Unhide** |  |

**Calculate Age from Date of Birth**

**Note**: Subtracting a date of birth from the current date will display the number of days between the two dates. To find out the age in years, divide by 365.25 (the .25 allows for leap years).

|  |  |
| --- | --- |
| 1. Select cell **E2** 2. Type in formula ….  **=ROUNDDOWN((TODAY()-D2)/365.25,0)** 3. Press **Enter** 4. Use the **AutoFill** tool to calculate the remaining results. |  |
| **Note**: The Rounddown function has the following structure. =Rounddown(number,num\_digits). In the above formula the number portion is generated by the formula **(TODAY()-d2)/365.25.** The num\_digits portion is designated zero meaning all the values after the decimal round down to zero e.g. 28.96 becomes 28.00. | |

1. Apply conditional formatting

|  |  |  |
| --- | --- | --- |
| **Apply formats to students over 26 years**   1. Select range to be formatted:**E2:E27** 2. Select the **Conditional Formatting** button from the **Styles** group on the **Home** tab 3. Hover over **Highlight Cell Rules** 4. Select **Greater Than…** | |  |
| 1. Type in **26** 2. Adjust formats to suit 3. Click **OK** |  | |

1. Apply conditional formatting to a whole row

|  |  |
| --- | --- |
| **Apply formats to students over 26 years**   1. Select range to be formatted:**A2:N2** 2. Select the **Conditional Formatting** button from the **Styles** group on the **Home** tab 3. Select **New Rule…** |  |
| 1. Select “**Use a formula to determine which cells to format**” 2. Enter **=$E2>26**   **Note**: This makes the column reference an absolute reference which means the condition will always be based on the content of that column but on a range of rows   1. Click the **Format…** button 2. Apply formatting as required 3. Click **OK** 4. Click on **OK** |  |
| 1. Select **Manage Rules** |  |
| 1. Go to the Applies To field 2. Change the range to **$A$2:$N$27**   **Note:** This will ensure the conditional formatting criteria will apply to all rows in the defined range   1. Click on **OK** |  |

Data Analysis

Excel can analyse a specified range of data using a variety of tools and can subsequently display results calculated from a formula or from user specified options

## ‘IF’ Function

The **IF** function will analyse data and provide results defined by the user. The analysis returns either a true or false answer. The displayed results can be text or calculated values. **Average and Final Exam grades** will analyse exam results and provide a grade for students based on pre-defined criteria.

1. Using ‘IF’ statements

Go to the **If Statement** sheet

|  |  |
| --- | --- |
| 1. Select cell **D2** 2. Enter formula **=IF(C2>=B2,C2\*2%,0)** 3. Select cell **E2** 4. Enter formula **=IF(D2>=300,”Excellent”,”Poor”)** 5. **Copy** the answers down the columns |  |

1. Practice Exercise Basic IF Statements

Go to the **Basic If Exercise** sheet.

|  |
| --- |
| 1. **Follow the instructions** below the table 2. **Create** the Average (Overall Score) and IF (Final Grade) statements in their respective columns 3. **Copy** the answers down the columns |
|  |

See page 20 for the answer.

## VLookup Function

You can also use the VLOOKUP function as an alternative to the IF function for elaborate tests. Lookup functions will analyse data and compare it against a predefined range prior to displaying the result. This works on the principle:

1. ***Here's a value.***
2. ***Go to another location and find a match for my value,***
3. ***When a match is found show the cell contents from within a specified column number***

A vertical array (or table) has headings in the first row and data in column beneath. This is the most common layout for information within Excel.

**Note:** If the Headers are in the first column and the data is in rows then you would use the HLookup function.

1. Using V lookup

|  |  |  |
| --- | --- | --- |
| **Use VLOOKUP to extract data from tables of information** | |  |
| 1. Go to the “**Vlookup**” sheet 2. Go to cell **E22** 3. Click the **Insert Function** button on the formula bar |  | |
| 1. Type **VLOOKUP** 2. Click **Go** 3. Select **VLOOKUP** 4. Click **OK** |  | |
| 1. Enter the **Name** VLOOKUP function as:  * The cell to check (Lookup\_value): **D22** * The range to compare (Table\_array): **D4:M17** * Column containing information (Col\_index\_num): **2** * Exact or Approximate match (Range\_lookup): **False** (exact) * **Select** cell F22  1. Enter the **Overall Score** VLOOKUP function as:  * The cell to check (Lookup\_value): **D22** * The range to compare (Table\_array): **D4:M17** * Column containing information (Col\_index\_num): **10** * Exact or Approximate match (Range\_lookup): **False** (exact) * Select cell **G22**  1. Enter the data opposite into the **Table 1** area on the spreadsheet 2. Enter the **Final Grade** VLOOKUP function as:  * The cell to check (Lookup\_value): **F22** * The range to compare (Table\_array): **A4:B9** * Column containing information (Col\_index\_num): **2** * Exact or Approximate match (Range\_lookup): **True** (range)  1. AutoFill down | **1**  **2**    **3**    **4** | |
| **Note:** As we are looking for an **approximate** match the data in column 1 of the table array A4:B9 must be sorted in ascending order. | | |

1. Practice Exercise Vlookup

|  |  |
| --- | --- |
| Go to the **VLookup Exercise** sheet.   1. **Follow** the 6 instructions at the top right 2. **Create** a vertical lookup function to extract the name of the currency 3. **Create** a vertical lookup function to display the amount of converted currency. 4. See page 20 for the answer. |  |

## Pivot Table

Pivot tables allow you to extract and arrange elements of your data to present it in an alternative table. With pivot tables you can group and summarise list data into a format that is easy for reporting and analysis. A pivot table won’t automatically update if the raw data changes and you will need to refresh to update any changes in the data.

1. Create a pivot table

|  |  |  |
| --- | --- | --- |
| 1. Select the **Fees PivotTable Data** sheet 2. Click any individual cell within the data 3. Click **Insert** tab 4. Click **Pivot Table** button |  | |
| 1. In the Create Pivot Table dialog box check the correct data range has been selected and entered 2. Click on **New Worksheet** 3. Click **OK** |  | |
| A new worksheet opens   1. **Rename** the worksheet **Pivot**   The fields available are displayed in the **PivotTable Fields** List at the right of the screen  **Note:** These are used to build the PivotTable. | |  |

Pivot Table categories define 3 main areas of information:

|  |  |  |
| --- | --- | --- |
| **Filters** | **Column/Row Labels** | **Values** |
| Gives an overall view which can be refined | *Groups of data:*  e.g. Dept, Model, Product Type, Locations, Salespeople | *Groups of data: e.g.* Amounts |

1. Add data to PivotTable

|  |  |
| --- | --- |
| **To display fees owing in each faculty**  Drag & Drop the following fields into the appropriate sections…   * **Year of Study** into **Column** section * **Faculty** into **Rows** section * **Fees Owing** into **Values** section   **Note 1:** The Report Filter allows you to apply filters to the Pivot Table to display select portions only e.g. Filter by Degree Type  **Note 2**: The PivotTable will automatically reflect changes as you work unless you select “**Defer Layout Update.”** This allows you to click the “**Update**” button when complete. |  |

1. Edit PivotTable

|  |  |
| --- | --- |
| To rearrange the Pivot Table reposition fields as needed.   1. Drag **Year of Study** from Column to **Row**   **Note**: The Pivot Table will adjust to display the new data layout   1. Drag **Year of Study** **above Faculty** within the Row section |  |

|  |  |
| --- | --- |
| **To change Table values displayed**  Pivot Tables can display more than one column of data at a time   1. Drag Faculty from the Fields List to the Values section   **Note**: Faculty as a value defaults to Count as it is text   1. Drag a second Fees Owing into the Values section |  |
| 1. On the **PivotTable Tools**; **Analyze** tab   Click on **‘Field Settings’** in **Active Field** group |  |
| 1. Click **Average** function 2. Click **OK**   **Note:** PivotTable will automatically change to display new summary figures |  |

## Pivot Table Slicers

Pivot table slicers are a type of filter you can use to display select data within your pivot table quickly and efficiently.

|  |  |
| --- | --- |
| 1. Click Pivot Table Tools - Analyse tab   In the Filter group   1. Click Insert Slicer |  |
| In the Insert Slicers window   1. Tick Faculty and Field of Study 2. Click OK | |  |
| Clicking a slice will apply a filter to display the choice made   1. Click Arts in Faculty slice 2. Click Accounting in Field of Study slice |  |

|  |
| --- |
|  |

|  |  |
| --- | --- |
| 1. Remove a slice by clicking the clear filter button in the top right hand corner of the slicer   Choose new slicers to apply if needed |  |

**Drill Downs**

A drill down is a breakdown of select information contained within a pivot table. It is activated by double clicking on selected data. The drill down displays in a new sheet.

|  |  |
| --- | --- |
| 1. Find the 4th year law student 2. Double click the Fees Owing value   **Note:** a new worksheet opens and the displayed data is not connected to the original data sheet or pivot table.   1. Click sheet **Fees Pivot Table Data** 2. Go to App No. 52 – Michelle Dempsey 3. Change her **Fees Paid** value to **14210** 4. Click **Pivot** tab 5. On the **PivotTable Tools**; **Analyze** tab 6. Click **Refresh**   **Note:** Data for 4th year law should now read 0   1. Click **Sheet 1** tab   **Note:** Data has not updated |  |

1. Practice Exercise Pivot Table Exercise

|  |
| --- |
| Click **Pivot Table Exercise** tab  **Insert** a pivot table onto the **green cell (J3)** using the following layout to calculate the displayed values |
|  |
|  |

1. Create a PivotChart

|  |  |
| --- | --- |
| **To add a PivotChart**   1. Click **Pivot** tab 2. Select a cell in the PivotTable to activate 3. Go to **Options** Tab 4. Select **PivotChart** button |  |
| 1. Select a **column** chart 2. Click on **OK** |  |
| **Note:** The PivotTable Field List is available as a filter pane for the Pivot Chart. It offers **Legend** **Fields** and **Axis** **Fields** to edit the chart data displayed. This will also adjust the Pivot Table it is connected to. |  |

## Extras Sorting & Filtering Lists

1. Sort by single criteria

Go to the **Sort & Filter** worksheet tab

|  |  |
| --- | --- |
| **To sort data by Date of Birth**   1. Click in the **Date of Birth** column 2. On the **Home** tab 3. Go to the **Editing** group 4. Click the **Sort & Filter** button 5. Select the date order **‘Oldest to Newest**’ |  |
| **To sort data by another criteria**   1. Click in any cell in **App No** column 2. On the **Home** tab 3. Go to the **Editing** group 4. Click the **Sort & Filter** button 5. Select sort order “**Sort Smallest to Largest**”   **Note:** If you had selected data that was recognised as text the option would be **“Sort A to Z”** |  |

1. Sort by multiple criteria

|  |  |  |
| --- | --- | --- |
| **To sort by Faculty, Field of Study then Year**   1. On the **Home** tab 2. Click **Sort & Filter** button 3. Select **Custom Sort…**   **Note**: The sort window will appear to add levels and criteria to sort the data. | |  |
| 1. Click the down arrow to **sort by…** 2. Select **Faculty (A to Z)** 3. Click on the **Add level** button 4. Click the down arrow beside **Then by** 5. Select **Field of Study (A to Z)**   **Note**: The data will be sorted according to the criteria entered. |  | |

Sorting Data allows you to present it in a specified order. If you want to temporarily hide or extract data use the filtering tool available from AutoFilter.

1. Filtering with AutoFilter

|  |  |  |
| --- | --- | --- |
| **To activate AutoFilter**   1. Go to the **Home** tab 2. Click **Sort & Filter** 3. Select **Filter**   **Note:** All columns will have an AutoFilter arrow in the heading cell. |  | |
| **To filter for one Field of Study**   1. Click on column AutoFilter arrow 2. Clear tick beside **Select All** 3. Select **Dentistry**   **Note**: All data is filtered to display records matching the criteria.  **To remove filter**   1. Click AutoFilter arrow 2. Click **Select All** 3. Click **OK** |  | |
| **To filter for Year 2 - Year of Study**   1. Click on column AutoFilter arrow 2. Clear tick beside **Select All** 3. Select **2** |  | |
| **Note**: All data is filtered to display only records matching the criteria | | |
| **To remove filter:**   1. Click **Sort & Filter** button 2. Select **Clear** | |  |

1. Progressive filtering

|  |  |  |
| --- | --- | --- |
| **To filter data for Undergraduates in their first year studying Arts**   1. Click on **Status** AutoFilter arrow 2. Clear tick beside **Select All** 3. Select **Undergraduate** 4. Click **Year of Study** AutoFilter arrow 5. Clear tick beside **Select All** 6. Select **1**      1. Click on **Faculty** AutoFilter arrow 2. Clear tick beside **Select All** 3. Select **Arts** |  | |
| **To remove all filters**   1. Go to **Home** tab 2. Click **Sort & Filter** button 3. Select **Clear** | |  |
| **To switch AutoFilter off**   1. Go to **Home** tab 2. Click **Sort & Filter** button 3. Select **Filter Note**: This is a toggle option, if AutoFilter is on it will be switched off. | |  |

## Find Unique Values and Remove Duplicates

1. Find unique values

Go to **Remove Duplicates** sheet

|  |  |
| --- | --- |
| **To Find Unique Values**   1. Sort by **App No** column 2. Go to **Data** tab 3. Click **Advanced** button in **Sort and filter** group |  |
| 1. Check List Range = **($A$1:$J$86)** 2. Click **Unique records only** 3. Click **OK** |  |
| **To Remove Duplicates**   1. Go to **Data** tab 2. Click **Remove Duplicates** button in **Data Tools** group |  |
| **To remove Filter**   1. Go to **Data** tab 2. Click **Clear** button in **Sort and filter** group |  |

## Protection

To prevent a user from accidentally or deliberately changing, moving, or deleting important data from a worksheet or workbook, you can protect certain worksheet or workbook elements, with or without a [password](javascript:AppendPopup(this,'XldefPassword_2')).

1. Worksheet protection

If you **protect** a worksheet; all cells will be locked by default. Users cannot make any changes to a locked cell. For example, they cannot insert, modify, delete, or format data in a locked cell.

|  |  |
| --- | --- |
| **To Protect a worksheet**   1. Go to **Home** tab 2. In the **Cells** group 3. Click **Format** 4. Select **Protect Sheet…** |  |
| **Note:** You will not be able to change **any** of the cells in the worksheet when protection is on. A password can be entered for further security. |  |
| **To turn off Protection**   1. Go to **Home** tab 2. In the **Cells** group 3. Click **Format** 4. Select **Unprotect Sheet** |  |

1. Unprotected cells

Excel protects **all** cells that are locked. All cells are locked by default, so when protection is applied all cells are unavailable. To enabling editing, cells must be unlocked before they are protected.

|  |  |
| --- | --- |
| **Selective Protection: Unlock Cells**   1. Select the cells you want users to be able to change - **“Remove Duplicates” (K1:K4)** 2. Go to the **Home** tab 3. Click the **Format** button 4. Select **Lock Cell**   **Note:** This will “unlock” the selected cells. When protection is applied these cells will still be accessible |  |
| **Selective Protection: Apply Protection:**   1. Go to **Home** tab 2. In the **Cells** group 3. Click **Format** 4. Select **Protect Sheet** 5. Click **OK**   **Note:** the unlockedcells K1:K4 can be edited but the remainder of cells are protected. |  |

## Goal Seek

If you know the result that you want from a formula, but are not sure what input value the formula needs to get that result, use the Goal Seek feature. This feature will change the actual values on a spreadsheet.

1. Use ‘Goal Seek’ tool

|  |  |
| --- | --- |
| ***Select the Relative and Absolute Reference worksheet and select cell M2.***  ***Calculate how much of the fees due should be paid to reach 92.25% of the total.***   1. Click on **Data** tab 2. Click **What if Analysis** button 3. Select **Goal Seek** |  |
| 1. Enter the **Set cell** reference – **M2 Note:** Set cell **must** have a formula 2. Type in the **result** you want – 92.25%   **Note**: % sign is essential or alternative enter 0.9225   1. Enter **Changing cell** reference - **$L$2 Note:** Changing cell **must** **NOT** have a formula |  |
| 1. Click **OK**   **Note**: Goal Seek will provide a solution in a dialog box for acceptance or rejection   1. Click **OK** again to accept. |  |

## Naming Cells

Naming cells or ranges allows you to use those names in formulas. This has the same effect as making a cell or range absolute. See Exercise 2 on page 3 for further information on absolute cell references.

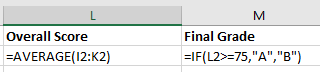
**Note**: Cell/Range names cannot have any spaces. They must start with a letter and can have numbers but they cannot be the same as a cell reference or a function name. E.g. You cannot use SUM or A1 as a cell/range name but you could use AAAA1 or SUM111 if you wish.

1. Naming cells via ribbon

|  |  |
| --- | --- |
| **To name a range**   1. Go to **Fees** **PivotTable** worksheet 2. Select range - **(A1:N62)** 3. Click **Formulas** tab 4. Click **Define Name** 5. Select **Define Name…** |  |
| **Note**: Excel will automatically insert a name from an adjacent cell if available.   1. Enter a name for the range e.g. Data 2. Click **OK** |  |

## Answers

**Basic If Exercise:**



**Vlookup Exercise**

