



Excel 2007

PivotTables

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PivotTables

A PivotTable organises and summarises large amounts of data. The data in one or more columns (also known as fields) in your dataset can become row and column labels in the PivotTable. The data in one column is usually chosen for the Values which are summarised in the centre of the table using a specific calculation. It is called a PivotTable because the headings can be rotated around the data to view or summarise it in different ways. You can also filter the data to display just the details for areas of interest.

You can alternatively choose to create a PivotChart which will summarise the data in chart format rather than as a table.

The source data can be:

- An Excel worksheet database/list or any range that has labelled columns. We will use Excel worksheets as examples in this manual.
- A collection of ranges to be consolidated. The ranges must contain both labelled rows and columns.
- A database file created in an external application such as Access.

The data in a PivotTable cannot be changed as they are the summary of other data. The data itself can be changed and the PivotTable recalculated thereafter. However, formatting changes such as bold, number formats, etc. can be made directly to the PivotTable data.

PivotTable datasets

A good dataset for creating a PivotTable will have data organised into columns with a heading at the top of each column. There should be no blank rows in the data so it is all organised into one rectangular block. Each row is a record and each column a field. In the data set on the right, each row represents a stationery order placed by a department.

Columns where the values are repeated within the column are ideal for PivotTable row or column labels. So for example, in the dataset on the left, **Dept**, **Term** or **Product** might be placed in the row or column headings. **Amount** might be used as the **Values** to be summarised in the centre of the PivotTable.

Dept	Term	Product	Amount
Geography	1	paper	11
Geography	1	toner	5
Geography	2	paper	10
Geography	3	paper	5
Geography	3	toner	6
History	1	toner	4
History	1	paper	9
History	2	toner	2
History	2	paper	10
History	3	paper	5
English	1	paper	12
English	1	toner	5
English	2	paper	15
English	2	toner	7
English	3	paper	16
English	3	toner	4

Example

If **Dept** is used as the row labels, each unique value in that column will appear down the left-hand side of the PivotTable. Similarly if

Product is used as the column labels then Paper and Toner will appear across the top of

Sum of Amount	Product		
Dept	paper	toner	Grand Total
English	43	16	59
Geography	26	11	37
History	24	6	30
Grand Total	93	33	126

the PivotTable. Where a particular value in a row and a particular value in a column intersect, the data in the **Amount** field is summarised in the centre. By default the calculation used is **Sum**. So, for example, where Geography and Paper intersect the total amount of Paper ordered by Geography will be displayed i.e. 26.

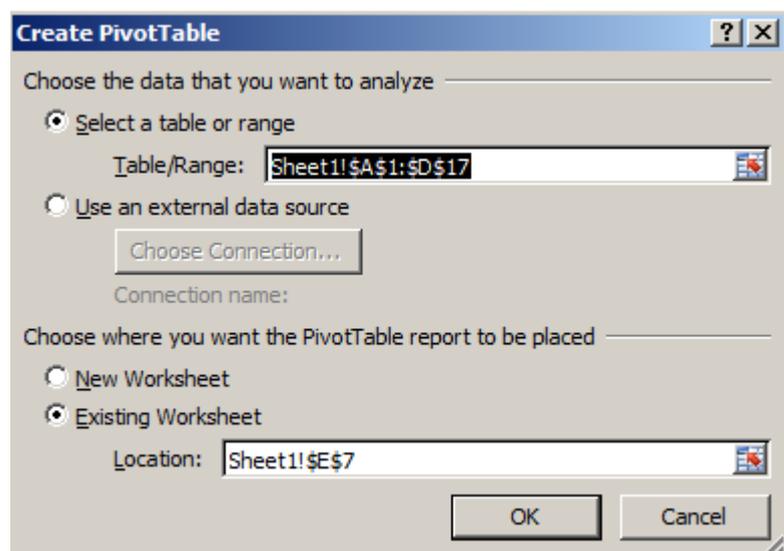
Creating a PivotTable

1. Click anywhere within the range of data you wish to use to create your PivotTable.
2. From the **Insert** tab select **PivotTable**.
Excel will display the Create PivotTable dialog box, automatically select the entire range and add the reference for that range to the Table/Range box.
3. Select **New Worksheet** or **Existing Worksheet** depending on where you want your PivotTable to appear.



PivotTable

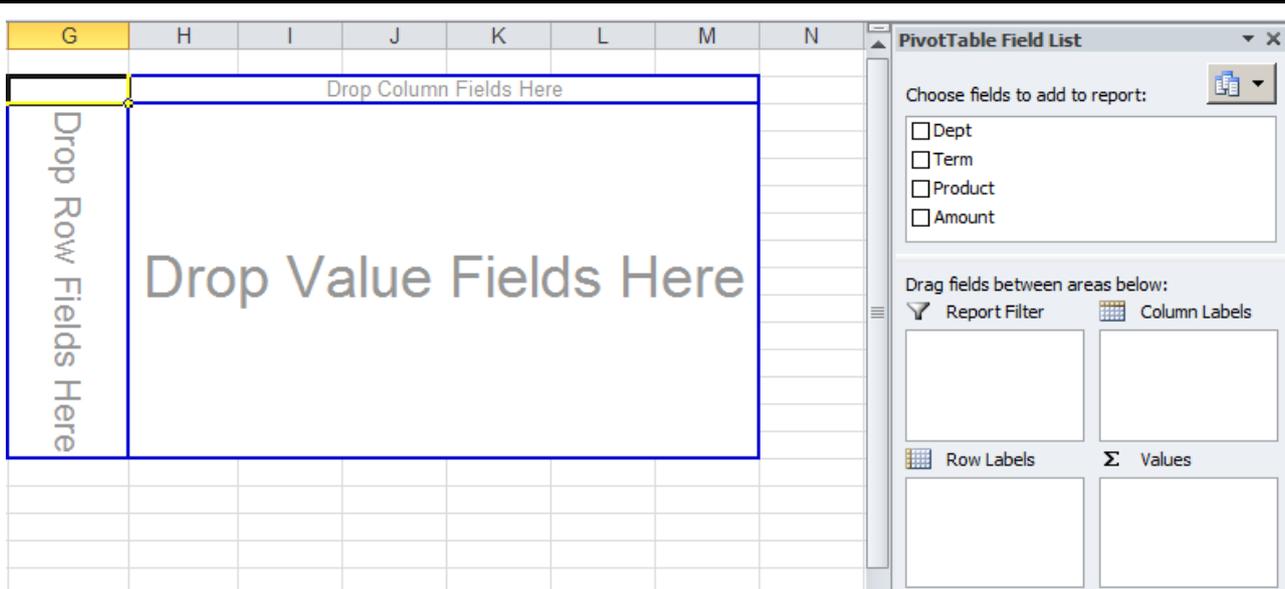
4. If you choose to put the PivotTable into the existing worksheet, you need to make sure you tell the wizard where to place it. The easiest way to do this is to click into an area in the existing spreadsheet. The cell reference will appear in the **Location** box.



5. Click on the **OK** button. A blank PivotTable and PivotTable Field List will be displayed. Two new **PivotTable Tools** tabs become available on the Ribbon: **Options** and **Design**. Any column headings become fields in the **Field List**.

Note that the Field List and additional Tabs on the Ribbon only appear when you click on the PivotTable.

Arranging your data



1. From the **Field List**, drag the fields with the data you want to display in rows to the area on the PivotTable diagram labeled **Drop Row Fields Here** or into the **Row Labels** box.
2. Drag the fields with the data you want to display in columns to the area labeled **Drop Column Fields Here** or into the **Column Labels** box.
3. Drag the fields that contain the data you want to summarize to the area labeled **Drop Value Fields Here** or into the **Values** box. Excel assumes **Sum** as the calculation method for numeric fields and **Count** for non-numeric fields.
4. If you drag more than one data field into rows or into columns, you can re-order them by clicking and dragging the columns on the PivotTable itself or in the boxes.
5. To rearrange the fields at any time, simply drag them from one area to another.
6. To remove a field, drag it out of the PivotTable report or untick it in the Field List. Fields that you remove remain available in the field list.

Example

Dept	Term	Product	Amount
Geography	1	paper	11
Geography	1	toner	5
Geography	2	paper	10
Geography	3	paper	5
Geography	3	toner	6
History	1	toner	4
History	1	paper	9
History	2	toner	2
History	2	paper	10
History	3	paper	5
English	1	paper	12
English	1	toner	5
English	2	paper	15
English	2	toner	7
English	3	paper	16
English	3	toner	4

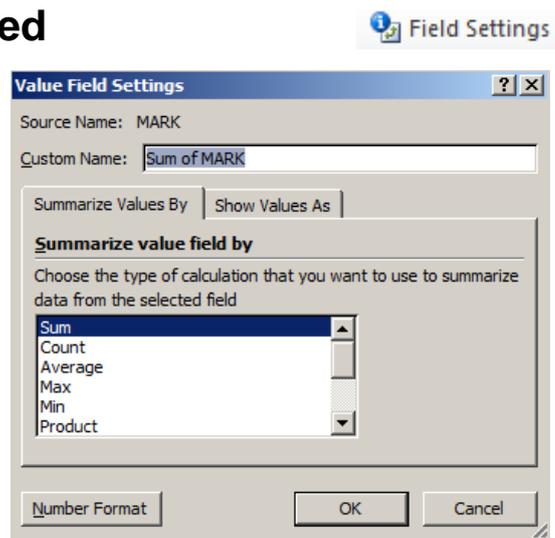
Sum of Amount	Product	Grand Total
Dept	paper	toner
English	43	16
Geography	26	11
History	24	6
Grand Total	93	33

Changing the way values are displayed

Changing the way data is summarised

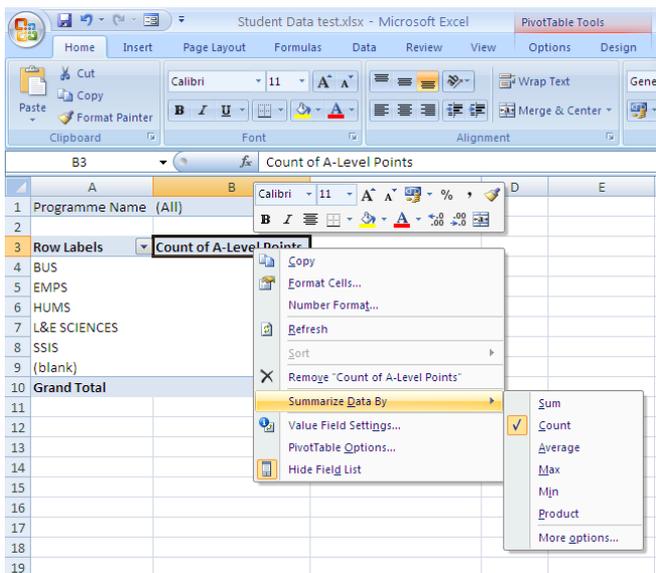
By default, Excel will use a **Sum** function on numeric data and **Count** on non-numeric to summarise or aggregate the data. If you have any text entries amongst a column containing mainly numbers, Excel will use the Count option. To change this:

1. Click on the field you want to change (on the PivotTable itself or in the areas below the Field list)
2. Click on **Field Settings** on the **PivotTable Tools Options** tab
The Field Setting dialog box will be displayed as shown right.
3. Select the appropriate calculation.
For example, change the calculation from **Sum** to **Average** (see below for example).



OR

Right-click in the PivotTable and select Summarize data By: and select from the list of calculations.



Example

In the example below, the data set contains student information including numerical data such as A-Level Points (although this column contains text, you can still do most calculations) and Fees Paid.

The PivotTable shows the average number of A-Level points for the students attending each college.

Programme Code	Programme Name	Gender	Country of Domicile	Mode of Study	Fee Status	Level of Study	A-Level Points	Fees Paid
PRH2SBESBE06	MPH Economics	F	Brunei	FT	Int/CI	PGR	unknown	4000
PTS1SBESBE08	MSC Financial Economics	M	Canada	FT	Int/CI	PGT	unknown	5000
PRH2SBESBE01	MPH Management Studies	F	Canada	PT	Int/CI	PGR	unknown	2500
UFA3SBESBE03	BA Business Economics	M	Channel Islands	FT	Int/CI	UG	340	3000
UFA3SBESBE03	BA Business Economics	M	Channel Islands	FT	Int/CI	UG	370	3000
UFA3SBESBE03	BA Business Economics	M	Channel Islands	FT	Int/CI	UG	360	3000
UFA3SBESBE03	BA Business Economics	F	Channel Islands	FT	Int/CI	UG	420	3000
UFA3SBESBE02	BA Economics	F	Channel Islands	FT	Int/CI	UG	320	3000
UFA3SBESBE03	BA Business Economics	M	Channel Islands	FT	Int/CI	UG	320	3000
UFA3SBESBE02	BA Economics	F	China	FT	Int/CI	UG	unknown	3000
UFA3SBESBE03	BA Business Economics	M	China	FT	Int/CI	UG	240	3000

	A	B
1	Programme Name (All)	
2		
3	Row Labels	Average of A-Level Points
4	BUS	392.2155689
5	EMPS	338.4833333
6	HUMS	386.5666667
7	L&E SCIENCES	385.4929577
8	SSIS	375.2307692
9	(blank)	
10	Grand Total	378.7792916
11		

This example shows Average A-Level Points by College.

To change the number format: Right-click in the PivotTable, and choose Number Format

Adding additional calculations

To display more than one calculation in the Values area, add the same Field twice. In the example shown below, the Sum and Count are being shown for the Fees Paid to each College. Count of Fees Paid is the *number* of fees paid to each College.

Row Labels	Sum of Fees Paid	Count of Fees Paid2
BUS	906750	245
EMPS	512500	162
HUMS	1067925	352
L&E SCIENCES	716250	212
SSIS	659000	181
Grand Total	3,862,425	1,152

Field List and Areas Section

The screenshot shows the PivotTable Field List task pane. Under 'Choose fields to add to report:', 'College' is checked. Under 'Drag fields between areas below:', 'College' is in the Row Labels area. In the Values area, 'Fees Paid' is added twice, with the first instance set to 'Sum of Fees Paid' and the second instance set to 'Count of Fees Paid2'.

Calculated Fields

You can have additional calculations, which are not part of the source data, in your PivotTable. You will use the fields containing numeric data to create new fields. They will become part of the PivotTable and can be used in further calculations.

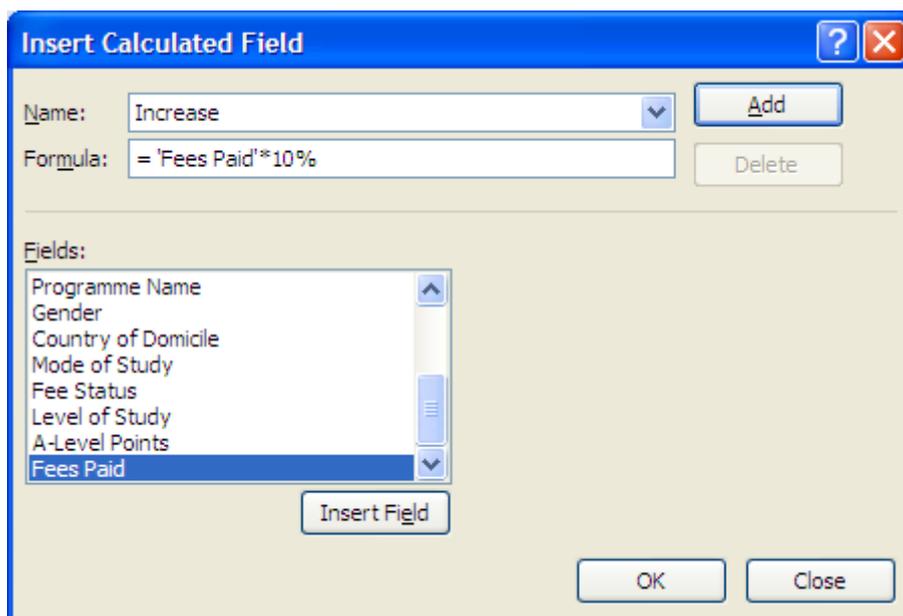
The following example shows a new field called **Increase** created by using the field **Fees Paid** and multiplying by 10%. The new field (**Increase**) can then used in another calculation.

- Click anywhere in PivotTable
 - a. On the Options tab, Tools group click on the Formulas button,



then **Calculated Field**

- b. Type in name you want to give your new field eg: Increase
- c. Then in Formula field the calculation required eg ='Fees Paid'*10%



- NB: You can type in the field names you want use in the calculation, or select them from the list and use the Insert Field button
- Formulae can be modified ='Fees paid'*7% and calculations will be updated immediately.

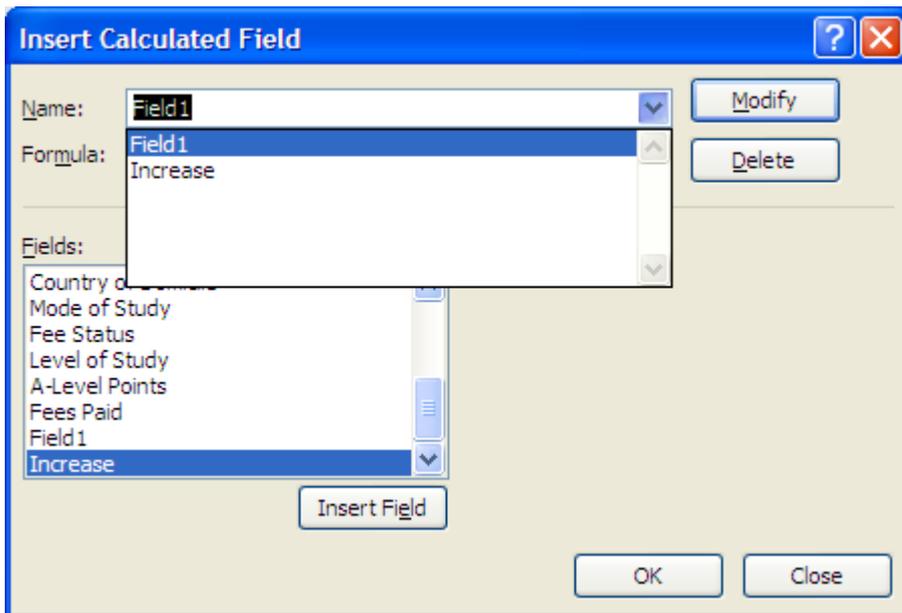
You can use the new field to create another calculated field:

Name: **NewFee**

Formula=**Fees Paid+Increase**

To Delete or Amend a Calculated Field

1. In the **Insert Calculated Field** dialog box, Click on drop-down at the side of the **Name:** field and select field to amend or delete.
2. Click on **Modify** to amend.
3. Click on **Delete** to remove.



Calculated Items

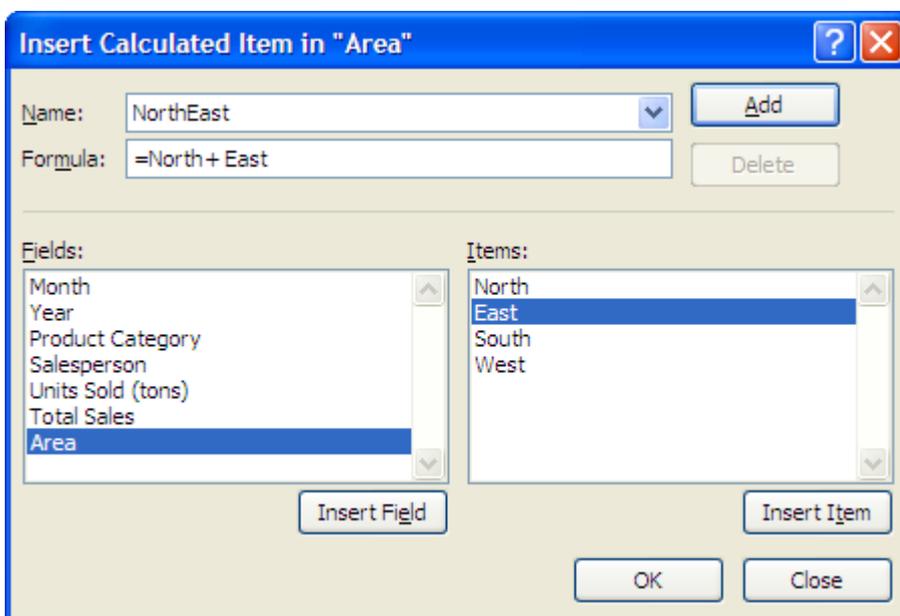
This is a feature which allows you to create calculations within the PivotTable using the summary figures there. For example, you may want add two fields together to form another heading.

The example below shows new calculated items (field heading NorthEast and SouthWest) which add together North and East sales figures and South and West figures respectively.

The screenshot shows an Excel PivotTable with the following data:

Product Category	North	East	South	West	NorthEast	SouthWest	Grand Total
Paint	85400	135420	97600	132980	220820	230580	902800
Paper	162500	200000	50000	50000	362500	100000	925000
Timber	285000	240000	180000	120000	525000	300000	1650000
Grand Total	532900	575420	327600	302980	1108320	630580	3477800

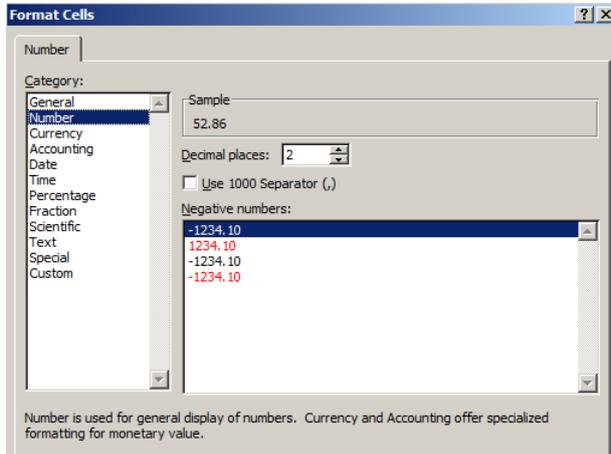
1. Start by clicking in the column or row heading which you want to include in the calculation
2. In **Fields**: click on the field name which contains the items you want to use in you formula
3. Select the item you want from the **Items**: list and click on the **Insert Item** button
4. Build up your formula using the fields and items as required



- Delete or modify calculated items by clicking on the drop-down at the side of the **Name**: field

Formatting values

1. Display the **Field Settings** dialog box as shown above.
2. Click on the **Number Format** button.
3. Select the **Category** you want and set any options.
For example, select Number and enter the number of decimal places to display the data to.



4. Click **OK** and **OK** again and your cells will be reformatted.

Displaying values as a percentages:

1. Display the **Field Settings** dialog box as shown above.
2. Click on the **Show Values As** tab.
3. Select **Percentage of Row Total** or **Percentage of Column Total**

Example

In the example below, products ordered (paper and toner) are shown for each department as a percentage of the total for all departments. This is done by displaying values as a percentage of the column total.

Sum of Amount	Product		
Dept	paper	toner	Grand Total
English	46.24%	48.48%	46.83%
Geography	27.96%	33.33%	29.37%
History	25.81%	18.18%	23.81%
Grand Total	100.00%	100.00%	100.00%

Helpful hint:

The Field Settings dialog box can be used to change the name of any Field in the PivotTable. For example, this can be used to change the name of **Dept** to Department.

Grouping data

Data can be summarised into higher level categories by grouping items within PivotTable fields. Depending on the data in the field there are three ways to group items:

- Group selected items into custom categories.
- Automatically group numeric items by a specific interval.
- Automatically group dates and times by a specific interval.

Grouping selected items

1. Select the items you wish to group in a given row or column. Select adjacent items by clicking and dragging, or non-adjacent items by selecting each item whilst holding down the **Ctrl** key.  Group Selection
2. Click on the **Group Selection** button on the **PivotTable Tools Options** tab.
3. An additional column is created to the left (for row labels) or an additional row is created above (for column labels) and a default name (e.g. Group1) is given to the group.
The name can be changed in the **Custom Name** box in **Field Settings** or in the **Formula Bar**.
4. Use the **+/-** buttons to expand and collapse the group.

Example

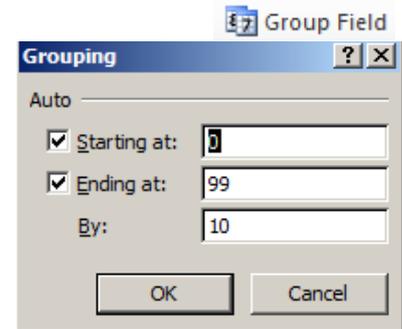
In the example below, some modules have been grouped by subject. The **Statistics** group has been collapsed so that average results for Statistics are shown for both modules STATB091 and STATB092.

Average of MARK		RESULT				Grand Total
MODCODE2	MODCODE	A	F	P	U	
COMPB401	COMPB401			70.41	0.00	67.35
ECONB009	ECONB009		28.00	56.88		55.18
LANG0I01	LANG0I01			42.00		42.00
MASTB011	MASTB011			56.71		56.71
MASTB012	MASTB012			52.86		52.86
Maths	MATHB51A			70.79		70.79
	MATHB51B		16.25	67.15		58.67
Statistics		0.00	31.00	61.57		57.10
Grand Total		0.00	24.80	64.00	0.00	60.56

Note that MODCODE2 is now another field in the Row Labels area and can be added or removed like any other field.

Grouping numeric items into ranges

5. Select a single field item in the PivotTable.
6. Click on the **Group Field** button on the **PivotTable Tools Options** tab.
7. Excel displays a dialog box in which it automatically enters a start and end number based on the highest and lowest values in your range. It also lists a number for the intervals to group by.
8. Select an appropriate interval and click **OK**.



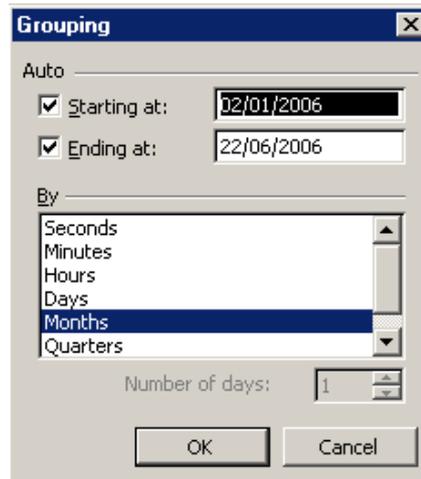
Example

In the example below, marks are grouped in intervals of **10** so, for example, you can see that **1** candidate got between 40 and 49 marks in COMPB401 and **4** got between 50 and 59 marks.

Count of CANDNO	MARK											
MODCODE	0-9	10-19	20-29	30-39	40-49	50-59	60-69	70-79	80-89	90-99	Grand Total	
COMPB401	1					1	4	6	7	1	3	23
ECONB009			1			4	5	5	2			17
LANG0I01						1						1
MASTB011						3	1	1	2			7
MASTB012					2	2		2	1			7
MATHB51A				1			4	9	3	1	6	24
MATHB51B	1	1	2		1	2	4	5	2	3	3	24
STATB091			2		3	3	8	4	3	1		24
STATB092	1					3	4	11	2	3		24
Grand Total	3	1	5	7	19	30	43	22	9	12		151

Grouping date or time data

1. Select a single field item in the PivotTable.
2. Click on the **Group Field** button on the **PivotTable Tools Options** tab.
3. Excel displays a dialog box in which it automatically enters a start and end date. It also lists a choice of intervals to group by.
4. Select an appropriate type of interval (e.g. Months) and click **OK**. If you select Days you can choose the number of Days. You can select more than one. For example if you select Months and Years, the data will be grouped by year and then displayed for each month as shown.



Years	Date
2008	Sep
	Oct
	Nov
	Dec
2009	Jan
	Feb
	Mar
	Apr
	May
	Jun
	Jul
	Aug
Grand Total	

Ungrouping

Click on the field you want to ungroup and click on the **Ungroup** button on the **PivotTable Tools Options** tab to ungroup specific custom groups, click on the name of the group and then the **Ungroup** button.

Default grouping for multiple values

Note that grouping automatically occurs where you have more than one Field in the same area (Row or Column). In the example below, the Department and Term fields are both added to the PivotTable as Row Labels. By putting the fields in the order Department then Term, data is grouped by Department. Subtotals are automatically displayed for each grouping i.e. by Department.

Note that you can remove **Subtotals** in the **Field Settings** dialog box.

Sum of Amount		Product		
Dept	Term	paper	toner	Grand Total
English	1	12	5	17
	2	15	7	22
	3	16	4	20
English Total		43	16	59
Geography	1	11	5	16
	2	10		10
	3	5	6	11
Geography Total		26	11	37
History	1	9	4	13
	2	10	2	12
	3	5		5
History Total		24	6	30
Grand Total		93	33	126

Sorting and Filtering Data

Filtering allows you to display only certain data, either on the whole report or for a particular field. Sorting allows you to sort columns or rows alphabetically or numerically.

Report filters

This allows you to filter all data out of a report if it has a value in a particular field.

1. Add the appropriate field to the **Report Filter** area.
The Field name will be displayed in a new area above the main part of the PivotTable.
2. Click on the drop-down arrow to the right of the word **(All)**.
3. Tick the **Select Multiple Items** check box if you want to view multiple values.
4. Click on or tick the values to include in the PivotTable.
5. Click **OK**.
A small funnel symbol will appear to show that the report is filtered.

Example

In the example below, only data from Terms 1 and 2 are displayed in the PivotTable:

Term	(Multiple Items) ↓			
Sum of Amount	Product			
Dept	paper	toner	Grand Total	
English	40.30%	52.17%	43.33%	
Geography	31.34%	21.74%	28.89%	
History	28.36%	26.09%	27.78%	

Filtering row or column labels

To **filter** out (remove) a particular value from row or column labels:

1. Click on the drop down arrow next to the Field name.
2. Untick any items you wish to remove.
3. Select **Value Filters** to see more options such as **Top 10**.
Top 10 filters out a specific number of the highest values in the Value area.

In the example below, Top 10 on the Mark field is set to **5** so it displays only the exam results with the highest 5 values in the Grand total row i.e. the 5 exam results that appear most frequently amongst candidates:

Count of CANDNO	MARK						
MODCODE	40-49	50-59	60-69	70-79	90-99	Grand Total	
MATHB51A		4	9	3	6	22	
MATHB51B	2	4	5	2	3	16	
STATB091	3	8	4	3		18	
STATB092	3	4	11	2		20	
Grand Total	8	20	29	10	9	76	

Sorting row or column labels:

1. Click on the drop down arrow next to the Field name.
2. Click on **Sort A to Z** or **Sort Z to A** for text, **Sort Smallest to Largest** or **Largest to Smallest** for numeric data or **Sort Oldest to Newest** or **Newest to Oldest** for dates.

Refreshing a PivotTable

When data is changed in the PivotTable source list, the PivotTable does not automatically recalculate. To refresh the table:



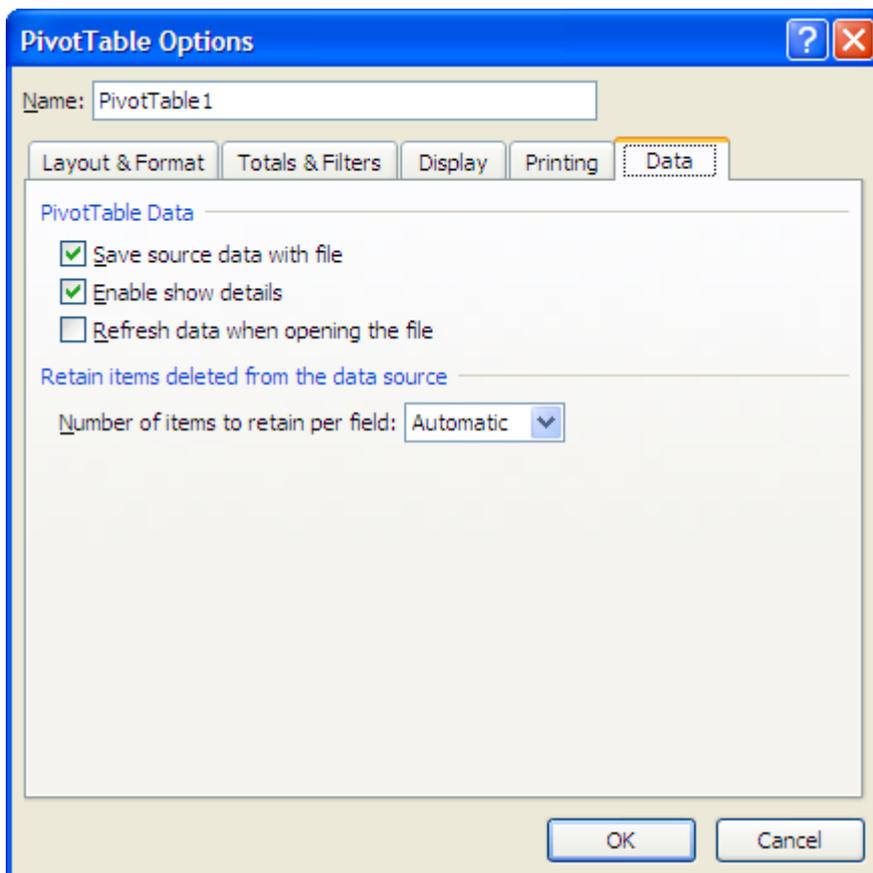
Select any part of the PivotTable.

5. On the PivotTable Tools Options tab, click on the **Refresh** button.

OR

Right-click in the PivotTable, and choose **Refresh**

You can also have your PivotTables refreshing every time you open the workbook. Click on **Options** button on the **Options** tab and tick **Refresh data when opening the file** on the **Data** tab:



Extending the dataset

If you add additional columns or rows to you will need to extend the data source of the PivotTable to include them.



Change Data Source ▾

1. Click on the **Data Source** button on the **PivotTable Tools Options** tab.
2. Edit the range in the **Table/Range** box to include your entire dataset and click **OK**.

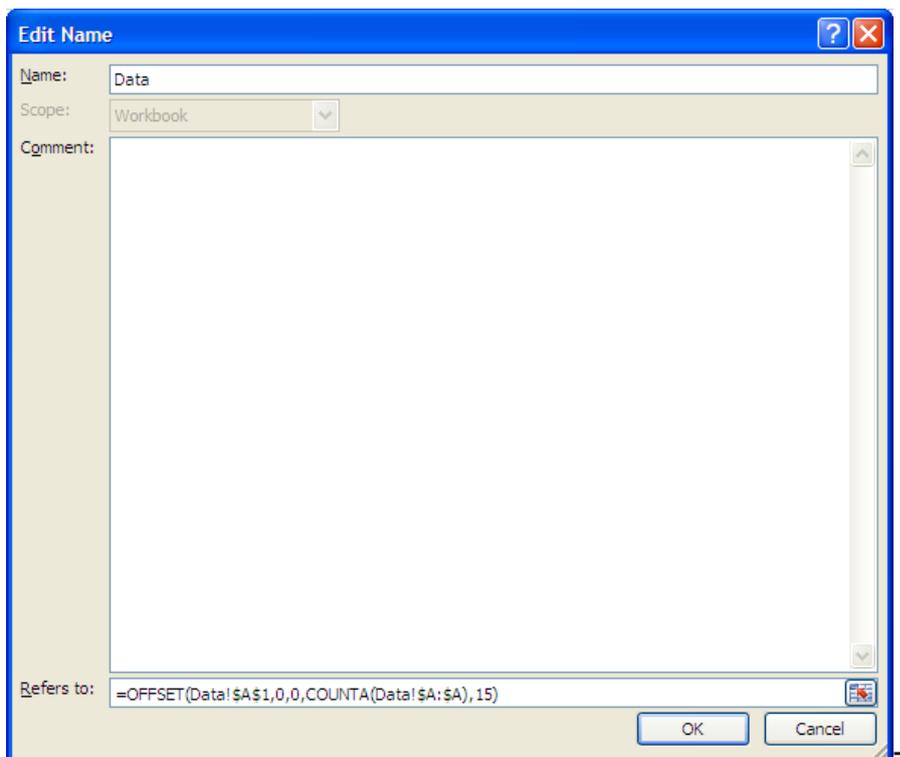
Dynamic Range Names

If more rows are added to your source data frequently, you can create a dynamic range name which will automatically update to include any additional rows:

- On the Formulas tab, select Name Manager, New
- Type in the name you want to give your range eg: Data
- Type in this function into the Refers to: field:

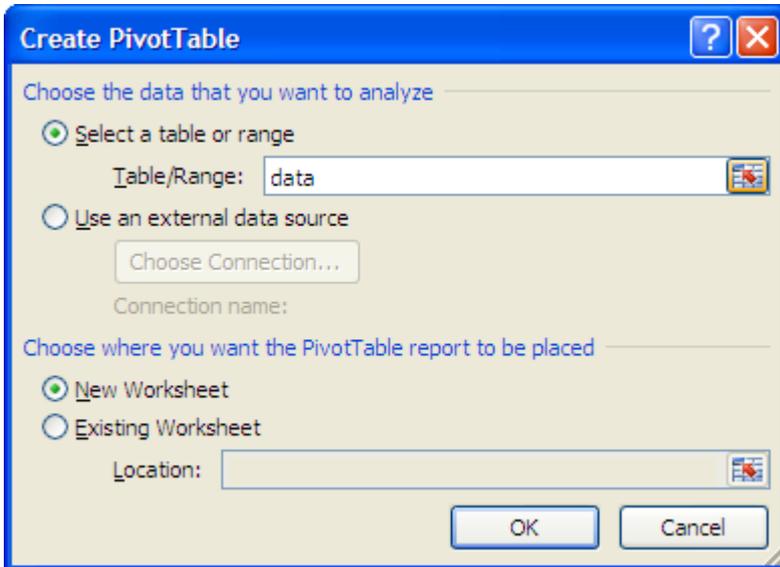
The syntax of this is: =OFFSET(Reference,rows,cols,[height],[width])

- =OFFSET(Data!\$A\$1,0,0,COUNTA(Data!\$A:\$A),15)
- Data!\$A\$1 - this is the top left corner of your range (including the sheet name)
- 0,0, This would be how many rows down and column right from Reference – in this case, not to move from A1
- COUNTA – This function will count the number of cells which are not empty, thereby return the number of rows down to select
- 15 The number of columns in the table



Applying the Named Range to a new PivotTable

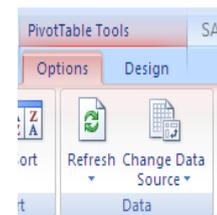
When you create a new PivotTable, you define the name as the source. Type the range name in the Create PivotTable dialog box:



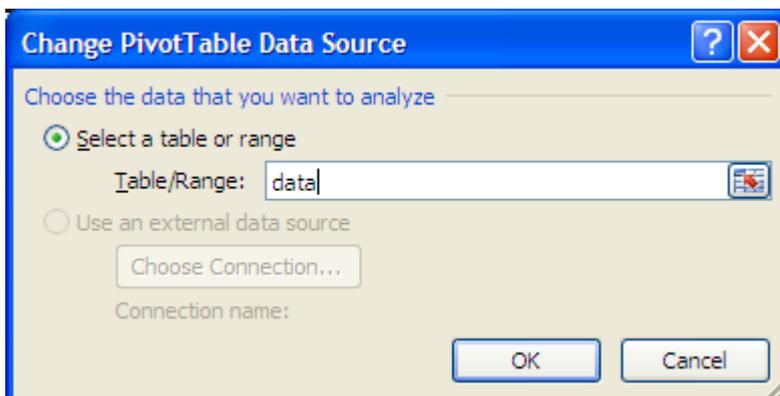
Applying the Named Range to an existing PivotTable

To use the new name in your PivotTable, you need to change the data source:

1. Select any cell in the PivotTable
2. On the Options tab, click the **Change Data Source** button:



3. Type in the dynamic range name. Or press F3 for a list of names



Formatting PivotTables

Various options can be used to change the look of PivotTables. These can be found on the **PivotTable Tools Design** tab. You can apply a **PivotTable Style** and choose whether or not to have banded columns or rows (i.e. where rows or columns are coloured in alternate shades).

Note that buttons to add or remove **Subtotals** and **Grand Totals** are also available on the **Design** tab.

GetPivotData Function

The =GetPivotTable function will allow you to get information from the PivotTable by referencing field names instead of cell references:

The syntax is: **GETPIVOTDATA**(data_field,pivot_table,field1,item1,field2,item2,...)

	A	B	C	D	E	F
1						
2						
3	Sum of Total Sales	Salesperson				
4	Area	Brown	Green	Hughes	Smith	Grand Total
5	East	90000	97820	261000	126600	575420
6	North	24400	231600	90000	186900	532900
7	South	123200		204400		327600
8	West	60000	73800	84180	85000	302980
9	Grand Total	297600	403220	639580	398500	1738900

=GETPIVOTDATA("total sales",\$A\$3) Will return the Grand Total 1738900

=GETPIVOTDATA("total sales",\$A\$3,"area","south") Will return Total sales for the Area South - 327600

=GETPIVOTDATA("total sales",\$A\$3,"area","south","salesperson","brown") Will return Salesperson Brown's Total Sales in the South Area - 123200

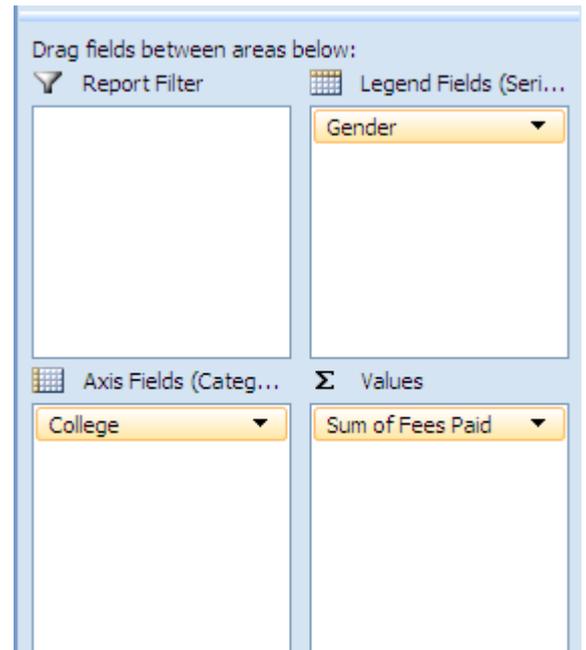
=GETPIVOTDATA("total sales",\$A\$3,"salesperson","smith) Will return Salesperson Smith's Total Sales - 398500

PivotCharts

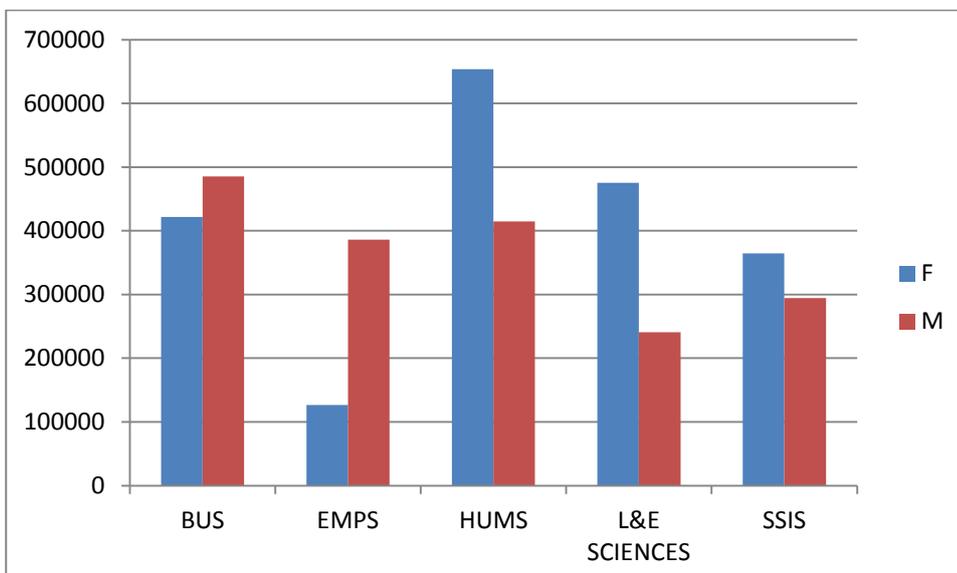
When you create a PivotChart, Excel automatically creates an associated PivotTable. If you have an existing PivotTable you can create a PivotChart based on it.

Creating a PivotChart with a PivotTable

1. Click anywhere within your dataset.
2. On the **Insert** tab, click on the **PivotTable** drop-down and select **PivotChart** from the list.
3. Choose the dataset and location of the PivotTable and PivotChart as you would to create a new PivotTable (see *Creating a PivotTable* on page 2).
A new blank PivotTable and PivotChart will be created.
4. Click and drag Fields from the Field List onto the different areas of the PivotTable in the usual way. The PivotChart and PivotTable will both be created simultaneously.



When the PivotChart is selected, the different areas of the Chart are defined slightly differently to the PivotTable areas. **Row Labels** are **Axis Fields (Categories)** and **Column Labels** are **Legend Fields(Series)** as shown right. The resulting PivotChart is shown below:



Adding a PivotChart to an existing PivotTable

You can also add a PivotChart if you have already created the PivotTable:

1. Click anywhere on the PivotTable.
2. On the Insert menu click on a type of Chart in the Charts group e.g. Column and then select a particular style e.g. 2-D Column. A PivotChart will be added to your existing PivotTable.

Note that some Chart types (for example Pie Charts) are not suitable for PivotTables because they can only show two variables.

Formatting PivotCharts

PivotCharts can be formatted in the same way as any other Chart in Excel.

PivotTable Exercise

1. Open file **Sales.xlsx**
2. Create a Pivot Table which shows sales of products by category for all the regions. It should look like the one below:

	A	B	C	D	E	F
1	Drop Page Fields Here					
2						
3	Sum of Total Sales	Area				
4	Product Category	North	East	South	West	Grand Total
5	Paint	85400	135420	97600	132980	451400
6	Paper	162500	200000	50000	50000	462500
7	Timber	285000	240000	180000	120000	825000
8	Grand Total	532900	575420	327600	302980	1738900
9						
10						

3. Add the **Salesperson** field to the Report Filter to enable you to see the sales figures for each Salesperson.
4. What was the value of Salesperson Green's paper Sales in the North Area? (Make a note of your answer).
5. Display the **Average** sales of Timber in the South Area for all salespeople. Format the figures to whole numbers.
6. Change the calculation back to a Sum of all sales and format to Currency.
7. Create a PivotChart as shown below: Note that this is showing the number of Units Sold, not the value.

