

Excel using V-lookup and H-lookup

IT Training



St. George's, University of
London

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If you have a St. George's username and password you can access all the files that goes with this manual.

Files can be found in a folder on the **N** drive in the **IT Training** folder named:

**Excel using V-lookup and
H-lookup N:\IT Training\ Excel using V-lookup and H-lookup**

UNDERSTANDING TABLES

Most spreadsheets provide three functions: calculating, graphing, and some limited database functionality. Excel continues on in this tradition. In Excel, formulas and functions make complex

calculations much simpler and accessible; the charting tools allow users to create graphs; and databases can be constructed using tables.

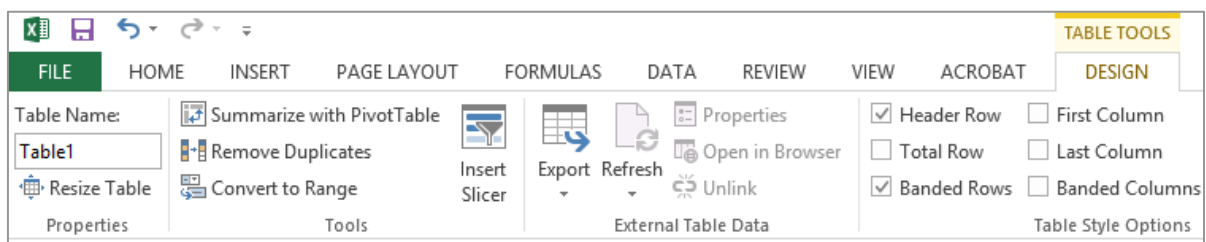
What Is A Table?

A table is made up of columns and rows and can be used to store many different kinds of information. In applications such as Microsoft Word, a table can be used to create page layouts and lists as well as perform many other tasks with the main purpose of formatting information. However in Excel the primary use for a table is to store data. A table that stores data is sometimes known as a database. Once the data is stored in a table it can then be processed.

In Microsoft Excel a table appears with quite a specific structure. Database tables are organised into records (rows) and fields (columns) so that the data can easily be sorted and queried. The first row is normally reserved for the headings – known as *field names*.

One of the normal database operations you can complete in Excel using a table is sorting the data. For instance, you can query the data either through the use of filters, or through more advanced techniques involving criteria (querying by example).

Database Features On The Ribbon



If you are looking for ways to work with data then you may want to use the commands in the **Editing** group on the **HOME** tab; for example, the **Sort & Filter** command which allows you to sort and filter data in a worksheet as well as in a table. The **DATA** tab also contains a **Sort & Filter** group that contains a number of commands for sorting data and creating filters.

CREATING A TABLE FROM DATA

A table can be created from data that is presented logically and continuously in rows and columns. Data you will be converting into a table should contain column headings and be organised as a

list. Generally, anything you can put in a list (names and addresses, inventory items, etc.) can be set up as a table in Excel.

Try This Yourself:

Before starting this exercise you MUST open the file E1356 Worksheet Tables_6.xlsx...

1 Click in any cell that contains data

2 Click on the **INSERT** tab, then click on **Table** in the **Tables** group to display the **Create Table** dialog box

Excel calculates the tables range by extending in all directions until empty rows or columns are reached...

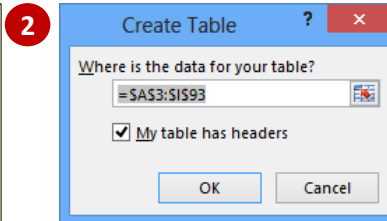
3 Click on [OK] to create the table

4 Click in any cell in the table to remove the selection highlighting

5 Click on the **TABLE TOOLS: DESIGN** tab, then click on the **More** arrow for the **Quick Styles** gallery in the **Table Styles** group to display a gallery of options

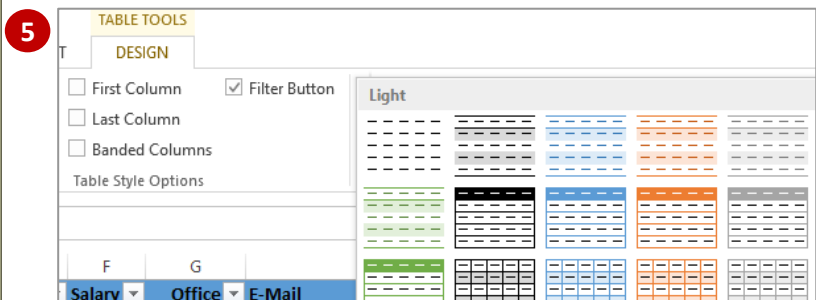
6 Point to an option to see it applied to the table in Live Preview

7 Click on **Table Style Medium 4** to apply this style to the table



3

	A	B	C	D
3	No	First Name	Last Name	Position
4	NZ0000001	Peter	Reynolds	Enterprise Leader
5	NZ0000002	Mary	Campbell	Effective People Leader
6	NZ0000003	Helen	Kai	Monies Leader
7	NZ0000004	Norris	Maunga	Forward Thinking Leader
8	NZ0000005	Vivian	Smith	Enterprise Opportunities Leader
9	NZ0000006	Grace	Goodson	Communications Service Leader
10	NZ0000007	Kate	Rualowy	Insurance Service Leader
11	NZ0000008	Brian	Houson	Banking and Finance Service Leader
12	NZ0000009	Tara	Kinelly	Legal Service Leader



7

	A	B	C	D
3	No	First Name	Last Name	Position
4	NZ0000001	Peter	Reynolds	Enterprise Leader
5	NZ0000002	Mary	Campbell	Effective People Leader
6	NZ0000003	Helen	Kai	Monies Leader
7	NZ0000004	Norris	Maunga	Forward Thinking Leader
8	NZ0000005	Vivian	Smith	Enterprise Opportunities Leader
9	NZ0000006	Grace	Goodson	Communications Service Leader
10	NZ0000007	Kate	Rualowy	Insurance Service Leader
11	NZ0000008	Brian	Houson	Banking and Finance Service Leader
12	NZ0000009	Tara	Kinelly	Legal Service Leader

For Your Reference...

To **create a table** in **Excel**:

1. Click anywhere in the list that will become the table
2. Click on the **INSERT** tab, then click on **Table** in the **Tables** group

Handy to Know...

- By advising Excel that the table has **headers**, the **column headings** in the first row become field names and appear with sort and filter arrows. If the table doesn't have headings, Excel will add its own as **Column 1**, **Column 2** and so on.

INSERTING TABLE COLUMNS

A **table** is a defined area in an Excel worksheet. When a table is created, its range must be specified so that Excel can determine where the *fields* (columns) and *records* (rows) begin and

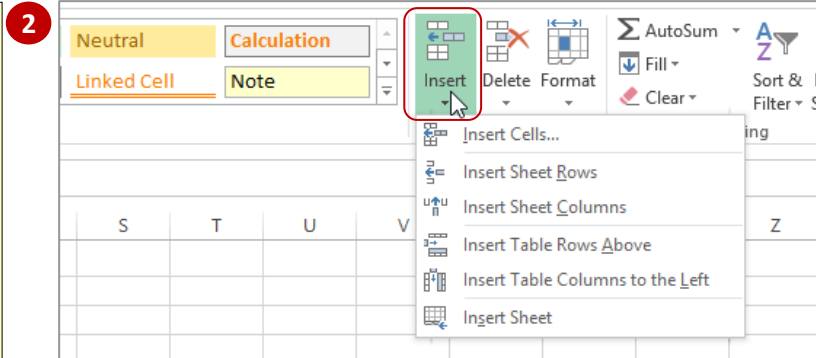
end. However, you can add more fields if required. When you choose the appropriate command, Excel will automatically adjust the size of the table.

Try This Yourself:

Same File

Continue using the previous file with this exercise, or open the file *E1356 Worksheet Tables_3.xlsx...*

- 1 Click in cell **B4**
- 2 Click on the **HOME** tab, then click on the drop arrow for **Insert** in the **Cells** group
- 3 Select **Insert Table Columns to the Left** to insert a new column
- 4 Click in cell **B3** (the new column heading), type **Colour**, then press **Enter**
- 5 Ensure that cell **B4** is selected, type **Green**, then press **Enter**
- 6 Click in cell **E5**
This cell is in the Type column...
- 7 Repeat step 2 to select **Insert Table Columns to the Right** to insert a new column
- 8 Click in cell **F3** (the new column heading), type **Year**, then press **Enter**



4

	A	B	C	D	E	F	G
1	Vehicle Fleet						
2							
3	Reg No	Colour	Make	Model	Type		
4	DWE998		Vauxhall	Victor	Sedan		
5	D22 R4		Ford	Anglia	Estate		
6	S233 G4		Morris	Mini	Sedan		
7	MEAN 1		Jaguar	E-Type	Convertible		
8	FRG334		Hillman	Imp	Sedan		
9	CXA422		Humber	SuperSnipe	Sedan		
10	Total				6		
11							

8

	A	B	C	D	E	F	G
1	Vehicle Fleet						
2							
3	Reg No	Colour	Make	Model	Type	Year	
4	DWE998	Green	Vauxhall	Victor	Sedan		
5	D22 R4		Ford	Anglia	Estate		
6	S233 G4		Morris	Mini	Sedan		
7	MEAN 1		Jaguar	E-Type	Convertible		
8	FRG334		Hillman	Imp	Sedan		
9	CXA422		Humber	SuperSnipe	Sedan		
10	Total				6		
11							

For Your Reference...

To **add** a **new column** to a **table**:

1. Click in the location for the new column
2. Click on the **HOME** tab, then click on the drop arrow for **Insert** in the **Cells** group
3. Select **Insert Table Columns to the Left**, or **Insert Table Columns to the Right**

Handy to Know...

- If you have duplicate headings in a table, Excel automatically numbers them sequentially from left to right. For instance, if you have two headings titled **Age**, the one closest to the left edge of the table will remain **Age**, while the one closest to the right will become **Age2**.

REMOVING TABLE COLUMNS

In a proper database application, removing a column (*field*) from a table can be a complex process. This is mostly to protect the integrity of

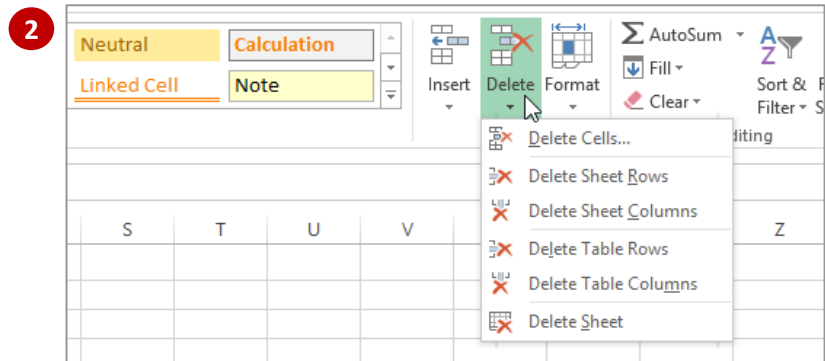
the data. However, it is relatively easy to remove existing columns from a table in Excel. You can simply use the options provided in the **cells** group on the **HOME** tab.

Try This Yourself:

Same File

Continue using the previous file with this exercise, or open the file *E1356 Worksheet Tables_4.xlsx...*

- 1 Click in cell **B4**
This is the Colour column of the table...
- 2 Click on the **HOME** tab, then click on the drop arrow for **Delete** in the **Cells** group
- 3 Select **Delete Table Columns** to delete the selected columns
Only one column will be deleted.
Notice that the column and its data have now been removed...
- 4 Click in cell **E4**
- 5 Repeat step 2, then select **Delete Table Columns** to delete the **Year** column



3

	A	B	C	D	E	F	G
1	Vehicle Fleet						
2							
3	Reg No	Make	Model	Type	Year		
4	DWE998	Vauxhall	Victor	Sedan			
5	D22 R4	Ford	Anglia	Estate			
6	S233 G4	Morris	Mini	Sedan			
7	MEAN 1	Jaguar	E-Type	Convertible			
8	FRG334	Hillman	Imp	Sedan			
9	CXA422	Humber	SuperSnipe	Sedan			
10	Total				6		
11							

5

	A	B	C	D	E	F	G
1	Vehicle Fleet						
2							
3	Reg No	Make	Model	Type			
4	DWE998	Vauxhall	Victor	Sedan			
5	D22 R4	Ford	Anglia	Estate			
6	S233 G4	Morris	Mini	Sedan			
7	MEAN 1	Jaguar	E-Type	Convertible			
8	FRG334	Hillman	Imp	Sedan			
9	CXA422	Humber	SuperSnipe	Sedan			
10	Total				6		
11							

For Your Reference...

To **remove** a **column** from a **table**:

1. Click in the column you want to remove
2. Click on the **HOME** tab, then click on the bottom half of **Delete** in the **Cells** group
3. Select **Delete Table Columns**

Handy to Know...

- You can delete a column using either the **Delete Table Columns** command (preferred) or the **Delete Sheet Columns** command which deletes the entire worksheet column. If you make a mistake and delete by accident simply click on **Undo** in the **QAT**.

WORKING WITH TABLE STYLES

Choosing the appropriate **table style** can improve the appearance of the data contained in the table and therefore make the data easier to

understand. The available style options change not only the appearance of the table but also some of the features available within it.

Try This Yourself:

Same File

Continue using the previous file with this exercise, or open the file E1356 Worksheet Tables_2.xlsx...

- 1 Click in cell **A4** to make the table active
- 2 Click on the **TABLE TOOLS: DESIGN** tab, then spend a few moments studying the options in the **Table Style Options** group
- 3 Click on **Header Row** in the **Table Style Options** group so that it appears unticked
When the Header Row is unticked the header row does not appear in the table...
- 4 Experiment with the other options in the **Table Style Options** group to see how both the format and structure of the table can be changed
- 5 When you have finished experimenting, ensure that the settings in the **Table Style Options** group are selected as shown

3

	A	B	C	D	E	F	G
1	Vehicle Fleet						
2							
3							
4	DWE998	Vauxhall	Victor	Sedan			
5	D22 R4	Ford	Anglia	Estate			
6	S233 G4	Morris	Mini	Sedan			
7	MEAN 1	Jaguar	E-Type	Convertible			
8	FRG334	Hillman	Imp	Sedan			
9	CXA422	Humber	Super Snipe	Sedan			
10							
11							

5

				TABLE TOOLS			
DATA				DESIGN			
Properties Open in Browser Refresh Unlink External Table Data				<input checked="" type="checkbox"/> Header Row <input checked="" type="checkbox"/> First Column <input checked="" type="checkbox"/> Filter Button <input checked="" type="checkbox"/> Total Row <input type="checkbox"/> Last Column <input type="checkbox"/> Banded Rows <input checked="" type="checkbox"/> Banded Columns			
Table Style Options							
	F	G	H	I	J	K	L

	A	B	C	D	E	F	G
1	Vehicle Fleet						
2							
3	Reg No	Make	Model	Type			
4	DWE998	Vauxhall	Victor	Sedan			
5	D22 R4	Ford	Anglia	Estate			
6	S233 G4	Morris	Mini	Sedan			
7	MEAN 1	Jaguar	E-Type	Convertible			
8	FRG334	Hillman	Imp	Sedan			
9	CXA422	Humber	Super Snipe	Sedan			
10	Total				6		
11							

For Your Reference...

To **change styles** in a **table**:

1. Click on the table
2. Click on the **TABLE TOOLS: DESIGN** tab
3. Click on the various **Table Style Options** to enable or disable them

Handy to Know...

- The **Total Row** option on the **TABLE TOOLS: DESIGN** tab inserts a **=SUBTOTAL** function using a **COUNTA** setting to count the number of records. You can modify this formula simply by clicking on it as you would with any other formula in a worksheet.

INSERTING OR DELETING TABLE RECORDS

In a database table, each row is known as a record. Obviously, removing or adding records in a table will determine the overall size of the table. Since a table in Excel is simply a range in a

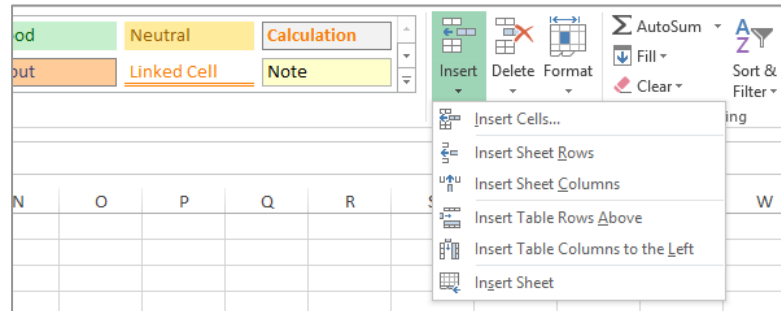
worksheet, it is critical that Excel knows the extent of the table at all times. There are specific commands in Excel that should be used for inserting and deleting rows (*records*) in a table.

Try This Yourself:

Same File

Continue using the previous file with this exercise, or open the file E1356 Worksheet Tables_7.xlsx...

- 1 Click anywhere in row 7 in the table
- 2 Click on the **HOME** tab, then click on the bottom half of **Insert** in the **Cells** group
- 3 Select **Insert Table Rows Above** to insert a new row at row 7
- 4 Select the range **A10:I10**, then copy and paste it into the range **A7:I7**
This will effectively duplicate this record – we'll deal with this a little later...
- 5 Click in the last cell in the **Telephone** column (this will be cell **I94**)
- 6 Press **Tab**
- 7 Notice that a new row is inserted into the table...
Ensure that the new row is active, click on the **HOME** tab, click on the drop arrow for **Delete** in the **Cells** group, then select on **Delete Table Rows**



2

	A	B	C	D
3	No	First Name	Last Name	Position
4	NZ0000001	Peter	Reynolds	Enterprise Leader
5	NZ0000002	Mary	Campbell	Effective People Leader
6	NZ0000003	Helen	Kai	Monies Leader
7				
8	NZ0000004	Norris	Maunga	Forward Thinking Leader
9	NZ0000005	Vivian	Smith	Enterprise Opportunities Leader
10	NZ0000006	Grace	Goodson	Communications Service Leader
11	NZ0000007	Kate	Rualowy	Insurance Service Leader

3

	A	B	C	D
3	No	First Name	Last Name	Position
4	NZ0000001	Peter	Reynolds	Enterprise Leader
5	NZ0000002	Mary	Campbell	Effective People Leader
6	NZ0000003	Helen	Kai	Monies Leader
7	NZ0000006	Grace	Goodson	Communications Service Leader
8	NZ0000004	Norris	Maunga	Forward Thinking Leader
9	NZ0000005	Vivian	Smith	Enterprise Opportunities Leader
10	NZ0000006	Grace	Goodson	Communications Service Leader
11	NZ0000007	Kate	Rualowy	Insurance Service Leader

4

For Your Reference...

To **insert** or **delete** rows within a **table**:

1. Click in the row where you want to insert or delete table records
2. Click on the **HOME** tab
3. In the **Cells** group, click on the bottom half of **Insert** or **Delete**, then select the required option

Handy to Know...

- You can insert or delete **sheet rows** and/or **table rows**. The difference is that if you choose the **table** option, the row is only inserted or deleted within the table area and not across the entire worksheet.

REMOVING DUPLICATES

Duplicate entries are an issue when using Excel as a database. Most database systems have *primary keys* to identify unique records. Because tables in Excel are simply normal rows and

columns, you don't have the same checks and balances. Fortunately, there is a command available that will check for duplication in a table.

Try This Yourself:

Same File

Continue using the previous file with this exercise, or open the file *E1356 Worksheet Tables_8.xlsx...*

1 Click in a cell within the table to make it active

If you look closely you'll see that row 7 is duplicated at row 10...

2 Click on the **TABLE TOOLS: DESIGN** tab, then click on **Remove Duplicates** in the **Tools** group to display the **Remove Duplicates** dialog box

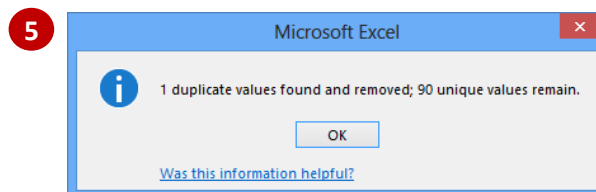
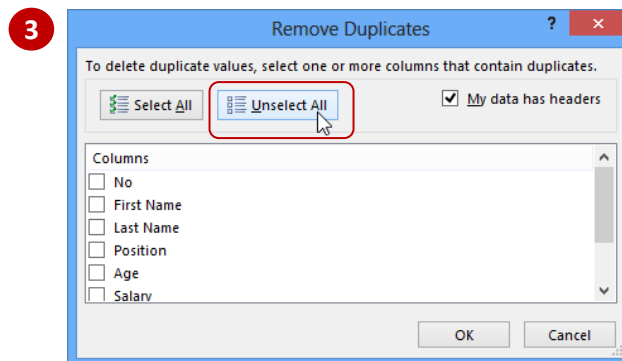
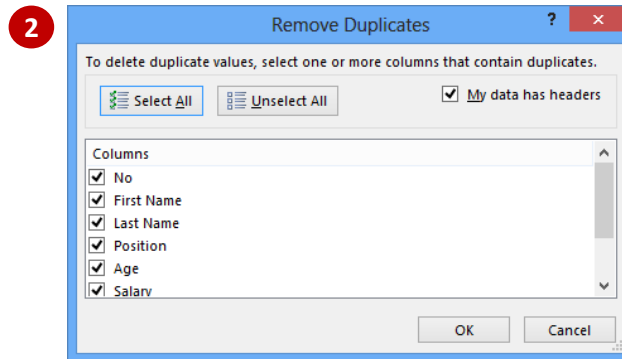
3 Click on **[Unselect All]** to remove the ticks from all of the columns

This table has a unique identifier (the employee number) which can be used to check for duplicates...

4 Under **Columns**, click on **No** so it appears ticked

5 Click on **[OK]**
A message will appear advising the number of duplicates that have been removed...

6 Click on **[OK]**
Notice that the duplicate at row 10 has now gone



6

	A	B	C	D
1	Alpheus Leader Listing			
2				
3	No	First Name	Last Name	Position
4	NZ0000001	Peter	Reynolds	Enterprise Leader
5	NZ0000002	Mary	Campbell	Effective People Leader
6	NZ0000003	Helen	Kai	Monies Leader
7	NZ0000006	Grace	Goodson	Communications Service Leader
8	NZ0000004	Norris	Maunga	Forward Thinking Leader
9	NZ0000005	Vivian	Smith	Enterprise Opportunities Leader
10	NZ0000007	Kate	Rualowy	Insurance Service Leader
11	NZ0000008	Brian	Houson	Banking and Finance Service Leader

For Your Reference...

To **remove duplicates** from a **table**:

1. Click in the table
2. Click on the **TABLE TOOLS: DESIGN** tab, then click on **Remove Duplicates** in the **Tools** group
3. Specify the columns to check for duplicates, then click on **[OK]**

Handy to Know...

- If you are looking for a duplicated record and don't have a unique field (such as an employee number) in your table, select all of the columns. If two records have the same details in each column then they must be duplicated.

FILTERING TABLES

Filtering, which allows you to display specific records that match a certain criteria provides you with a great opportunity for displaying and hiding records. You can display up to 1,000 items

in a filtered list. You can easily specify more advanced ways of filtering and can turn the filter results on or off with the click of a button.

Try This Yourself:

Same File

Continue using the previous file with this exercise, or open the file *E1356 Worksheet Tables_10.xlsx...*

1

Click on the **filter** drop arrow for the **Age** column, as shown

2

Click on **Select All** to remove all of the ticks, then scroll down and click on **65**

This specifies that only employees aged 65 will be displayed...

3

Click on **[OK]** to display the employees aged **65**

4

Click on the **filter** drop arrow for the **Office** column, click on **Select All** to remove all of the ticks, click on **New York**, then click on **[OK]**

This will show all 65 year old employees in New York...

5

Click on the **DATA** tab, then click on **Clear** in the **Sort & Filter** group to

No	First Name	Last Name	Position	Age	Salary
NZ0000016	Hine	Boramori	Ve	65	75,000
NZ0000002	Mary	Campbell	Eff	65	89,670
NZ0000006	Grace	Goodson	Col	65	84,500
NZ0000008	Brian	Houson	Bar	65	108,200
NZ0000015	Samuel	Jenkins	Col	65	90,500
NZ0000012	Kelly	Jones	He	65	89,540
NZ0000003	Helen	Kai	Mc	65	92,300
NZ0000009	Tara	Kinelly	Leg	65	99,500
NZ0000013	Arthur	Maohori	Col	65	78,500
NZ0000004	Norris	Maunga	For	65	88,500
NZ0000010	Nora	Mita	Bui	65	67,500
NZ0000018	Whetu	Ramabundi	Too	65	75,800
NZ0000001	Peter	Reynolds	Ent	65	112,500
NZ0000007	Kate	Rualowy	Ins	65	99,345
NZ0000017	Bob	Smith	Lif	65	78,400
NZ0000005	Vivian	Smith	Ent	65	75,600
NZ0000014	Marama	Takarami	Ele	65	79,800
NZ0000011	Kris	Tamahori	Car	65	84,300
IR0000015	Michelle	Cahalan	Col	65	99,550
IR0000017	Nora	Caissie	Lif	65	86,240
IR0000001	Paula	Cleary	Enterprise Leader	47	123,750

1

No	First Name	Last Name	Position	Age	Office
50	AU0000005	Mark	Jones	Enterprise Opportunities Leader	65
57	AU0000018	Lance	Williams	Tools Product Leader	65
68	US0000012	Zak	Mauriceson	Health Services Service Leader	65
94					
95					
96					
97					

3

No	First Name	Last Name	Position	Age	Salary	Office
	Zak	Mauriceson	Health Services Service Leader	65	88,645	New York

4

For Your Reference...

To **filter data** in a **table**:

1. Click anywhere in the table area
2. Use the filter arrows to select the data you wish to view
3. Click on **[Clear]** to remove the filter

Handy to Know...

- When you create a filter in a table, Excel simply hides the rows that don't match the filter. That's why you'll see some row numbers missing.

RENAMING A TABLE

In Excel you can have more than one table in a worksheet or workbook. Since a table is actually part of a range in a worksheet, each table is assigned its own unique **range name**. Tables are

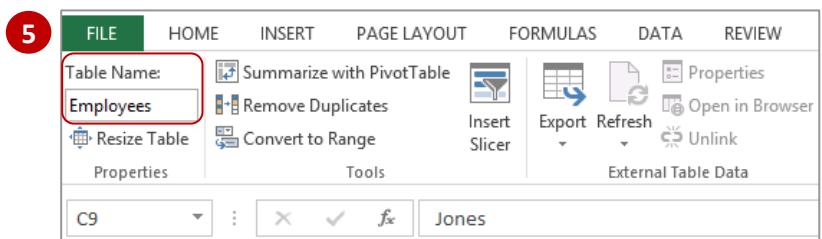
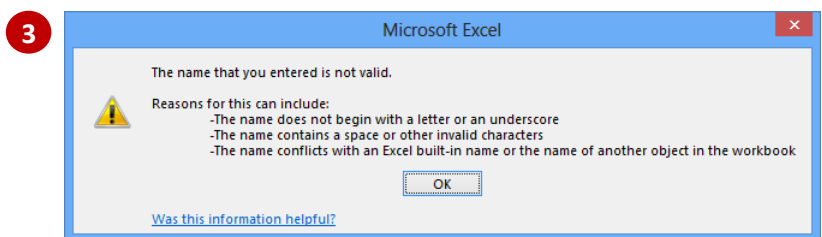
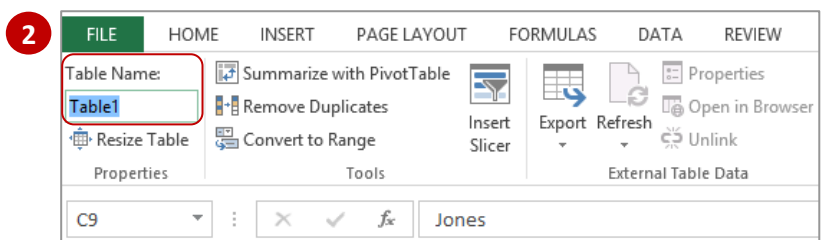
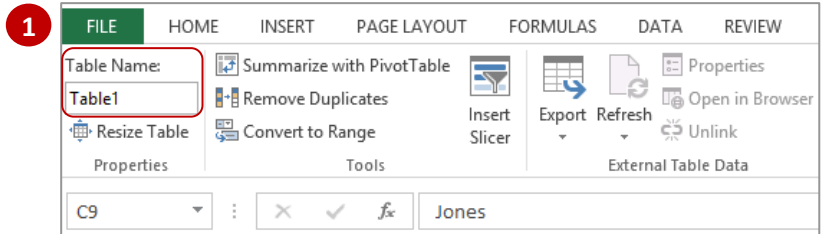
named *Table1*, *Table2* etc. by default; however, you can assign more meaningful names if you prefer.

Try This Yourself:

Same File

Continue using the previous file with this exercise, or open the file E1356 Worksheet Tables_11.xlsx...

- 1 Click anywhere in the table to make it active, then click on the **TABLE TOOLS:DESIGN** tab
Notice that the name of the table (Table1) appears in Table Name setting in the Properties group...
- 2 Click on **Table1** in **Table Name** to select it
- 3 Type **Employee Table**, then press
Spaces are not allowed in range names...
- 4 Click on **[OK]**
- 5 Click on **Table1** which has reappeared in **Table Name**, type **Employees**, then press
The table will be renamed



For Your Reference...

To **rename** a **table**:

1. Click in the table, then click on the **TABLE TOOLS: DESIGN** tab
2. Click on the existing table name, type the new name, then press

Handy to Know...

- Table names are **range names** and are therefore subject to the same naming conventions. While spaces are not permitted in range names, an underscore may be used instead (e.g. **Employee_Table**).

DELETING A TABLE

There may come a time when a table is no longer required. Deleting a table is quite simple, providing the entire defined range of the table is selected first. If you attempt to delete parts of

the table the table itself will remain in place but some of its data, headings, or structure may change depending upon the cell or range you have deleted.

Try This Yourself:

Same File

Continue using the previous file with this exercise, or open the file E1356 Worksheet Tables_13.xlsx...

- 1 Click in cell **C3**, then press **Del**
The text of the heading is deleted but immediately replaced by the text Column1...
- 2 Select the range **C3:D9**, then press **Del**
The data will be deleted....
- 3 Select the range **A3:I21**, then press **Del**
The entire table, including its formatting will be removed...
- 4 Select the range **A23:I95**, then press **Del** to delete this table
- 5 Click on the **FORMULAS** tab, then click on **Name Manager** in the **Defined Names** group to display the **Name Manager** dialog box
Since there are no names listed here we can safely assume that the table has been deleted...
- 6 Click on **[Close]**

	A	B	C	D	E
3	No	First Name	Column1	Position	Age
4	NZ0000016	Hine	Boramori	Vehicles Product Leader	57
5	NZ0000002	Mary	Campbell	Effective People Leader	56
6	NZ0000006	Grace	Goodson	Communications Service Leader	61
7	NZ0000008	Brian	Houson	Banking and Finance Service Leader	54
8	NZ0000015	Samuel	Jenkins	Computer Products Product Leader	54
9	NZ0000012	Kelly	Jones	Health Services Service Leader	28
10	NZ0000003	Helen	Kai	Monies Leader	34
11	NZ0000009	Tara	Kinelly	Legal Service Leader	23

1

	A	B	C	D	E
3	No	First Name	Column1	Column2	Age
4	NZ0000016	Hine			57
5	NZ0000002	Mary			56
6	NZ0000006	Grace			61
7	NZ0000008	Brian			54
8	NZ0000015	Samuel			54
9	NZ0000012	Kelly			28
10	NZ0000003	Helen	Kai	Monies Leader	34
11	NZ0000009	Tara	Kinelly	Legal Service Leader	23

2

	A	B	C	D	E
3					
4					
5					
6					
7					
8					
9					
10					
11					

3

Name Manager

New... Edit... Delete Filter

Name	Value	Refers To	Scope	Comment

Refers to: X Y Z

Close

5

For Your Reference...

To **delete** a **table** from a **worksheet**:

1. Select the entire range of the table
2. Press **Del**

Handy to Know...

- The **Name Manager** dialog box is a useful way of finding out what tables, if any, you have in a worksheet. If you click on the **[Filter]** button you can filter the names to show only table names.

UNDERSTANDING DATA LOOKUP FUNCTIONS

Data lookup functions are used to retrieve data from a table. They generally require at least two pieces of information; **what** to look for and **where** to look for it. The **what to look for** part is

often part of a table of information which can be referred to as a **calculation area**. The **where to look for it** is known as a **data table** – a table in which a list of rates, figures, text or other items are held.

1 Data Area

The **data area** is often on a worksheet by itself, protecting it from accidentally being modified or deleted. It holds all of the possible values for the data. The values are laid out in a table format and they are listed in numerical or alphabetical order of the code that the lookup function will search for.

The name **Pay_Rates** has been created as a quick way to reference the data table in the range B3:C7...

	A	B	C	D
1		Hourly Rates		
2				
3		1	23.5	
4		2	30.0	
5		3	35.0	
6		4	38.5	
7		5	42.5	
8				
9				

Calculation Area

- 2 The **calculation area** is usually on a worksheet by itself unless you require the data values to be visible as well as the resulting calculations.

The calculation area uses a formula, such as VLOOKUP, to find the correct data for each situation. In this example, the VLOOKUP function shown is comparing the value in **C5** with the values in the

	A	B	C	D	E	F
1	Weekly Payroll					
2						
3						
4	First Name	Last Name	Pay Scale	Hourly Rate		
5	Michelle	Calahan	2	\$30.00		
6	Kira	Convery	3			
7	Paddy	Deegan	4			
8	Marty	Doyle	3			
9	Connor	Healy	2			
10	Alana	Keane	1			
11	Siobhan	Kelliher	1			
12	Anthony	O'Brien	3			
13	Melissa	Quinn	4			
14						
15						

The formula here takes the Pay Scale value in C5 (i.e. 2) and finds the corresponding row in the **Pay_Rates** table (i.e. B4). It then returns the value in the second column of the corresponding row of the **Pay-Rates** table, which in this case is \$30.00...




USING VLOOKUP

The classic lookup function is **VLOOKUP** – the **vertical lookup**. This function searches vertically down a sorted data table looking for a match with the lookup-value (or the next lowest value).

It then looks across the table to the column you have specified to find the value to return. This is ideal for looking up numeric values within a range, such as tax rates, or commission amounts.

Try This Yourself:

Same File Continue using the previous file with this exercise, or open the file E831 Lookup Functions_2.xlsx...

- 1 Click on the drop arrow  for the **Name Box** and select **Tax_Table**
This is the data table for our VLOOKUP function...
- 2 Click on the **Payroll** worksheet tab to return to the payroll table and click on **G5**
- 3 Type **=VLOOKUP(F5,Tax_Table,2)**
- 4 Press 
0% appears because the Gross Pay is less than \$500...
- 5 Copy the formula in **G5** to the range **G6:G13**
- 6 Enter the formula **=F5*G5** in **H5**, then copy it to **H6:H13**
- 7 Enter the formula **=F5-H5** in **I5**, then copy it to **I6:I13**
- 8 Click on **C10**
- 9 Type **2** and press 
The change in the Pay Scale results in changes to the Hourly Rate, Gross Pay, Tax Rate, Tax and Net Pay for Alana Keane

1

B	C	D	E	F	G	H
Hourly Rates				Tax Table		
1	23.5			Salary Range	Tax Rate	
2	30.0			\$0.00	0%	
3	35.0			\$500.00	10%	
4	38.5			\$1,000.00	12%	
5	42.5			\$1,200.00	16%	
				\$1,400.00	18%	
				\$1,600.00	20%	
				\$1,800.00	22%	
				\$2,000.00	24%	
				\$2,200.00	26%	
				\$2,400.00	28%	
				\$2,600.00	30%	

4

ale	Hourly Rate	Hours Worked	Gross Pay	Tax Rate	Tax	Net Pay
	\$30.00	12.5	\$375.00	0%		
	\$35.00	9.0	\$315.00			
	\$38.50	16.0	\$616.00			
	\$35.00	35.5	\$1,242.50			
	\$30.00	5.0	\$150.00			
	\$23.50	41.0	\$963.50			
	\$23.50	2.0	\$47.00			
	\$35.00	25.0	\$875.00			
	\$38.50	32.0	\$1,232.00			

ale	Hourly Rate	Hours Worked	Gross Pay	Tax Rate	Tax	Net Pay
	\$30.00	12.5	\$375.00	0%	\$0.00	\$375.00
	\$35.00	9.0	\$315.00	0%	\$0.00	\$315.00
	\$38.50	16.0	\$616.00	10%	\$61.60	\$554.40
	\$35.00	35.5	\$1,242.50	16%	\$198.80	\$1,043.70
	\$30.00	5.0	\$150.00	0%	\$0.00	\$150.00
	\$30.00	41.0	\$1,230.00	16%	\$196.80	\$1,033.20
	\$23.50	2.0	\$47.00	0%	\$0.00	\$47.00
	\$35.00	25.0	\$875.00	10%	\$87.50	\$787.50
	\$38.50	32.0	\$1,232.00	16%	\$197.12	\$1,034.88
		Totals	\$6,082.50		\$741.82	\$5,340.68

9

For Your Reference...

VLOOKUP(lookup_value,table,col_index_num)

This function searches down the left-most column of the **table** until it finds the **lookup-value** or the row with the next lowest value. It then refers to the **column index number** nominated in the function, and returns the value found in the corresponding row and column.

Handy to Know...

An alternative to the **VLOOKUP** function is the horizontal or **HLOOKUP** function. This looks for a value in the top row of a table or array of values, and returns the value from the same column in the row you specify.

USING VLOOKUP FOR EXACT MATCHES


Generally, the **VLOOKUP** function uses three arguments: the lookup-value, the table location and the column number. This lookup will find a row based on a numeric range. However, you

may only want to return a value if you get an exact match, and the optional fourth argument, **match-type**, makes this possible. By adding **FALSE** to the function, **#NA** is returned if a match isn't found.

Try This Yourself:

Same File

Continue using the previous file with this exercise, or open the file *E831 Lookup Functions_3.xlsx*...


- 1 Click on the drop arrow  for **Name Box** and click on **Items_List**

This lookup table includes specific product codes that require an exact match...


- 2 Click on the **Invoice** worksheet tab, then click on **C7**


We'll use the exact lookup to find the description...

- 3 Type **=VLOOKUP(B7,Items_List,2,FALSE)**

- 4 Click on **E7**, type **=VLOOKUP(B7,Items_List,3,FALSE)**, then press 

We only want to charge a deposit if B3 is not blank...

- 5 Click on **F7**, type **=IF(ISBLANK(\$B\$3),0,VLOOKUP(B7,Items_List,4,FALSE))**, then press 

- 6 Click on **G7**, type **=(D7*E7)*(1-F7)**, then press 

- 7 Copy the formulas in columns **C**, **E**, **F** and **G** down to **Row 10** to complete the invoice as shown

Item	Description	Quantity	Price	Deposit	Total Cost
TEL00001	=VLOOKUP(B7,Items_List,2,FALSE)				
TEL00003		1			
TEL00005		2			
TEL00007		1			

3

Item	Description	Quantity	Price	Deposit	Total Cost
TEL00001	World Communicator 223	2	\$234.50	12%	\$412.72
TEL00003		1			
TEL00005		2			
TEL00007		1			

6

Item	Description	Quantity	Price	Deposit	Total Cost
TEL00001	World Communicator 223	2	\$234.50	12%	\$412.72
TEL00003	Master Communicator 10 Plus	1	\$1,237.90	22%	\$965.56
TEL00005	Global Roamer 514	2	\$237.80	22%	\$370.97
TEL00007	Global Roamer 516	1	\$677.00	12%	\$595.76
				Total Items	\$2,859.50
				Total Deposit	\$514.49
				Total Invoice	\$3,373.99

7

For Your Reference...

To use **VLOOKUP** for **exact matching**:

VLOOKUP(lookup_value,table,col,range_lookup)

Use the value of **FALSE** for **range_lookup** when you want to ensure exact matches only. **#NA** will be returned if an exact match isn't found.

Handy to Know...

- You can use the **ISNA(value)** function to trap **#NA** results. For example, the structure **=IF(ISNA(lookup),"Code not found",lookup)** will display a useful message when an exact match is not possible, rather than **#NA** which does not explain the problem clearly.

USING HLOOKUP

Another commonly used lookup function is **HLOOKUP** – the **horizontal lookup**. This function searches horizontally across a sorted data table looking for a match with the lookup-value (or

the next lowest value). It then looks down the table to the row you have specified to find the value to return. This can be used to search for text, numbers, or logical values.

Try This Yourself:

Same File

Continue using the previous file with this exercise, or open the file E831 Lookup Functions_4.xlsx...

- 1 Click on the **Index** worksheet tab then click on **D14** and examine the formula

This is an example of the **VLOOKUP** function. This scans down the list of options looking for the corresponding Equipment number. When it finds a match, it returns the description.

You can use **HLOOKUP** in a similar way...

- 2 Click on cell **D15** and type **=HLOOKUP(C15,Rate_Type,2,TRUE)**
- 3 Press **Enter**
The name of the Rate Type will be returned and displayed...
- 4 Experiment with different values in cells **C14** and **C15**
You'll find that the formulas return the corresponding descriptions

D14 fx =VLOOKUP(C14,Equipment_List,2,FALSE)

	A	B	C	D	E	F
1		Communications Equipment Hire Costs				
2						
3			1	2	3	4
4	No	Description	Corporate	Frequent	Private	Staff
5	1	World Communicator 223	\$60.00	\$51.00	\$66.00	\$30.00
6	2	Planet Tamer 34e	\$75.00	\$63.75	\$82.50	\$37.50
7	3	Master Communicator 10 Plus	\$120.00	\$102.00	\$132.00	\$60.00
8	4	Global Roamer 514	\$60.00	\$51.00	\$66.00	\$30.00
9	5	Global Roamer 515	\$75.00	\$63.75	\$82.50	\$37.50
10	6	Global Roamer 516	\$85.00	\$72.25	\$93.50	\$42.50
11	7	Global Roamer 517	\$95.00	\$80.75	\$104.50	\$47.50
12						
13				Description		
14	Equipment Item No	5	Global Roamer 515			
15	Rate Type	1				
16	Number of Days	10				
17						

1

1	Communications Equipment Hire Costs				
2					
3			1	2	3
4	No	Description	Corporate	Frequent	Private
5	1	World Communicator 223	\$60.00	\$51.00	\$66.00
6	2	Planet Tamer 34e	\$75.00	\$63.75	\$82.50
7	3	Master Communicator 10 Plus	\$120.00	\$102.00	\$132.00
8	4	Global Roamer 514	\$60.00	\$51.00	\$66.00
9	5	Global Roamer 515	\$75.00	\$63.75	\$82.50
10	6	Global Roamer 516	\$85.00	\$72.25	\$93.50
11	7	Global Roamer 517	\$95.00	\$80.75	\$104.50
12					
13				Description	
14	Equipment Item No	5	Global Roamer 515		
15	Rate Type	1	Corporate		
16	Number of Days	10			
17					

3

For Your Reference...

HLOOKUP(lookup_value,table,row_index_num)

This function searches across the top-most column of the **table** until it finds the **lookup_value** or the row with the next lowest value. It then refers to the **row index number** nominated in the function, and returns the value found in the same column

Handy to Know...

- If the **lookup_value** is smaller than the smallest value in the first row of **table**, **HLOOKUP** will return the **#N/A** error value.
- **Range_lookup** is an optional argument. If **TRUE** or omitted, it will find the closest match in the top row. **FALSE** forces an exact match.

USING MATCH

The **MATCH** function looks for an item in a list and returns the position of that item. **MATCH** is used instead of the other lookup functions when the **position** of the item rather than the item

itself is needed. For example, you can search for a particular category name in an alphabetical list and return its location in the list, such as 3 for the 3rd position or 4 for the 4th position.

Try This Yourself:

Continue using the previous file with this exercise, or open the file E831 Lookup Functions_6.xlsx...

1 On the **Index** worksheet, click on **C18** and examine the formula. At the moment, the formula uses the Rate Type in C15 to determine which column to look in. Using **MATCH** you can allow the user to type the rate name rather than a number...

2 Click on cell **C15** and type **Staff**, then press **Tab** and delete the contents of **D15** which will display an error

3 Click on **C18**, then double-click on **C15** in the formula to select it – we'll replace it with the **MATCH** function

4 Type **MATCH(C15,C4:F4)**

5 Press **Enter**
The formula looks up the text and returns its position, which is 4 in this case. This is, in turn, used by the **INDEX** function to locate the correct hire rate for the given rate type

MIN		=INDEX(Rate_List,C14,C15)	
A	B	INDEX(array, row_num, [column_num])	
1	Communications Equipment Hire Costs		
2			

3

MIN		=INDEX(Rate_List,C14,MATCH(C15,C4:F4))			
A	B	INDEX(array, row_num, [column_num]) INDEX(reference, row_num, [column_num], [area_num])			
1	Communications Equipment Hire Costs				
2					
3					
4	No	Description	1 Corporate	2 Frequent	3 Private
5	1	World Communicator 223	\$60.00	\$51.00	\$66.00
6	2	Planet Tamer 34e	\$75.00	\$63.75	\$82.50
7	3	Master Communicator 10 Plus	\$120.00	\$102.00	\$132.00
8	4	Global Roamer 514	\$60.00	\$51.00	\$66.00
9	5	Global Roamer 515	\$75.00	\$63.75	\$82.50
10	6	Global Roamer 516	\$85.00	\$72.25	\$93.50
11	7	Global Roamer 517	\$95.00	\$80.75	\$104.50
12					

4

C19			=C16*C18			
A	B	C	D	E	F	
1	Communications Equipment Hire Costs					
2						
3			1	2	3	4
4	No	Description	Corporate	Frequent	Private	Staff
5	1	World Communicator 223	\$60.00	\$51.00	\$66.00	\$30.00
6	2	Planet Tamer 34e	\$75.00	\$63.75	\$82.50	\$37.50
7	3	Master Communicator 10 Plus	\$120.00	\$102.00	\$132.00	\$60.00
8	4	Global Roamer 514	\$60.00	\$51.00	\$66.00	\$30.00
9	5	Global Roamer 515	\$75.00	\$63.75	\$82.50	\$37.50
10	6	Global Roamer 516	\$85.00	\$72.25	\$93.50	\$42.50
11	7	Global Roamer 517	\$95.00	\$80.75	\$104.50	\$47.50
12						
13			Description			
14	Equipment Item No		1	World Communicator 223		
15	Rate Type		Staff			
16	Number of Days		10			
17						
18	Hire Per Day		\$30.00			
19	Total Hire		\$300.00			
20						

5

For Your Reference...

MATCH(lookup_value,table,match_type)

This function searches through the **table** until it finds the **lookup_value** or the row with the next lowest value. It then returns the position of the value in the array. **Match_type** can be 1 (find value less than or equal to **lookup_value**), 0 (exact match) or -1 (value greater than or equal to).

Handy to Know...

- When **MATCH** searches for a text value, it expects to find the list in alphabetical order. If it doesn't find an exact match in the alphabetical search, it will return the position of the word that would have appeared alphabetically before it in the list. This can be varied by changing **match-type**.

USING IFERROR


IFERROR is used to trap errors that may occur as the result of a calculation and then display alternative text or values. For example, if you divide a number by zero, Excel will normally

return the message **#DIV/0!** which can be a bit alarming for novice users. **IFERROR** tests a calculation to see if it works and, if so, performs the calculation. If not, it displays an alternative.

Try This Yourself:

Same File

Continue using the previous file with this exercise, or open the file E714 Logical Functions 4.xlsx...

- 1 Click on the ***IFERROR Function*** worksheet tab and click in **E7**
- 2 Type the following
=IFERROR(C7/D7, "First Year")
- 3 Press 
- 4 Click on **E7** and then double-click on the fill handle to copy the formula down the column

Instead of giving an error where the divisor is zero, Excel displays the text "First Year" in the cell

2

	B	C	D	E	F	G
Global Enterprises						
Total Sales						
	Total Sales	Years as Agent	Average Annual Sales			
Costas	2,578,015	2	=IFERROR(C7/D7,"First Year")			
Daniels	4,875,485	4				
Grayson	2,978,450	3				
Hancock	7,586,204	6				
Houison	1,083,650	0				
Kai	1,284,500	0				
Maunga	7,658,900	8				
Nguyen	4,357,859	5				
Rualowy	2,487,652	3				

4

	Total Sales	Years as Agent	Average Annual Sales		
Costas	2,578,015	2	1,289,008		
Daniels	4,875,485	4	1,218,871		
Grayson	2,978,450	3	992,817		
Hancock	7,586,204	6	1,264,367		
Houson	1,083,650	0	First Year		
Kai	1,284,500	0	First Year		
Maunga	7,658,900	8	957,363		
Nguyen	4,357,859	5	871,572		
Rualowy	2,487,652	3	829,217		

For Your Reference...

IFERROR(calculation, error_value)

This function performs the **calculation** and if there are no errors, displays the result of the calculation. If an error does occur, it displays the **error value**.

Handy to Know...

- In this example we've used text as the entry to be displayed if an error is located, but you could just as easily display nothing (using `""`) or perform an alternative calculation.

ABSOLUTE VERSUS RELATIVE REFERENCING

Excel is a calculation tool and as such is geared around the concept of formulas. Formulas are entered into a worksheet using cell references rather than actual values. Each time a formula is

entered using cell referencing a shape is created and it is this shape which determines where Excel goes to pick up values for use in the calculation.

Understanding Formula Shapes

When you create a formula you don't enter numbers into the formula – you enter **cell references**. This creates a great time advantage when you need to duplicate that formula in other cells. Formulas are merely **shapes** that reference cells in specific locations in the worksheet or workbook. For example, let's say you have a formula in cell **E5** that is written as **=D5*C5**. To Excel this is interpreted as a shape that says "from my current position (E5) go left one cell (D5), take the value there and multiply it by the value two cells left (C5)". This becomes the formula shape – *left one multiply by left two*.

When this formula, or shape, is then copied or filled to adjacent cells it is the **shape** that is copied and the cell references within those copied formulas change **relative** to the shape (which doesn't change). For example if you copy **=D5*C5** from **E5** to **E6** the formula in **E6** changes to **=D6*C6** – but the shape is still – *left one multiply by left two*.

	A	B	C	D	E
1	Alpheius Global Enterprises				
2	Weekly Payroll				
3					
4	First Name	Last Name	Hours	Rate	Gross Pay
5	Angelo	Marcuzzo	43	35.60	=D5*C5
6	Riley	Griffin	35	32.10	1,123.50
7	Celeste	O'Connor	28	12.50	350.00
8	Alex	Barnard	15.5	32.40	502.20
9	Tammy	Huber	22.5	10.25	230.63
10	Ishara	Tringali	40	10.25	410.00
11					
12	Totals				4,147.13
13					

	A	B	C	D	E
1	Alpheius Global Enterprises				
2	Weekly Payroll				
3					
4	First Name	Last Name	Hours	Rate	Gross Pay
5	Angelo	Marcuzzo	43	35.60	1,530.80
6	Riley	Griffin	35	32.10	=D6*C6
7	Celeste	O'Connor	28	12.50	350.00
8	Alex	Barnard	15.5	32.40	502.20
9	Tammy	Huber	22.5	10.25	230.63
10	Ishara	Tringali	40	10.25	410.00
11					
12	Totals				4,147.13
13					

Absolute Referencing

There will be times however when one or more cell references in a formula are always required to be located in a specific cell, row, or column. In the example below, sales tax of 10% is located in cell **B4** and must always be referenced from **B4**. The sales tax for the dining table is calculated using the formula **=B8*B4** while the sales tax for the sofa is calculated using the formula **=B9*B4**. These are different **shapes** and if you were to copy the formula from **C8** (**=B8*B4**) to **C9** it would copy the shape and the formula would be **=B9*B5** – which is wrong.

	A	B	C	D	E
1	Alpheius Global Enterprises				
2	Price List				
3					
4	Sales Tax:	10%			
5					
6		Price	Tax	Price	
7		Ex Tax		Inc Tax	
8	Dining Table	1,255.50	=B8*B4	1,381.05	
9	Sofa	2,788.90	278.89	3,067.79	
10	Credenza	355.50	35.55	391.05	
11					

	A	B	C	D	E
1	Alpheius Global Enterprises				
2	Price List				
3					
4	Sales Tax:	10%			
5					
6		Price	Tax	Price	
7		Ex Tax		Inc Tax	
8	Dining Table	1,255.50	125.55	1,381.05	
9	Sofa	2,788.90	=B9*B4	3,067.79	
10	Credenza	355.50	35.55	391.05	
11					

When dealing with cells in formulas that must be referenced from the same location you must fix these cell references by making them **absolute**. This is done by placing a **\$** sign in front of either or both the row and column co-ordinate of the cell depending on which of these has to remain fixed (e.g. **\$B\$4**, **\$B4**, or **B\$4**). In the example above, both row and column co-ordinates need to be fixed and the formula in **C8** should be written as **=B8*\$B\$4** before it can be copied to adjacent cells.


RELATIVE FORMULAS

Most of the formulas that you enter into a worksheet, unless you are dealing with quite complex mathematical modelling, will be **relative formulas** where the cell references will


be able to change when the formulas are copied to other locations. This is particularly true of columnar worksheets where there is a series of columns that all have the same shape and structure.

Try This Yourself:

Open File Before starting this exercise you **MUST** open the file **E711 Absolute_1.xlsx...**

- 1 Click in cell **B9** to make it the active cell
- 2 Click on the **Sum** command  in the **Editing** group on the **Home** tab of the **Ribbon** to commence a formula in this cell
- 3 Press **Enter** to complete the formula
- 4 Click on cell **B9** again, and drag the small square handle (the **fill handle**) at the bottom right corner of the cell to **E9**

This will copy the formula shape from B9 to E9...

- 5 Click in cell **F6** to make it the active cell
- 6 Click on the **Sum** command  in the **Editing** group to commence a formula in this cell
- 7 Press **Enter** to complete the formula
- 8 Click on cell **F6** again, and drag the **fill handle** to **F9**

This will copy the formula shape from F6 to F9

1

	A	B	C	D	E	F
1	Alpheius Global Enterprises					
2	Revenue					
3						
4		Auckland	Dublin	Melbourne	New York	Total
5						
6	January	1,050,254	1,547,000	1,488,369	1,523,124	
7	February	1,524,294	1,685,548	1,599,854	1,789,552	
8	March	3,521,487	2,985,448	2,741,221	2,521,447	
9	1st Quarter					
10						

2

	A	B	C	D	E	F
1	Alpheius Global Enterprises					
2	Revenue					
3						
4		Auckland	Dublin	Melbourne	New York	Total
5						
6	January	1,050,254	1,547,000	1,488,369	1,523,124	
7	February	1,524,294	1,685,548	1,599,854	1,789,552	
8	March	3,521,487	2,985,448	2,741,221	2,521,447	
9	1st Quarter	=SUM(B6:B8)				
10						
11						

4

	A	B	C	D	E	F
1	Alpheius Global Enterprises					
2	Revenue					
3						
4		Auckland	Dublin	Melbourne	New York	Total
5						
6	January	1,050,254	1,547,000	1,488,369	1,523,124	
7	February	1,524,294	1,685,548	1,599,854	1,789,552	
8	March	3,521,487	2,985,448	2,741,221	2,521,447	
9	1st Quarter	6,096,035	6,217,996	5,829,444	5,834,123	
10						
11						

6

	B	C	D	E	F	G	H
	Global Enterprises						
		Auckland	Dublin	Melbourne	New York	Total	
		1,050,254	1,547,000	1,488,369	1,523,124	=SUM(B6:E6)	
		1,524,294	1,685,548	1,599,854	1,789,552		
		3,521,487	2,985,448	2,741,221	2,521,447		
		6,096,035	6,217,996	5,829,444	5,834,123		

For Your Reference...

To create a relative formula:

1. Click in the cell in which you want the formula
2. Type or enter the formula and ensure that the formula contains references to other cells

Handy to Know...

- The formulas that we created above copied successfully and correctly because the same formula shape is used in each of the cells in which the formula was copied – this is the real benefit of relative formulas.

PROBLEMS WITH RELATIVE FORMULAS

Copying formulas can present problems when the **shape** of the formula varies from cell to cell. This can occur when one or more values in a formula must be located in a specific cell, row, or

column – that is, the formula must include an **absolute** cell reference. In this exercise you will see some strange values when you copy a formula to other cells using the default copying method.

Try This Yourself:

Open File

Before starting this exercise you **MUST** open the file *E711 Absolute_2.xlsx...*

- 1 Click in cell **C11** where we need to calculate the product's surcharge
- 2 Type **=B11*B5**
Notice the shape of the formula as indicated by the highlighted cells...
- 3 Press **Enter** to complete the formula
Okay, we can now copy (or perhaps fill, seeing as the destination cells are adjacent) to the other cells...
- 4 Click on cell **C11** again
- 5 Move the mouse pointer to the **fill handle** at the lower right corner of the cell and drag down to cell **C22**
The results are meaningless!

2

4			
5	Head Office Surcharge	12%	
6			
7			
8		Nett of	
9	Product	Surcharge	Surcharge
10			
11	World Communicator 223	234.50	=B11*B5
12	Planet Tamer 34e	344.55	
13	Master Communicator 10 Plus	1,245.50	

3

4			
5	Head Office Surcharge	12%	
6			
7			
8		Nett of	
9	Product	Surcharge	Surcharge
10			
11	World Communicator 223	234.50	28.14
12	Planet Tamer 34e	344.55	
13	Master Communicator 10 Plus	1,245.50	

5

4				
5	Head Office Surcharge	12%		
6				
7				
8		Nett of		
9	Product	Surcharge	Surcharge	Incl
10				Surc
11	World Communicator 223	234.50	28.14	
12	Planet Tamer 34e	344.55	0.00	
13	Master Communicator 10 Plus	1,245.50	0.00	
14	Master Communicator 20 Plus	13,455.00	#VALUE!	
15	Global Roamer 514	112.34	#VALUE!	
16	Global Roamer 515	135.60	0.00	
17	Global Roamer 516	166.70	39,091.15	
18	Global Roamer 517	198.00	68,220.90	
19	Sat-Direct 1460	566.80	705,949.40	
20	Sat-Direct 1560	655.34	8,817,599.70	
21	Sat-Direct 1660	788.90	88,625.03	
22	Sat-Direct 1760	1,255.00	170,178.00	
23				
24				

Handy to Know...

- So what has gone wrong with the formulas above? The whole problem hinges on the fact that each of the formulas in column C uses a different shape from the other formulas. For example, the first formula in C11 is =B11*B5. The shape of this formula is one left, then six up and one left.
- The second formula in C12 has become =B12*B6 because it uses the same shape as the originating formula in C11. In reality the formula should be =B12*B5. All of the formulas above must reference the Head Office Surcharge of 12% which is in cell B5 – that is, the cell reference must be **absolute**.

CREATING ABSOLUTE REFERENCES

There will be times when you need to create a formula which references cells that must remain the same even when it is copied around the worksheet. That is, you will need to make the cell

references **absolute**. A cell reference in a formula is made absolute by preceding its row coordinate or its column coordinate or both with a \$ sign.

Try This Yourself:

Same File

Continue using the previous file with this exercise, or open the file *E711 Absolute_3.xlsx...*

- 1 Click on cell **C11** then click on the **B5** reference of the formula in the **Formula bar** at the top of the screen
- 2 Press the **Absolute** key **F4** several times and notice how the reference cycles through various \$ sign configurations. Press the **Absolute** key **F4** until **B5** appears as **\$B\$5**
- 3 Press **Enter** to complete the editing
- 4 Click on **C11**, move the mouse pointer to the **fill handle** at the bottom right of the cell, and drag down to **C22** to fill the formulas down – successfully this time

1

	A	B	C
4			
5	Head Office Surcharge	12%	
6			
7			
8		Nett of	
9	Product	Surcharge	Surcharge
10			
11	World Communicator 223	234.50	=B11*B5
12	Planet Tamer 34e	344.55	0.00
13	Master Communicator 10 Plus	1,245.50	0.00
14	Master Communicator 20 Plus	13,455.00	#VALUE!

2

	A	B	C
4			
5	Head Office Surcharge	12%	
6			
7			
8		Nett of	
9	Product	Surcharge	Surcharge
10			
11	World Communicator 223	234.50	=B11*\$B\$5
12	Planet Tamer 34e	344.55	0.00
13	Master Communicator 10 Plus	1,245.50	0.00
14	Master Communicator 20 Plus	13,455.00	#VALUE!

4

	Product	Nett of Surcharge	Including Surcharge
11	World Communicator 223	234.50	28.14
12	Planet Tamer 34e	344.55	41.35
13	Master Communicator 10 Plus	1,245.50	149.46
14	Master Communicator 20 Plus	13,455.00	1,614.60
15	Global Roamer 514	112.34	13.48
16	Global Roamer 515	135.60	16.27
17	Global Roamer 516	166.70	20.00
18	Global Roamer 517	198.00	23.76
19	Sat-Direct 1460	566.80	68.02
20	Sat-Direct 1560	655.34	78.64
21	Sat-Direct 1660	788.90	94.67
22	Sat-Direct 1760	1,255.00	150.60

For Your Reference...

To make a **cell reference absolute**:

1. Press **F4** to insert \$ before the row and column references, or type \$ before each

To **remove absolute references**:

1. Press **F4** until all \$ are removed, or delete the \$ from the formula

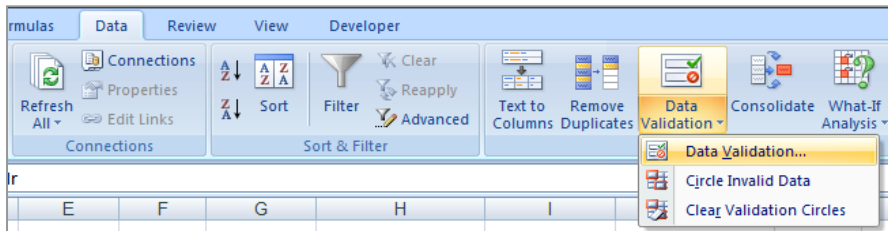
Handy to Know...

- To make a **row** reference absolute, press **F4** twice to insert \$ before the row reference only. To make a **column** reference absolute, press **F4** three times to insert \$ before the column reference only.

UNDERSTANDING DATA VALIDATION

Data validation is used to define restrictions on what data can or can't be entered in a cell. You can set validation to prevent users from entering data that is not valid. If you prefer, you can allow

users to enter invalid data but warn them when they try to type it in the cell. You can also provide messages to say what input you expect for the cell, and instructions to help users correct any errors.



Access the **Data** tab. Click on the drop-down arrow on the **Data Validation** button to select from the available menu list. Alternatively, click on the top section of the **Data Validation** button to instantly access the **Data Validation** dialog box.

Data Validation Settings

Data validation is invaluable when you want to share a workbook with others in your organisation, and you want the data entered in the workbook to be accurate and consistent. You can enter **settings** to restrict the type of information that a user can enter. Here are some examples:

- Restrict entry to predefined items in a **List**.
- Restrict numbers outside of a specified range.
- Restrict dates outside a certain time frame (date or time).
- Limit the number of text characters entered into a cell.
- Validate data based on formulas or values in other

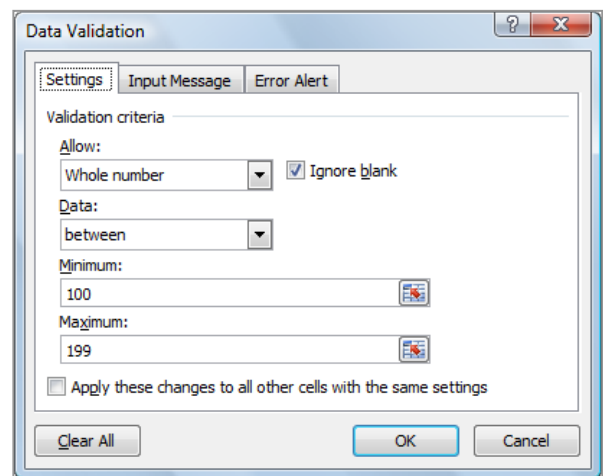
Input Messages

In addition to the validation settings, you can also choose to show an input message when the user selects the cell. This type of message appears near the cell. You can move this message, if you want to, and it remains until you

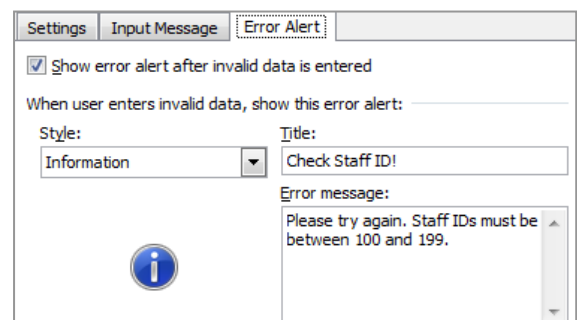
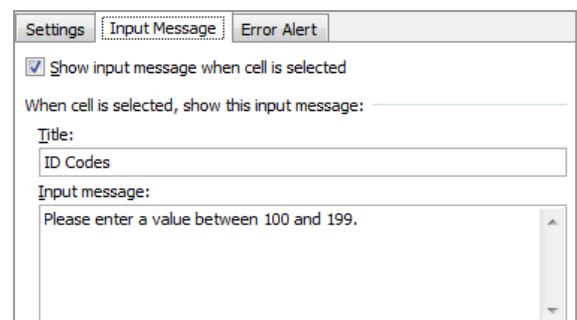
Error Alerts

You may want to provide a meaningful error message if a user types in the wrong information. Using an **error alert**, you can choose a **warning**, **stop** or **information** error message to appear. Used with an input message, the error alert gives the user instructions as to what they have done wrong and what information should be entered instead.

Input messages and error alerts appear only when data is typed directly into the cells, not when the data is copied or filled into the cells.



On the **Settings** tab, use the **Allow** option to control what type of restriction you wish to set. In the above example, the **Allow** option has been set to **Whole number** and the range of numbers set between **100** and **199**.



CREATING DROP-DOWN LISTS



If you have a limited number of possible options for a cell, you can create a drop-down **list** for the user to select from. This ensures that the spelling of the choices is consistent, and makes it

much easier for the user to complete their data entry tasks. Lists are created using the **Data Validation** settings and a separate list of items is stored in the workbook.

Try This Yourself:

Same File

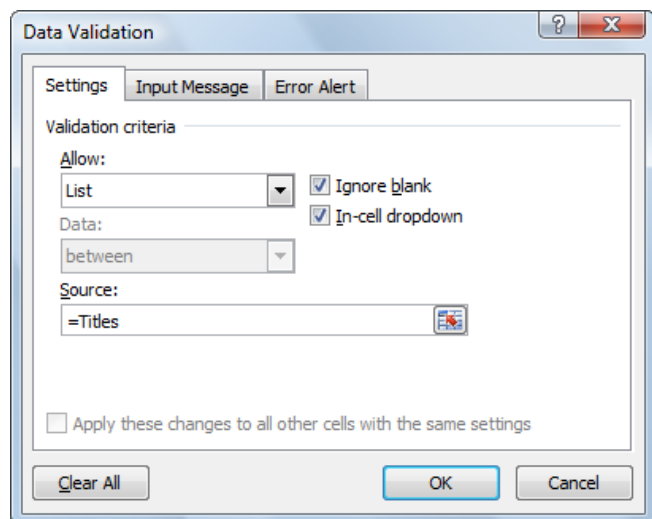
Continue using the previous file with this exercise, or open the file *E765 Validation_5.xlsx...*

- 1 Click on the **Sources** worksheet tab and read through the lists
We'll use the Titles list as the entries for the drop-down list...
- 2 Click on the **Payroll** tab, then click on cell **B10**
- 3 On the **Data** tab, click on the **Data Validation** button and then click the **Settings** tab
- 4 Click on the drop arrow  for **Allow** and click on **List**
- 5 Click in **Source** and press **F3** to display a list of range names
- 6 Click on **Titles** to select it, then click on **[OK]**
- 7 Click on **[OK]** to apply the settings
Because cell B10 is already selected, a drop arrow will appear...
- 8 Click on the drop arrow  for **B10** to display a list of titles
- 9 Click on **Mr** to select it and enter the text in the cell

1

	A	B	C	D	E	F	G
1	Titles	Depts					
2			These are lists that are used in validations.				
3	Mr	Banking and Finance					
4	Mrs	Buildings					
5	Ms	Communications					
6	Miss	Health					
7	Dr	Insurance					
8		Legal					

6



Data Validation

Settings | Input Message | Error Alert

Validation criteria

Allow: List ☒ Ignore blank


Data: between ☒ In-cell dropdown

Source: =Titles

☐ Apply these changes to all other cells with the same settings

Clear All OK Cancel

8

6						Employee Det
7						
8	Staff ID	Title	First Name	Last Name	Date Hired	Position
9						
10	106					
11		Mr				
12		Mrs				
13		Ms				
14		Miss				
15		Dr				

For Your Reference...

To **create** a **drop-down list**:

1. Type a list of items in a worksheet, then click where you want the list to appear
2. On the **Data** tab, click on the **Data Validation** to and then click the **Settings** tab
3. Select **List** in **Allow**, type the list range for **Source**, then click on **[OK]**

Handy to Know...

- The list we used has been given a range name (**Titles**) to make it easier to locate. It has also been placed on a separate worksheet to protect it. To provide even better protection, you could hide the worksheet by right clicking on the worksheet

UNDERSTANDING LABELS AND NAMES

Labels are used to refer to individual cells or ranges of cells as an alternative to using cell references. Names are more descriptive than labels, but they serve the same purpose.

For example, in a formula that calculates profit, the profit column's formula may look like **=Income-Expenses**, which is more readable than **=E12-E9**. Here are some other examples.

Labels

The term **label** usually refers to text that you have typed in a cell. If the text appears next to a continuous list of values, Excel sees the label as a 'tag' that represents that range of values. The label can then be used in formulas instead of direct cell references. If you have used numbers as 'labels', such as the year 2004, Excel allows you to define these as labels too. Note that labels can be used only within the same worksheet.

	A	B	C	D	E	F	G
1	Expenses						
2							
3	Expense Type						
4		Qtr 1	Qtr 2	Qtr 3	Qtr 4	Total	
5	Wages	3,778	5,289	4,707	4,190	=SUM(Wages)	
6	Insurance	553	746	664	591	2,554	
7	Raw Materials	21,667	30,344	26,997	24,027	103,035	
8	Freight	34	45	23	48	150	
9							
10	Total	26,032	36,424	32,391	28,856	123,703	

Here the label **Wages**, typed originally in A5, is being used in the formula in F5 to refer to the range B5:E5.

Similarly, the label **Qtr_1** could be used to refer to the cells in the range B5:B8.

Names

If you want to create a **tag** that refers to a range of cells holding values and text, or that you can use in formulas on other worksheets, you need to create a **Name**.

Names are like labels except that the name has to be specified against a particular range, and does not usually appear on the spreadsheet. Names can be used to refer to cells in other worksheets, in other workbooks, and can even be used to represent a fixed value rather than a range of cells. For example, if you need to use a **constant** value in your calculations, but don't want the value to appear in the worksheet in case it is accidentally changed, you can define a name and assign it a value. For example, **GST** could represent the value **10%**.

The name **ExpenseTotals** is being created in the Name box to refer to the non-contiguous range A5:A8 and F5:F8.

This name can be used to re-select the range later, or to refer to this range

	A	B	C	D	E	F	G
1	Expenses						
2							
3	Expense Type						
4		Qtr 1	Qtr 2	Qtr 3	Qtr 4	Total	
5	Wages	3,778	5,289	4,707	4,190	17,964	
6	Insurance	553	746	664	591	2,554	
7	Raw Materials	21,667	30,344	26,997	24,027	103,035	
8	Freight	34	45	23	48	150	
9							
10	Total	26,032	36,424	32,391	28,856	123,703	

Need to Know...

There are two important rules to follow when creating **Names**:

1. You can only use letters of the alphabet, numbers or the underscore character (**_**) in names. Spaces and other special characters such as **&**, ***** or **%** are not allowed.
2. Names must not begin with a number. Use a letter or an underscore as the first character of your name, for example, **Yr1996** or **_2005**.

LOOKUP FUNCTIONS

Practice Exercise

Tasks:

Before starting this exercise you MUST have completed all of the topics in the chapter Lookup Functions...

- 1 Open the workbook called **PE_Lookup Functions.xlsx** (you will find it in the student files folder)
- 2 Study the data on both worksheets
- 3 Use the **LOOKUP** function to reference the **Named Ranges** worksheet and to add the **Staff Name** and **Department** to cells **C6:C8** and **D6:D8** respectively on the **Awards** worksheet
- 4 Use the **INDEX** functions in cells **E6:E8** to reference the winnings table of the **Named Ranges** worksheet, based on the following information on the **Awards** worksheet:
Quarter: see cell B3
Place: see cells A6:A8 for first, second and third
- 5 Copy and modify the formulas so that they refer to the correct cells for each quarter, completing the worksheet as shown in the sample on the next page
- 6 Use the **Save As** command to save the worksheet as **PE_Lookup Functions (Completed).xlsx**

LOOKUP FUNCTIONS

Practice Exercise

	A	B	C	D	E	F
1	Quarterly Staff Achievement Awards					
2						
3	Quarter: 1					
4						
5	Place	Staff ID	Name	Department	Winnings	
6	1	742	Scott Nomates	Security	\$100	
7	2	735	Colleen Norton	Security	\$50	
8	3	751	Kate Singer	Sales	\$20	
9						
10	Quarter: 2					
11						
12	Place	Staff ID	Name	Department	Winnings	
13	1	765	Glenda Christensen	Sales	\$90	
14	2	756	George Lazenby	Sales	\$75	
15	3	747	Lars Black	Admin	\$25	
16						
17	Quarter: 3					
18						
19	Place	Staff ID	Name	Department	Winnings	
20	1	760	Stephen Lee	Sales	\$100	
21	2	763	Deborah Winter	Admin	\$50	
22	3	753	Emma Steinbeck	Admin	\$20	
23						
24	Quarter: 4					
25						
26	Place	Staff ID	Name	Department	Winnings	
27	1	748	James Hatfield	Sales	\$120	
28	2	762	Greg Haynes	Marketing	\$65	
29	3	759	Thomas Scott	Marketing	\$40	
30						