

Microsoft Excel 2010 – Level 1

5 – Formulas and functions



FORMULAS AND FUNCTIONS



InFocus

The real magic of Excel lies in the use of **formulas**.

If all Excel could do was allow you to input numbers and words it would be virtually no different to a word processing package – without the fancy features for processing words!

Just as Microsoft Word allows you to work with words, Excel allows you to **process** numbers. This is done with **formulas** that are used to perform calculations.

Formulas can perform simple tasks such as adding up a few cells or more complex operations. Excel actually contains several hundred pre-programmed formulas for performing complex operations – these are known as **functions**.

In this booklet you will:

- ✓ gain an understanding of how formulas work and are written in **Excel**
- ✓ learn how to create formulas that add using the pointing method
- ✓ learn how to create formulas that subtract
- ✓ learn how to create formulas that multiply and divide
- ✓ gain an understanding of what functions are and how they work
- ✓ learn how to use the **SUM** function to add values
- ✓ learn how to sum non-contiguous ranges
- ✓ learn how to calculate an average
- ✓ learn how to find a maximum value using the **MAX** function
- ✓ learn how to find a minimum value using the **MIN** function
- ✓ learn how to create more complex formulas
- ✓ learn how to perform **What If** testing using the formulas in a worksheet

UNDERSTANDING FORMULAS

Formulas can be very simple, very complex, or somewhere in between. Excel, however, must know when you are entering a formula in a cell, after all, how can it discern the difference between

numbers, words, and formulas unless you specifically tell it? And one other thing, you'll also need to understand some basic maths theories before proceeding to more complex formulas.

How Formulas Work

In Excel every formula that you create MUST start with an equal sign (=). This is a trigger to Excel. When Excel sees you start a cell entry with an equal sign it immediately knows that you are about to enter a formula that will perform a calculation.

For instance, if you type **5+6** in a cell, as shown in example 1, Excel will display **5+6** in that cell. It doesn't know what else to do with it.

However, if you type **=5+6** in a cell, as shown in example 2, Excel will display **11** in that cell in the worksheet. In the formula bar at the top of the worksheet it will actually display **=5+6** whenever that cell is the active cell.

So far, so good. But really, what use is there in typing **=5+6** in a cell? If you next need to know what 6+6 will equal you will need to do some tricky cell editing to change the formula, or retype the formula completely.

Formulas in Excel actually work like an illusion – a magician's trick performed with mirrors! Instead of typing numbers into a formula, you type the numbers in their own cells, then type the **cell addresses** that refer to those numbers in the formula.

In example 3, the value **5** has been typed into **B2**, the value **6** has been typed into **B3**, and the formula **=B2+B3** has been typed into **B4**.

This might seem like a lot more typing than you might otherwise do, but the real gain lies in the functionality of what is done here. For example, if you need to know what 6 plus 6 equals, you simply type **6** in **B2**, and the formula in **B4** will instantly update to show you the answer.

This occurs because Excel interprets the formula shown in **B4** as *this cell should equal whatever is in B2 plus whatever is in B3*. Whenever something new is typed into one of the two referenced cells this formula is immediately recalculated and provides the latest result.

Rules For Using Formulas

Excel follows the **BODMAS** rules of arithmetic to determine the order in which calculations in any given formula are performed. The order is – Brackets Of, then Division, then Multiplication, then Addition, then Subtraction.

So the equation **3 + 2 x 10** could equal either **50** or **23**. Using BODMAS the correct answer is **23**: $2 \times 10 = 20 + 3 = 23$.

Computers do not have the standard arithmetic symbols that we are accustomed to. The keys on the keyboard that you will use to perform the following basic arithmetic operations are shown below.



Addition



Subtraction



Multiplication



Division

1

	A	B	C	D	E
1					
2					
3		5+6			
4					
5					

2

	A	B	C	D	E
1					
2					
3		11			
4					
5					

3

	A	B	C	D	E
1					
2		5			
3		6			
4		11			
5					

CREATING FORMULAS THAT ADD

In Excel you can **create formulas** by **typing** them directly into the cells, or by **pointing** to the cells. When pointing to a cell, Excel types the cell address into the formula for you. This helps to avoid typing

errors in your formulas. In this exercise you will use the **pointing method** to create a formula that adds the gross pays for *Alpheius Global Enterprises*.

Try This Yourself:

Open
File

Before starting this exercise you **MUST** open the file *E810 Formulas_1.xlsx*...

- 1 Click on cell **E15** where we need to add up all of the gross pays
- 2 Type = to start the formula
- 3 Click on cell **E8** and type + (the plus sign)
The E8 cell reference will be added to the formula and the active cell pointer will jump back down to E15 ready for the next cell reference – the formula is actually being typed as you point to the cells...
- 4 Repeat step 3 for each cell from **E9** to **E12**
Remember to press + after you click in each cell...
- 5 Click on cell **E13** (but don't type + because there are no more cells to add)
- 6 Press to complete the formula

2

6					
7	First Name	Last Name	Hours	Rate	Gross Pay
8	Angelo	Marcuzzo	43	35.60	1530.8
9	Riley	Griffin	35	32.10	1123.5
10	Celeste	O'Connor	28	12.50	350
11	Alex	Barnard	15.5	32.40	502.2
12	Tammy	Huber	22.5	10.25	230.625
13	Ishara	Tringali	40	10.25	410
14					
15	Totals				=
16					

3

6					
7	First Name	Last Name	Hours	Rate	Gross Pay
8	Angelo	Marcuzzo	43	35.60	1530.8
9	Riley	Griffin	35	32.10	1123.5
10	Celeste	O'Connor	28	12.50	350
11	Alex	Barnard	15.5	32.40	502.2
12	Tammy	Huber	22.5	10.25	230.625
13	Ishara	Tringali	40	10.25	410
14					
15	Totals				=E8+
16					

4

6					
7	First Name	Last Name	Hours	Rate	Gross Pay
8	Angelo	Marcuzzo	43	35.60	1530.8
9	Riley	Griffin	35	32.10	1123.5
10	Celeste	O'Connor	28	12.50	350
11	Alex	Barnard	15.5	32.40	502.2
12	Tammy	Huber	22.5	10.25	230.625
13	Ishara	Tringali	40	10.25	410
14					
15	Totals				=E8+E9+E10+E11+E12+
16					

6

6					
7	First Name	Last Name	Hours	Rate	Gross Pay
8	Angelo	Marcuzzo	43	35.60	1530.8
9	Riley	Griffin	35	32.10	1123.5
10	Celeste	O'Connor	28	12.50	350
11	Alex	Barnard	15.5	32.40	502.2
12	Tammy	Huber	22.5	10.25	230.625
13	Ishara	Tringali	40	10.25	410
14					
15	Totals				4147.125
16					
17					

For Your Reference...

To **create a formula** using the **pointing method**:

1. Click on the cell to hold the addition
2. Type = then click on each of the desired cells (typing + after all except for the last)
3. Press

Handy to Know...

- The pointing technique is great to use, as you can actually see the formula being built on the screen for you.

CREATING FORMULAS THAT SUBTRACT

There are many different types of formulas that can be written in Excel. Virtually any type of mathematical operation can be performed. As well as addition, you can

create formulas that subtract one value from another. Because it is usual to include cell references in the formula, when any values change so to do the formula results.

Try This Yourself:

Same File

Continue using the previous file with this exercise, or open the file E810 Formulas_2.xlsx...

- 1 Click on the **Subtraction** worksheet tab at the bottom of your screen to make it the active worksheet
- 2 Click in cell **G8** where we need to calculate *Angelo Marcuzzo's Net Pay*
- 3 Type = to start the formula, then click on the gross pay value in cell **E8**
- 4 Type - (the minus sign) to indicate that you wish to subtract from this value, then click on the tax value in cell **F8**
- 5 Press **Enter** to complete the formula
We can now fill this formula down for the other staff...
- 6 Click on cell **G8**, then hover over the small black square at the bottom right of the cell until the mouse pointer changes to a thin cross
- 7 Drag down to cell **G15** then release the mouse button
- 8 Click in cell **G14** and press **Del** to delete the unwanted formula

3

6	7	First Name	Last Name	Hours	Rate	Gross Pay	Tax	Net Pay
8	Angelo	Marcuzzo	43	35.60	1530.80	430.87	=E8	
9	Riley	Griffin	35	32.10	1123.50	322.56		
10	Celeste	O'Connor	28	12.50	350.00	89.55		
11	Alex	Barnard	15.5	32.40	502.20	232.45		
12	Tammy	Huber	22.5	10.25	230.63	89.56		
13	Ishara	Tringali	40	10.25	410.00	154.50		
14								
15	Totals				4147.13	1319.49		
16								

4

6	7	First Name	Last Name	Hours	Rate	Gross Pay	Tax	Net Pay
8	Angelo	Marcuzzo	43	35.60	1530.80	430.87	=E8-F8	
9	Riley	Griffin	35	32.10	1123.50	322.56		
10	Celeste	O'Connor	28	12.50	350.00	89.55		
11	Alex	Barnard	15.5	32.40	502.20	232.45		
12	Tammy	Huber	22.5	10.25	230.63	89.56		
13	Ishara	Tringali	40	10.25	410.00	154.50		
14								
15	Totals				4147.13	1319.49		
16								

6

6	7	First Name	Last Name	Hours	Rate	Gross Pay	Tax	Net Pay
8	Angelo	Marcuzzo	43	35.60	1530.80	430.87	1099.93	
9	Riley	Griffin	35	32.10	1123.50	322.56		
10	Celeste	O'Connor	28	12.50	350.00	89.55		
11	Alex	Barnard	15.5	32.40	502.20	232.45		
12	Tammy	Huber	22.5	10.25	230.63	89.56		
13	Ishara	Tringali	40	10.25	410.00	154.50		
14								
15	Totals				4147.13	1319.49		
16								

8

6	7	First Name	Last Name	Hours	Rate	Gross Pay	Tax	Net Pay
8	Angelo	Marcuzzo	43	35.60	1530.80	430.87	1099.93	
9	Riley	Griffin	35	32.10	1123.50	322.56	800.94	
10	Celeste	O'Connor	28	12.50	350.00	89.55	260.45	
11	Alex	Barnard	15.5	32.40	502.20	232.45	269.75	
12	Tammy	Huber	22.5	10.25	230.63	89.56	141.07	
13	Ishara	Tringali	40	10.25	410.00	154.50	255.50	
14								
15	Totals				4147.13	1319.49	2827.64	
16								

For Your Reference...

To **create** a **subtraction formula**:

1. Click on the cell to hold the subtraction
2. Type = then click in the first cell
3. Type - (minus sign) then click on the cell to subtract
4. Press **Enter**

Handy to Know...

- You can mix various arithmetic signs in a formula to create more complex formulas. For example you can have a complex formula that adds specific values and subtracts others.

FORMULAS THAT MULTIPLY AND DIVIDE

Basic formulas involve the same types of arithmetical operations within the one calculation – that is, addition, subtraction, multiplication, or division. You can mix these operations within the one formula as

much and as often as you need. However, you should always keep in mind the basic rules of **BODMAS**, especially where division is concerned.

Try This Yourself:

Same
File

Continue using the previous file with this exercise, or open the file E810 Formulas_3.xlsx...


In this exercise we'll calculate the superannuation payable for employees, which is 9% of their gross pay. The logic is:

$gross \times super\ rate$

$gross \times 9\ divided\ by\ 100$

$gross \times (9 / 100)$

Note that the brackets are for readability only and won't affect the calculation...

- 1 Click on the **More Complex** worksheet tab to ensure that it is the active worksheet, then click in **H8** which is where we will calculate Angelo's super
- 2 Type = to start the formula, click in **E8** then type ***(9/100)**
- 3 Press  to complete the formula
We'll fill down now...
- 4 Click in **H8** then hover over the fill handle at the bottom right of the cell until the cell pointer changes to a thin cross
- 5 Click and drag down to **H13**
- 6 Repeat steps 4 and 5 to fill **H15** from **G15**

Last Name	Hours	Rate	Gross Pay	Tax	Net Pay	Superannuation
Marcuzzo	43	35.60	1530.80	430.87	1099.93	=E8*(9/100)
Griffin	35	32.10	1123.50	322.56	800.94	
O'Connor	28	12.50	350.00	89.55	260.45	
Barnard	15.5	32.40	502.20	232.45	269.75	
Huber	22.5	10.25	230.63	89.56	141.07	
Tringali	40	10.25	410.00	154.50	255.50	
			4147.13	1319.49	2827.64	

Last Name	Hours	Rate	Gross Pay	Tax	Net Pay	Superannuation
Marcuzzo	43	35.60	1530.80	430.87	1099.93	137.772
Griffin	35	32.10	1123.50	322.56	800.94	
O'Connor	28	12.50	350.00	89.55	260.45	
Barnard	15.5	32.40	502.20	232.45	269.75	
Huber	22.5	10.25	230.63	89.56	141.07	
Tringali	40	10.25	410.00	154.50	255.50	
			4147.13	1319.49	2827.64	

Last Name	Hours	Rate	Gross Pay	Tax	Net Pay	Superannuation
Marcuzzo	43	35.60	1530.80	430.87	1099.93	137.772
Griffin	35	32.10	1123.50	322.56	800.94	101.115
O'Connor	28	12.50	350.00	89.55	260.45	31.5
Barnard	15.5	32.40	502.20	232.45	269.75	45.198
Huber	22.5	10.25	230.63	89.56	141.07	20.75625
Tringali	40	10.25	410.00	154.50	255.50	36.9
			4147.13	1319.49	2827.64	

Last Name	Hours	Rate	Gross Pay	Tax	Net Pay	Superannuation
Marcuzzo	43	35.60	1530.80	430.87	1099.93	137.772
Griffin	35	32.10	1123.50	322.56	800.94	101.115
O'Connor	28	12.50	350.00	89.55	260.45	31.5
Barnard	15.5	32.40	502.20	232.45	269.75	45.198
Huber	22.5	10.25	230.63	89.56	141.07	20.75625
Tringali	40	10.25	410.00	154.50	255.50	36.9
			4147.13	1319.49	2827.64	373.24

For Your Reference...

To **create** a **formula** that **multiplies** or **divides**:

1. For multiplication, separate the variables with an asterisk (*)
2. For division, separate the variables with a forward slash (/)

Handy to Know...

- More complex formulas can be managed using brackets. For example, if you want to multiply two numbers then divide them by the product of another two numbers, enclose both multiplication parts of the equation in brackets separated by a division sign. For example, **(A*B)/(C*D)**.

UNDERSTANDING FUNCTIONS

Imagine having to create a formula that calculated the monthly payments on a loan, or the average of over 100 cells – these would require complex or long

formulas that would be time consuming to develop. This is the role of hundreds of **arithmetic functions** that have been pre-programmed into Excel for you.

1 Functions Overview

Functions are simply pre-programmed formulas already provided for you in Excel which can perform calculations covering a wide range of categories including statistics, date and time arithmetic, financial calculations, lists, engineering and much more.

Just like normal formulas that you create, functions must start with an **equal sign**. The equal sign is then followed by the specific **name** of the function (usually a descriptive name which indicates the purpose of the function). Most functions also require additional information known as **arguments** which are supplied to the function in brackets after the function name. Functions are therefore written as follows:

=name(arguments)

The arguments are quite often cell or range references that contain values that can be used in the function. For example, the most common function is the **SUM** function which, as its name suggests, is used to sum or add values together. If you wanted to add all of the values in the cells from **B10** to **D15** you would write this function as:


=SUM(B10:D15)

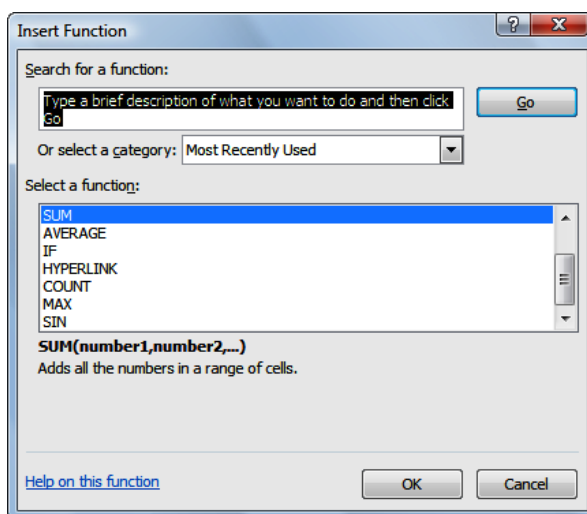
As you can see this is much simpler than writing your own referential formula which would look like:

=B10+B11+B12+B13+B14+B15+D10+D11+D12+D13+D14+D15

Imagine writing and proofing a formula where you had to add 200 cells!

2 Typing Functions

If you are familiar with the function that you need you can type it into a cell exactly the same way you type any other formula. If you are not sure if Excel has a function or you can't quite remember how it is written you can use the **Insert Function** tool  on the formula bar to assist you. When you click on this tool the **Insert Function** dialog box will be presented to you which lists the most recently used or common functions and also allows you to search for other functions that you might need.



The **Insert Function** dialog box will also type the function out for you and then provide you with a further dialog box to guide you through the process of specifying the arguments that the function needs to perform its calculation.

USING THE SUM FUNCTION TO ADD


One of the most used functions is the **SUM** function. This function allows you to add the values in a range of cells. The function is written as **=SUM(range or ranges to add)**.

You can type the function and then use the pointing technique to fill in the arguments. Excel then paints marquees around the cells involved helping you to track your progress.

Try This Yourself:

Open
File

Before starting this exercise you **MUST** open the file **E810 Formulas_4.xlsx...**

- 1 Click on **B9** then type **=sum(** to start the formula
- 2 Click on **B6** to point to this cell as the start, hold down the **Shift** key and click on **B8**
Notice the relative addressing details, **3R x 1C**, that appears in the tool tip...
- 3 Type **)** and press **Enter** to complete the function
- 4 Click on **B9**, then move the mouse pointer to the fill handle on the lower right corner of the cell and drag across to **E9** to fill function across the range
- 5 Click on the **Copy** command  on the **Clipboard** group on the **Home** tab
- 6 Click on **B14**, hold down **Ctrl** and then click on cells **B19** and **B24**
- 7 Release **Ctrl** and press **Enter** to paste equivalent functions into the worksheet

1

	A	B	C	D
1	Alpheius Global Enterprises			
2	Revenue Takings Last 12 Months			
3				
4		Auckland	Dublin	Melbourne
5				
6	January	1,050,254	1,547,000	1,488,369
7	February	1,524,294	1,685,548	1,599,854
8	March	3,521,487	2,985,448	2,741,221
9	1st Quarter	=sum(
10		SUM(number1, [number2], ...)		
11	April	2,531,225	2,621,889	2,453,999

2

	A	B	C	D
1	Alpheius Global Enterprises			
2	Revenue Takings Last 12 Months			
3				
4		Auckland	Dublin	Melbourne
5				
6	January	1,050,254	1,547,000	1,488,369
7	February	1,524,294	1,685,548	1,599,854
8	March	3,521,487	2,985,448	2,741,221
9	1st Quarter	=sum(B6:B8	3R x 1C	
10		SUM(number1, [number2], ...)		
11	April	2,531,225	2,621,889	2,453,999

7

	Auckland	Dublin	Melbourne	New York	
4					
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	April	2,531,225	2,621,889	2,453,999	2,547,441
12	May	550,998	850,554	818,874	837,228
13	June	838,223	926,778	879,114	983,225
14	2nd Quarter	3,920,446	4,399,221	4,151,987	4,367,894
15					
16	July	1,936,882	1,641,554	1,507,774	1,386,448
17	August	1,392,666	1,441,447	1,349,552	1,400,116
18	September	3,332,211	223,323	322,332	673,322
19	3rd Quarter	6,661,759	3,306,324	3,179,658	3,459,886
20					
21	October	2,311,234	1,298,877	1,299,567	1,342,112
22	November	1,234,455	2,341,122	1,884,566	324,555
23	December	2,590,332	3,213,332	844,355	12,665,444
24	4th Quarter	6,136,021	6,853,331	4,028,488	14,332,111
25					

For Your Reference...

To **type** a **sum function** for a **contiguous range**:

1. Type **=sum(**
2. Select the range of cells
3. Type **)**
4. Press **Enter**

Handy to Know...

- You can also use the **Sum** command in the **Editing** group on the **Home** tab of the **Ribbon** to have Excel automatically enter a sum function based on a range of cells.
- You can type the name of a function in upper or lowercase – it is not case sensitive.

SUMMING NON-CONTIGUOUS RANGES

Many users simply use the **SUM** function to add a continuous block of data – known as a **range** but you can do more if you know how. With Excel you can write a **SUM** function that adds up data from one or

more ranges within a worksheet. The ability to sum non-contiguous ranges of data helps you to increase the level of functionality of your worksheet.

Try This Yourself:

Same
File

Continue using the previous file with this exercise, or open the file E810 Formulas_5.xlsx...

- 1 Click on **B26** and type **=sum(** to start the formula
- 2 Click on **B9**, type **,** (comma), and click in cells **B14**, **B19** and **B24** – typing **,** (comma) after each cell except the last one
- 3 Press **Enter** to complete the function, then click on **B26** again
Oops! We didn't add a right bracket. Excel adds the bracket for you with functions that use only one set of brackets. You can also use multiple ranges in a function...
- 4 Click on **C26** and type **=sum(**
- 5 Hold down **Ctrl** and use the mouse to select the following ranges
C6:C8 **C16:C18**
C11:C13 **C21:C23**
- 6 Press **Enter** then click on **C26**
- 7 Move the mouse pointer to the fill handle and drag to **E26** to copy the function across

2

19	3rd Quarter	6,661,759	3,306,324	3,179,658	3,459,886
20					
21	October	2,311,234	1,298,877	1,299,567	1,342,112
22	November	1,234,455	2,341,122	1,884,566	324,555
23	December	2,590,332	3,213,332	844,355	12,665,444
24	4th Quarter	6,136,021	6,853,331	4,028,488	14,332,111
25					
26	Total	=sum(B9,B14,B19,B24			
27		SUM(number1, [number2], [number3], [number4], [number5], ...)			
28	Monthly				

3

B26		fx					=SUM(B9,B14,B19,B24)					
	A	B	C	D	E	F						
20												
21	October	2,311,234	1,298,877	1,299,567	1,342,112							
22	November	1,234,455	2,341,122	1,884,566	324,555							
23	December	2,590,332	3,213,332	844,355	12,665,444							
24	4th Quarter	6,136,021	6,853,331	4,028,488	14,332,111							
25												
26	Total	22,814,261										
27												

5

NPV		X ✓ fx					=sum(C6:C8,C11:C13,C16:C18,C21:C23)				
	A	B	C	D	E	F					
4		Auckland	Dublin	Melbourne	New York						
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	April	2,531,225	2,621,889	2,453,999	2,547,441						
12	May	550,998	850,554	818,874	837,228						
13	June	838,223	926,778	879,114	983,225						
14	2nd Quarter	3,920,446	4,399,221	4,151,987	4,367,894						
15											
16	July	1,936,882	1,641,554	1,507,774	1,386,448						
17	August	1,392,666	1,441,447	1,349,552	1,400,116						
18	September	3,332,211	223,323	322,332	673,322						
19	3rd Quarter	6,661,759	3,306,324	3,179,658	3,459,886						
20											
21	October	2,311,234	1,298,877	1,299,567	1,342,112						
22	November	1,234,455	2,341,122	1,884,566	324,555						
23	December	2,590,332	3,213,332	844,355	12,665,444						
24	4th Quarter	6,136,021	6,853,331	4,028,488	14,332,111						
25											
26	Total	22,814,261	=sum(C6:C8,C11:C13,C16:C18,C21:C23								
27			SUM(number1, [number2], ...)								
28	Monthly										

For Your Reference...

To type a **sum function** for a **non-contiguous range**:

1. Type **=sum(**
2. Click on the first cell to sum
3. Type **,** and click in the next cell to sum
4. Type **)** then press **Enter**

Handy to Know...

- The big problem with typing a function is that there is more chance of making a typing mistake. Excel actually has some in-built error checking, called **Formula AutoCorrect**, that can correct up to 15 of the most common mistakes users make (e.g. the right bracket to finish a function).

CALCULATING AN AVERAGE




The **AVERAGE** function allows you to average the values in a range of cells. It is written in much the same way as the **SUM** function, for example, **=AVERAGE(range of cells to average)**. The average

function can be applied using the **Functions Wizard**; a part of Excel that steps you through the process of creating a function, or you can type it in yourself if you are comfortable with it.

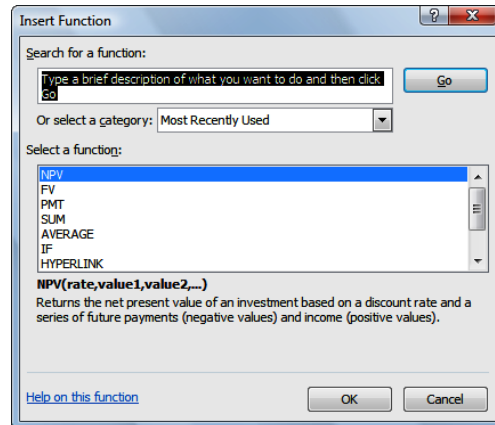
Try This Yourself:

Same
File

Continue using the previous file with this exercise, or open the file *E810 Formulas_6.xlsx*...

- 1 Click on **B29** then click on the **Insert Function** tool  to display the **Insert Function** dialog box
- 2 Click on **AVERAGE** in **Select a function** then click on **[OK]** to display the **Function Arguments** dialog box
- 3 Click on the **Range Selector** tool  for **Number1** to roll up the wizard, then hold down **Ctrl** and select the following ranges
B6:B8 **B16:B18**
B11:B13 **B21:B23**
- 4 Press **Enter** to complete the range specifications, then click on **[OK]** to complete the process
Let's use the AutoSum function...
- 5 Click on **B34**, then click on the drop arrow for **Sum**  in the **Editing** group, on the **Home** tab and select **Average**
- 6 Click on **B9**, hold down **Ctrl** and click on **B14**, **B19** and **B24**, then press **Enter** to complete the formula

1




3

AVERAGE						=AVERAGE(B6:B8,B11:B13,B16:B18,B21:B23)					
	A	B	C	D	E	F	G				
4		Auckland	Dublin	Melbourne	New York						
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						
12	May	550,998	850,554	818,874	837,228						
13	June	838,223	926,778	879,114	983,225						
14	2nd Quarter	3,920,446	4,399,221	4,151,987	4,367,894						
16	July	1,936,882	1,641,554	1,507,774	1,386,448						
17	August	1,392,666	1,441,447	1,349,552	1,400,116						
18	September	3,332,211	223,323	322,332	673,322						
19	3rd Quarter	6,661,759	3,306,324	3,179,658	3,459,886						
21	October	2,311,234	1,298,877	1,299,567	1,342,112						
22	November	1,234,455	2,341,122	1,884,566	324,555						
23	December	2,590,332	3,213,332	844,355	12,665,444						
24	4th Quarter	6,136,021	6,853,331	4,028,488	14,332,111						
26	Total	22,814,261	20,776,872	17,189,577	27,994,014						
28	Monthly										
29	Average	=AVERAGE(B6:B8,B11:B13,B16:B18,B21:B23)									
30	Maximum										

For Your Reference...

To **insert** an **average** function:

1. Click in the cell then click on the **Insert Function** tool 
2. Click on **AVERAGE** in **Select a function**
3. Insert the required ranges then click on **[OK]**

Handy to Know...

- You can type queries like "How do I work out the monthly payment for a car loan?" into the **Search** box in the **Insert Function** dialog box. Once you have selected a function from the **Select a function** list, the **Function Arguments** dialog box will help you to enter the values into the function.

FINDING A MAXIMUM VALUE





When reviewing a long list of numbers it is sometimes difficult to see which is the largest value in the list. The **MAX** function allows you to extract the highest value from a range of cells. It is written in much

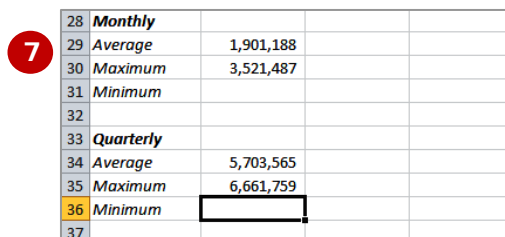
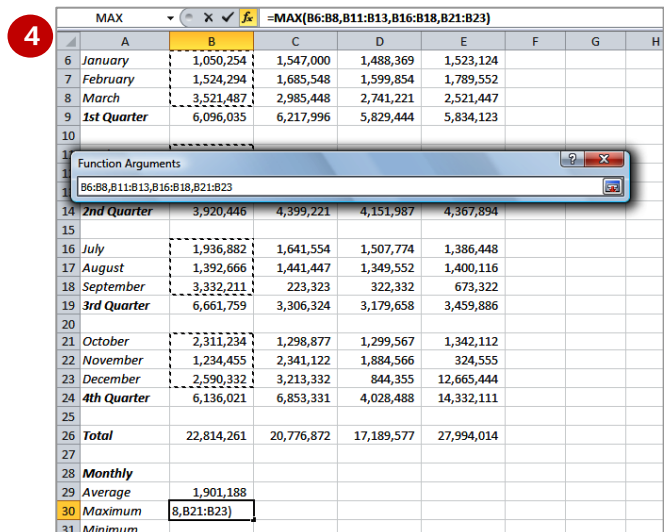
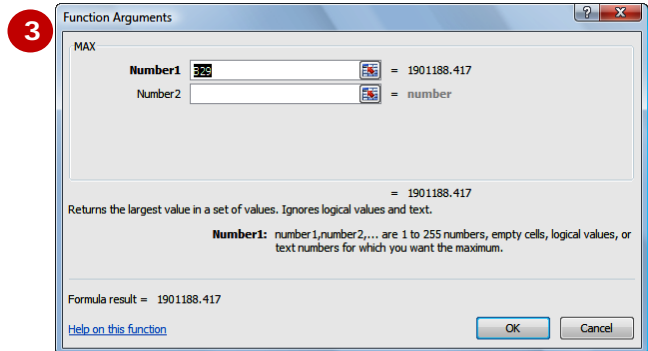
the same way as the **SUM** function: **=MAX(range of cells)**. The function can either be typed into the worksheet or entered using the **Function Wizard**.

Try This Yourself:

Same File


Continue using the previous file with this exercise, or open the file *E810 Formulas_7.xlsx*...

- 1 Click on **B30**, then click on the **Insert Function** tool  to display the **Insert Function** dialog box
- 2 Click on the drop arrow  for **Or select a category** and click on **All**
- 3 Scroll down and click on **MAX** in **Select a function**, then click on **[OK]** to display the **Function Arguments** dialog box
- 4 Click on the **Range Selector** tool  for **Number1**, then hold down **Ctrl** and select the ranges:
B6:B8 **B16:B18**
B11:B13 **B21:B23**
- 5 Press **Enter** to complete the range specifications, then click on **[OK]** to complete the process
- 6 Click on **B35**, then click on the drop arrow for the **Sum** command  in the **Editing** group, then select **Max**
- 7 Click on **B9**, hold down **Ctrl** and click on **B14**, **B19** and **B24**, then press **Enter** to complete the formula



For Your Reference...

To **insert** a **maximum** function:

1. Click in the cell then click on the **Insert Function** tool 
2. Click on **MAX** in **Select a function**
3. Insert the required ranges then click on **[OK]**

Handy to Know...

- The **MAX** function is ideal for charting high points over a seasonal period. For example, you may have monthly sales figures and use a **MAX** function to display the maximum each month. This series can then be charted to show the high points in the sales.

FINDING A MINIMUM VALUE




The **Minimum** or **MIN** function allows you to extract the lowest value from a range of values. It is written in much the same way as the **SUM** function or **MAX** function:

=MIN(range of cells). The function can be applied using the **Function Wizard**, or by typing the function in detail directly into the cell.

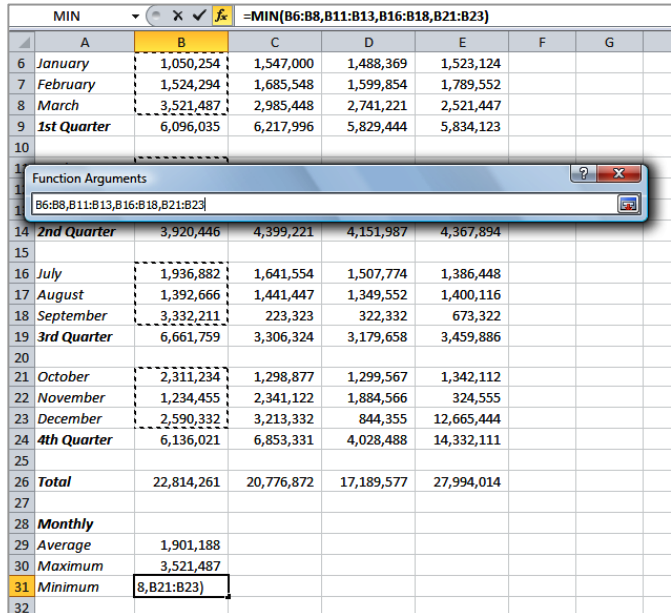
Try This Yourself:

Same File

Continue using the previous file with this exercise, or open the file E810 Formulas_8.xlsx...

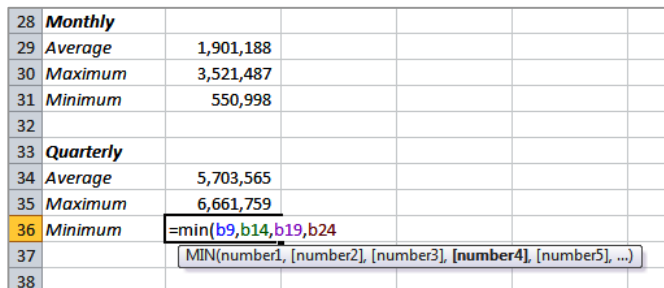
- 1 Click on **B31** then click on the **Insert Function** tool  to display the **Insert Function** dialog box
- 2 Click on the drop arrow  for **Or select a category** and click on **Statistical**
- 3 Scroll down and click on **MIN** in **Select a function** then click on **[OK]** to display the **Function Arguments** dialog box
- 4 Click on the **Range Selector** tool  to roll up the wizard, then hold down **[Ctrl]** and select the following ranges:
B6:B8 **B16:B18**
B11:B13 **B21:B23**
- 5 Press **[Enter]** to complete the range specifications, then click on **[OK]** to complete the process
Let's simply type the function this time...
- 6 Click on **B36** and type **=MIN(B9,B14,B19,B24)**
- 7 Press **[Enter]** to complete the formula

4



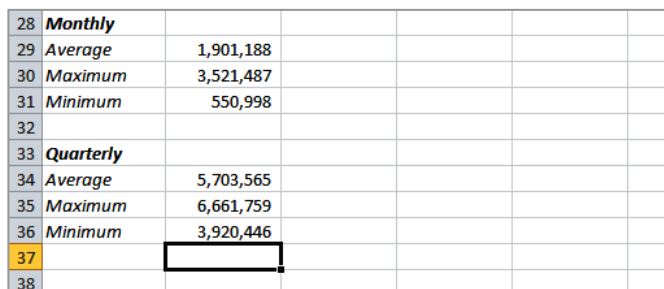
	A	B	C	D	E	F	G
6	January	1,050,254	1,547,000	1,488,369	1,523,124		
7	February	1,524,294	1,685,548	1,599,854	1,789,552		
8	March	3,521,487	2,985,448	2,741,221	2,521,447		
9	1st Quarter	6,096,035	6,217,996	5,829,444	5,834,123		
10							
14	2nd Quarter	3,920,446	4,399,221	4,151,987	4,367,894		
15							
16	July	1,936,882	1,641,554	1,507,774	1,386,448		
17	August	1,392,666	1,441,447	1,349,552	1,400,116		
18	September	3,332,211	223,323	322,332	673,322		
19	3rd Quarter	6,661,759	3,306,324	3,179,658	3,459,886		
20							
21	October	2,311,234	1,298,877	1,299,567	1,342,112		
22	November	1,234,455	2,341,122	1,884,566	324,555		
23	December	2,590,332	3,213,332	844,355	12,665,444		
24	4th Quarter	6,136,021	6,853,331	4,028,488	14,332,111		
25							
26	Total	22,814,261	20,776,872	17,189,577	27,994,014		
27							
28	Monthly						
29	Average	1,901,188					
30	Maximum	3,521,487					
31	Minimum	550,998					
32							
33	Quarterly						
34	Average	5,703,565					
35	Maximum	6,661,759					
36	Minimum	=min(b9,b14,b19,b24)					
37							
38							

6



28	Monthly						
29	Average	1,901,188					
30	Maximum	3,521,487					
31	Minimum	550,998					
32							
33	Quarterly						
34	Average	5,703,565					
35	Maximum	6,661,759					
36	Minimum	=min(b9,b14,b19,b24)					
37							
38							


7



28	Monthly						
29	Average	1,901,188					
30	Maximum	3,521,487					
31	Minimum	550,998					
32							
33	Quarterly						
34	Average	5,703,565					
35	Maximum	6,661,759					
36	Minimum	3,920,446					
37							
38							

For Your Reference...

To **insert a minimum function**:

1. Click in the cell then click on the **Insert Function** tool 
2. Click on **MIN** in **Select a function**
3. Insert the required ranges then click on **[OK]**

Handy to Know...

- You might use a **MIN** function in real life to find the lowest value in a large range of numbers. For example, in a large inventory it can be used to work out which product is the slowest seller.

MORE COMPLEX FORMULAS

Out in the real world, you will find that you are often faced with creating formulas that need to add, subtract, multiply, divide, and so on, all in the same formula. Don't be daunted. The one rule that reminds you of

the order in which Excel performs its calculations is **BODMAS**: **B**rackets **O**f, then **D**ivision, then **M**ultiplication, then **A**ddition, then **S**ubtraction.

Try This Yourself:

Same File

1

Continue using the previous file with this exercise, or open the file *E810 Formulas_9.xlsx*...

Click on the **Multiplication & Addition** worksheet tab

Let's create a formula that determines the average number of hours worked by each employee and then calculate how much the weekly payroll would be if all employees were earning \$22.50 per hour.

So we need to add the total hours, then divide by the number of employees (6), then multiply by the new hourly rate, then multiply by the number of employees again. Considering BODMAS, the order is fine except for the initial addition, which will have to be enclosed in brackets...

2

Click on **C15** then click on the **Sum** command Σ in the **Editing** group

3

Click on **C14** in the **Formula Bar** and change it to **C13**, then press **Enter**

4

Click on **C15** again, click immediately to the right of **C13**) then type **/6*22.50*6**

5

Press **Enter** to complete the formula – hey it's pretty close to the current gross pay

6					
7	First Name	Last Name	Hours	Rate	Gross Pay
8	Angelo	Marcuzzo	43	35.60	1530.8
9	Riley	Griffin	35	32.10	1123.5
10	Celeste	O'Connor	28	12.50	350
11	Alex	Barnard	15.5	32.40	502.2
12	Tammy	Huber	22.5	10.25	230.625
13	Ishara	Tringali	40	10.25	410
14					
15	Totals		=SUM(C8:C14)		4147.125
16					
17					

2

MIN						=SUM(C8:C13)/6*22.50*6					
	A	B	C	D	E	F					
1	Alpheus Global Enterprises										
2	Weekly Payroll										
3	Department: Communications										
4											
5											
6											
7	First Name	Last Name	Hours	Rate	Gross Pay						
8	Angelo	Marcuzzo	43	35.60	1530.8						
9	Riley	Griffin	35	32.10	1123.5						
10	Celeste	O'Connor	28	12.50	350						
11	Alex	Barnard	15.5	32.40	502.2						
12	Tammy	Huber	22.5	10.25	230.625						
13	Ishara	Tringali	40	10.25	410						
14											
15	Totals		=SUM(C8:C13)/6*22.50*6								
16											

4

6											
7	First Name	Last Name	Hours	Rate	Gross Pay						
8	Angelo	Marcuzzo	43	35.60	1530.8						
9	Riley	Griffin	35	32.10	1123.5						
10	Celeste	O'Connor	28	12.50	350						
11	Alex	Barnard	15.5	32.40	502.2						
12	Tammy	Huber	22.5	10.25	230.625						
13	Ishara	Tringali	40	10.25	410						
14											
15	Totals		4140		4147.125						
16											
17											

5

For Your Reference...

To **create complex formulas**:

1. Plan your formula
2. Type your formula keeping in mind that Excel solves all bracketed operations first, then completes the remaining operations in the order of division, multiplication, addition and finally subtraction.

Handy to Know...

- The **Evaluate Formula** command in the **Formula Auditing** group in the **Formula** ribbon tab is handy for checking complex formulas. It will display the formula in an **Evaluate Formula** dialog box which allows you to step through each part of the formula to see how it works.

WHAT IF FORMULAS

When you've added formulas to your worksheet you have a **calculation model**. Every time you change one of the dependent values that are used in a formula, that formula, and every one that

is dependent on it will update instantly. This allows you to perform **what-if** testing. For example, you can enter **what if formulas** that answer questions like 'what if inflation goes up by 2%?'

Try This Yourself:

Same File

Continue using the previous file with this exercise, or open the file E810 Formulas_10.xlsx...

- 1 Click on the **Summary** worksheet tab and make a mental note of the values here
 - 2 Click on the **More Complex** tab to display the worksheet, then click in cell **C8** which contains the hours for **Angelo Marcuzzo**
 - 3 Type **37** and press
- Notice how the formulas update the values in row 15 as you change the dependent data...
- 4 Click on the hours for the other employees and type the new values as shown
 - 5 Click on the **Summary** worksheet tab to return to the **Summary** worksheet
The values will have been automatically recalculated to reflect the changes

1

	A	B	C	D
1	Alpheus Global Enterprises			
2	Weekly Payroll			
3	Department: Communications			
4				
5				
6	Summary			
7				
8	Paid To Staff	2827.64		
9	Paid To Insurance Company	373.24		
10	Paid To Government	1319.49		
11				

Last Name	Hours	Rate	Gross Pay	Tax	Net Pay	Superannuation
Marcuzzo	37	35.60	1317.20	430.87	886.33	118.55
Griffin	25	32.10	802.50	322.56	479.94	72.23
O'Connor	33	12.50	412.50	89.55	322.95	37.13
Barnard	16	32.40	518.40	232.45	285.95	46.66
Huber	43	10.25	440.75	89.56	351.19	39.67
Tringali	27	10.25	276.75	154.50	122.25	24.91
			3768.10	1319.49	2448.61	339.13

4

5

	A	B	C	D
1	Alpheus Global Enterprises			
2	Weekly Payroll			
3	Department: Communications			
4				
5				
6	Summary			
7				
8	Paid To Staff	2448.61		
9	Paid To Insurance Company	339.13		
10	Paid To Government	1319.49		
11				

For Your Reference...

To **use** a **formula** for **what-if testing**:

1. Change the value in the cell that is referenced by a formula
2. Evaluate the changed results in the formula results cell

Handy to Know...

Excel has three different functions that can be applied for what-if testing:

- **SUMIF** calculates a total amount based on a single condition.
- **COUNTIF** counts the number of times a value appears in a range of cells.
- **IF** is used for either/or scenarios.

CONCLUDING REMARKS

Congratulations!

You have now completed the **Formulas and functions** booklet. This booklet was designed to get you to the point where you can competently perform a variety of operations as listed in the objectives on page 2.

We have tried to build up your skills and knowledge by having you work through specific tasks. The step by step approach will serve as a reference for you when you need to repeat a task.

Where To From Here...

The following is a little advice about what to do next:

- Spend some time playing with what you have learnt. You should reinforce the skills that you have acquired and use some of the application's commands. This will test just how much of the concepts and features have stuck! Don't try a big task just yet if you can avoid it - small is a good way to start.
- Some aspects of the course may now be a little vague. Go over some of the points that you may be unclear about. Use the examples and exercises in these notes and have another go - these step-by-step notes were designed to help you in the classroom and in the work place!

Here are a few techniques and strategies that we've found handy for learning more about technology:

- visit CLD's e-learning zone on the Intranet
- read computer magazines - there are often useful articles about specific techniques
- if you have the skills and facilities, browse the Internet, specifically the technical pages of the application that you have just learnt
- take an interest in what your work colleagues have done and how they did it - we don't suggest that you plagiarise but you can certainly learn from the techniques of others
- if your software came with a manual (which is rare nowadays) spend a bit of time each day reading a few pages. Then try the techniques out straight away - over a period of time you'll learn a lot this way
- and of course, there are also more courses and booklets for you to work through
- finally, don't forget to contact CLD's IT Training Helpdesk on **01243-752100**