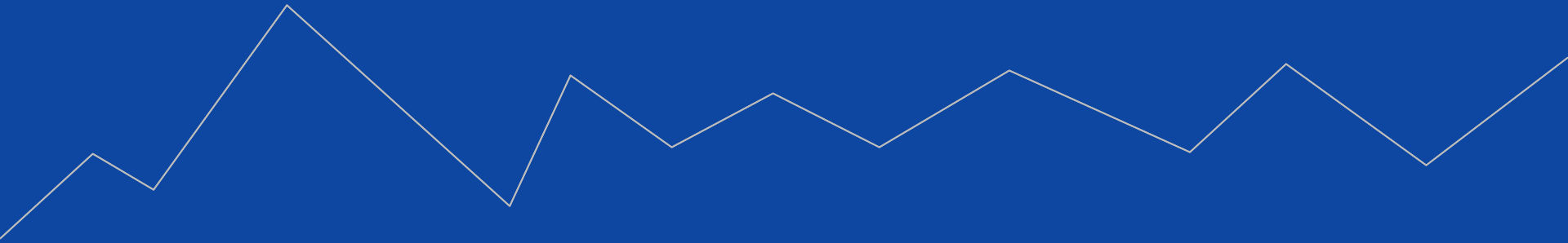


Santa Monica Data Academy

DA101B

Excel Basics



Welcome!

- Your name
- Your role
- Why are you taking this class?

Learning Objectives

- Understand how Excel facilitates **data organization**
- Learn the **vocabulary** of common Excel operations
- Apply basic **formulas** and **functions** to data in Excel

Why learn **Excel**?

Excel files are everywhere!



G1-C.xlsx

Microsoft Office Excel Worksheet
84,8 KB



G1-D.xlsx

Microsoft Office Excel Worksheet
86,1 KB



G1-E.x

Micros
86,3 KB



G1-G.xlsx

Microsoft Office Excel Worksheet
87,2 KB



G1-H.xlsx

Microsoft Office Excel Worksheet
88,1 KB



G1-I.xl

Micros
85,8 KB



G1-K.xlsx

Microsoft Office Excel Worksheet
85,6 KB



G1-L.xlsx

Microsoft Office Excel Worksheet
88,8 KB



G1-M.:

Micros
86,1 KB



G1-O.xlsx

Microsoft Office Excel Worksheet
87,5 KB



G1-P.xlsx

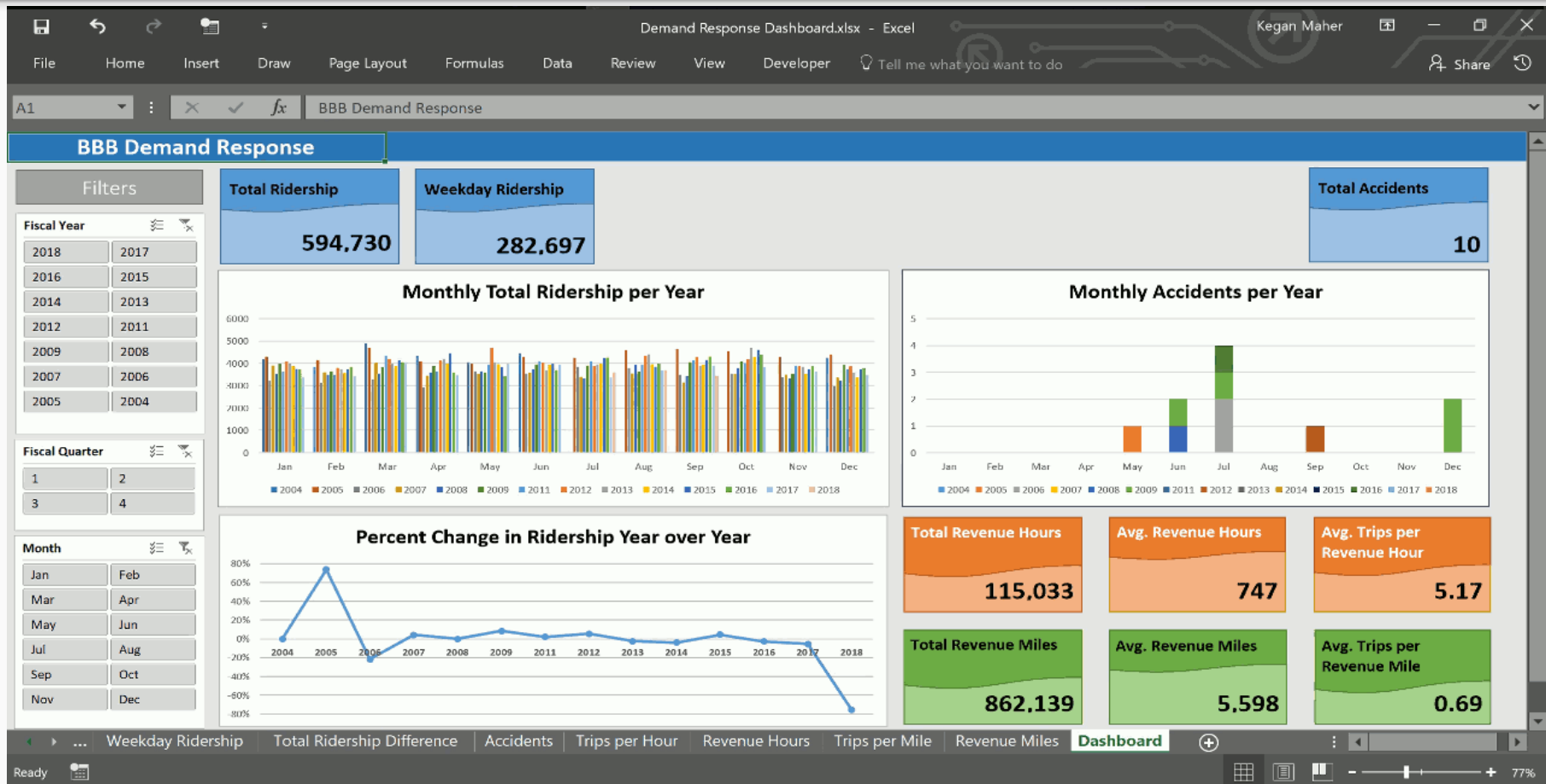
Microsoft Office Excel Worksheet
86,6 KB



G1-Q.>

Micros
85,9 KB

Excel is powerful!



Using Excel *doesn't have to be **hard***

Excel is a HUGE program with many features

We'll focus on the concepts important for
working with data.

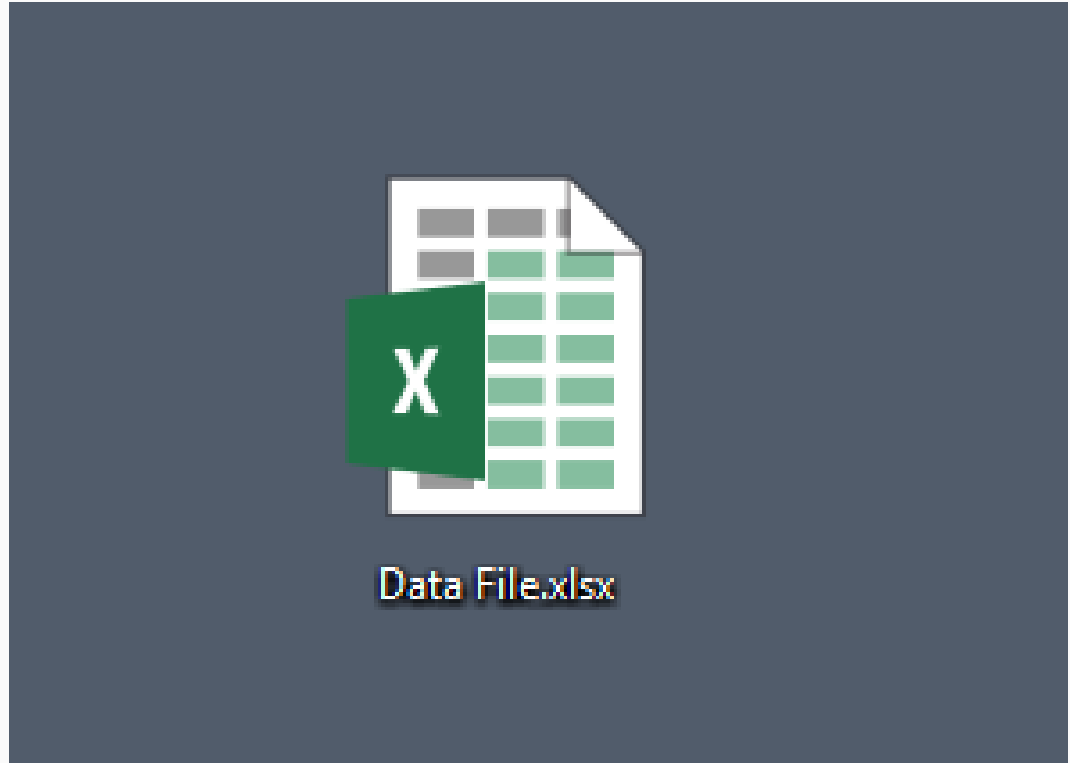
Many additional Excel learning resources are
available, including more training!

The Excel **Environment**

The Environment

Excel files are called
Workbooks

Excel files use
the **.xlsx**
extension



Open Excel on your laptop

Choose ***Blank Workbook*** from the
template options

The Environment

Workbooks contain one or more *Worksheets*



Right-click to rename or remove
Hold and drag to reorder

Click to add a new
sheet

The Environment

Worksheets
are divided
into:

Columns
(A, B, C, ...)

Rows
(1, 2, 3, ...)

	A	B	C
1			
2			
3			
4			
5			

Cells: where a **column** and **row** intersect

Name Box

A1

Cell address = (Column letter)(Row number)

	A	B	C
1			
2			

Cells have an **address**

The image shows a screenshot of an Excel spreadsheet. At the top, there is a blue header bar with the text "Cells have an **address**". Below the header, there is a red box containing a white question mark. The spreadsheet grid has columns labeled A, B, C, and D, and rows labeled 1, 2, 3, and 4. The cell at the intersection of column C and row 3 is highlighted in green. The cell at the intersection of column C and row 4 is highlighted in black. The cell at the intersection of column A and row 1 is highlighted in white. The cell at the intersection of column A and row 2 is highlighted in white. The cell at the intersection of column A and row 3 is highlighted in white. The cell at the intersection of column A and row 4 is highlighted in white. The cell at the intersection of column B and row 1 is highlighted in white. The cell at the intersection of column B and row 2 is highlighted in white. The cell at the intersection of column B and row 3 is highlighted in white. The cell at the intersection of column B and row 4 is highlighted in white. The cell at the intersection of column D and row 1 is highlighted in white. The cell at the intersection of column D and row 2 is highlighted in white. The cell at the intersection of column D and row 3 is highlighted in white. The cell at the intersection of column D and row 4 is highlighted in white.

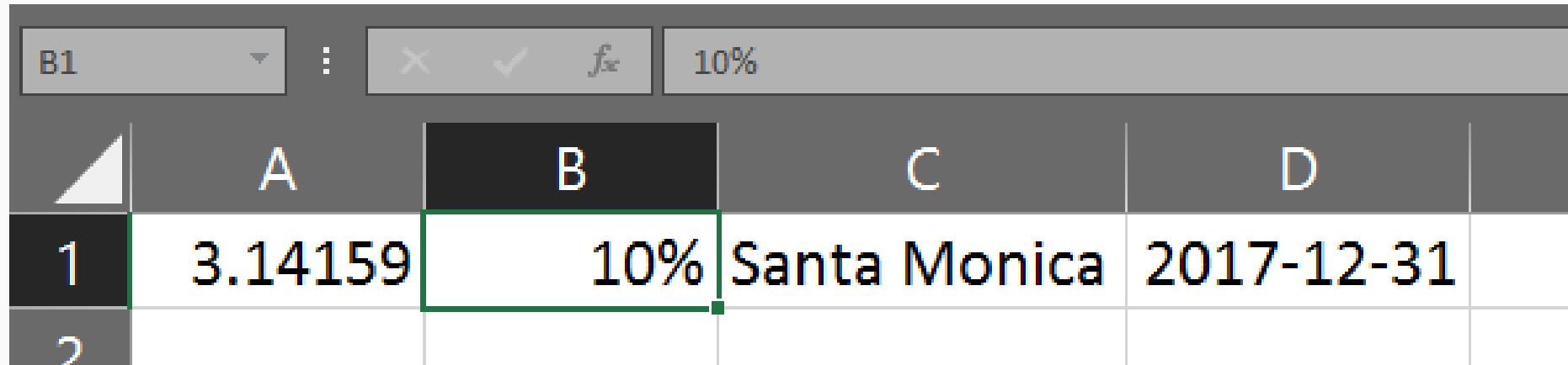
	A	B	C	D
1				
2				
3				
4				

Cells can contain **values**

The image shows a screenshot of an Excel spreadsheet. At the top, a formula bar displays the value 3.14159. Below it, a grid of cells is visible. The first row has columns labeled A, B, C, and D. The first column has rows labeled 1 and 2. The cell at the intersection of row 1 and column A contains the value 3.14159. The cell at the intersection of row 1 and column B contains the value 10%. The cell at the intersection of row 1 and column C contains the text Santa Monica. The cell at the intersection of row 1 and column D contains the date 2017-12-31. The cell at the intersection of row 2 and column A is empty. The cell at the intersection of row 2 and column B is empty. The cell at the intersection of row 2 and column C is empty. The cell at the intersection of row 2 and column D is empty.

	A	B	C	D
1	3.14159	10%	Santa Monica	2017-12-31
2				

Cells can contain **values** of different types



The image shows a screenshot of an Excel spreadsheet. The active cell is B1, which contains the value 10%. The formula bar above the spreadsheet shows the formula =10%. The spreadsheet has columns A, B, C, and D, and rows 1 and 2. The cell B1 is highlighted with a green border. The cell A1 contains the value 3.14159, C1 contains the text 'Santa Monica', and D1 contains the date '2017-12-31'.

	A	B	C	D
1	3.14159	10%	Santa Monica	2017-12-31
2				

Cells can also contain **Formulas**

The image shows a portion of an Excel spreadsheet interface. At the top, a blue banner contains the text "Cells can also contain **Formulas**". Below this, the spreadsheet's formula bar and grid are visible. The formula bar, located at the top right, contains the text "fx" and the formula "=2+2". A red box highlights the "fx" icon and the formula text. Below the formula bar, a red box with the text "Formula Bar" points to the bar itself. The spreadsheet grid shows column headers A, B, and C, and row headers 1 and 2. Cell A1 is selected and contains the number "4".

	A	B	C
1	4		
2			

Formulas

References

Functions

Core Concepts

Formulas

References

Functions

Core Concepts

Formulas return a **value**



=



Calculation

Formulas

can be simple calculations



=



2 + 2

Formulas

can be more complex calculations

=

$1 - ((5/9) * 0.83)$

Formulas

can also use **References**



=



A2 + 1

Formulas

References

Functions

Core Concepts

References: *Cells*

The image shows a screenshot of an Excel spreadsheet. The formula bar at the top displays the formula $=A1+7$, which is highlighted with a red box. Below the formula bar, the spreadsheet grid is visible. The active cell is B1, which contains the value 9. The grid shows columns A, B, C, and D, and rows 1 and 2. The cell A1 contains the value 2.

	A	B	C	D
1	2	9		
2				

References: *Cells* – Try It!

1. Enter a value in Cell **A1**
2. Enter a formula in Cell **B1** that uses a reference to **A1**
3. Change the value in **A1**, observe the value in **B1**

Multiple cells can be *referenced*
together in a **Range**

Range references: *Partial column*

B2:B5

An Excel spreadsheet grid with columns A, B, and C, and rows 1 through 6. The header row (row 1) has a grey background. Column B is highlighted with a green border, and the cells B2 through B5 are shaded grey, representing the range B2:B5.

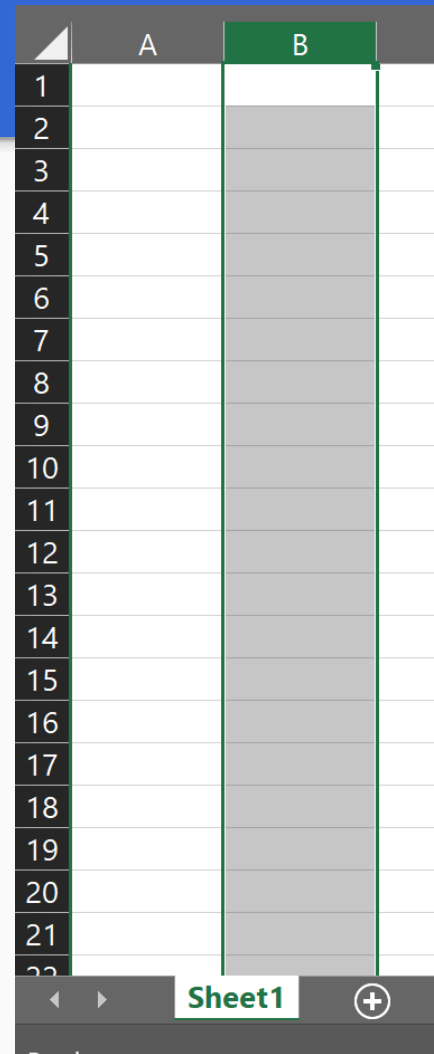
	A	B	C
1			
2			
3			
4			
5			
6			

“B2 *through* B5”

Range references: *Full column*

B:B

“Column B”



A screenshot of an Excel spreadsheet interface. The grid shows columns A and B, and rows 1 through 22. Column B is highlighted in grey, indicating it is selected. The column headers 'A' and 'B' are visible at the top. At the bottom, the sheet name 'Sheet1' is displayed in a green box, and a plus sign icon is visible to its right.

	A	B
1		
2		
3		
4		
5		
6		
7		
8		
9		
10		
11		
12		
13		
14		
15		
16		
17		
18		
19		
20		
21		
22		

Range references: *Partial row*

B2:D2

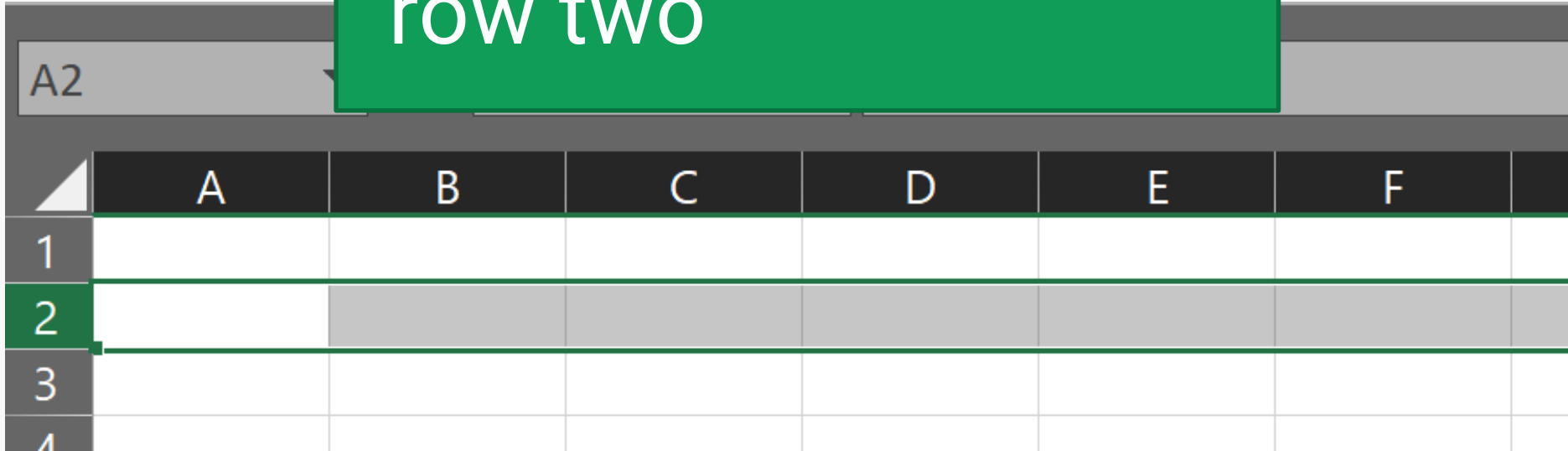
The image shows an Excel spreadsheet interface. At the top, the active cell is B2. Below the formula bar, the spreadsheet grid is visible. The columns are labeled A, B, C, D, and E. The rows are labeled 1, 2, and 3. A green border highlights the range B2:D2, which is a partial row. The cells B2, C2, and D2 are shaded gray, indicating they are part of the selected range.

	A	B	C	D	E
1					
2					
3					

Range references: *Full row*

2:2

“The second row”
“row two”

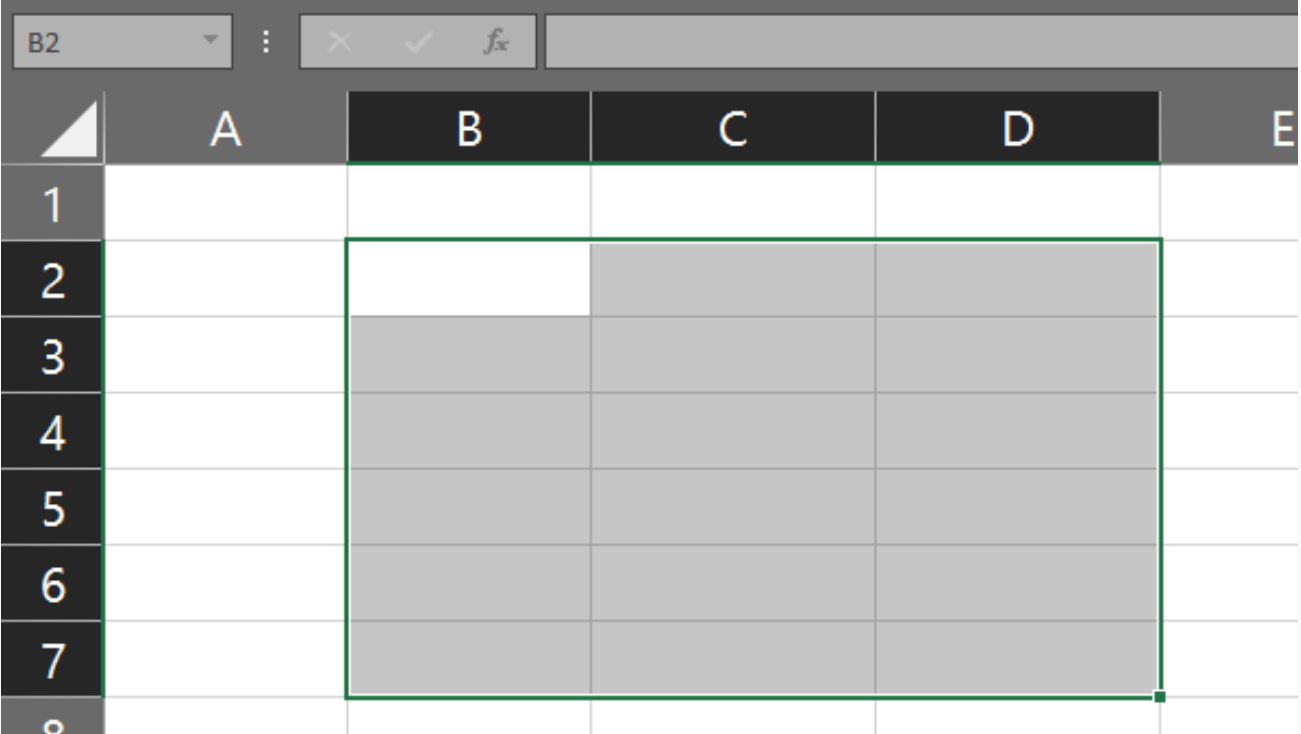


An Excel spreadsheet interface showing a grid of cells. The column headers are A, B, C, D, E, and F. The row headers are 1, 2, 3, and 4. Row 2 is highlighted in grey, indicating it is the selected row. The cell reference 'A2' is visible in the top-left corner of the grid.

	A	B	C	D	E	F
1						
2						
3						
4						

Range references: *Rectangle*

B2:D7



The image shows a screenshot of an Excel spreadsheet. The active cell is B2, as indicated by the name box at the top left. The spreadsheet has columns A through E and rows 1 through 8. A green border highlights the range B2:D7, which is shaded gray. The formula bar at the top right is empty, and the status bar at the bottom is not visible.

	A	B	C	D	E
1					
2					
3					
4					
5					
6					
7					
8					

References:

Cross-sheet

SheetName!A1:B2

'Sheet Name'!A1:B2

References: *Cross-sheet*

SheetName!A1:B2

References: *Cross-sheet*

SheetName!A1:B2

References:

Relative vs. Absolute

References: *Relative* vs. *Absolute*

Relative

A1

B1:B3

Absolute

\$A\$1

\$B\$1:\$B\$3

References: *Relative vs. Absolute*

Relative

A1

B1:B3

Absolute

\$A\$1

\$B\$1:\$B\$3

Why does this matter?

Formulas

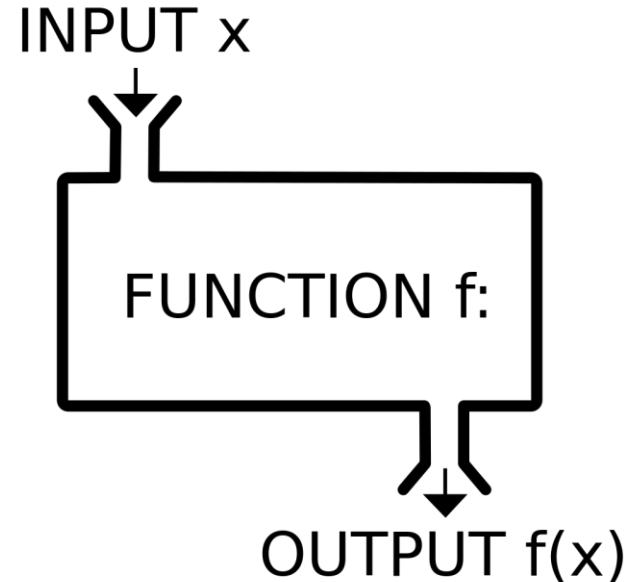
References

Functions

Core Concepts

Functions

- *Predefined Formulas* that come with Excel
- Take *Input*, perform calculation, produce *Output*



The **AVERAGE** function

The **AVERAGE** function

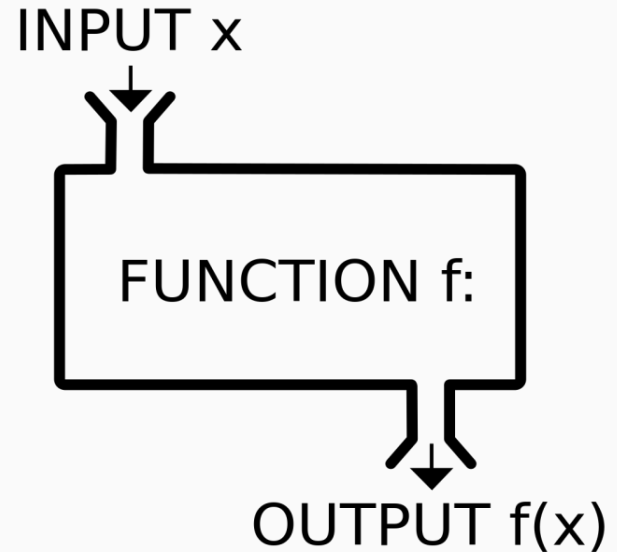
The image shows an Excel spreadsheet with the following data:

	A	B	C
1	4		
2	7		4.3333333
3	2		

The formula bar at the top shows the formula `=AVERAGE(A1:A3)` in a red box. The result in cell C2 is 4.3333333, which is highlighted with a green border.

The **AVERAGE** function

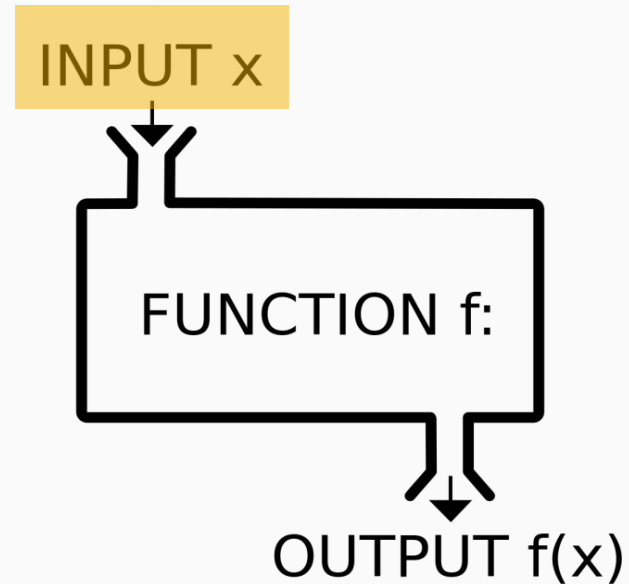
=AVERAGE(A1:A3)



The **AVERAGE** function

=AVERAGE (**A1 : A3**)

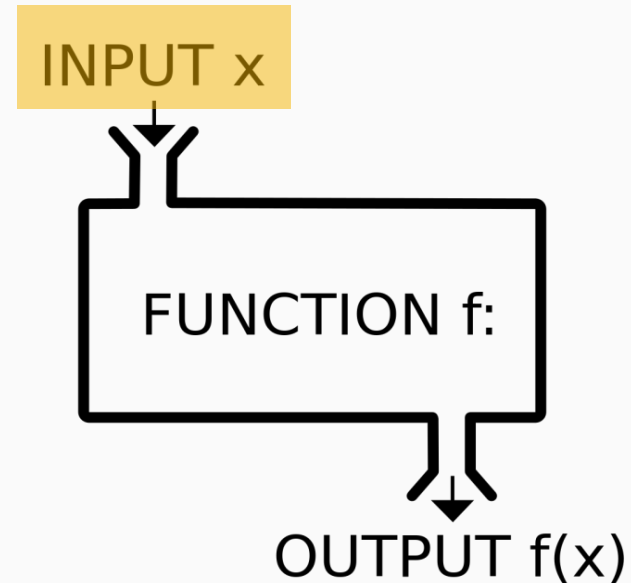
Inputs to functions
are called *Arguments*



The **AVERAGE** function

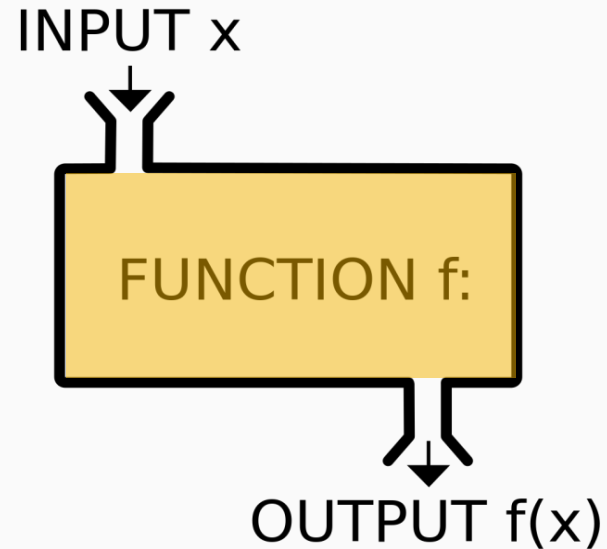
=AVERAGE (**A1**, **A2**, **A3**)

Multiple *Arguments*
can be separated by
commas



The **AVERAGE** function

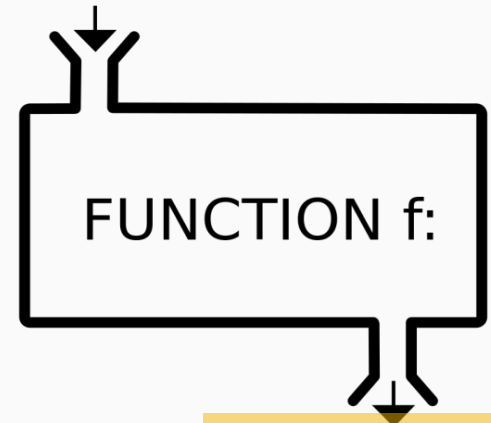
=**AVERAGE**(A1:A3)



The **AVERAGE** function

=AVERAGE(A1:A3)

INPUT x



OUTPUT $f(x)$

Functions are **live**

	A	B	C
1	4		
2	7		4.3333333
3	2		

The image shows a spreadsheet interface with a formula bar at the top containing the formula `=AVERAGE(A1:A3)`. The spreadsheet grid has three columns labeled A, B, and C, and three rows labeled 1, 2, and 3. Column A contains the values 4, 7, and 2. Column C contains the value 4.3333333, which is the average of the values in column A. The cell containing 4.3333333 is highlighted with a green border, and the cell containing 2 in row 3, column A is highlighted with a red border.

Functions are **live**

	A	B	C
1	4		
2	7		5
3	4		

The image shows a spreadsheet interface with a formula bar at the top containing the formula `=AVERAGE(A1:A3)`. The spreadsheet grid has three columns labeled A, B, and C, and three rows labeled 1, 2, and 3. Cell A1 contains the value 4, A2 contains 7, and A3 contains 4. Cell C2 contains the value 5. A red border highlights cell A3, and a green border highlights cell C2.

Functions - Try It!

1. Enter values in Cells **A1, A2, A3**
2. Enter the **AVERAGE** function in Cell **B1**, passing the values you entered as *arguments*
3. Change one of the values in **A**, observe the value in **B1**

The **VLOOKUP** function

Imagine you are an HR
analyst

Produce a report analyzing
time card metrics per
Department

VLOOKUP in action

Time Cards table

Employee ID	Month	Hours
2	Jan	160
0	Feb	155
0	Jan	164

Employees table

Employee ID	Dept
0	CCS
1	ISD
2	PCD

VLOOKUP in action

Time Cards table

Employee ID	Month	Hours	Dept
2	Jan	160	PCD
0	Feb	155	CCS
0	Jan	164	CCS

Employees table

Employee ID	Dept
0	CCS
1	ISD
2	PCD

VLOOKUP



VLOOKUP **arguments**

VLOOKUP arguments

```
=VLOOKUP(  
    lookup_value,  
    table_array,  
    col_index_num  
)
```

VLOOKUP arguments

```
=VLOOKUP(  
    lookup_value,  
    table_array,  
    col_index_num  
)
```

What are
you looking
up?

VLOOKUP arguments

Time Cards table

Employee ID	Month	Hours	Dept
2	Jan	160	?
0	Feb	155	?
0	Jan	164	?

A red box highlights the first column (Employee ID) of the Time Cards table. A red callout box with the text "lookup_value" is positioned over the first row of the table.

Employees table

Employee ID	Dept
0	CCS
1	ISD
2	PCD

VLOOKUP



VLOOKUP arguments

=VLOOKUP (

lookup_value,

table_array,

col_index_num

)

Where are
you looking?

VLOOKUP arguments

Time Cards table

Employee ID	Month	Hours	Dept
2	Jan		
0	Feb	155	?
0	Jan	164	?

table_array

Employees table

Employee ID	Dept
0	CCS
1	ISD
2	PCD

VLOOKUP



VLOOKUP arguments

=VLOOKUP(

lookup_value,

table_array,

col_index_num

)

Which

column's
value do you
want?

VLOOKUP arguments

Time Cards table

Employee ID	Month	Hours	Dept
2	Jan	160	CCS
0	Feb	155	CCS
0	Jan	164	CCS

Employees table

Employee ID	Dept
0	CCS
1	ISD
2	PCD

col_index_num

VLOOKUP



VLOOKUP **data requirements**

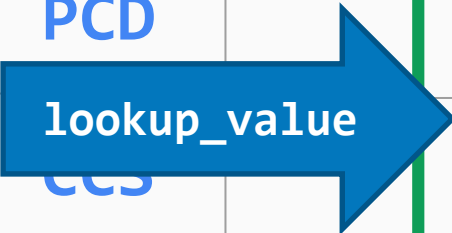
VLOOKUP data requirements

lookup_value must be in the *first column* in **table_array**

VLOOKUP data requirement **met**

Time Cards table

Employee ID	Month	Hours	Dept
2	Jan	160	PCD
0	Feb	155	CCS
0	Jan	164	CCS



Employees table

Employee ID	Dept
0	CCS
1	ISD
2	PCD

VLOOKUP data requirements

the **lookup_value** column must be *sorted* in **table_array**

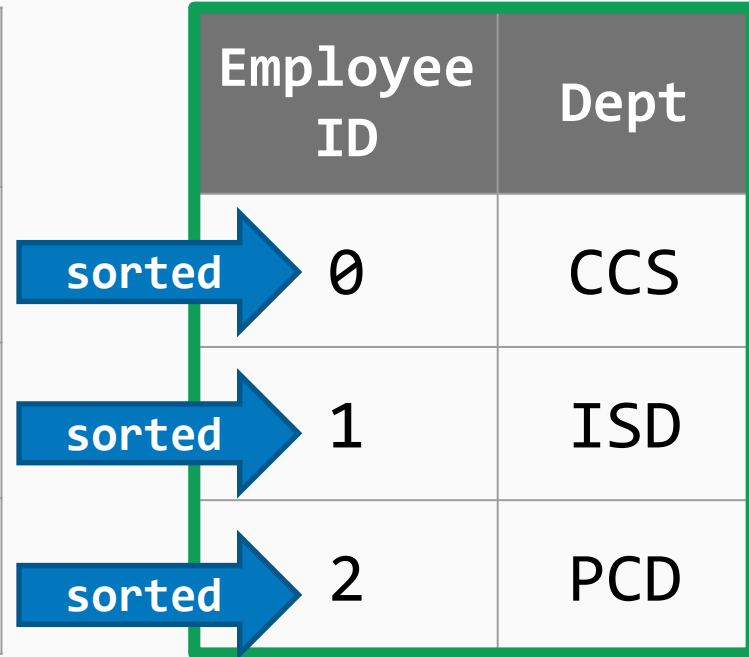
VLOOKUP data requirement **met**

Time Cards table

Employee ID	Month	Hours	Dept
2	Jan	160	PCD
0	Feb	155	CCS
0	Jan	164	CCS

Employees table

Employee ID	Dept
0	CCS
1	ISD
2	PCD



Function Discovery

Excel will help you find functions

The image shows a screenshot of the Microsoft Excel interface. At the top, the formula bar contains the text "=SUM". Below the formula bar, the worksheet grid is visible with columns A, B, and C, and rows 1 through 5. Cell A1 is selected and contains the text "=SUM". A dropdown menu is open below cell A1, listing several functions: SUM, SUMIF, SUMIFS, SUMPRODUCT, SUMSQ, SUMX2MY2, SUMX2PY2, and SUMXMY2. The "SUM" function is highlighted in blue. To the right of the dropdown menu, a tooltip box displays the text "Adds all the numbers in a range of cells".

	A	B	C
1	=SUM		
2			
3			
4			
5			

- ⓧ SUM
- ⓧ SUMIF
- ⓧ SUMIFS
- ⓧ SUMPRODUCT
- ⓧ SUMSQ
- ⓧ SUMX2MY2
- ⓧ SUMX2PY2
- ⓧ SUMXMY2

Adds all the numbers in a range of cells

Function Library

File Home Insert Page Layout Formulas Data Review View

fx Σ

Insert Function AutoSum Recently Used Financial Logical Text Date & Time Lookup & Reference Math & Trig More Functions

SUM
FIND
CODE
AND
TRANSPOSE
CHOOSE
AREAS


A1


	A	C	D
1			
2			

An entry in the **Function Library**

Function Arguments ? ×

SUM

Number1  = number

Number2  = number

=

Adds all the numbers in a range of cells.

Number1: number1,number2,... are 1 to 255 numbers to sum. Logical values and text are ignored in cells, included if typed as arguments.

Formula result =

[Help on this function](#) OK Cancel

Function Library

Function Arguments



SUM

Number1	10		= 10
Number2	20		= 20
Number3	-4		= -4
Number4			= number

= 26

Adds all the numbers in a range of cells.

Number3: number1,number2,... are 1 to 255 numbers to sum. Logical values and text are ignored in cells, included if typed as arguments.

Formula result = 26

[Help on this function](#)

OK

Cancel

Formulas

References

Functions

Core Concepts

Santa Monica Data Academy

10 Minute Break

BREAK IS OVER



Working with data

CCS Program Fees

Working with Data: **CCS Program Fees**

- Quick info from the **Status Bar**
- **AutoFilter** and **Sort**
- Cross-reference other data using **VLOOKUP**
- Calculating **subtotals**

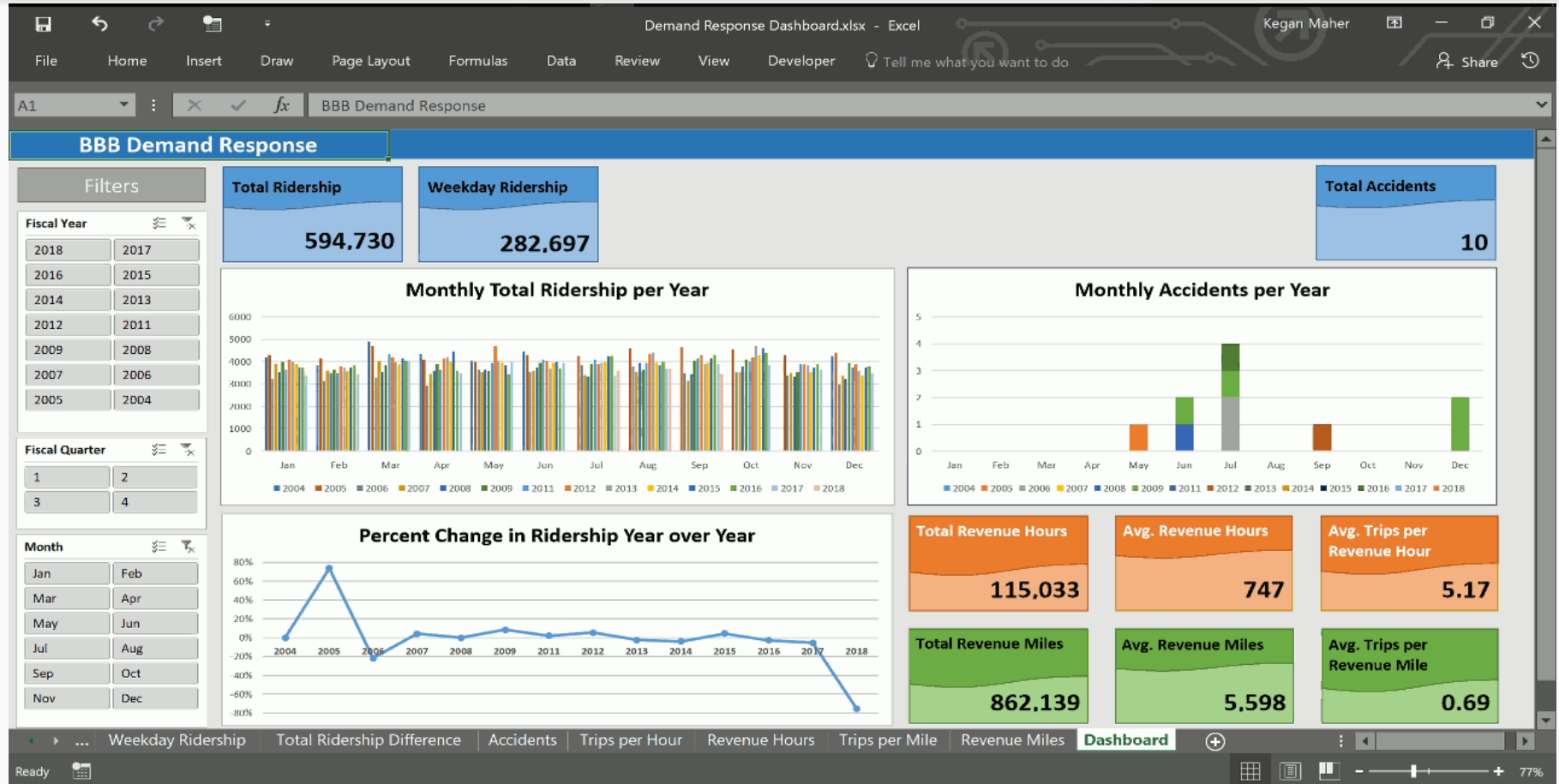
Download the data file:

santamonica.gov/DA101B

Look for the **.xlsx** under *Course Materials*

Wrapping Up

Excel is a powerful data tool!



Core Concepts

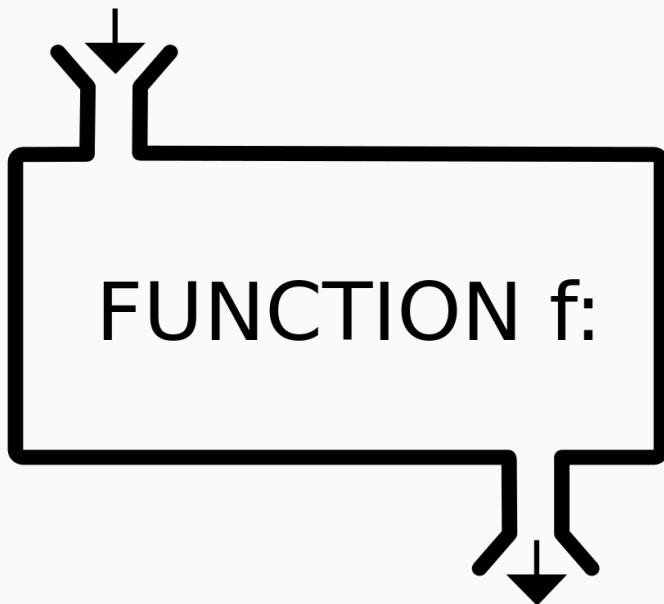
Formulas

References

Functions

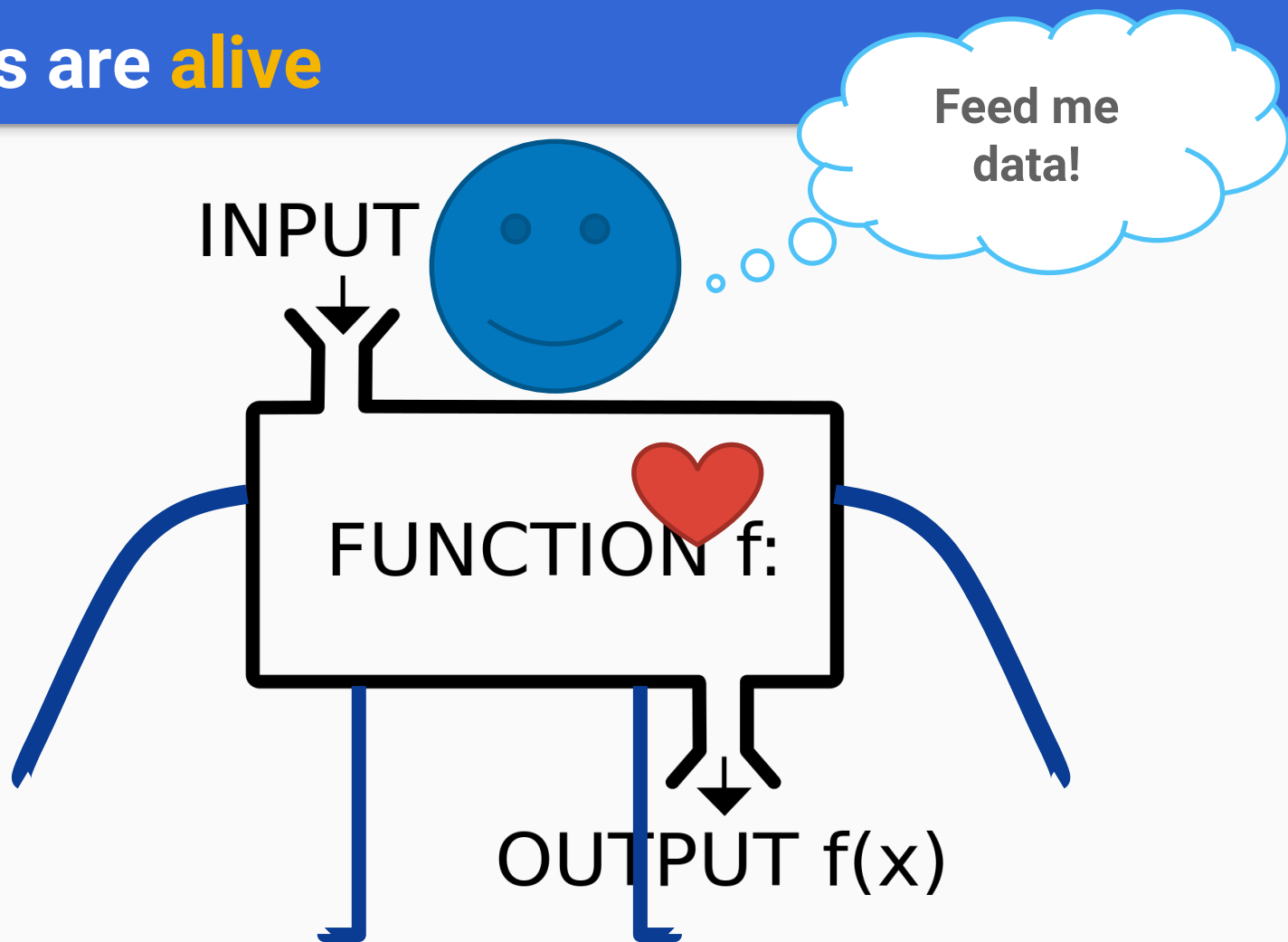
Functions

INPUT x



OUTPUT $f(x)$

Functions are **alive**



VLOOKUP

Sorting

AutoFilter

Subtotals

Working with data

Shameless Self Plug: **DATA ACADEMY**

- Learn to use **Excel** for data analysis and visualization
- Learn about the City's **Open Data, GIS, and SaMoStat** programs, and other **data projects** throughout the organization

DA101A
Data Basics

DA102
Intro to Data Analysis

More coming soon!

DA103
Intro to Data Visualization

Thank You For Joining Us!

Please fill out the feedback form before leaving 😊

Materials for today's course:

santamonica.gov/DA101B

Questions, feedback anytime: **data@smgov.net**