

# CMPT 155: Computer Applications for Life Sciences

## Lecture 5: Formulas and Functions

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# Presentation Outline

- 1 Creating Basic Formulas
- 2 Exercises
- 3 Cell Ranges
- 4 Functions and Formulas
- 5 Testing/Error Analysis

# Creating Basic Formulas

- A formula is a series of instructions that are placed in a cell to perform a calculation.
- Formulas must begin with an equal sign '=' (e.g., =1+1).
- try the example and see what Excel returns.

# Arithmetic Operators

Operator	Name	Example	Return
+	Addition	$= 1 + 1$	2
-	Subtraction	$= 1 - 1$	0
*	Multiplication	$= 2 * 2$	4
/	Division	$= 4 / 2$	2
^	Exponentiation	$= 2^3$	8
%	Percent	$= 20\%$	0.20

# Excel's Order of Precedence

Excel's order of precedence differs a little from traditional PEMDAS.

- 1 Parentheses
- 2 Percent
- 3 Exponents
- 4 Division & Multiplication
- 5 Addition & Subtraction

While order of precedence is important, reduce ambiguity by adding parentheses around terms you think can be affected by order of precedence.

Try these examples to see how excel chooses to modify order of operations.

$$\bullet = 5 + 2 * 2^3 - 1$$

$$\bullet = 5 + 2 * 2^{(3 - 1)}$$

# Cell References

We can refer to values in other cells by using cell references.

## Outcome from refering to cells

Suppose Cell A1 contains the value 1. What value would be returned if we wrote  $= A1 + A1$  in a new cell?

We can use autofill to solve a sequence of equations. try using autofill on a formula that contains call references to see how the functicon changes.

# Exercise 1

- 1 Download *Llama\_Caloric\_Intake.xlsx* from moodle.
- 2 Insert a formula in cell E2 to calculate how much the *caloric intake* is **per** *body weight*.
- 3 Autofill the formula to the end of the list.
- 4 Format the data in Column E to keep to 4 decimal places.
- 5 Add the title “Intake per Body weight” to Column E.

# Exercise 1: Solution

	B	C	D	E	F
1	<b>Food Type</b>	<b>Caloric Intake</b>	<b>Current Weight (lb)</b>	<b>Intake per Bodyweight</b>	
2	Alfalfa Hay	640	301	2.1262	
3	Grains	630	300	2.1000	
4	Scrambled Eggs	10050	301	33.3887	
5	Alfalfa Hay	520	304	1.7105	
6	Alfalfa Hay	700	304	2.3026	
7	Chicken Nuggets	12000	308	38.9610	
8	Alfalfa Hay	680	307	2.2150	
9	Assorted Cheesecakes	13575	308	44.0747	
10	Alfalfa Hay	850	308	2.7597	
11	Alfalfa Hay	810	307	2.6384	
12	Grains	810	307	2.6384	
13	Grains	750	307	2.4430	
14	Alfalfa Hay	550	307	1.7915	
15	Alfalfa Hay	700	307	2.2801	
16	Sandwiches	820	307	2.6710	

## Explanation:

- 1 in Cell E2 type =  $C2 + D2$
- 2 Autofill the formula to cell E16.
- 3 Select cells E2:E16 and right click the selection
- 4 click on Format Cells.
- 5 Change the cell format to number and change decimal places from 2 to 4.



## Exercise 2

- 1 Download *StudentGrades1.xlsx*
- 2 Calcualte the final mark for each student.

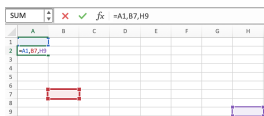
## Exercise 2: Solution

	A	B	C	D	E
1	<b>Student</b>	<b>Test A (25%)</b>	<b>Test B (25%)</b>	<b>Assignment (50%)</b>	<b>Final Mark</b>
2	Edith Abbott	78	84	90	85.50
3	Grace DeWitt	58	80	75	72.00
4	Vittoria Accoramboni	78	75	69	72.75
5	Abigail Smith	86	88	90	88.50
6	Annette Yuang	90	91	95	92.75
7	Hannah Adams	77	70	64	68.75
8	Janet Chung	92	84	77	82.50
9	Maresh Di Giorgio	65	73	50	59.50
10	Katharine Susan	0	72	60	48.00

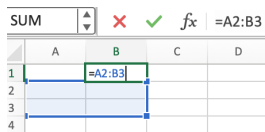
- 1 Select cells B2:E10.
- 2 If in the home tab of the ribbon go to Number tab and change the number back to general from percent.
- 3 Calculate the weighted average for the Edith Abbot's scores in E2 using appropriate cell references.
- 4 it should read  $= (B2 * 0.25) + (C3 * 0.25) + (D3 * 0.5)$
- 5 Use autofill to fill in scores for successive students.

# Cell Ranges

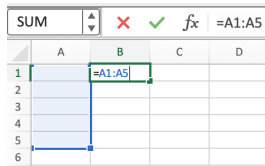
- Comma (,)
  - ▶ separates more than one cell/cell range.
  - ▶ e.g., A1, B7, H9
  - ▶ Also used to separate arguments in functions.
- Colon(:)
  - ▶ use to describe selections solely by the top-left and bottom-right corners of a block of cells.
  - ▶ e.g., A1:A5, A2:B3



(a)



(b)



(c)

Figure: different selections for examples above

# Cell Ranges (cont.)

- Selecting entire rows is done by writing the row number twice separated by a colon, (e.g., 2:2)
- Selecting entire columns is done by writing the column letter twice (e.g., B:B)

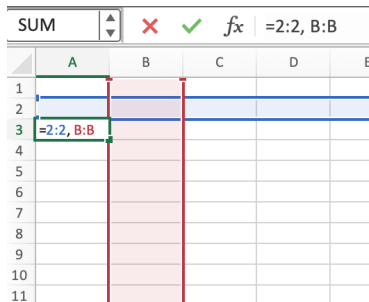


Figure: selection range in examples above

# The SUM() function

??????

# Example: Profit Analysis

- 1 Download *ProfitAnalysis.xlsx*
- 2 Use SUM() to compute totals in cells B7:D7.
- 3 Use SUM() and '/' compute the average in cells E4:E7.

	A	B	C	D	E
1	<b>Profit Analysis</b>				
2					
3		<b>London</b>	<b>Paris</b>	<b>New York</b>	<b>Average</b>
4	<b>Jan</b>	2,500	3,100	2,300	<b>2633.33</b>
5	<b>Feb</b>	2,200	2,700	2,600	<b>2500.00</b>
6	<b>Mar</b>	2,100	2,600	2,800	<b>2500.00</b>
7	<b>Total</b>	<b>6800</b>	<b>8400</b>	<b>7700</b>	<b>7633.33</b>

Figure: Profit Analysis Solution

# The AVERAGE() function

- The AVERAGE() function takes arithmetic means(i.e., simple average) of a selection.
- The average function will compute averages of numerics but will ignore cells that contain text/strings or blanks.

Try:

- 1 doing the Profit Analysis example using AVERAGE().
- 2 deleting and see how the computed average changes.

# Types of Errors

When learning how new functions and operators work, take time to break them and understand their limits.

When entering functions you may run into these kinds of error messages

Error Code	Type	Description
#####	None	The number returned was too long. Expand the column width to see the number.
#NAME!	Name	Excel does not recognize the <b>Name</b> of the function you have typed.
#VALUE!	Value	You have entered a <b>Value</b> for the cell that does not work with the operator.
#DIV/0!	Division	Somehow you attempted to divide by 0.
#NULL!	Null	When you forget to separate two cell references.
#REF!	Reference	The Cell contains incorrect references to other cells.