

F. Excel Scenario Tutorial – Mobile Phone Plans

Purpose: Use Excel Scenario Manager as a Decision Support System (DSS). The Scenario Manager provides a “what-if” analysis. In addition, in this tutorial you will build your spreadsheet using concepts from a Vertical Lookup (VLOOKUP) function.

Decision Support Systems (DSS) allow businesses to create models of real-life business problems. A DSS can help in the decision-making process by providing a look at the possible outcome in a given situation. Excel has several tools that can be used to provide decision support system without complex software.

Excel Scenario Manager utilizes the concepts of input and output. When given a set of input (values to be used), the results of a series of calculations (the output) can change. Some business problems have various possible outcomes or you may want to consider the effects created by one or more input values.

A scenario represents one snapshot of a given problem. This scenario will include the inputs given and the output created. Instead of manually creating all scenarios and manually collecting the results to compare, you can set up the Scenario Manager within Excel to process all scenarios at once and collect the results in a comparative report. With a few steps of formatting & modification, this report can easily be distributed to help in the decision-support process.

Excel Scenario Manager Tutorial Components:

F.1. Downloading your Starting Spreadsheet Template	F-2
F.2. Overview of the Scenario Tutorial Template	F-3
F.3. Excel Formulas	F-5
3.1. Excel Formulas: Relative, Absolute, Multiple Sheets	F-5
3.2. Vertical Lookup (VLOOKUP)	F-6
3.3. IF Statement	F-11
F.4. Creating the Scenario Manager	F-15
4.1. Running the Scenario Manager and Generating a Report	F-18
4.2. Formatting the Summary Report	F-20
F.5. Interpreting the Results	F-21

Appendix:

Appendix 1 – Uploading your file to Entropy	
Appendix 1.1 - Uploading from your machine	Appendix - 1

F.1 – Downloading your Starting Spreadsheet Template

To start this tutorial, you will be given an Excel template with a basic setup for Scenario Manager. After a brief introduction to the problem given and the file template you will learn

- (1) how to prepare a worksheet for the use of Excel Scenario Manager,
 - (2) how to create the scenarios in Scenario Manager,
 - (3) how to run the Scenario Manager and generate a report,
 - (4) how to format the Scenario Manager report, and
 - (5) how to interpret the results.
- All Excel projects are graded with the help of a computer system (Entropy), which means that you must follow directions closely and place all formulas, headings etc. in the exact cells specified or the grading system will not find your work. In particular, do not insert extra rows or columns!
 - **Do you own work, and do not share any files with other students.**

1. Download a starting template from Entropy as shown in Figure F-1. Go to <https://csbapp.uncw.edu/entropy> (or Google UNCW Entropy)
2. Find the Upload files/download link in Entropy
3. **Download the Template for the Scenario Tutorial assignment:**

File Upload/Download

The following projects are available for upload/download

Assignment Name	Due	Due Time	Late Acceptance Until	File Type	Upload	Download
Project 7 - Excel Refresher	12/25/2020	11:59 PM	12/25/2020	XLSX	Upload Now	Download Starting Template
Project 8 - Scenario Tutorial	12/31/2020	11:59 PM	12/31/2020	XLSX	Upload Now	Download Starting Template

Figure F-1: Entropy screen for Excel upload/download files

4. Save the downloaded file to your desktop in either your **Downloads or Documents or OneDrive** Folder. Do not open the spreadsheet in a browser
5. Rename the file **yourLastNameScenarioMobile.xlsx** as in appleScenarioMobile.xlsx
6. **Do not share this file with anyone else; it has been created just for you.**

F.2 – Overview of the Scenario Tutorial Template

To demonstrate the use of Excel Scenario Manager, we will be working with the following problem:

Local Crisis Hotline (LCH) is a nonprofit call center that helps manage various problems dealing with social and behavioral issues around coastal North Carolina. The hotline is operated 24 hours by social workers and health professionals. Due to the nature of the business, management is always required to be on call. To aid in this requirement, LCH uses multiple on call mobile phones that are passed from different members of the management team throughout the workdays. Generally, managers use landlines or other means to communicate, but these mobile phones are critical to the success of the business in emergency cases.

LCH must determine which mobile phone provider and plan to purchase to best accommodate the prior usage of the on call mobile phones. Upper management would like to consider the available plans from the various providers. Figure F-2 shows the available plans and providers.

Plan Abbreviation	Monthly Fixed Costs	Included GB (per line)	\$ Per GB Above Free	Plan Description
AG	20	5	15	AT&T Per Gig
AU	35	50	0	AT&T Unlimited
TU	40	50	0	TMobile Unlimited
VG	10	1	10	Verizon Per Gig
VU	40	50	0	Verizon Unlimited
* download quantity where provider may slow download speeds				
** prices do not reflect current pricing / offers				

Figure F-2: Available cell phone plans and details for 5 phones

Here are a few notes about the plans available:

- There are three providers in the service market
- All three providers provide unlimited plans, with pricing as shown as well as the point each line may be throttled
- Two providers provide a per Gig plan
- Monthly fixed costs reflect five phones, while the GB's per line reflect each phone

Since LCH is a nonprofit organization, saving costs wherever possible is necessary. You have been asked to analyze several factors to help determine what plan to use. Currently, LCH is subscribed to a per Gig plan. In the past it was argued that since there is no way to anticipate the GigaBytes (GB) used each month, it is best to just pay for usage instead of paying for the unlimited plans.

Question 1: With the data from LCH's prior 6 months, do you support this argument?

Question 2: Based on the previous usage of the on call mobile phones, which plan best suits the needs of LCH?

Question 3: Which plans would be the worst selections for LCH?

Before you begin, let's take a moment to review the spreadsheet template file you've been given.

First, notice the bottom left of your Excel window. The tabs display the worksheets available in this file (Figure F-3). There are two to start with: Calculations and MobilePlans. Do not change the starting sheet names.

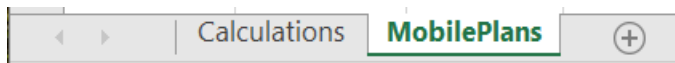


Figure F-3: Multiple worksheets are displayed as different tabs in the bottom left of Excel

Switch to the MobilePlans sheet to review it. To access the sheet, click the MobilePlans tabs in the bottom left. You should see a summary of the plan details from Figure F-2. These details will be referenced on the Calculations sheet when we look up the MobilePlans Details (Section 4) **You do not need to make any changes to the MobilePlans worksheet; it will be referenced but it should remain unchanged throughout this tutorial.**

Next, look at the Calculations sheet – this is where the bulk of your work will be performed. Notice that there are several sections of this worksheet; some sections have already been filled out (namely Sections 1, 2, and 3) and some require formulas to be created (namely Sections 4, 5, and 6). To get a better understanding of each section, read the following descriptions.

Section 1: The first section contains several **constants**, that is, factors that are assumed to remain unchanged in the current case. The constants are referred to in other parts of the spreadsheet for various calculations, but no entries need to be made here. Note that while the values for the constants have been chosen to reflect common industry practice, adjustments can be made easily by a user, such as to accommodate a change of the applicable service fees.

Section 2: The second section contains **usage data**. In this case, this is the usage data from the past 6 months for the on call mobile phones at LCH. This will be used in our calculations. Like the constants section, no changes need to be made here, but moving forward, a company representative may want to update this data to further analyze the company's plan decision.

Section 3: The third section is reserved for **user input** (highlighted in yellow). After you enter all the calculations in Sections 4 to 6, changes to this section should modify the results in the other sections.

Section 4: The fourth section gives the **plan details** based on the input. We will create a series of **lookup** statements to generate these details.

Section 5: The fifth section contains the various **calculations** required to arrive at the results. In this section, you will experience several different types of simple or complex formulas. Since the results need to be based on many of the MobilePlan details and are not known until a plan is selected, these calculations will utilize various cell references.

Section 6: The sixth and final section provides a **summary** based on the monthly calculations. These values will be used to compare the output of each of our different scenarios.

Moving forward, more detailed information is provided on each of the sections on the worksheet. For reference, a snapshot of the final results is provided at the end of this tutorial (Figure F-17).

1. Section 1: Constants – no changes need to be made:

Row 4: Number of Phones Desired: This is the number of phones that management will be shared among the employees to provide 24 hour coverage.

Row 5: Federal Universal Surcharge Percentage: This percentage is taken on all fees applied regardless of plan selected.

Row 6: Federal Excise Tax Percentage: This percentage is taken on all fees applied regardless of plan selected.

Row 7: State Franchise Tax Recovery Fee Percentage: This percentage is taken on all fees applied regardless of plan selected.

Row 8: 911 Service Fee (per phone): This is a flat rate applied every month regardless of plan selected.

2. Section 2: Usage data – no changes need to be made:

Row 11: Gigabytes Used: Each value represents the number of GBs used for a particular month.

3. Section 3: User Input – direct entry, no formulas (will be modified later by the Scenario Manager):

Row 14: Plan Code (AG, AU, TU, VG, VU): This value will determine which plan has been selected. Modification of this input will alter Sections 4, 5, and 6. **To match the figures used in this tutorial, AG should be entered in cell B14.**

Sections 4, 5, and 6 in the spreadsheet will consist of formulas. Remember that formulas will be evaluated when a spreadsheet is loaded and any time a value has been changed. For this tutorial, directions and explanations will be provided for the advanced formula topics you will need. Before moving on, a few concepts within Excel should be reviewed.

F.3. – Excel Formulas

F.3.1. – Excel Formulas: Relative, Absolute, Multiple Sheets

For some formulas, you may want to use the numbers (Example: $=179 * 372$). This is known as “hard coding” the numbers and your spreadsheet will no longer work if those values are hard coded into an equation. **Rarely will your formula use numbers (instead use Cell References).** Typically, a formula needs to use a **cell reference**. Cell references ask Excel to get the value from a designated cell and use that value in the formula. Example: Use $=B5*B17$ instead of $=.02478 * 20$. In these cases, Excel will get the value(s) and perform the operation(s) you’ve given and then display the resulting value in the cell selected.

Referring to Data on another Sheet

Some cell references may be found on other worksheets within the same workbook. To do this, you must give the sheet name before the cell reference. For example, if you had an Excel workbook with two sheets – one named Data and one named Calculations. On the Calculations sheet, you may wish to reference cells located on the Data worksheet. When creating formulas in Calculations, you would type a formula with the sheet name followed by an exclamation point (!). For example, $=Data!C4 * C2$ would get the value from cell C4 on the Data worksheet and multiply by the value of C2 on our Calculations sheet. Keep in mind that the **SheetName!** part of a cell reference is only required if there are multiple worksheets used in the formula.

Relative References

Excel also has two types of cell references. The default reference is known as a **relative reference**. Relative references adjust according to their relative position, meaning the references move with the formula that is copied. This is often intended and comes in very handy. A good example will be Section 5 of this tutorial. These calculations will need to be copied for columns B through G (Jan – Jun). The

references to B11 in the cells in column B will need to change to C11, D11, etc. when the formulas are moved to column C. You will see several examples of this later in the tutorial.

Absolute References

If a reference is not desired to change (for example, any reference to cell B5 needs to stay B5, no matter where the formula (or column) is copied to – the Federal Universal Surcharge Percentage never changes in this spreadsheet), then we use what is called an **absolute reference**. An absolute reference is characterized by \$-signs, e.g., **\$B\$5**. You may manually type these \$-signs, or when you are creating formulas, you may press the **function key F4** after selecting the cell you wish to make an absolute reference. The \$-signs appear automatically without having to be typed.

You will need to use Absolute References for many of your formulas in Section 5

F.3.2 – Vertical Lookups (VLOOKUP)

Section 4: Plan Details – formulas will only need to be placed in column B of this section. For reference, a snapshot of the final results is provided in Figure F-17.

- Row 17: Plan Base Fixed Cost:** This value will change based on the plan code given in B14. To get this value, **you CANNOT manually look the value up**. Since you want this value to be changed automatically if we alter the contents in B14, you must create a formula. For this formula, you should use a VLOOKUP.

The VLOOKUP (Vertical Lookup – implying the formula will “**look up**” the values in a column) formula is a very useful built-in formula in Excel. VLOOKUP looks for a value in the leftmost column of a group of cells that you supply, and then returns a value in the same row from a column you supply. The generic setup for a VLOOKUP is as follows:

```
=VLOOKUP(lookup_value, table_array, col_index_num, [range_lookup])
```

To assist you with your first VLOOKUP for cell B17, the following explains the parts of the VLOOKUP in more detail. After the explanation, a visual how-to is given.

- lookup_value:** This will be the value to match to the leftmost column of the table (in our example on the Mobile Plans Sheet) we will designate. For B17, we must know the Plan Code in order to find the Plan Base Monthly Cost. Plan Code is found in cell B14. B14 becomes our look-up value for the VLOOKUP. In addition, notice the B14 should NEVER change – it will ALWAYS be B14 (it’s not modified from month to month). This means any reference to B14 should be an absolute reference. You will use **\$B\$14** for this part.
- table_array:** This will be used to identify where to look up the value we supplied above. For B17, we wish to look up the value of the Plan Base Monthly Cost in the table provided on the MobilePlans sheet. Looking at this sheet, notice the table data runs from cell A6 to D10. It’s important NOT to include the column headings in this lookup table. Since these cell references exist on a different sheet, you need to make sure that the sheet name is included in our reference. Also, these references should be absolute – they will not change. Your formula for B17 will use **MobilePlans!\$A\$6:\$D\$10** for this part.
- col_index_num:** This will be a number that represents the column that the value you want to get exists in from the table selected. Columns start numbering with 1 and then increase to the right. Figure F-4 labels the columns for the table used for the VLOOKUP in B19. For B19, we are interested in the value in column 2.

- **range_lookup**: This is an optional part that is not needed (or can be set to TRUE) as long as the values in the first column of the **table_array** are sorted in ascending order. It is set to FALSE if the values in the first column are not sorted in ascending order.

Plan	Monthly	Included	\$ Per GB	Plan
Abbreviation	Fixed Costs	GB (per line Above Free)		Description
AG	20	5	15	AT&T Per Gig
AU	35	50	0	AT&T Unlimited
TU	40	50	0	TMobile Unlimited
VG	10	1	10	Verizon Per Gig
VU	40	50	0	Verizon Unlimited
1	2	3	4	(*do not enter column numbers)

Figure F-4: Column numbers in red for the lookup table used for Plan Details Section

- To begin creating the formula for B17, place your cursor in the cell. Then use the Formula Wizard to assist you on your first VLOOKUP formula. Mac Users see figure F-5A.

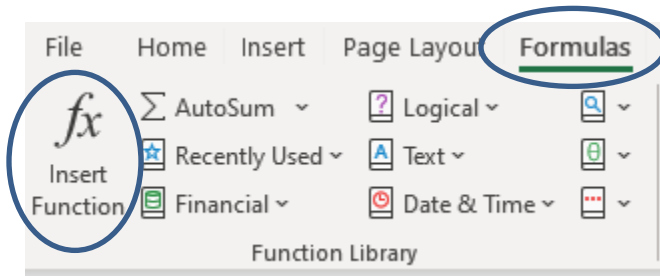
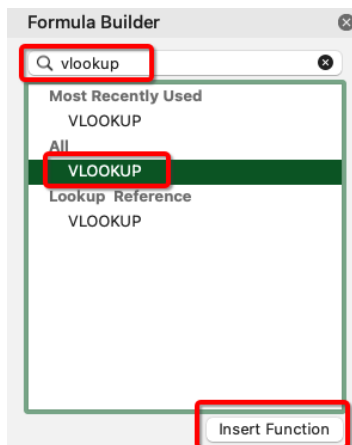


Figure F-5: Using the Insert Function Wizard to assist with your first VLOOKUP.



Mac Users:

In the formula builder window, type vlookup in the search box, select VLOOKUP in the list, then click Insert Function

Figure F-5A (Mac Users)

- In the **Select a function** option, find VLOOKUP and click OK.

7. The cell that contains our plan we desire to find the pricing is in B14, thus type `B14` as the `Lookup_value` in the Function Arguments Dialog Box (Figure F-6.). *If your Mac does not support the popup help, type the entries found in Figure F-10 (but replace the 3 at the end with 2 for column two)*

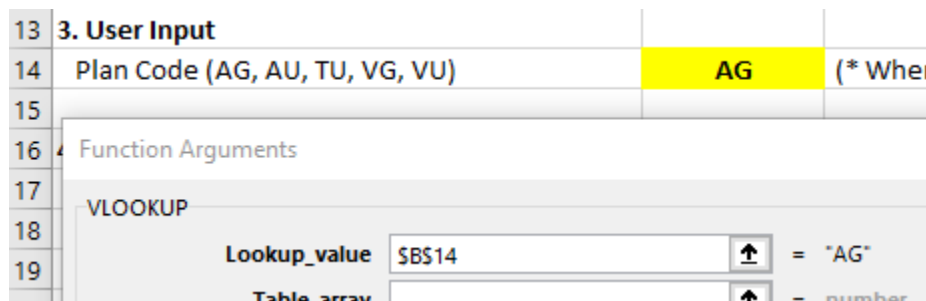


Figure F6: Inserting the Cell with the Lookup Value for our Scenario.

8. Click the Up Arrow in the `Table_array` row in the Function Argument Dialog Box, then click the sheet tab `MobilePlans` and highlight A6 to D10. Excel will insert the `MobilePlans!A6:D10` as the `Table_array`. We recommend that you modify the formula to use absolute references so that you can copy the formula later (see Section F.3.1). With an ending result formula as shown in Figure F-8.

3	Plan	Monthly	Included	\$ Per GB	Plan
4	Abbreviation	Fixed Costs	GB (per line Above Free		Description
5					
6	AG	20	5	15	AT&T Per Gig
7	AU	35	50	0	AT&T Unlimited
8	TU	40	50	0	TMobile Unlimited
9	VG	10	1	10	Verizon Per Gig
10	VU	40	50	0	Verizon Unlimited

Figure F-7: Highlighting the Rows/Columns (Table) that contains the values to used based on the Plan Abbreviation

9. As we desire to display the Monthly Fixed Costs based on the Mobile Plan Abbreviation, we want the formula to use Column 2 (or B). Insert 2 in the `Col_index_num` box and click OK. You may leave the range lookup blank. Your Function Arguments (with absolute references) should look like Figure F-8.

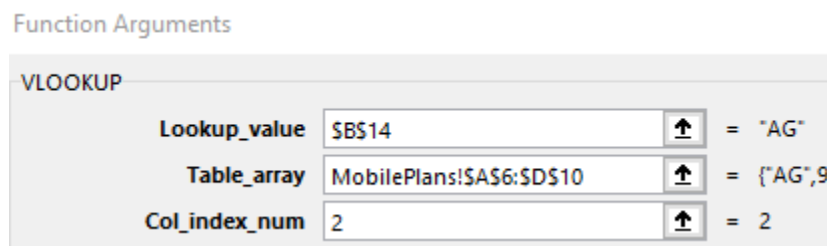


Figure F8: Entering the column number indicating which column's value should be transferred back to your original sheet (Calculations) based on the MobilePlan Abbreviation. Mac Users: See Figure F-8A.

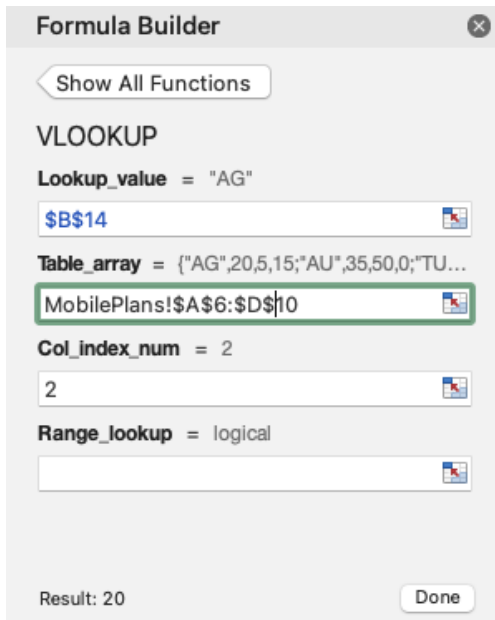


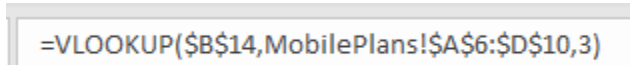
Figure F-8A: VLookUp Screen as it would appear for MAC Users

10. Press enter (or click OK) and Excel should return to the Calculations worksheet. If you had **AG** entered in B14, you should see \$20.00 as the value in cell B17. Click the cell and you'll see that the formula bar still displays the VLOOKUP. If you manually change the value in B14 to AU, you should see a new value (\$35.00) in B14. This indicates that your VLOOKUP is working and will change values based on the MobilePlan Abbreviation entered in B14. Make sure to change B14 back to AG so your data will match the figures in this handout.

14	Plan Code (AG, AU, TU, VG, VU)	AG
15		
16	4. Plan Details	Per Phone
17	<i>Plan Base Fixed Cost (Per Phone)</i>	\$20.00

Figure F9: Result of VLOOKUP for Cell B17 for Plan AG.

11. **Row 18: Number of Base GigaBytes Included in the Plan:** This value will change based on the plan code given in B14. Like Row 17 you should use a VLOOKUP. Copy the formula in B17 to B18. However, note the Number of Gigabytes is in the third column of the MobilePlans sheet. Your last entry which is the column index number the VLOOKUP formula, should be changed from column 2 to column 3. See Figure F-10. Also make sure you used Absolute References as shown for the first two entries of the VLOOKUP function.



=VLOOKUP(\$B\$14,MobilePlans!\$A\$6:\$D\$10,3)

Figure F-10: Formula for Cell B18, with the values for Gigabytes included in the ‘third column’ of the MobilePlans sheet.

12. **Row 19 (Column B): Cost Per GigaByte Over Base:** We will need to reference our table on the MobilePlans sheet and refer to the column with the \$ per GB above the free allowance. Copy the formula from B17 and remember to change the column index number to the column in the MobilePlans sheet with the \$ per GB above. When complete with this section, your spreadsheet should look like Figure F-11. Ensure that row 18 is not formatted as currency (right click Format).

16	4. Plan Details	Per Phone
17	<i>Plan Base Fixed Cost (Per Phone)</i>	\$20.00
18	Number of Base GigaBytes (Per Phone)	5
19	Cost Per GigaByte Over Base	\$15.00

Figure F-11A: Results of the VLOOKUP functions for Section 4 of our spreadsheet (if the plan code is AG)

14	Plan Code (AG, AU, TU, VG, VU)	VU
15		
16	4. Plan Details	Per Phone
17	<i>Plan Base Fixed Cost (Per Phone)</i>	\$40.00
18	Number of Base GigaBytes (Per Phone)	50
19	Cost Per GigaByte Over Base	\$0.00

Figure F-11B: Results of the VLOOKUP functions for Section 4 of our spreadsheet (if the plan code is VU)

13. **Rows 17 to 18 – Column C: Totals for all phones.** Next, get the total for the # of phones desired. Basically multiply your values in Column B * the Number of Phones Desired (use the cell reference and NOT 5). Your results are shown in Figure F-12 for plan AG. C19 should just equal B19.

16	4. Plan Details	Per Phone	All Phones
17	<i>Plan Base Fixed Cost (Per Phone)</i>	\$20.00	\$100.00
18	Number of Base GigaBytes (Per Phone)	5	25
19	Cost Per GigaByte Over Base	\$15.00	\$15.00

Figure F-12: Testing your formulas, results if your Plan Code is AG.

F.3.3 – Function: IF Statement

Section 5: Calculations – formulas need to be placed in columns B through G for this section. For reference, a snapshot of the final results is provided at the end of this tutorial (Figure F-17):

14. **Row 24: Number of GigaBytes Over:** This can be found if you can subtract Number of Base GB (All Phones, think column C) from GB Used BUT there will be a problem when GB Used is less than GB Included – the result will be a negative number. For example, in January, LCH used 18 GB. Plan AG provides 25 GB minutes. If you just subtract 18-25, the GB Over would be -7. This is not correct. If GB Used is less than GB Included, the value for this formula should be 0. To get this to work, you must use an IF statement.

An IF function can be used to alter the formula used based on some condition. When a condition is met (true), one formula or value is used, if a condition is not met (false), a different formula or value is used. The generic setup for an IF statement is as follows:

=IF(logical_test, value_if_true, value_if_false)

15. **Row 24: Number of GB Over:** For B24, we need to create a formula such that: **IF** GB Used is **LESS THAN** GB Included, **THEN** the value should be 0, **OTHERWISE** the value should be GB Used minus the Base GB allowed.

Using the formula you need for B24 as an example, the following explains the IF function in more detail.

- **logical_test:** This is the condition that we will test. Basic conditions will use the condition symbols = (equal to), <> (not equal to), > (greater than), < (less than), >= (greater than or equal to), <= (less than or equal to) and so forth. For B24, we want to test if GB Used (B11) is **MORE THAN** the **total** GB in the Base Plan (C18). This would be written as B11 > C18 (notice C18 is the total allowed). Don't forget – you must decide what type of cell references these will be.

NOTE: For EVERY cell reference you use, you should ask yourself “Is this an absolute or relative reference?” If you constantly ask that, it will eventually become second nature and you will have mastered the use of absolute and relative references. See section F.3.1 for a review.

16. Again, we will use the Insert Function Assistant to help with our first IF statement. Click in Cell B24 and the FORMULAS and then select IF from the available functions. Enter your Logical Test, you want to ask if B11 (GB Used) is greater than C18 (GB Allowed). Notice one of the cells is relative (will change as you copy), and one is absolute (needs to refer to a particular cell and not change when it is copied). See Figure F-13 for your Logical Test. Again if you are on a MAC and the pop up helper does not appear use Figure F-14 as your guide and put commas between the 3 entries.

Function Arguments

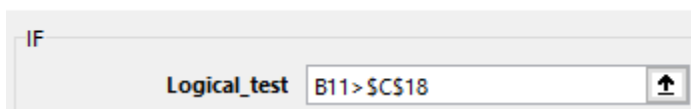


Figure F-13: Test to determine if we have used more GB then allowed in our plan.

- **value_if_true:** Now you can type the formula needed when the condition you created is TRUE. So, when B11 **IS** greater than C18, what quantity of GB's are we over? The answer is **to subtract the total allowed from the total used (B11 - \$C\$18)**
- **value_if_false:** Now you can type the formula needed when the condition you created is FALSE. So, when B11 **IS** less than B19, what should the GB Over be? The answer is zero (0). Figure F14 shows the three components of the IF function for B24.

Function Arguments

IF

Logical_test	B11>5C518	↑
Value_if_true	B11-5C518	↑
Value_if_false	0	↑

Figure F-14: Completed IF function for Cell B24.

Press enter and Excel will calculate the value. With an AG in B14, you should get 0 for B24.

17. Copy the formula in B24 to C24 through G24. If you used the proper absolute references, your results will be as shown to Figure F-15.

23	5. Calculations	Jan	Feb	Mar	Apr	May	Jun
24	Number of GigaBytes Over	0	7	13	0	0	22

Figure F-15: Completed IF function for Row 24.

18. **Row 25: Overage Cost:** Multiply the # of GBs over by the Cost per GigaByte Over Base (use column C and remember to make it 'absolute').
19. **Row 27: Total Taxable Items:** Sum the Plan Base Fixed Costs (all phones) and the Total Overage Cost for each month. Your results are shown in Figure F-16.

5. Calculations	Jan	Feb	Mar	Apr	May	Jun
Number of GigaBytes Over	0	7	13	0	0	22
Total Overage Costs	\$0.00	\$105.00	\$195.00	\$0.00	\$0.00	\$330.00
Total Taxable Items	\$100.00	\$205.00	\$295.00	\$100.00	\$100.00	\$430.00

Figure F-16: Total Overage and Total Taxable Items.

Bonus Questions (check with your instructor):

- No IF function is required for this formula. Why not?
 - Which of the cell references in the prior two formulas should be Absolute? Relative?
20. **Row 29: Federal Universal Surcharge:** This is found by multiplying the Federal Universal Surcharge Percentage (a constant) by the Total Taxable Items. HINT: Values from the Constants area do NOT change every month (think absolute! And do not put .02478 in the formula).
21. **Row 30: Federal Excise Tax:** This is found by multiplying the Federal Excise Tax Percentage by the Total Taxable Items.
22. **Row 31: State Franchise Tax Recovery Fee:** This is found by multiplying the State Franchise Tax Recovery Fee Percentage by the Total Taxable Items.

23. **Row 32: 911 Service Fee:** This is a flat rate that applies to all plans every month **per phone** on the plan. Write a formula to repeat the value from the constants section. Remember, this value will not change from month to month, but a formula is still required.

Bonus Questions (check with your instructor):

- c) Why should a formula be used here? Why wouldn't you just type 7.50 into the cells in Row 32?
24. **Row 33: Total Taxable Items:** This is the **SUM** of the previous 4 rows (29 through 32). Make sure you don't accidentally include the Total Taxable Items that should not be included in this formula.
25. **Row 35: Plan Base Monthly Cost:** This value was the result of the lookup in Row 17 (Column C). The value should be repeated for columns B through G here. You DO NOT need to rekey the VLOOKUP formula, instead we recommend you simply use a cell reference: =\$C\$17.
26. **Row 36: Monthly Overage Cost (for all phones):** This value was calculated in Row 25. The values from Row 25 should be repeated for columns B through G here. You DO NOT need to rekey the VLOOKUP, use a cell reference back to row 25 – remember to ask, “is this a relative or an absolute reference?”
27. **Row 37: Monthly Taxes & Fees:** This value was calculated in Row 33. The values from Row 33 should be repeated for columns B through G here
28. **Row 38: Total Monthly Cost:** This is the sum of the previous 3 rows (35 through 37).

Summary - formulas will only need to be placed in column B of this section. For reference, a snapshot of the final results is provided at the end of this section (Figure F-17).

29. **Row 41: Total Monthly Base Costs:** This is the sum of all months for the Plan Base Monthly Cost. You can use a SUM formula for row 35, columns B through G.
30. **Row 42: Total Overage Costs:** This is the sum of all months for the Monthly Overage Cost. You can use a SUM formula for row 36, columns B through G.
31. **Row 43: Total Taxes & Fees:** This is the sum of all months for the Monthly Taxes & Fees. You can use a SUM formula for row 37, columns B through G.
32. **Row 44: Total of All Costs:** This is the sum of the previous 3 rows (41 through 44).

Your resulting spreadsheet should look like Figure F-17.

Which mobile phone plan should you choose?						
1. Constants						
Number of Mobile Phones Desired	5					
Federal Universal Surcharge Percentage	2.478%					
Federal Excise Tax Percentage	3.000%					
State Franchise Tax Recovery Fee Percentage	0.899%					
911 Service Fee (per phone)	\$1.50					
2. Usage Data						
	Jan	Feb	Mar	Apr	May	Jun
Gigabytes Used (Total of all phones)	18	32	38	22	20	47
3. User Input						
Plan Code (AG, AU, TU, VG, VU)	AG	(* When you change this code, your calculations should change)				
4. Plan Details						
	Per Phone	All Phones				
Plan Base Fixed Cost (Per Phone)	\$20.00	\$100.00				
Number of Base GigaBytes (Per Phone)	5	25				
Cost Per GigaByte Over Base	\$15.00	\$15.00				
5. Calculations						
	Jan	Feb	Mar	Apr	May	Jun
Number of GigaBytes Over	0	7	13	0	0	22
Total Overage Costs	\$0.00	\$105.00	\$195.00	\$0.00	\$0.00	\$330.00
Total Taxable Items	\$100.00	\$205.00	\$295.00	\$100.00	\$100.00	\$430.00
Federal Universal Surcharge	\$2.48	\$5.08	\$7.31	\$2.48	\$2.48	\$10.66
Federal Excise Tax	\$3.00	\$6.15	\$8.85	\$3.00	\$3.00	\$12.90
State Franchise Tax Recovery Fee	\$0.90	\$1.84	\$2.65	\$0.90	\$0.90	\$3.87
911 Service Fee	\$7.50	\$7.50	\$7.50	\$7.50	\$7.50	\$7.50
Total Taxes & Fees	\$13.88	\$20.57	\$26.31	\$13.88	\$13.88	\$34.92
Plan Base Monthly Cost	\$100.00	\$100.00	\$100.00	\$100.00	\$100.00	\$100.00
Monthly Overage Cost	\$0.00	\$105.00	\$195.00	\$0.00	\$0.00	\$330.00
Monthly Taxes & Fees	\$13.88	\$20.57	\$26.31	\$13.88	\$13.88	\$34.92
Total Monthly Cost	\$113.88	\$225.57	\$321.31	\$113.88	\$113.88	\$464.92
6. Summary						
Total Monthly Base Costs	\$600.00					
Total Overage Costs	\$630.00					
Total Taxes & Fees	\$123.44					
Total of All Costs	\$1,353.44					

Figure F-17: Completed Calculations Sheet.

F.4 – Creating the Scenario in Scenario Manager

Now that the formulas have been created, we can easily manipulate the User Input section and our formulas should reflect this change. Ultimately, the new plan details will be looked up. The subsequent formulas will be reevaluated, and the values will be displayed. Since we have 5 possible plans, take some time change the Plan Code value in B14 (AU, TU, etc.) and seeing how that may affect the calculations section of this spreadsheet.

The benefit in using the Scenario Manager is that we can tell Excel what to values to change to assist us in making a recommendation to management. In this tutorial, the change will be the mobile phone plan selected in B14. Excel will then manipulate that cell and collect the critical data together in one report. This prevents us from having to manually alter the input and write down the results from each plan one by one.

33. Start the Scenario Manager. To do so, click the Data menu ribbon. Click the What-If Analysis icon in the Data Tools section of the Data menu ribbon. In the drop down that is displayed, select Scenario Manager (Figure F-18). If you do not see the What IF, you might be working in the 'cloud' version of Excel and not the version on your desktop. Visit the PDF for Project 8, section E-0 for help.

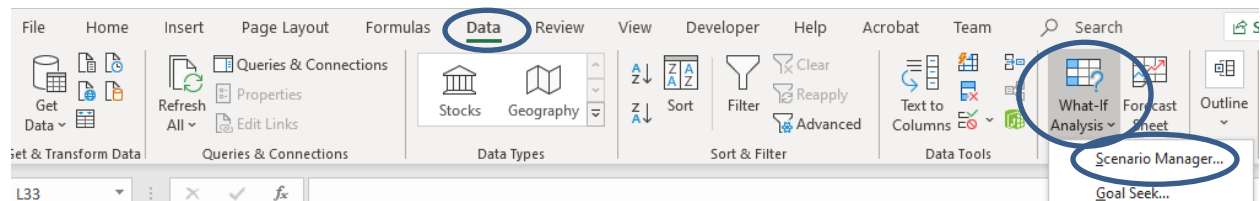


Figure F-18: Scenario Manager is found under the What-If Analysis icon in the Data Tools section of the Data menu ribbon

The starting setup screen for the Scenario Manager is shown in Figure F-19. There are no scenarios set up when you first start the Scenario Manager.

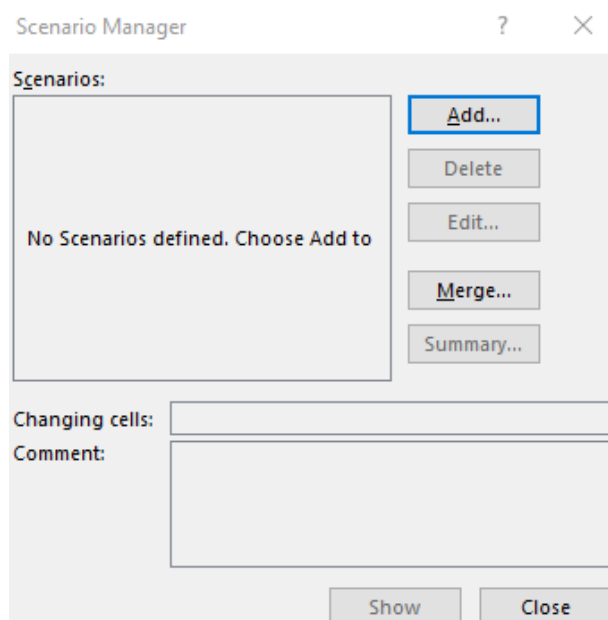


Figure F-19: Starting setup for Scenario Manager (Mac Users should click the + (Plus sign) to add a Scenario)

34. Your first step in the scenario manager will be to add a scenario. Each scenario represents a different “set of inputs” from our spreadsheet. For this tutorial, we will be creating one scenario for each mobile phone plan available. We will have 5 scenarios.

Click the Add button to create your first scenario. Figure F-20 shows the setup screen that will start the creation of a scenario.

Figure F-20: Setup screen of one scenario

NOTE: Your setup may request a comment. Ignore that comment block.

35. Each scenario must be given a name. It’s best to use a descriptive name because this will be displayed on the output report. In addition, it will be easier to tell the scenarios apart when making updates if you use a descriptive name.

Name this scenario **AT&T PerGig** and place this in the Scenario name box provided in the scenario setup.

36. Changing cells refers to one or several input cells that will be modified for each scenario. For this tutorial, we have one input that we will change, **cell B14**. The use of absolute or relative cell references in the scenario setup will make no difference in your results. It is suggested you leave the default that Excel decides to use. Cell B14 will take on the values AG, AU, TU etc. each representing one of the mobile plans we want to compare.

You may manually type the cell references into the Changing cells box provided. Alternatively, you can use your mouse to click the cells on the worksheet in the background. Feel free to move the Add Scenario window so you can see the cells below it.

Either type B14 or select cell B14 as the changing cells for the first scenario. This will be the selection for all other scenarios that we create in this tutorial. After this first scenario is set up, the others will use the same values by default. Figure F-21 shows the scenario setup after adding the appropriate name and changing cell.

Edit Scenario ? X
 Scenario name:
 AT&T PerGig
 Changing cells:
 B14
 Ctrl+click cells to select non-adjacent changing cells.
 Comment:
 Created by Janicki, Thomas N. on 12/29/2020
 Protection
 Prevent changes
 Hide
 OK Cancel

Figure F-21: Scenario setup after adding a name for the scenario and the changing cells

37. Continue with the setup by clicking the OK button. Figure F-22 shows the next screen you will see.

Scenario Values ? X
 Enter values for each of the changing cells.
 1: \$B\$14 AG
 Add OK Cancel

Figure F22: Scenario Values screen for our first scenario case

On this screen you will input the desired values for the given scenario (AT&T PerGig). These values are referenced by cell. For this tutorial, we will only alter the value of B14 so this cell is the only changing cell listed. Since AU is the current value of cell B14, the B14 box is prefilled with an AU. For our first plan, we do not need to change this.

38. Click OK to save this scenario. Notice that the Scenario Manager now lists AT&T PerGig as one of the Scenarios.

39. Add the 4 other required scenarios. They should be:
- AT&T Unlimited (value of AU in B14)
 - TMobile Unlimited (value of TU in B14)
 - Verizon PerGig (value of VG in B14)
 - Verizon Unlimited (value of VU in B14)

Once completed your Scenario Manager should look like Figure F-23.

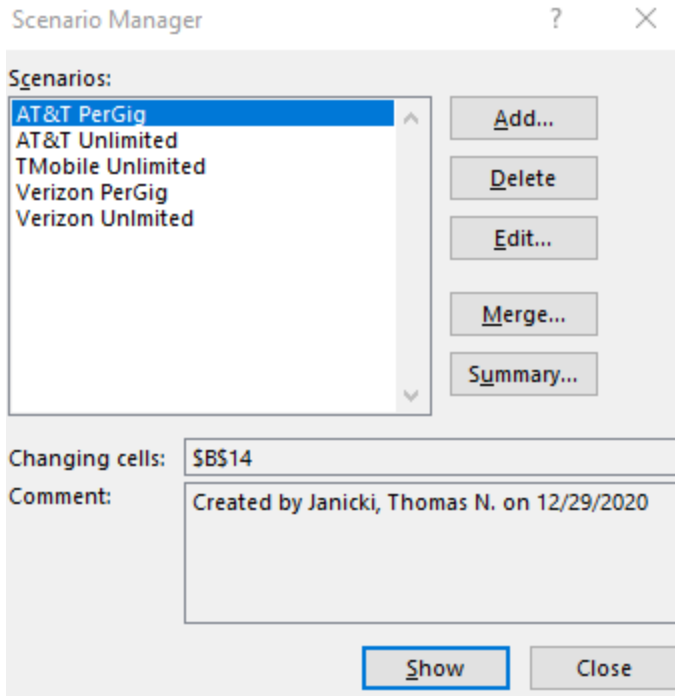


Figure F-23: Scenario Manager after adding all scenarios

Take some time to familiarize yourself with the other buttons on the Scenario Manager screen. Highlighting an existing scenario will activate the buttons. If you click Delete (Mac Users click the – (minus) sign, the scenario will be removed, and the details will be lost. If you click Edit, you can go back through the setup and make updates to the scenario. This may be required if you have a typo in the scenario name, accidentally typed the wrong input, or used an incorrect changing cell.

In your Scenario Manager, pop-window double click on TMobile Unlimited. Your Calculations spreadsheet will now show TU in B14 and will have modified all of results of your the equations. As a double check your value in B44 should be \$1321.52 if the plan is TMobile Unlimited.

F.4.1 – Running the Scenario Manager and Generating a Report

40. With the Scenario Manager screen open, you may generate a report by clicking the Summary button.

Start the process to create a scenario summary report. Figure F-24 shows the popup that appears after you click the Summary button.

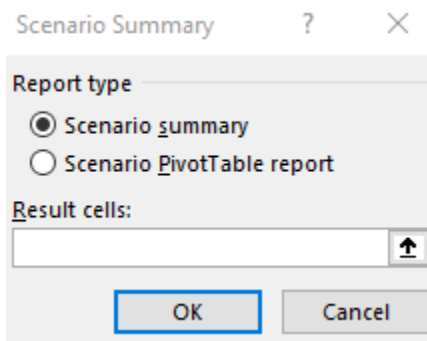


Figure F-24: Scenario Summary options popup

For the report type, you should create a Scenario Summary. This is most likely the default selection, leave that selection.

41. For Results cells, you can select cells from the spreadsheet that will be displayed on the Scenario Summary report. Excel attempts to guess the Results cells desired. Typically, Excel is wrong. For this tutorial, you will want to compare 4 values for each scenario you have created. These are:

- Total Monthly Base Costs
- Total Overage Costs
- Total Taxes & Fees
- Total of All Costs

These values are found in cells **B41 through B44**.

42. Select the appropriate Results cell for the Scenario Summary Report. You may manually type the values or use your mouse to select the cells behind the popup screen. Your setup should look like Figure F-25. (Remember, for these setup screens, absolute or relative references will not affect the resulting summary reports.)

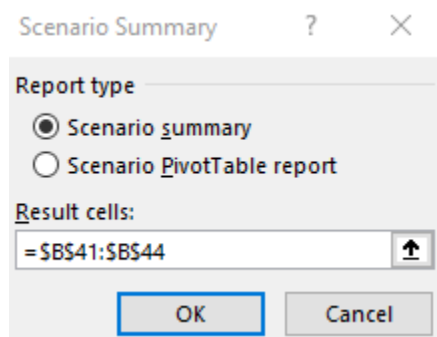


Figure F-25: Scenario Summary options after adding Results cells

43. Click OK to create the Scenario Summary Report. Your Scenario Summary should be on a new tab/worksheet named Scenario Summary. It should look like Figure F-26.

Scenario Summary							
Current Values:	AT&T PerGig	AT&T Unlimited	TMobile Unlimited	Verizon PerGig	Verizon Unlimited		
Changing Cells:							
\$B\$14	AG	AG	AU	TU	VG	VU	
Result Cells:							
\$B\$41	\$600.00	\$600.00	\$1,050.00	\$1,200.00	\$300.00	\$1,200.00	
\$B\$42	\$630.00	\$630.00	\$0.00	\$0.00	\$1,470.00	\$0.00	
\$B\$43	\$123.44	\$123.44	\$111.96	\$121.52	\$157.87	\$121.52	
\$B\$44	\$1,353.44	\$1,353.44	\$1,161.96	\$1,321.52	\$1,927.87	\$1,321.52	
Notes: Current Values column represents values of changing cells at time Scenario Summary Report was created. Changing cells for each scenario are highlighted in gray.							

Figure F-26: Initial Scenario Summary created (before formatting)

NOTE: If you execute the summary report multiple times, it will create multiple summary worksheets (tabs). If you need to rerun your report, **you should delete** the existing Scenario Summary worksheet (tab at bottom) **before generating another**.

44. Take a minute to familiarize yourself with the setup of the Scenario Summary Report generated. Notice these items:

- There are 2 sections of the report, the Changing Cells and the Results Cells. They are listed with their cell references (column C).
- The scenario names you used are across the top of the columns of the report (row 3).

F.4.2. – Formatting the Summary Report

Before distributing the report, it's best to perform some basic formatting to make the Scenario Summary Report more presentable.

45. Delete the blank column A and blank row 1. Also, delete the column that has the Current Values. This is the same as Plan A for this tutorial. The note provided underneath the report is not required and can be deleted. Figure F-27 shows what your report should look like before you delete the Current Values column.

	A	B	C	D	E	F	G	H
1	Scenario Summary							
2			Current Values:	AT&T PerGig	AT&T Unlimited	TMobile Unlimited	Verizon PerGig	Verizon Unlimited
4	Changing Cells:							
5		\$B\$14	AG	AG	AU	TU	VG	VU
6	Result Cells:							
7		\$B\$41	\$600.00	\$600.00	\$1,050.00	\$1,200.00	\$300.00	\$1,200.00
8		\$B\$42	\$630.00	\$630.00	\$0.00	\$0.00	\$1,470.00	\$0.00
9		\$B\$43	\$123.44	\$123.44	\$111.96	\$121.52	\$157.87	\$121.52
10		\$B\$44	\$1,353.44	\$1,353.44	\$1,161.96	\$1,321.52	\$1,927.87	\$1,321.52

Figure F-27: Scenario Summary Report after deleting unnecessary rows and columns

If this report is distributed without the associated Excel spreadsheet, the cell references will make no sense at all. It's best to retrieve the meaning of each value from the Calculations Sheet. These can be retrieved from the row names given on the Calculations spreadsheet. The best location for these would be column A beside the cell references.

46. Delete Column B on your Scenario Summary Sheet.
47. Click in Cell A5 and then type = and then click on the Calculations Sheet Tab and click on Cell A14. Your result on the Scenario Summary sheet should be a formula of =Calculations! A14
48. Click next in A7 (Scenario Sheet) and then an equal sign and refer to cell A41 on the Calculations Sheet. Copy your formula from A7 to A10 on the Scenario Sheet.
49. Increase the width of Column A to see the entire description of the plans and totals.
50. Center and bold the items in B2 to F2 and B5 to F5 to make the cases names more easy to read for the user.
51. Your final scenario should appear as in Figure F-28. **For grading purposes, please make sure the sheet tab name is Scenario Summary (with a space).**

	A	B	C	D	E	F
1	Scenario Summary					
2		AT&T PerGig	AT&T Unlimited	TMobile Unlimited	Verizon PerGig	Verizon Unlimited
4	Changing Cells:					
5	Plan Code (AG, AU, TU, VG, VU)	AG	AU	TU	VG	VU
6	Result Cells:					
7	Total Monthly Base Costs	\$600.00	\$1,050.00	\$1,200.00	\$300.00	\$1,200.00
8	Total Overage Costs	\$630.00	\$0.00	\$0.00	\$1,470.00	\$0.00
9	Total Taxes & Fees	\$123.44	\$111.96	\$121.52	\$157.87	\$121.52
10	Total of All Costs	\$1,353.44	\$1,161.96	\$1,321.52	\$1,927.87	\$1,321.52

Figure F-28: Finalized Scenario Summary Result after all formatting

F.5 – Interpreting the Results *(optional – check with instructor)*

Recall from the opening summary that there were several questions to be answered. Recall that currently, LCH is subscribed to the Per Gigabyte plan and that in the past, it was argued that since there is no way to anticipate the Gigabytes used each month, it's best to just pay for GB usage instead of having unused GB's each month. Before now, there was no data to support this decision.

Question 1: With the data from LCH's prior 6 months, do you support the argument?

Looking at the results, the Per Gigabyte plan has cost LCH \$1289.61 total in charges. There is one other plan that would have resulted in fewer charges than this plan. Now that there is data to support an argument, what would you say about the Per GigaByte as a solution for LCH, and based on the previous usage of the mobile phones, which plan do you suggest best suits the needs of LCH? Justify your recommendation

Question 2: If our data usage increased by 10%, which is the best plan?

The value of the Scenario Manager feature is highlighted by this question. With all the calculations already set up, now all you need to do is to go back and increase the numbers in cells B11 to G11 by 10%, then and rerun the scenario then rerun the scenario manager and generate a new Scenario Summary report..

Appendix 1.1 Uploading a file to Entropy that is stored on your machine.

1. **Make sure your Excel file is closed. Excel should not be open when you upload it to Entropy.**
2. Open a web browser.
3. Go to Entropy (<https://csbapp.uncw.edu/Entropy/>). Enter your Entropy UserID and Password and select the appropriate class.
4. Click the **Upload Assignment** option.

Your Progress

[Check Progress](#)

[Upload Assignment / Download Starting Template](#)

Figure Appendix-1: Entropy, starting the process to upload an assignment

5. Find the correct assignment you wish to upload. This will vary based on your instructor.
6. Click **Upload Now** beside the appropriate assignment.

File Upload/Download

The following projects are available for upload/download

Assignment Name	Due	Due Time	Late Acceptance Until	File Type	Upload	Download
Project 7 - Excel Refresher	12/25/2020	11:59 PM	12/25/2020	XLSX	Upload Now	Download Starting Template

Figure Appendix-2: Entropy, upload an assignment

7. Entropy will respond with a listing of all files uploaded and their date/time. *Should you upload a file to the same assignment more than once, it will list both uploads but only keep and grade the most recent upload.*

Assignment Name	Due Date	Upload Date	File Size	Unique Upload ID
Project 3 - Access Queries	09/10/2020 11:00 PM	09/11/2020 03:24 PM	950272	196972
Project 3 - Access Queries	09/10/2020 11:00 PM	09/11/2020 03:09 PM	819200	196973

Figure Appendix-3: Summary of files uploaded

8. Be sure to save a copy of your Excel file onto a permanent storage device. Recommended storage area would be your **OneDrive storage area** via your Email account.