

## ITEC1010 Assignment #2 – Excel Spreadsheets

**Submissions must be made via the link at the top portion of the course site by the deadline.**

- **Due Monday., July 27, 10PM – No Late Submissions Accepted**

When we create a worksheet model using a spreadsheet program such as Excel, we instruct the computer by providing steps it can take to solve the problem at hand. Problem solving in this context is how best to achieve the desired results using appropriate formulas and functions that are **flexible**, **elegant** and optimally **comprehensible/meaningful**. In this assignment you are asked to solve problems in Excel and submit the workbook containing all of the solutions.

### **IMPORTANT!!!!**

- **Cell addresses and literal numbers should NOT be used in any formula solutions for Problems 2 to 5 inclusive.**
- **In all cases, up to 50% penalty will be applied for formulas that contain cell addresses or literal numbers and not using named ranges optimally.**

### **RECOMMENDED:**

Solve each assignment problems below by following the 5-step problem-solving strategies below:

STEP 1: **Understand** the problem clearly -- read the problem instruction carefully more than once.

STEP 2: **Strategize** -- begin by thinking roughly as to how the problem can be solved -- write your ideas out in words.

STEP 3: **Design** solutions-- write a more structured algorithm or draw a flow chart of the ordered set of steps required to solve the problem.

STEP 4: **Implementation** -- translate your design algorithm to formulae that Excel can execute -- use appropriate functions and name-defined cell ranges for full credit.

STEP 5: **Verification** -- ensure that the results of your formulae match the example values.

### **MAIN TASK: READ CAREFULLY BEFORE PROCEEDING**

1. Create an Excel Workbook containing the solutions to the problems below.
2. Save the workbook as your **full name**, e.g., peggy\_carter.xlsx (all lowercase)
3. Each problem must be solved in its own worksheet; please keep everything compact so that they are easily found and viewable when opened.
4. Rename each sheet tab with the specific problem **title**, e.g., Mortgage, Invoice, Movies, etc.
5. Use the data as provided in the examples to test your solutions.
6. Be sure to **include all required components** in indicated format for each problem solution.

## Problem 1: Mortgage

1. Re-create the Mortgage Calculator model below in your Excel worksheet.
2. Formulae for cells F4 to F7 are as per *Figure 1*.

	A	B	C	D	E	F	G	H	I
1		Mortgage Calculator							
2									
3		Initial Assumptions			Result				
4		Borrowed Amount			Financed Amount	=C4-C5			
5		Deposit			Payment (Month)	=IFERROR(PMT(C7/12, C6*12, -C4--C5),0)			
6		Term (Yrs)			Total Payments	=IFERROR(F5*C6*12,0)			
7		Interest Rate			Total Interest	=IFERROR(F6-F4,0)			

Figure 1

3. **Rewrite** the formulae replacing all cell address references with named ranges.
4. Test by entering assumption inputs to cells C4 to C7 using input examples in *Figure 2*.
5. Now reconstruct the summary table (as per *Figure 2* - B10:E11) and populate cells B11 to E11 with appropriate named references.
6. Finally format the whole model as per *Figure 2* including:
  - a. Model title font set to 14pts and merge-centered (B2:F2);
  - b. "Initial Assumptions" and "Result" merge-centered across 2 columns with Thick Outside Borders; other data with All Borders
  - c. Summary table labels with Thick Bottom Borders
  - d. Format values appropriately as Number, Currency, or Percentage;
  - e. Color fill areas with 3 different colors as shown;
  - f. Bold face displayed data.

	A	B	C	D	E	F
1		<b>Mortgage Calculator</b>				
2						
3		<b>Initial Assumptions</b>			<b>Result</b>	
4		Borrowed Amount	\$350,000.00		Financed Amount	\$315,000.00
5		Deposit	\$35,000.00		Payment (Month)	\$1,396.97
6		Term (Yrs)	30		Total Payments	\$502,907.72
7		Interest Rate	3.40%		Total Interest	\$187,907.72
8						
9						
10		<b>Interest Rate</b>	<b>Monthly Payment</b>	<b>Total Payments</b>	<b>Total Interest</b>	
11		3.40%	\$1,396.97	\$502,907.72	\$187,907.72	
12						

Figure 2

## Problem 2: Invoice

Re-create the **Sales Invoice** model below for purchased products with the format and features including merged cells shown in *Figure 3*. You may use the **Item**, **Quantity** and **List\_Price** data as provided.

- **Discount\_Rate**, **Discount\_Threshold** and **HST\_Rate** amounts should be specified as parameters referenced in formulae so that any changes in those values will be automatically applied to the Sales Invoice calculations.
- The **Discount** column displays 5% for any line item when **Quantity** is at least 40 but remain blank otherwise (not zeros).
- **Sale\_Price** is same as the **List\_Price** except when a discount is applicable.
- **Total** is the item total price for each quantity ordered;
- **Subtotal** is the total of all line item totals;
- **HST** is applied to the **Subtotal**
- **Amount\_Due** is the final invoice total.

Hint: Key functions to use: **IF**; **ISNUMBER**;

Example:

Sales Invoice					
Item	Quantity	List Price /unit	Discount	Sale Price /Unit	Total
Printer Ink	36	38.99		38.99	1403.64
Paper Pack	50	9.29	5%	8.83	441.28
File Folders	200	27.99	5%	26.59	5318.10
USB Sticks	40	12.99	5%	12.34	493.62
				<b>Subtotal</b>	7656.64
				<b>HST</b>	995.36
Discount Rate	Discount_Threshold	HST_Rate			
5%	40	13%	<b>Amount Due</b>	8652.00	

Figure 3

### Problem 3: Movies

Re-create the model below that searches the **Top IMDB User Rated Movies** table and returns the attributes of the Rank holding movie.

- Download database file **Top10.csv** and import into your workbook (*Figure 4*).
- The model works by having the user enter the rank # and Excel returns the details stored in the database table. *Figure 5*: Rank # 8 is entered by the user and Excel returns the related Info data.
- The solution should be a **single 'master' formula** that would work for any attribute i.e., the formula that returns the correct Title in the searcher Info is appropriate for being Auto-Filled down the column to return the rest of the movie attributes in the Database.

Hint: Key functions to use: **VLOOKUP; MATCH**

Rank	Title	Genre	Director(s)	Rating	Year
1	The Shawshank Redemption	Crime, Drama	Frank Darabont	9.3	1994
2	The Godfather	Crime, Drama	Francis Ford Coppola	9.2	1972
3	The Dark Knight	Action, Crime, Drama	Christopher Nolan	9	2008
4	The Godfather: Part II	Crime, Drama	Francis Ford Coppola	9	1974
5	The Lord of the Rings: The Return of the King	Adventure, Drama, Fantasy	Peter Jackson	8.9	2003
6	Pulp Fiction	Crime, Drama	Quentin Tarantino	8.9	1994
7	Schindler's List	Biography, Drama, History	Steven Spielberg	8.9	1993
8	12 Angry Men	Drama	Sidney Lumet	8.9	1957
9	Inception	Action, Adventure, Sci-Fi	Christopher Nolan	8.8	2010
10	Fight Club	Drama	David Fincher	8.8	1999

Figure 4 - Database: Top10

Enter Rank # to Search:	8
Info	
Title	12 Angry Men
Rating	8.9
Year	1957
Genre	Drama
Director(s)	Sidney Lumet

Figure 5 - Searcher

## Problem 4: Estimates

A company purchases Widgets according to this price schedule:

- For the first 100 units, \$9.20 per Unit
- For any of the next 500 units \$8.80 per Unit
- For any oil beyond 1000 units, \$7.95 per Unit

The Purchase Estimate spreadsheet calculates the total price of buying Units of Widgets, where a number input to a cell (**Units Ordered**) on the worksheet with values that may fall into any or all of the 3 Tiers of pricing.

Re-create the model as per below:

1. The model must be able to handle any order quantity scenarios.
2. Format with differentiating colors as per example below.

Hint: Key functions to use: **IF**

Here are 3 possible output examples you can use to test your solutions:

	A	B	C	D	E	F	G	H	I	J
1	Purchase Estimates:									
2					Purchase Price			Units Ordered	50	
3	Tier Thresholds				schedule:	Qty		Price	Total	
4	Tier1	100			Tier1:	50	@	9.20	460.00	
5	Tier2	500			Tier2:	-	@	8.80	0.00	
6	Tier3	1000			Tier3:	-	@	7.95	0.00	
7					Total:	50		Total Price:	460.00	

Figure 6 - Scenario1: Tier1 Order (50)

	A	B	C	D	E	F	G	H	I	J
1	Purchase Estimates:									
2					Purchase Price			Units Ordered	300	
3	Tier Thresholds				schedule:	Qty		Price	Total	
4	Tier1	100			Tier1:	100	@	9.20	920.00	
5	Tier2	500			Tier2:	200	@	8.80	1,760.00	
6	Tier3	1000			Tier3:	-	@	7.95	0.00	
7					Total:	300		Total Price:	2,680.00	

Figure 7 - Scenario2: Tier2 Order (300)

	A	B	C	D	E	F	G	H	I
1	Purchase Estimates:								
2					Purchase Price			Units Ordered	1,500
3	Tier Thresholds				schedule:	Qty		Price	Total
4	Tier1	100			Tier1:	100	@	9.20	920.00
5	Tier2	500			Tier2:	500	@	8.80	4,400.00
6	Tier3	1000			Tier3:	900	@	7.95	7,155.00
7					Total:	1,500		Total Price:	12,475.00

Figure 8 - Scenario: Tier3 Order (1500)

## Problem 5: Commissions

Re-create the model below that identifies the attributes of the **Top Performer of the Month** (the sales Associate with the most accrued sales).

- Download/import the **Monthly\_Sales.csv** and complete the **Monthly\_Sales** table (Figure 10) used to record each Associate's individual sales for the month as per image below.
  - To do this, re-create the **Commissions Lookup** table (Figure 9) defining the commission % for the corresponding **SalePrice** that falls within a range.
- Recreate the **Performance Table** (Figure 11) which is the summary of the individual associate's Monthly Sales with formulas for **Properties\_Sold**; **Total\_Sales**; **Commision\_Earned**
- Finally, recreate the **Top Performer of the Month** table (Figure 12) returning the highest **Total\_Sales** from the **Performance Table** (Figure 10) identifying the **Associate**; **Properties\_Sold**; **Commision\_Earned**.

Key Functions to use: **LOOKUP**; **COUNTIF**; **SUMIF**; **MAX**; **INDEX**; **MATCH**;

Commissions Lookup	
PriceRanges	Commissions
0	1.0%
100,000	2.5%
500,000	3.0%
750,000	3.5%
1,000,000	5.0%

Figure 9. Commission Lookup Table

Monthly Sales:		
Name	SalePrice	Commission
Qiu	690000	20,700
Enders	560000	16,800
Irons	923000	32,305
Irons	973000	34,055
Forrest	280000	7,000
Karim	1339000	66,950
Forrest	485000	12,125
Enders	551000	16,530
Irons	1240000	62,000
Qiu	991000	34,685
Enders	270000	6,750
Irons	777000	27,195
Enders	2262000	113,100
Karim	669000	20,070
Karim	700000	21,000
Forrest	1399000	69,950

Figure 10. Monthly Sales

Performance Summary			
Associate	Properties Sold	Total Sales	Commission Earned
Enders	4	3,643,000	153,180
Forrest	3	2,164,000	89,075
Irons	4	3,913,000	155,555
Karim	3	2,708,000	108,020
Qiu	2	1,681,000	55,385

Figure 11. Monthly Performance Summary

TOP Performer of the Month			
Total Sales	Associate	Properties Sold	Commission Earned
3,913,000	Irons	4	155,555

Figure 12. Top Performer of the Month

## Problem 6: Forecasting and Charting

You have an idea for an Internet service that offers customized training for subscribers, but you want to estimate how your business could grow by capturing portions of the potential market in the next 5 years (60 months) to inform interested investors.

Construct a forecasting worksheet to calculate:

- the number of new clients each month (period), and
- the total client base (cumulative number of clients signed up) each month (period).

There are the three key parameters values that impact your projections (Figure 13):

1. **Total market potential**
2. **% remaining captured/period**
3. **Market growth/period**

	A	B	C	D
1	Forecasting and Charting			
2				
3		Total market potential	2,000,000	
4		% remaining captured/period	0.75%	
5		Market growth/period	1.2%	
6				

Figure 13 - Forecasting Parameters

In your model, make projections for 60 Periods (Months) based on these parameters for the two separate scenarios described below to project the number of new customers (Figure 14).

**Scenario 1: Constant Market** - Total market potential is 2,000,000 customers. Each month you sign up 0.75% of customers in the market that have not yet signed up.

**Scenario 2: Growing Market** - Total market potential is initially 2,000,000 customers but grows at 1.2% per month. Each month you sign up 0.75% of customers in the market that have not yet signed up.

- Both scenarios initially (**Period 0**) have 0 new customers and 0 total customers.
- Beginning **Period 1**, calculations must take into account the previous period's **Total\_Clients** values as well as the current period's **New\_Clients** values.
- In the case of Scenario 2, the Period 2 **Total\_Market** calculations also accounts for the **Market growth/period** parameter value.

**Hint:** Whenever you need to reference a value calculated in a previous row in Excel, you have no other option but to use its [cell address](#), not a range name; but remember that the rest of the formula should make use of named ranges.



Scenario 1: Constant Market				Scenario 2: Growing Market			
Period	New_Clients	Total_Clients		Period	Total_Market	New_Clients	Total_Clients
0	0	0		0	0	0	0
1	15,000	15,000		1	2,000,000	15,000	15,000
2	14,888	29,888		2	2,024,000	15,068	30,068
3	14,776	44,663		3	2,048,288	15,137	45,204
4	14,665	59,328		4	2,072,867	15,207	60,412
5	14,555	73,883		5	2,097,742	15,280	75,692
6	14,446	88,329		6	2,122,915	15,354	91,046
7	14,338	102,667		7	2,148,390	15,430	106,476
8	14,230	116,897		8	2,174,170	15,508	121,984
9	14,123	131,020		9	2,200,260	15,587	137,571
10	14,017	145,037		10	2,226,664	15,668	153,239
11	13,912	158,950		11	2,253,384	15,751	168,990
12	13,808	172,758		12	2,280,424	15,836	184,826
13	13,704	186,462		13	2,307,789	15,922	200,748
14	13,602	200,063		14	2,335,483	16,011	216,758
15	13,500	213,563		15	2,363,509	16,101	232,859
16	13,398	226,961		16	2,391,871	16,193	249,052
17	13,298	240,259		17	2,420,573	16,286	265,338
18	13,198	253,457		18	2,449,620	16,382	281,720
19	13,099	266,556		19	2,479,015	16,480	298,200
20	13,001	279,557		20	2,508,764	16,579	314,779
21	12,903	292,460		21	2,538,869	16,681	331,460
22	12,807	305,267		22	2,569,335	16,784	348,244

Figure 14 - Two Scenarios of Market Capture (Partial View)

## Charting

Re-create the Excel chart below (Figure15) that draws on the Forecasting worksheet data comparing the total customer base under each of the two scenarios.

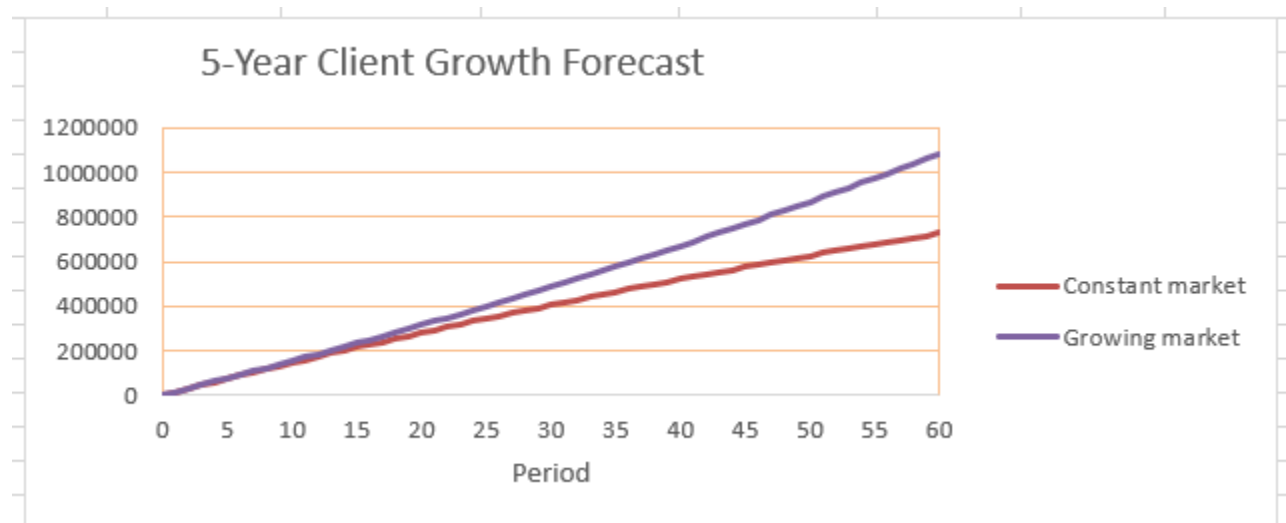


Figure 15 - Market Capture Projections

One way to easily create a chart like this is to select the column of values for “Total Customers” for the first scenario and create a simple chart.

- Select the data and select: **Insert > Insert Line Chart >** (There are several chart types available; you may use line or scatter chart type.)
- Now from the second scenario select the values from the “Total Customers” column and **copy** (CTRL/Command-C) to the Windows Clipboard.
- Click the edge of the existing chart and **paste** (CTRL/Command-V) the Clipboard values to add the second, comparison line.

- You can click anywhere on the chart to reveal the three tool buttons beside the chart; use the top tool to modify various chart elements.



- Or, right-click on the specific area of the chart then select **Format Chart Area** options to refine your chart elements with all appropriate labels, etc. as per the example.

Enjoy!