

CS 130 Assignment 2

Date Assigned: Monday, February 9, 2015

Date Due: Monday, September 16, 2015 at 2:15pm

Points: 50

Goals: Build a worksheet, format data correctly, use named cells, build simple formulas, use built in Functions, build a table, and build a simple chart.

In a Workbook called **02ExcelPUNetID**, create each of the following worksheets:

Worksheet #1 (Name it Coffee Shop)

Build a worksheet to keep track of one year (52 weeks) of your recently opened coffee shop's expenses and profits.

Get the workbook from the CS 130 Public directory on grace and copy and paste the data from the CoffeeShop worksheet into your workbook. This data provides the number of customers that you served at your coffee shop each week.

The worksheet should be setup as shown below. Allow the user to enter in values for Dollars Per Pound, Pounds Per Customer, Gross Profit (Dollars Per Customer), and Standard Overhead (standard overhead includes rent, insurance, and garbage pickup).

	A	B	C	D	E	F	G	H	I	J	K	L
1	Coffee Beans											
2												
3	Coffee											
4	Dollar Per Pound	\$	1.79									
5	Pounds Per Customer		0.04									
6	Gross Profit (Dollars per customer)	\$	1.99									
7	Standard Overhead	\$	15,000.00									
8												
9												
10	Expected Profits											
11	Customer Overhead	At Least	Charge	Week	Customers	Coffee Needed (pounds)	Coffee Cost	Gross Income	Overhead	Net Income	Net Income To Date	Net Overhead to Date
12	High Bracket	500	6%	1	340	14	\$ 25.06	\$ 676.60	\$ 15,101.49	(14,449.95)	(14,449.95)	\$ 15,101.49
13	Mid Bracket	20	15%	2	550	22	\$ 39.38	\$ 1,094.50	\$ 15,065.67	(14,010.55)	(28,460.50)	\$ 30,167.16
14	Low Bracket	0	30%	3	1080	44	\$ 78.76	\$ 2,149.20	\$ 15,128.95	(13,058.51)	(41,519.01)	\$ 45,296.11
				4	3210	129	\$ 230.91	\$ 6,387.90	\$ 15,383.27	(9,226.28)	(50,745.30)	\$ 60,679.39

Users also need to input the data in the Overhead table. This overhead includes the cost of water, cups, napkins, and electricity (items that depend on the number of customers you serve). There are three overhead brackets: High, Mid, and Low. In the example above, you pay 6% overhead (*on your Gross Income*) if you have at least 500 customers in a week; you pay 15% overhead if you have at least 200 customers but fewer than 500 customers in a week; If you have fewer than 200 customers in a week you pay 30% overhead.

Finally, you need to build a table of data to represent your expenses and profits throughout the entire year. The columns are as follows:

- **Coffee Needed (pounds):** This is based on the number of customers.
- **Coffee Cost:** This is based on the number of pounds needed for the week.
- **Gross Income:** This is the income you earned this week before overhead is paid and coffee is bought.

- **Overhead:** The amount of overhead you paid this week. This includes the standard overhead and the overhead based on the number of customers.
- **Net Income:** This is the income you earned this week after overhead is paid and coffee is bought.
- **Net Income To Date:** Your total net income up to and including this week.
- **Overhead to Date:** Your total overhead paid up to and including this week.

Below the table you need to calculate the totals for: Gross Income and Net Income.

Charting:

Below the table build a chart that charts Net Income to Date and Overhead to Date for each Week. Make sure to properly label the chart and ensure that both datasets are readable.

BONUS: Chart Customers on the same chart, using a secondary vertical axis.

What If Analysis: The user should be able to change any of the input values and see the table and chart update.

Formatting:

Be sure to format money and percentages correctly. All percentages must have no digits past the decimal point. Make sure column headers are justified appropriately. The example above is poorly formatted.

Goal Seek:

Using Goal Seek, determine how much your Gross Profit (dollars per customer) would need to be for you to earn a total net income of \$1.2 million. Place this number in a properly labeled and visible cell.

Reset the Gross Profit (dollars per customer) back to \$1.99. Determine what your Standard Overhead would need to be to earn a total net income of \$1.5 million. Place this number in a properly labeled and visible cell.

Worksheet #2 (Name it Newton)

Newton's Law of Cooling describes how a heated object cools over time. The law is:

$$h(t) = M + (h(0) - M) \times e^{kt}, \quad k < 0$$

Where **M** is the constant temperature of the surrounding medium (the air, the water, etc), **h(0)** is the initial temperature of the object, **k** is a negative constant, and **t** is the time the object has been cooling.

$h(0)$ = the fully heated temperature without any cooling.

$h(1)$ = the temperature after 1 unit of time spent cooling.

Build a worksheet, named **Newton**, as described below:

1) Construct a worksheet that will allow the user to input a value for **h(0)**, **M**, and **k**. The worksheet should display a **table** to calculate all values from $h(1)$ to $h(40)$ in increments of 1. The table should have three columns, **t**, **h(t)**, **Amount of Cooling**. Display $h(t)$ to three decimal places by using the ROUND() function. In the **Amount of Cooling** column display how much the object has cooled since the previous time step:

Cooled zero degrees

Cooled more than 0 but less than 2 degrees

Cooled 2 degrees or more

No Cooling

Slow Cooling

Fast Cooling

2) Use $h(0) = 50.0$, $M = 25.0$, and $k = -0.29$ for your initial calculation. When you submit your Excel file, this is the data I want to see displayed.

3) In cell G2 place the answer to the following question in a comment: Given the input in 2), at what time, **t**, does the object reach 25 degrees (find the minimum value of **t** where $h(t) = M$)? You should just type the answer into cell G2, you should not try to write a formula to fill in this cell.

4) In cell G6 place the answer to the following question in a comment: The initial temperature of the object is 100.0. The temperature of the surrounding medium is 10.0. If we want the temperature of the object to be 70.0 at **t=40**, what should the value of **k** be?

5) Change the values for the inputs to those specified in 2). Build a line chart that shows the temperature of the object over time. Remember, the independent variable always goes on the x-axis and the dependent variable goes on the y-axis. Place this chart immediately to the right of your data. Be sure to label your axes and chart.

Don't forget: the exp() function is used to calculate e^x .

BONUS

Use conditional formatting to color the background of the **h(t)** column blue when $h(t) = M$ to indicate that the object has stopped cooling.

Worksheet #3 (Name it PMT Calculations)

Write down the PMT function you would need to use to calculate each of the following. Display both the function and the result of the function. Make sure that your worksheet has a professional look.

Calculate the:

- monthly payment on a \$200,000 loan that has an annual interest rate of 3.85% and must be paid off in 15 years. The payments are due at the beginning of the pay period.
- monthly payment required to save \$20,000 for the purchase of a car. The payments will be paid into a savings account with an interest rate of 0.85% and you would like to purchase the car in one year. The payments will be made at the end of the pay period.
- number of years it will take for you to pay off a credit card loan. You currently owe \$2,000 and will be paying \$50 a month. The annual interest rate on the card is 13%. Neither the interest rate nor the payment will change over the length of the loan. The payments will be made at the end of the month. Note: Do not use the PMT function. You will need to look up a new financial function.
- value of savings that you will have if you pay \$50 a month into a savings account with an annual interest rate of 0.85% for 5 years. The payments will be made at the end of the month. Note: Do not use the PMT function. You will need to look up a new financial function.

How to Submit and Grading Policies

A copy of your single Excel file (properly named) with the two worksheets (properly named) is to be placed in the CS130 Drop Box by **2:15pm** on the due date to be considered on time.

Grading will be based on:

- Correctness of your results
- Completeness of your results
- Professional look of the worksheets as described above and discussed in class
- Ability to perform a what-if analysis by changing any of the user input data with accurate results computed and displayed in the worksheet.