

## CS130 Assignment #2

Date Assigned: Wednesday, January 9, 2019  
Date Due: Thursday, January 10, 2019, 3:00pm  
Points: 50

**Goals:** Build a worksheet, Charting, What If-Analysis, Goal Seek, Import Data from the Web, If statements, Conditional Formatting.

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

### Worksheet #1 – (Name it Newton)

#### Newton's Law of Cooling, or how Newton can ruin your coffee. Physics

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

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

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

No Cooling

Cooled more than 0 but less than 2 degrees

Slow Cooling

Cooled 2 degrees or more

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.

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### **Worksheet #2 (Name it BankStatement) Business**

You need to build a worksheet to keep track of your savings and checking accounts balances.

Get the data from the specified address below. This provides the initial balance (in the top left corner) in each account and the type and amount of each transaction. The Checking account can have a Deposit, D, or Withdraw, W. The Savings account can have a Deposit, D, or Withdraw, W, or Transfer, T. The Transfer from Savings will always transfer the amount of the transaction from the Savings to the Checking account.

<http://zeus.cs.pacificu.edu/chadd/cs130w19/Assignments/BankStatement.html>

The worksheet should be setup as shown at the end of this document. The full color version of this document is available on the class schedule web page. Allow the user to change the initial balance of the accounts, any transaction information, or the interest table and have the entire spreadsheet update.

Savings New Balance is the Savings Balance, plus or minus the Transaction Amount, plus the Interest Earned. Checking New Balance is Checking Balance plus or minus the Transaction Amount plus the Transfer Amount.

► You will need to write a calculation for Savings Balance, Interest Earned, Savings New Balance, Checking Balance, Transfer Amount, and Checking New Balance.

The interest table determines what interest rate a Savings account earns based on that account's balance. There are three brackets: High, Mid, and Low. In the example below, you earn 2.00% interest if you have at least \$10,000.01 in your account, you earn 1.00% interest if you have at least \$5,000.01 in your account, and you earn 0.50% interest otherwise. **Interest is calculated before a transaction is applied.** *You must reference the table in the interest calculation so that **any** changes to the table will change your calculations automatically.* The Checking account does not earn interest.

► I recommend completing the Checking half of the table before starting on the Savings half of the table. The If statements in the Checking half are slightly more simple than the If statements in the Savings half.

### **Charting:**

Below the table build a chart that charts Savings New Balance and Interest Earned for each transaction. Make sure to properly label the chart and ensure that both datasets are readable.

**What If Analysis:** The user should be able to change any of the input values and see the

table and chart update.

**Goal Seek:**

What over \$10,000.01 interest rate will get the last number in the "Savings New Balance" column to \$2,000? Place your answer in cell J1.

**Formatting:**

Be sure to format money and percents correctly. All percents must have two digits past the decimal point. Make sure column headers are justified appropriately. **The example is poorly formatted.** Note that for money you must use the "**Accounting**" formatting. The Accounting formatting displays \$0.00 as "\$ -".

Use **conditional formatting** to highlight the Savings Transaction Type if the transaction is a Transfer.

**How to Submit and Grading Policies**

A copy of your single Excel file (properly named) with the two worksheets (properly named) is submitted to Moodle by **3:00pm** on the due date to be considered on time.

Grading will be based on:

- Correctness and Completeness of your results
- Professional look of the worksheets as described above and discussed in class
- Make sure all of your data is properly formatted
- Use Named Cells where appropriate
- Ability to perform a what-if analysis by changing any of the user input data with accurate results computed and displayed in the worksheet.

The formulas and functions on these spreadsheets are trickier than they appear! Start early!

Remember, this is an individual assignment. Do not discuss your solution with other students.

| Savings Account | Checking Account | Savings Account Interest Rate |                 | W                   | Withdraw         |                  |                    |                 |                      |
|-----------------|------------------|-------------------------------|-----------------|---------------------|------------------|------------------|--------------------|-----------------|----------------------|
| \$ 10,000.00    | \$ 1,000.00      | At Least                      | Interest        | D                   | Deposit          |                  |                    |                 |                      |
|                 |                  | \$10,000.01                   | 2.00%           | T                   | Transfer         |                  |                    |                 |                      |
|                 |                  | \$5,000.01                    | 1.00%           |                     |                  |                  |                    |                 |                      |
|                 |                  | \$0.01                        | 0.50%           |                     |                  |                  |                    |                 |                      |
|                 |                  |                               |                 |                     |                  |                  |                    |                 |                      |
| Savings Balance | Transaction Type | Transaction Amount            | Interest Earned | Savings New Balance | Checking Balance | Transaction Type | Transaction Amount | Transfer Amount | Checking New Balance |
| \$ 10,000.00    | W                | \$ 800.00                     | \$ 100.00       | \$ 9,300.00         | \$ 1,000.00      | W                | \$ 900.00          | \$ -            | \$ 100.00            |
| \$ 9,300.00     | D                | \$ 100.00                     | \$ 93.00        | \$ 9,493.00         | \$ 100.00        | D                | \$ 312.00          | \$ -            | \$ 412.00            |
| \$ 9,493.00     | T                | \$ 1,200.00                   | \$ 94.93        | \$ 8,387.93         | \$ 412.00        | D                | \$ 90.00           | \$ 1,200.00     | \$ 1,702.00          |
| \$ 8,387.93     | W                | \$ 300.00                     | \$ 83.88        | \$ 8,171.81         | \$ 1,702.00      | W                | \$ 30.00           | \$ -            | \$ 1,672.00          |

Note that in this example above the formatting is poor and the spreadsheet is too large to fit well on this page. You may wish to have the column titles on one line instead of broken across two lines. Be sure to highlight every other row in the table for easy reading.