

CP212 Assignment 3

Winter 2013

Marks: 16

Weight: 5.1%

Due Date: Saturday, March 9 before 11:45pm

Objectives

- Write a function
- Design a user form for use in a program

Description

Submit one macro-enabled Excel file (.xlsm file) that contains the function and data from **Part 1** and the Userform in **Part 2**. Make sure the file includes your username, like hend4820_a3.xlsm.

Part 1: Excel Application

You may need to look ahead to Chapter 10 to see how to write a function in VBA to complete this part.

The triangular distribution is a probability distribution that is commonly used in business spreadsheet simulations. It is literally triangularly shaped. There are three parameters to this distribution, labeled a , b and c . The parameters a and c are the minimum and maximum possible values, and the parameter b is the most likely value (where you see the high point in the triangle). This is a simple distribution for people to understand, but it is not straightforward to generate random numbers for this distribution. The method is as follows:

- Calculate $d = (b - a) / (c - a)$
- Generate a uniformly distributed random number U between 0 and 1 (with VBA's Rnd function).
- If $U \leq d$, return $a + (c - a) * \text{sqr}(d * U)$ as the random number. Sqr(x) is a VBA function which will return the square root of x.
- If $U > d$, return $a + (c - a) * (1 - \text{sqr}((1 - d) * (1 - U)))$ as the random number.

Write a function subroutine called **Triangular** that takes three arguments corresponding to a , b , and c and returns a triangularly distributed random number. (Use the **Application.Volatile** and **Randomize** statements that were used in **Example 10.4** in the text). Then try out your random number generator in a worksheet by entering the formula and copying it down to generate a large number of these random numbers. You should also create a **histogram** of these random numbers, just to see if it has an approximate triangular shape.

Notes:

- **The ONLY VBA required is a single function.** The rest of the work can be done by hand in Excel (copying the equation down to at least 1000 rows, creating the chart)... but feel

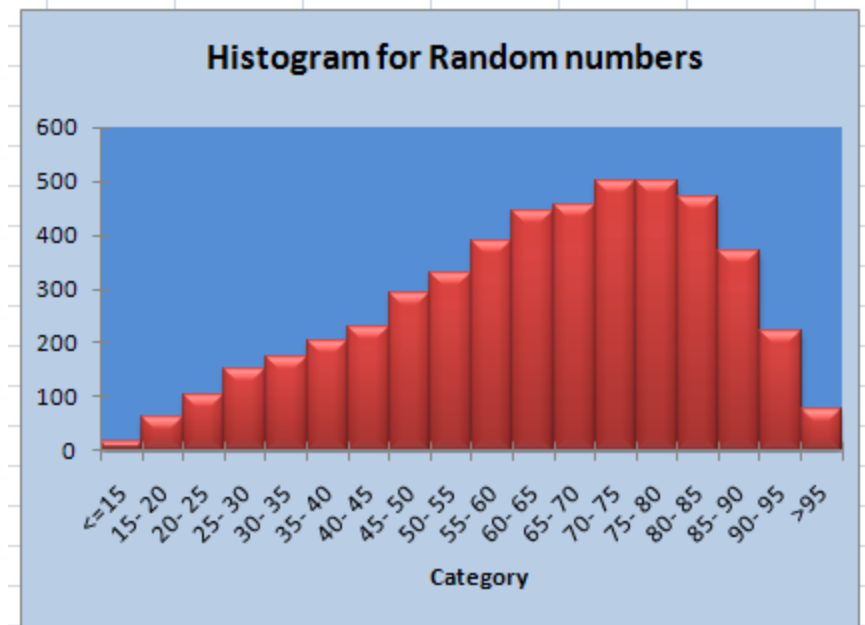
free to do more with VBA if you wish. Writing an equation to 1000 cells in VBA is a LOT faster than doing it by hand.

You will be writing a function that can be used in a worksheet cell in Excel just like the functions built into the software such as **=sum()** and **=average()**. You will create a function called **Triangular** which takes 3 arguments so using your function will look like this: **=Triangular(\$B\$2, \$B\$3, \$B\$4)**

if you were passing in the values in cells B2, B3, and B4.

When you recalculate to get different random numbers, the Histogram will not redraw itself because the data the chart is based on is generated from the Bins that you set up and copied to another location. To redraw the histogram, you'd have to create it again. It may be possible to do this in VBA but it is not a requirement.

A **Histogram** is just a chart in Excel with the **gap-width option** set to 0 and with the frequency of the value counted and placed into groups:



(This was created by custom software by the author of the text and uses 5000 values. Your results won't look like this.)

To set the **Gap Width** to 0, do the following:

- Create your chart so you have a Column Chart. You'll want to use Excel's statistical functions to create a **histogram** (which requires bin ranges to plot the data nicely. If you are not familiar with creating a **histogram** in Excel [follow the instructions here for details](#)).
- **Click** once on one of the bars to select the **Data Series**. Only the bars should be selected (not the PlotArea or any other object).
- **Right-click** and choose **Format Data Series...**
- Slide the **Gap Width** slider to **0** (or type 0 into the box).

Requirements:

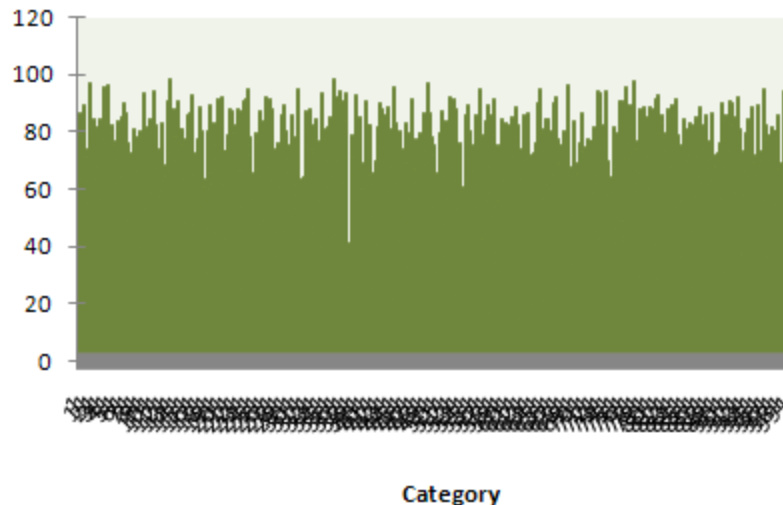
- A Triangular function subroutine

- At least 1000 triangularly random numbers generated with your function
- A histogram. For simplicity sake, you can use bins grouped by tens instead of by fives shown in the above diagram.

References (for more information if interested):

- Triangular Distribution at Brighton-Webs: <http://www.brighton-webs.co.uk/distributions/triangular.htm>
- Triangular Distribution at Wikipedia: http://en.wikipedia.org/wiki/Triangular_distribution

This is not an acceptable chart. Its not a histogram:



Your completed question could look like

this: http://docs.google.com/View?id=dcbv28pb_145gznk5td7

(however, your chart will look slightly different since it only uses 1000 values)

Part 2: Form Application

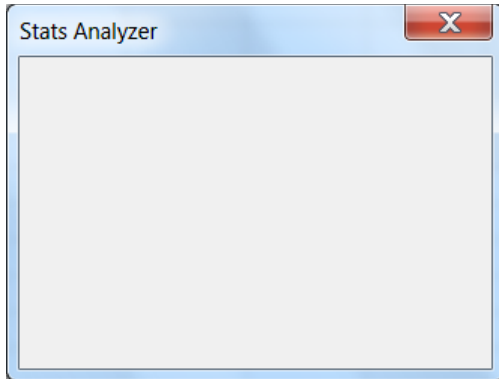
Your boss has given you a mockup of a stats analyzer form he wants you to create. He's a creative genius, so he doodled it together in MS Paint:

The purpose of the form is to have the user select a range of cells, and then choose a number of descriptive statistics to analyze the values.

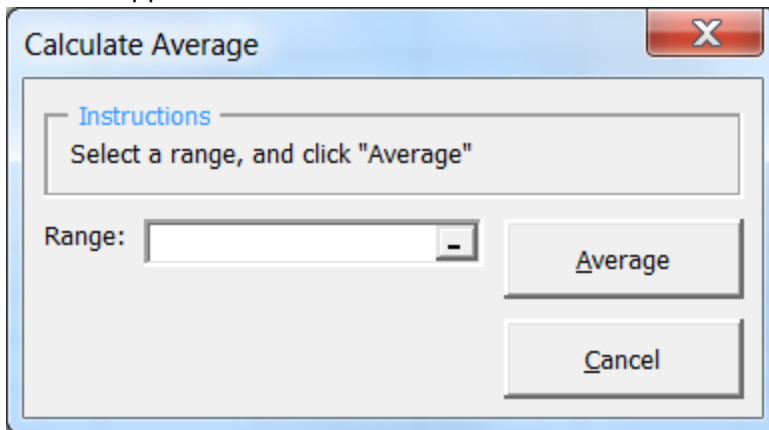
- Your boss decides he wants the user to select a range of cells for the results to be placed, but he didn't include that in the mockup.
- The results should be output starting in the cell selected by the user, or starting in

- the first cell in the range if the user selects a range.
- Your form should be professional looking and improve on what the boss has created in Paint.
- Some samples are on the next page but please feel free to use your own ideas.

As a userform in Excel, it will start off looking like this (under Windows 7):



Possible approaches would be similar to this one:



However, you will have more options for your application.