# How to Solve an Interpolation Using Calculator

Zuraira Libasin and Norazah Umar
*zuraira946@uitm.edu.my, norazah191@uitm.edu.my*

Jabatan Sains Komputer & Matematik (JSKM), Universiti Teknologi MARA Cawangan Pulau Pinang, Malaysia

**Linear Interpolation**

Let us say that we have two known points $x_1, y_1$ and $x_2, y_2$ . Now we want to estimate what y value we would get for some x value that is between x1 and x2. Call this y value estimate as an interpolated value. A simple traditional method to find the y value is by drawing a straight line between $x_1, y_1$ and $x_2, y_2$ . We look to see y value on the line for our chosen x. This is called linear interpolation (Figure 1).
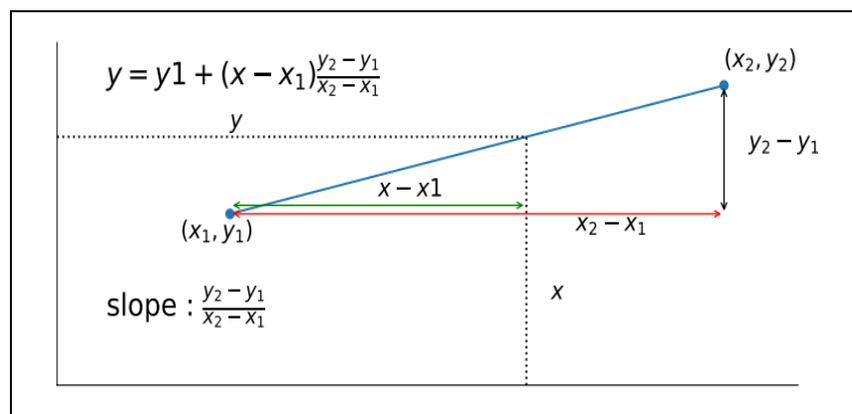


Figure 1: Linear Interpolation. Figure adapted from https://matthew-brett.github.io/teaching/linear_interpolation - Retrieved 5/3/2020

As time goes by, the scientific calculator is another tool to solve the interpolation. One of the advantages of using this tool is it can make potentially lengthy calculations much shorter and time wisely. Nowadays, there are so many scientific calculators you can find out there.

According to the article written by LaToya Irby (2020), there are 8 best scientific calculators were selected in the year 2020. These scientific calculators have their own strength for solving maths, science, and engineering problem. Table 1 shows this type of scientific calculators.

Table 1: Type of Scientific Calculator.

| Scientific Calculator Model | Description |
| --- | --- |
| Texas Instruments TI-36X Pro | The TI-36X can be used in high school and college for algebra, geometry, trigonometry, statistics, calculus, and biology |
| Casio FX-115ES Plus | Calculator is great for high school and college students in general math, algebra, statistics, trigonometry, calculus, engineering, and physics. |
| Texas Instruments TI-30X IIS 2-Line | The calculator is ideal for general math, pre-algebra, algebra 1 and 2, geometry, statistics, and general science. |
| Casio FX-300MS | Allows you to enter fractions, figure out standard deviations, calculate sine, cosine, tangent, and inverse, and many more mathematical functions. |
| Casio FX-260 | Suitable for middle school and early high school math. |
| HP 35s | Great option for engineers, surveyors, scientists, medical professionals, and college students. |
| Texas Instruments TI-30XS MultiView | Enter and view expressions using common math notation — exactly the way expressions appear in the textbook — for easier understanding. |
| Sharp Calculators EL-W516TBSL | The calculator can handle 640 different functions including trig functions, logarithms, reciprocals, powers, and more. |
| Casio fx-570EX (CLASSWIZ) | ClassWiz contains calculation functions that support mathematical operations, including spreadsheet calculations, $4 \times 4$ matrix calculations, simultaneous equations with four unknowns. It also generates QR codes of equations input into the calculator by a simple operation. Graphs and other graphics can be displayed on smartphone or tablet screens. |

https://www.thoughtco.com/best-scientific-calculators-4178005

**Casio FX991, Casio FX991ES & Casio fx-570EX (CLASSWIZ)**

In this article, we use the scientific calculator model Casio FX991 , Casio FX991ES and Casio fx-570EX (CLASSWIZ) to show the steps on how to solve the interpolation problem. The first two models are commonly used by the students in UiTM Penang and recently the third model has been widely introduced to them.

**The guidance about the calculator**

Problem: For z of 1.64 the probability is 0.9495 and for z of 1.65, the probability is 0.9505. This implies the probability of the z of 1.645 lies somewhere between 0.9495 and 0.9505. Refer Figure 2. The ratio of the short line to the long line is the same for the z-value and the corresponding probabilities. The x represents the unknown probability we would like to determine.
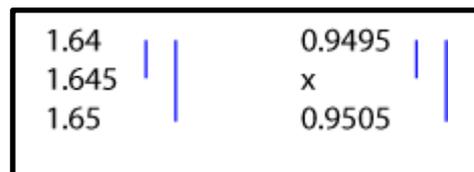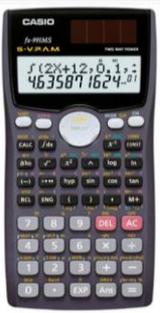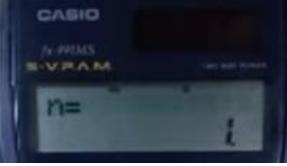


Figure 2: Interpolation Process. Figure adapted from https://accendoreliability.com/interpolation-within-distribution-tables/ - Retrieved 10/3/2020

| Model | Steps |
|---|---|
| Casio FX991 | 1. Calculator must be in mode Regression. Press **MODE** and choose **REG** by pressing the button number **2.**<br><br>2. Then choose **LIN** by pressing the button **1.**<br><br>3. Enter the first two values: **1.64 , 0.9495** . Then press the button **M+**. You can see **n=1** on the screen. It shows that this is the first two values in the interpolation being store in the calculator. |

4. Next, enter another two values: **1.65 , 0.9505** . Then press the button **M**+. You can see **n=2** on the screen. It shows that this is another two values in the interpolation that are in the calculator.
5. To find **x**, enter **1.645**, then press the button **SHIFT** and **2**. The screen will show as below:
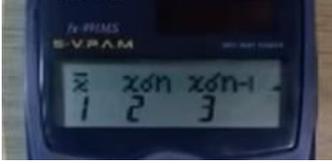


Then, **move to the right** until you can find the this symbol



Hence, press button **2** and press the button = . Finally you got the answer.
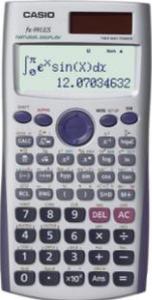


Casio

FX991ES

1. Press **MODE** and choose **STAT** by pressing the button number 3**.**



2. Then choose A+BX  by pressing the button number **2**
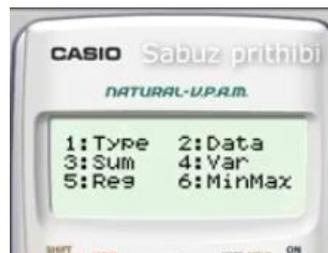
3.  The screen will appear like this


.

4.  Key-in all the values.

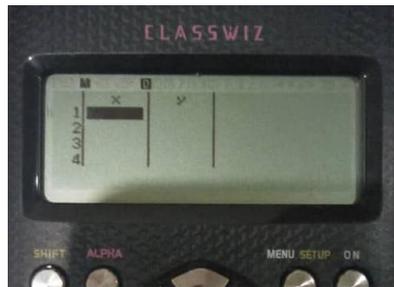|   | **X** | **Y** |
|---|-------|-------|
| **1** | 1.64 | 0.9495 |
| **2** | 1.65 | 0.9505 |

Then, press the button **AC**

5.  Enter the value **1.645,** and then press **SHIFT** followed by
    pressing the button **1.** The screen will appear like this


.

Choose **REG**

| | |
|---|---|
| |  6. Hence, choose the symbol number 5 by pressing the button number **5**.<br><br>7. Finally, press the button = and you got the answer. |
| <br><br>Casio fx-<br><br>570EX<br><br>(CLASSWIZ) | 1. Press **MENU** and choose **Statistics** by pressing button number 6**.**<br><br><br><br>2. Then choose y-a+bx by pressing the button number **2**<br><br><br><br>3. The screen will appear like this. |

4. Key-in all the values.

|   | X | Y |
|---|------|--------|
| **1** | 1.64 | 0.9495 |
| **2** | 1.65 | 0.9505 |

Then, press the button **AC**

5. Press **OPTN,** scroll down and choose number 4 for **regression**
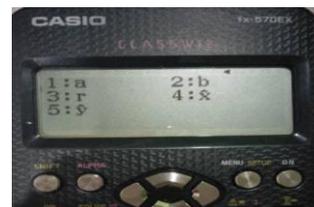


then choose number 5 for $\hat{y}$ .

6. Enter the value **1.645** right before $\hat{y}$ , and then press =**.**



The answer will appear on the screen .

**References:**

LaToya Irby. 2020. "The Best Scientific Calculators". In https://www.thoughtco.com/best-scientific-calculators-4178005 - Retrieved 5/3/2020

https://matthew-brett.github.io/teaching/linear_interpolation - Retrieved 5/3/2020

https://accendoreliability.com/interpolation-within-distribution-tables/ - Retrieved 9/3/2020