

Fathom Instructions

Marriages by Month Sinusoidal Activity



Background Information

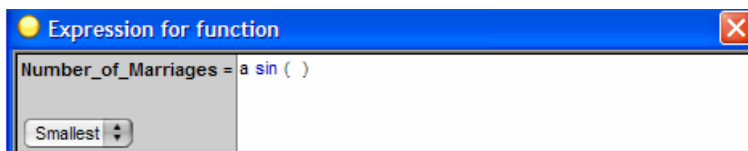
A graph of data based on human activities rarely approximates the shape of a sinusoidal curve with any accuracy. However, occasionally the underlying conditions lead to trends that closely follow a sinusoidal curve. The dataset you will be using was obtained from CANSIM Table 101-1001, Marriages by Marriage Type and Month, from E-STAT on the Statistics Canada website (<http://estat.statcan.ca>). You will be approximating the parametric form of a sine curve $[y = a (\sin(k(x - d))) + c]$ and a cosine curve $[y = a (\cos(k(x - d))) + c]$ to this data by varying the values of sliders in Fathom for the parameters **a**, **k**, **d**, and **c**.

Fathom Analysis

Note: These instructions were written for Fathom 2. If you are using Fathom 1, some instructions may be slightly different.

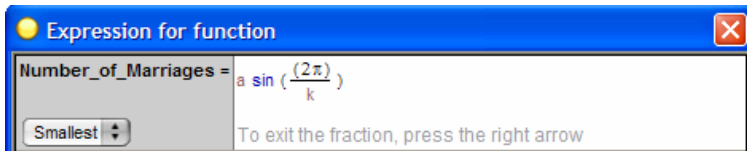
- 1) Download the dataset in [Fathom](#) format.
- 2) In **Fathom**, open the collection by double-clicking on it.
- 3) Click on the **Comments tab** to read the notes about how the dataset was generated.
- 4) Click on the **Cases tab** to see the different data cases. For example, the first case of Month = 1 and Number_of_Marriages = 4369 indicates that in January of 2000, there were 4369 marriages.
- 5) Create a new graph by dragging and dropping the **Graph** icon onto the workspace.
- 6) Drag and drop the attribute **Month** on the **x-axis** and the attribute **Number_of_Marriages** on the **y-axis**. Your graph of the marriage data by month should now appear.
- 7) Drag and drop **four sliders** to the workspace.
- 8) Rename **V1** as **a**, **V2** as **k**, **V3** as **d**, and **V4** as **c** by double-clicking on the pre-assigned slider names.
- 9) **Right-click** on the graph and select **Plot Function**. A pop-up window 'Expression for function' will appear.
- 10) Type the letter **a** and then click on the **x button (multiplication sign)**.
- 11) Click on the **+ sign** beside **Functions** to extend the list. Then, click on the **+ sign** beside **Trigonometric** to extend that list. Now, **double-click** on **sin**.

Your screen should look like this:



- 12) Inside the brackets, click on the **() button** again. In these inner brackets, type the number **2** and then click on the **+ sign** beside **Special** to extend the list. **Double-click** on **pi**. Now, click to the right of the inner brackets (still inside the outer brackets) and then click on the **÷ button (division sign)** and then type the letter **k**.

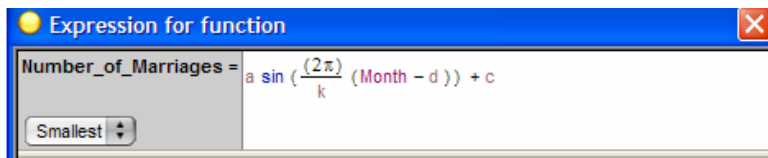
Your screen should look like this:



Note: It is necessary to use $\frac{2\pi}{k}$ instead of just k in this equation because the variable on the x-axis is measured in non-angle units (months) as opposed to angle units (radians).

- 13) Click to the right of the $\frac{2\pi}{k}$ fraction (still inside the outer brackets) and click on the () button again. Scroll to the top and click on the + sign beside **Attributes** to extend the list. **Double-click** on **Month**. Then, type $-d$. Finally, click to the right of all the brackets and type $+c$.

Your screen should look like this:

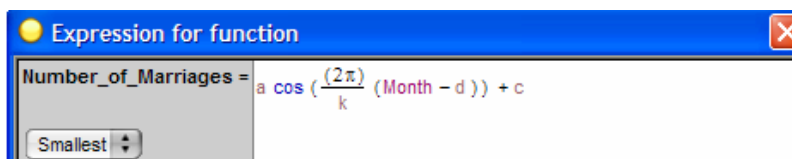


- 14) Click on the **OK** button. Your function will now be displayed on the graph.
 15) Using your knowledge of sinusoidal functions and the meaning of the parameters **a**, **k**, **d**, and **c**, change the sliders to values that will closely approximate the monthly marriage data.

Note: You can change the upper and lower bounds of the slider by double-clicking on the values and then editing the **Upper_** and **Lower_** in the pop-up table. You can also manually drag the values on the slider by placing your mouse over the values until a **sideways hand** appears. Drag this hand in order to stretch or compress the range of values.

******* Go to your worksheet and answer questions #1 to 10. Question #10 requires that you paste your graph into your worksheet. To do this, click on the graph, then go to the Edit menu, and select Copy As Picture. When you are in the worksheet document, right-click and paste your graph. *******

- 16) **Double-click** on your **equation** shown under the graph. This will bring up the Expression for function pop-up window.
 17) Click to the **right** of **sin** and **delete it only**.
 18) Click on the + sign beside **Functions** to extend the list. Then, click on the + sign beside **Trigonometric** to extend that list. Now, **double-click** on **cos**.



- 19) Click on the **OK button**. You will notice that your graph has now changed.
- 20) Using your knowledge of sinusoidal functions and the meaning of the parameters **a**, **k**, **d**, and **c**, alter the slider values (as directed above) until your graph once again is a close approximation to the data.

******* Go to your worksheet and answer questions #11 to 15. Paste your graph in question #15 as directed above. *******