Perform magnitude scaling on f(x) such that the scaling ranges *a* and *b* are given by user, where $a < b$ and $a > 0$. The scaled output f_{scaled} can be found from:

$$f_{scaled} = \frac{(\mathrm{b}-\mathrm{a})(f(x) - \min(f(x)))}{\max(f(x)) - \min(f(x))} + a$$

1. Find mean of f_{scaled} for 5 evenly divided quantiles of f_{scaled} and find the frequency of occurrence within each quantile.
2. Find standard deviation of f_{scaled} for 5 evenly divided quantiles of f_{scaled} and find the frequency of occurrence within each quantile.
3. Find variances of f_{scaled} for 5 evenly divided quantiles of f_{scaled} and find the frequency of occurrence within each quantile.
4. Remove values of f_{scaled} which is less than P, where P will be entered by user and $a \leq P \leq b$. Then find the means of f_{scaled} for each 5 evenly divided quantiles of the new data
5. Remove values of f_{scaled} which is more than P, where P will be entered by user and $a \leq P \leq b$. Then find all the standard deviations of f_{scaled} for each 5 evenly divided quantiles of the new data
6. Normalize f_{scaled} into f_{norm} with mean $\bar{y}$ and standard deviation σ_y of f_{norm} is 0 and 1 respectively, where the normalization is given as:

   $$f_{norm} = (f_{scaled} - \mathrm{mean}(f_{scaled}))\left(\frac{\sigma_y}{std\ dev(f_{scaled})}\right) + \bar{y}$$

   Show your answer in a table consists of x and f_{norm}

7. Linearly scale f_{scaled} into f'_{scaled} where the scaling is given as:

   $$f'_{scaled} = \frac{f_{scaled} - \min(f_{scaled})}{\max(f_{scaled}) - \min(f_{scaled})}$$

   Show your answer in a table consists of x and f'_{scaled}

8. Normalize f_{scaled} into $f_{softmax}$ using soft-max normalization such that:

   $$f_{softmax} = \frac{\log(\min(f_{scaled}) + 2)}{\log(f_{scaled} + 2)}$$

   Show your answer in a table consists of x and $f_{softmax}$

9. Change each f_{scaled} values less than P into 0 and others into 1, where P is specified by user. This given by:

$$f_{scaled} = \begin{cases} 1 & if\ f_{scaled} \geq P \\ 0 & if\ f_{scaled} < P \end{cases}$$

Show your result in a table consists of x and the changed values. Then compute the number of resulting 1's and 0's.

10. Rearrange each f_{scaled} values in increasing and decreasing order. Show the result in a table consists of x, $f_{increasing}$ and $f_{decreasing}$

11. Given that $\bar{y}$ and σ_y is the mean and standard deviation of f_{scaled} respectively, find all f_{scaled} values which fall in between of range of $\bar{y} - \sigma$ to $\bar{y} + \sigma$. Show the result in a table consists of x and the newly obtained f_{scaled}.

12. Prompt user to enter a value P such that $a \leq P \leq b$. Find the closest value to P from f_{scaled} and return that value to the user.

13. Divide f_{scaled} into two arrays of equal size called x and y. Find the L_2 Norm distance between the two arrays where the L_2 Norm distance is given as:

$$L_2\ norm = \sqrt{\sum_{i=1}^{N} (x_i - y_i)^2}$$

14. Divide f_{scaled} into two arrays of equal size called x and y. Find the L_1 Norm distance between the two arrays where the L_1 Norm distance is given as:

$$L_1\ norm = \sum_{i=1}^{N} x_i - y_i$$

15. Divide f_{scaled} into two arrays of equal size called x and y. Find the L_3 Norm distance between the two arrays where the L_3 Norm distance is given as:

$$L_3\ norm = \sqrt[3]{\sum_{i=1}^{N} (x_i - y_i)^3}$$