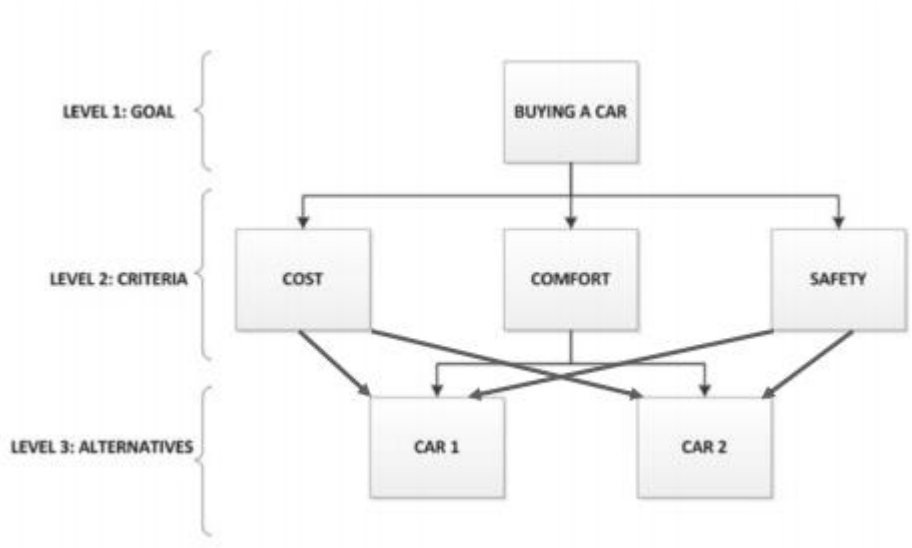
TRAN LUONG BANG – AHP Homework

1. Describe the functions of the program.
   - Criteria:
     + Input the comparison matrix for criteria
     + Calculate priority
     + Consistency check for criteria
   - Alternative:
     + Input the comparison matrix for alternatives
     + Calculate priorities
     + Consistency check for alternatives
   - Recommend to make the final decision.
2. How to excute the code

   TESTCASE 1

   AHP Structure:



   Step 1: Run the program.

   Step 2: Input file name of pairwise **comparison matrix for criteria**

   Input: **t1.csv**

   Output:

```
Input file name of pairwise comparison matrix of criteria:

t1.csv
Comparision Matrix: [[1.         7.         3.        ]
 [0.14285714 1.         0.33333333]
 [0.33333333 3.         1.        ]]
Priority Vector: [0.66869689 0.08820212 0.24310098]
Consistenty check:
RCI Value:  0.58
Lambdamax: 3.010784913753363
CR:  0.009297339442554207
Consistency OK
```

Step 3: Input file name of pairwise **comparison matrix for alternative**

Input: **t1_cost.csv**

Output:

```
Input file name of pairwise comparison matrix of alternative:

t1_cost.csv
Priority:  [0.875 0.125]
Consistenty check:
RCI Value:  0
With RCI value equals to 0. Should revise the comparison matrix
Input file name of pairwise comparison matrix of alternative:
```

Step 4: Continue input file name of pairwise **comparison matrix for alternatives**

Input: **t1_comfort.csv**

Output:

```
Input file name of pairwise comparison matrix of alternative:

t1_comfort.csv
Priority:  [0.16666667 0.83333333]
Consistenty check:
RCI Value:  0
With RCI value equals to 0. Should revise the comparison matrix
Input file name of pairwise comparison matrix of alternative:
```

Step 5: Continue input file name of pairwise **comparison matrix for alternatives**

Input: **t1_safety.csv**

Output:

```
Input file name of pairwise comparison matrix of alternative:

t1_safety.csv
Priority:  [0.1 0.9]
Consistenty check:
RCI Value:  0
With RCI value equals to 0. Should revise the comparison matrix
```

When the final alternative file name is input. Program will calculate the overall priorities between alternatives

and recommend the final decision making.

Decision making:

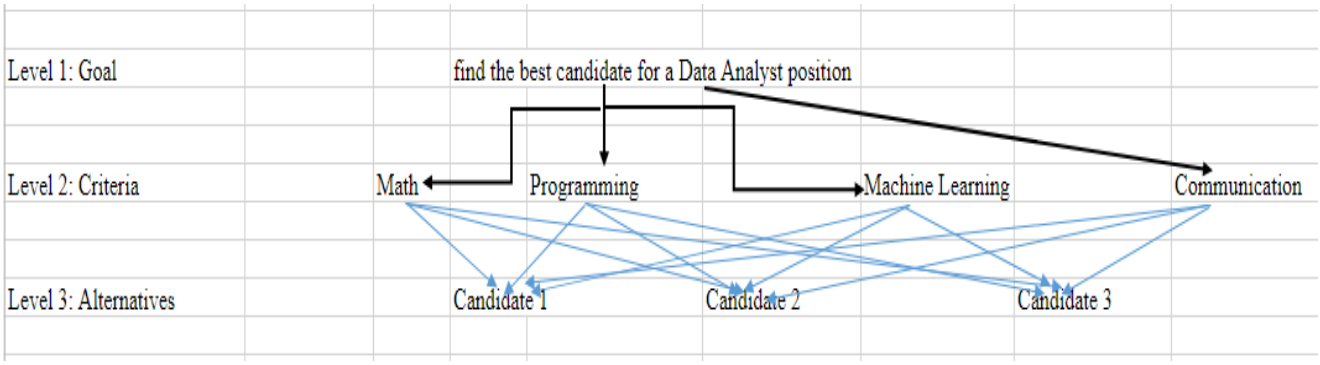
```
Decision Making:
Priorities: [[0.875      0.16666667 0.1       ]
 [0.125      0.83333333 0.9       ]]
Overall priorities:  [0.62412023 0.37587977]
the final decision could be made by alternative number: [1] with max overall priority:
0.6241202345937849
```

The program will automatically continue to run for the 2nd testcase. It doesn't need to run program again.

If you want to stop the program: Input: 0.

TESTCASE 2

AHP Structure:



Step 6: Input file name of pairwise **comparison matrix for criteria**

Input: **t2.csv**

Output:

```
Input file name of pairwise comparison matrix of criteria:

t2.csv
Comparision Matrix: [[1.         2.         0.2        6.        ]
 [0.5        1.         0.33333333 5.        ]
 [5.         3.         1.         7.        ]
 [0.16666667 0.2        0.14285714 1.        ]]
Priority Vector: [0.22692208 0.17457796 0.54972073 0.04877923]
Consistenty check:
RCI Value:  0.9
Lambdamax: 4.443439216104988
CR:  0.16423674670555105
Revise the comparison matrix
Input file name of pairwise comparison matrix of alternative:
```

Step 7: Input file name of pairwise **comparison matrix for alternative**

Input: **t2_math.csv**

Output:

```
Input file name of pairwise comparison matrix of alternative:

t2_math.csv
Priority:  [0.22360859 0.65970962 0.11668179]
Consistenty check:
RCI Value:  0.58
Lambdamax: 3.3062210121309943
CR:  0.26398363114740886
Revise the comparison matrix
Input file name of pairwise comparison matrix of alternative:
```

Step 8: Input file name of pairwise **comparison matrix for alternative**

Input: **t2_programming.csv**

Output:

```
Input file name of pairwise comparison matrix of alternative:

t2_programming.csv
Priority:  [0.72631848 0.20835467 0.06532685]
Consistenty check:
RCI Value:  0.58
Lambdamax: 3.352890852260152
CR:  0.30421625194840707
Revise the comparison matrix
Input file name of pairwise comparison matrix of alternative:
```

Step 9: Input file name of pairwise **comparison matrix for alternative**

Input: **t2_machinelearning.csv**

Output:

```
Input file name of pairwise comparison matrix of alternative:

t2_machinelearning.csv
Priority:  [0.18052683 0.06860589 0.75086729]
Consistenty check:
RCI Value:  0.58
Lambdamax: 3.333215298300545
CR:  0.28725456750047
Revise the comparison matrix
Input file name of pairwise comparison matrix of alternative:
```

Step 10: Input file name of pairwise **comparison matrix for alternative**

Input: **t2_communication.csv**

Output:

```
Input file name of pairwise comparison matrix of alternative:

t2_communication.csv
Priority:  [0.14408526 0.54042278 0.31549196]
Consistenty check:
RCI Value:  0.58
Lambdamax: 4.161019843592874
CR:  1.0008791755110986
Revise the comparison matrix
```

Output of testcase 2:

```
Decision Making:
Priorities: [[0.22360859 0.72631848 0.18052683 0.14408526]
 [0.65970962 0.20835467 0.06860589 0.54042278]
 [0.11668179 0.06532685 0.75086729 0.31549196]]
Overall priorities:  [0.28380864 0.25015229 0.46603907]
the final decision could be made by alternative number: [3] with max overall priority:
0.46603907119346655
```

If you want to stop the program: Input: 0.