EECE 1313: PROGRAMMING FOR ENGINEERS
(Section 5 and 16)

Project [10% of total mark]

Description:

Path loss is very important measure to determine the loss when the signal is transmitted via a communication channel. In addition, to satisfy the transmission, there are parameters such as the frequency (f_o), distance between a transmitter and receiver (d), the height of transmitter (h_b) and the height of the receiver (h_m) are defined. The equation for the path loss, $L_{O\text{-}H}$ is given in Table 1 below and its corresponding equation is based on the size of area.

Table 1: Path Loss $L_{O\text{-}H}$ for different size of area

$$L_{O-H} = A + B\log\left(d_{|km}\right) + C$$

where $A = 69.55 + 26.16\log\left(f_{0|MHz}\right) - 13.82\log\left(h_b\right) - a\left(h_m\right)$ and $B = 44.9 - 6.55\log\left(h_b\right)$

	$a(h_m) =$	$C =$
Metropolitan areas	$8.29\left(\log\left(1.54h_m\right)\right)^2 - 1.1$ for $f_0 \le 200$ MHz $3.2\left(\log\left(11.75h_m\right)\right)^2 - 4.97$ for $f_0 \ge 400$ MHz	0
Small/medium-size cities	$\left(1.1\log\left(f_{0,MHz}\right) - 0.7\right)h_m -$ $\left(1.56\log\left(f_{0,MHz}\right) - 0.8\right)$	0
Suburban environments		$-2\left[\log\left(f_{0,MHz}/28\right)\right]^2 - 5.4$
Rural areas		$-4.78\left[\log\left(f_{0,MHz}\right)\right]^2 + 18.33\log\left(f_{0,MHz}\right) - 40.94$

Furthermore, a textfile named, 'info.txt' has the information of parameters, f_o in MHz, d in km, h_b in m, and h_m in m, listed accordingly as follows:

```
10000
10
10
1.5
```

Meanwhile, the areas is also in another textfile named, 'SizeArea.txt', depending on population size as following:

Areas	Population Size
Arau	20,000
Ipoh	500,000
Kuala Lumpur	2,000,000
Johor Baharu	1,500,000
Kampar	30,000
Kota Bharu	150,000
Kampung Pauh	4,000
Kuala Krai	50,000
Merapoh	3,000
Alor Setar	200,000

In general, the areas can be categorized based on the population size, such as, the metropolitan is more than 1 mil of people, small city is in between 100,000 to 1 mil, suburban is between 10,000 and 100,000, and lastly the rural area is less than 10,000.

Write a complete C++ program to

- Read the two textfiles
- Store them in an array
- Classify the area according to the category based on the population size by creating a function *classifyPlace*(…)
- Use searching and sorting algorithm to find the lowest and highest population size.
- Determine the path loss, $L_{O\text{-}H}$, by creating a function *pathLoss*(…) for the following places:
    a) Kampung Pauh
    b) Kota Bharu
    c) Kuala Lumpur City Centre (KLCC)
- Write the results of the path loss in another textfile called 'reportPathLoss.txt'.

Things to do/submit:

a) You can do this project in group (3 or 4 people).
b) Source file which should be named as group member names such as firstname1_firstname2_firstname3.cpp.
c) The file must be emailed to "eece1313.s5.s16@gmail.com"

Deadline:

15-Dec-2017 (Friday), 12.00 PM.
There would be a penalty for late submission **(-25% per day).**
Penalty of **50%** will be given for copying / plagiarizing from Internet.
Penalty of **Mark Sharing** will be given for copying / plagiarizing from other groups.
Penalty for wrong results depends on the degree of errors.