1. Given the following 5 data: A1(1,5), A2(2,5), A3(2,3), A4(4,3) and A5(3,1), the Euclidean distance is used as the distance metric:
   a. compute the distance matrix of the 5 data given above;
   b. using the k-means algorithm with k=2 and initial centroids of A1 and A5, write the cluster members and the cluster centroids at each iteration until convergence.

   Using the same 5 data above and the distance matrix as in no. 1.a. , use the agglomerative hierarchical clustering to cluster the data:
   c. write the updated distance matrix on each iteration if the single link is used, then draw the dendogram of the clustering result;
   d. write the updated distance matrix on each iteration if the complete link is used, then draw the dendogram of the clustering result.

2. The table below lists dataset D, which describes 10 clients' profiles and whether they like playing computer games.

Client ID	Occupation	Gender	Age ≤ 40	Likes computer games?
C01	Journalist	Female	No	No
C02	Clerk	Female	Yes	No
C03	Freelancer	Female	No	No
C04	Freelancer	Male	Yes	Yes
C05	Clerk	Female	No	No
C06	Clerk	Male	Yes	Yes
C07	Journalist	Male	No	No
C08	Journalist	Male	Yes	Yes
C09	Freelancer	Male	No	No
C10	Journalist	Female	Yes	No

a. Use the given dataset D to construct the decision tree generated by calculating information gain using the GINI index. Show your calculation steps and final decision tree!

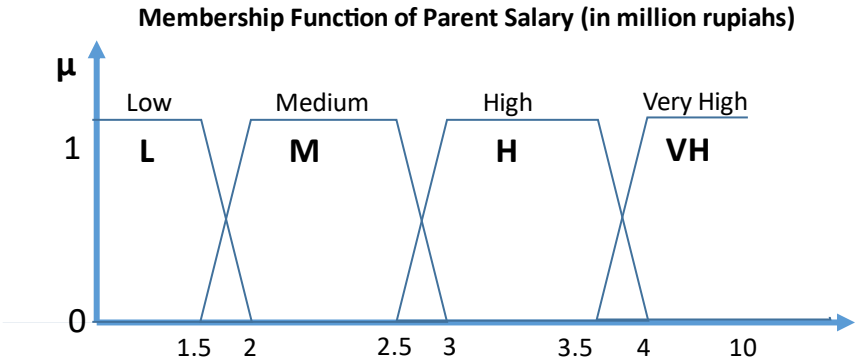
b. Using the decision tree generated in no. 2a, what is the prediction of the following test instance ***X***?

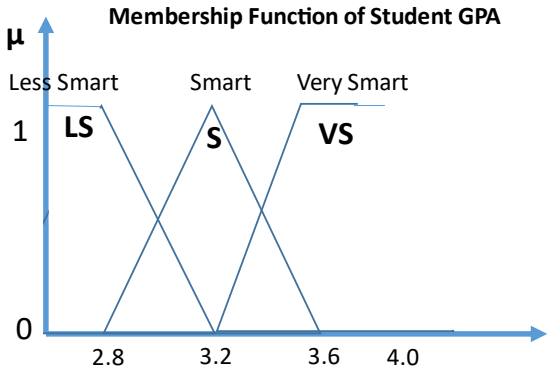
X = (OCCUPATION = *Clerk*, GENDER = *Male*, AGE = 42)

c. Using the decision tree generated in no. 2a, what is the prediction of the following test instance ***X***?

X = (OCCUPATION = *Journalist*, GENDER = *Female*, AGE = 28)

3. Following are the membership functions of Parent Salary, Student GPA, and Scholarship Type. The table below shows the Fuzzy rule.





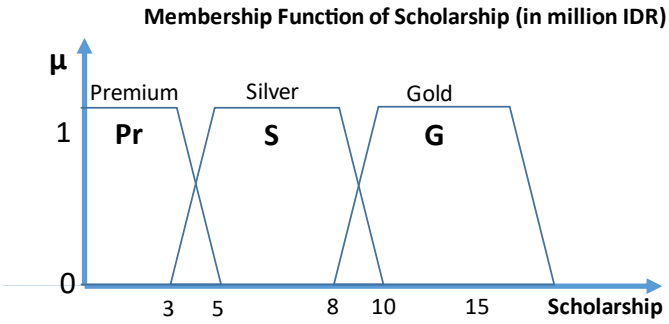


Table 1: Fuzzy Rule

		Parent Salary			
		L	**M**	**H**	**VH**
Student GPA	**LS**	G	S	Pr	Pr
	S	G	G	S	Pr
	VS	G	G	S	S

Using the **Mamdani Fuzzy Model**, define the scholarship received by a student with **GPA = 3.0 and parent salary = IDR 2,800,000**

Write the computation steps if the center of gravity (COG) and the following scholarship samples are used: value of 2 through 12 with interval = 2; or if the COG of Premium, Silver, and Gold are 3, 7, and 11, respectively.