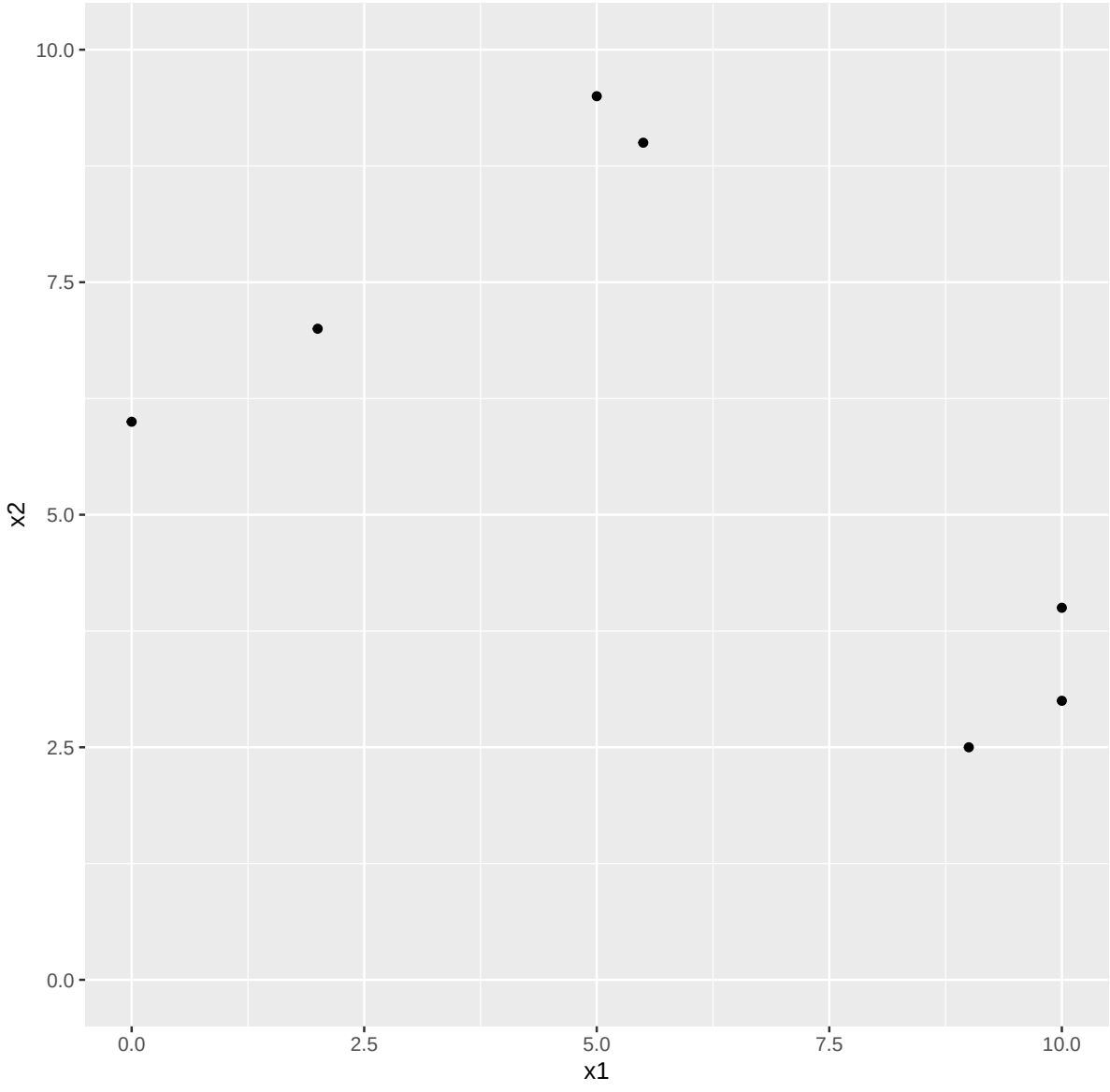
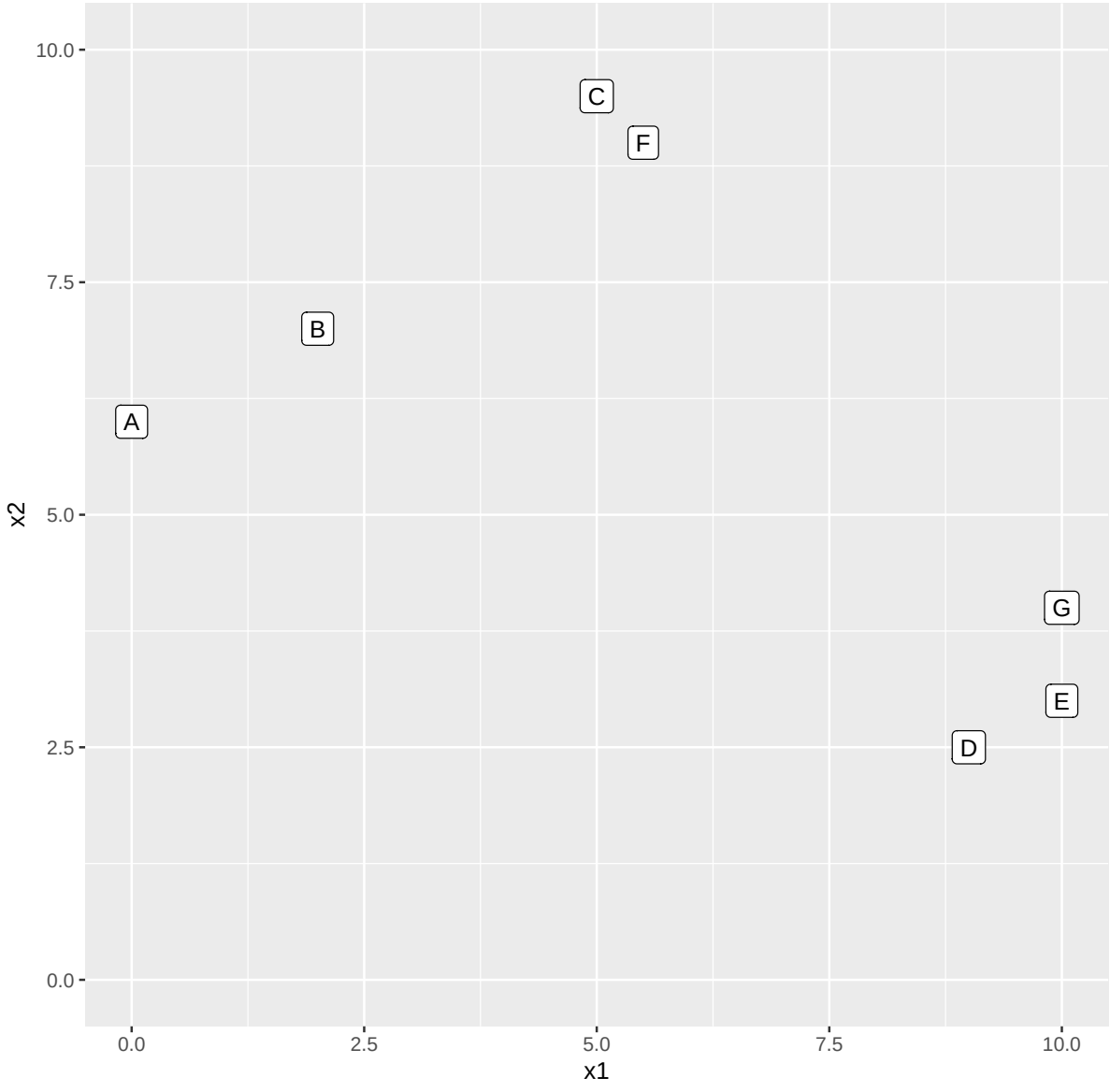
Hierarchical Clustering

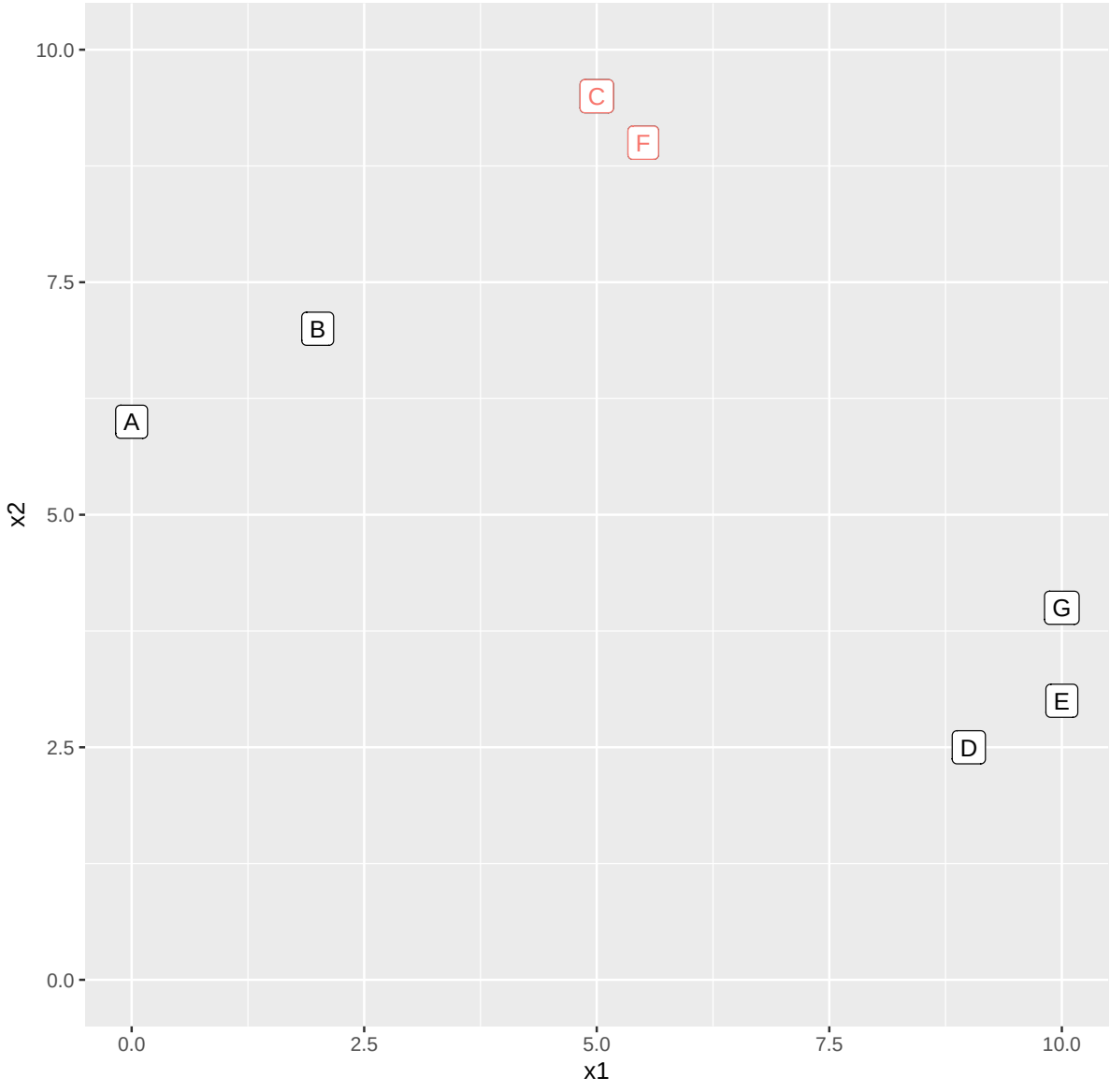
Hierarchical clustering - Centroid Linkage



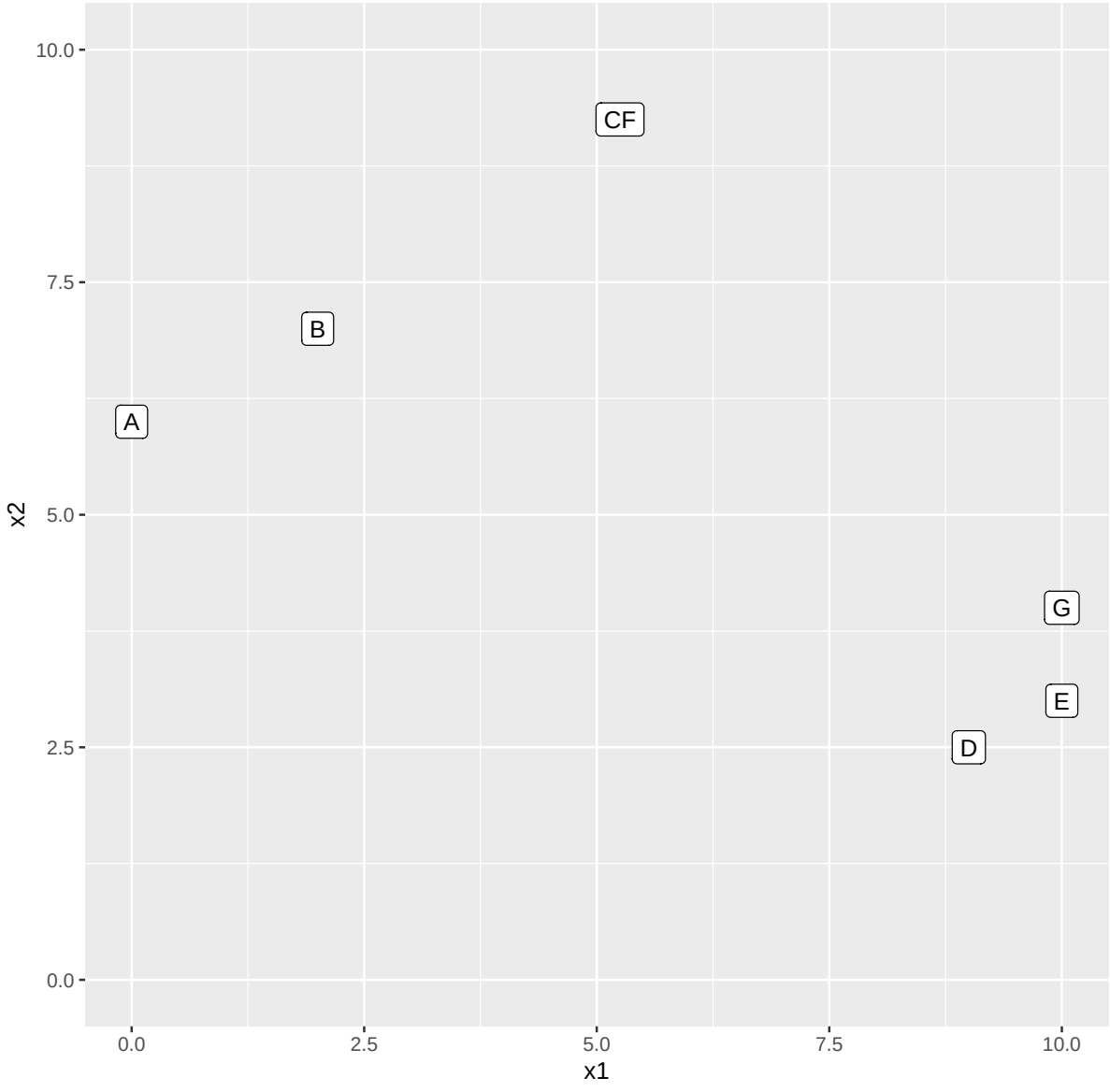
Label the Points



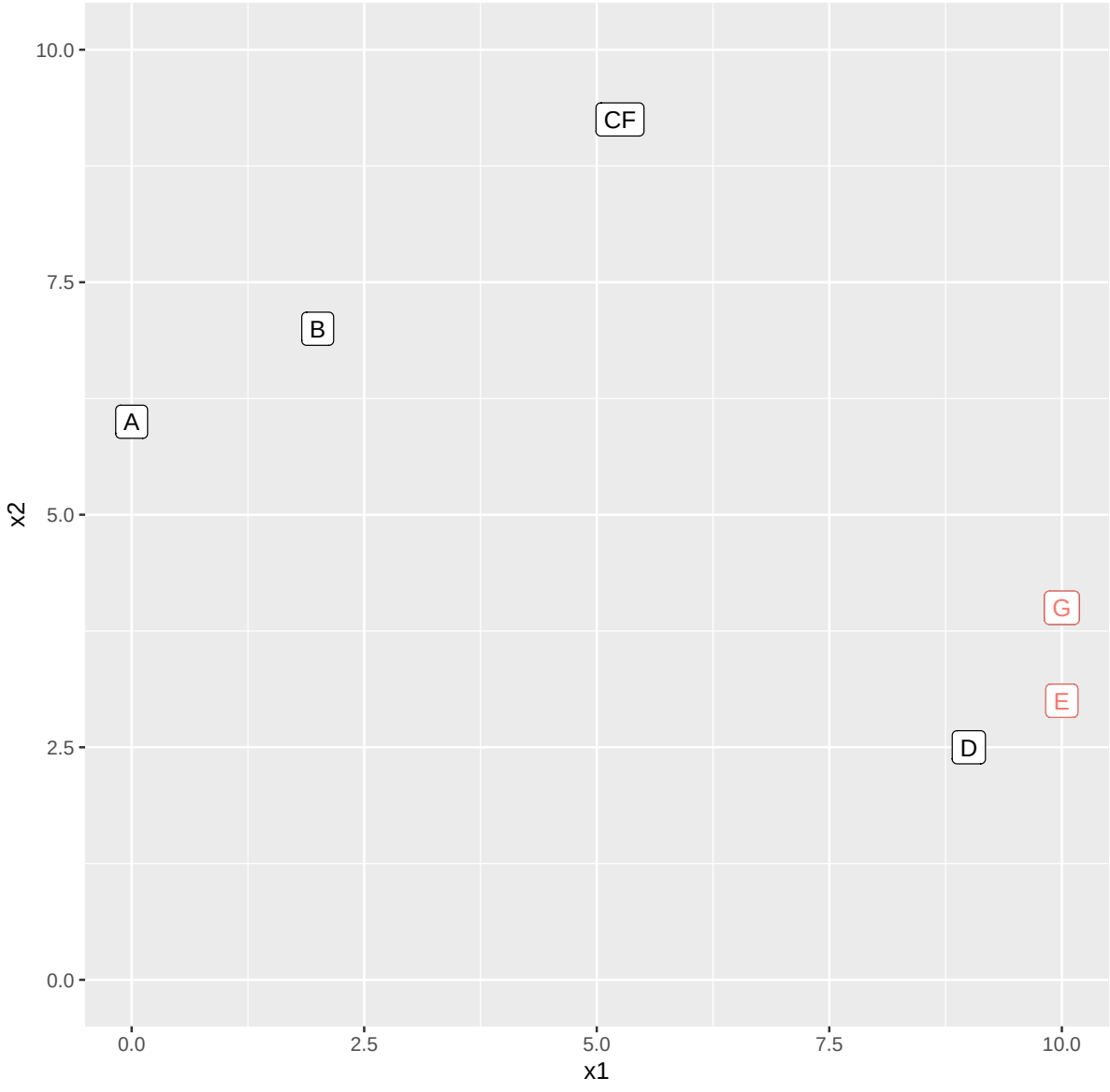
Identify the pair with the smallest distance.



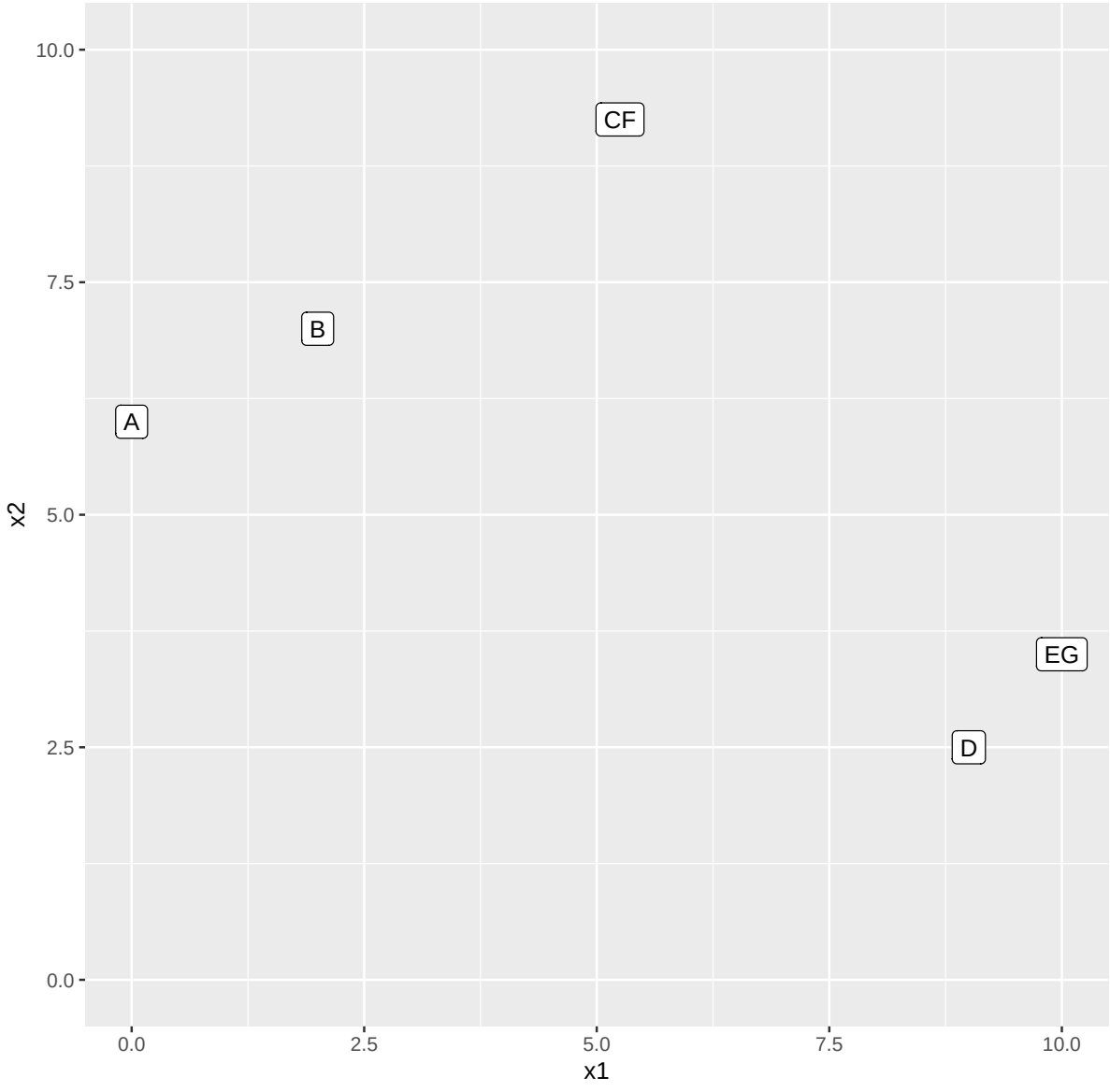
Group the pair



Identify the pair with the smallest distance.



Group the pair



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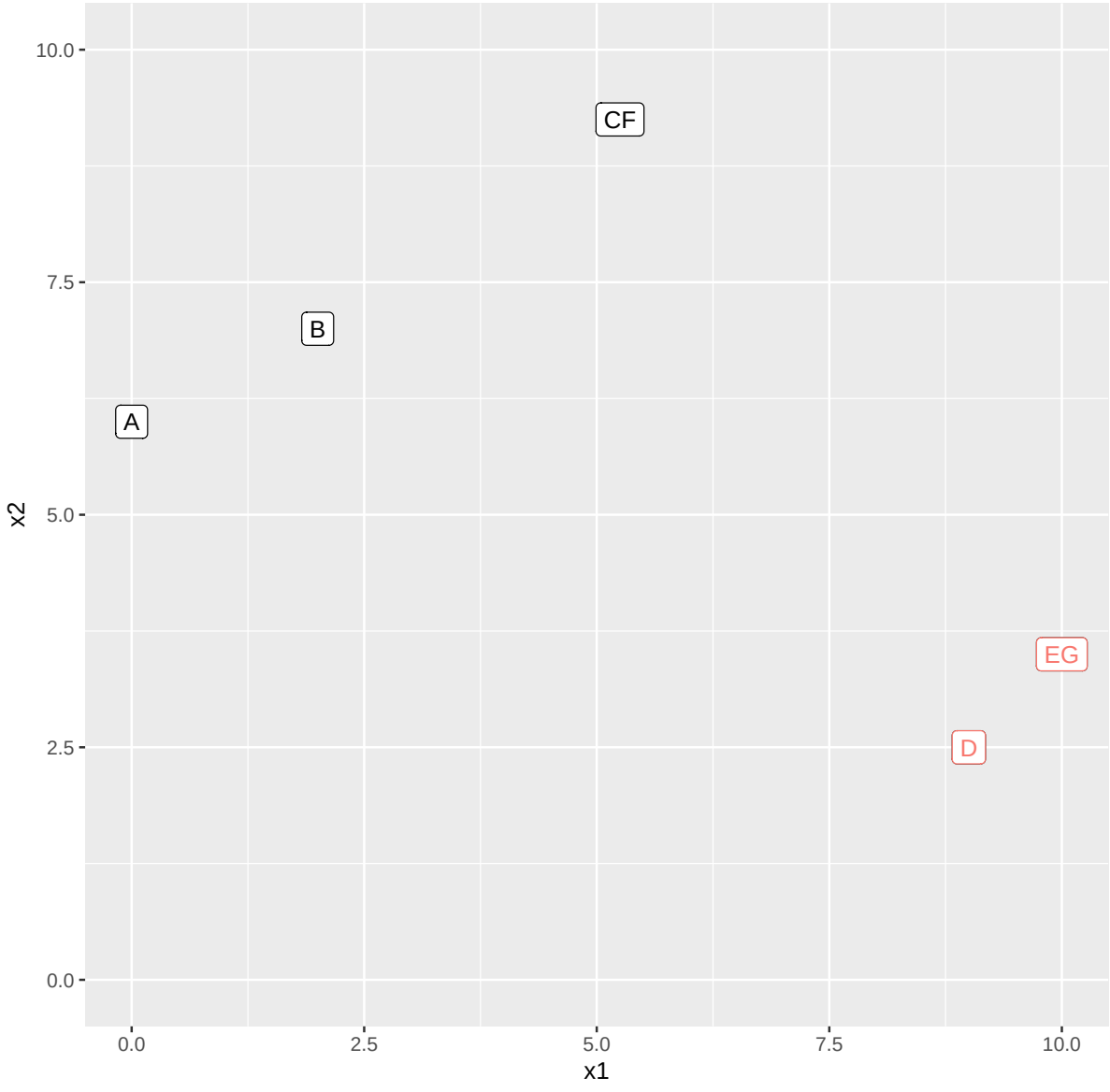
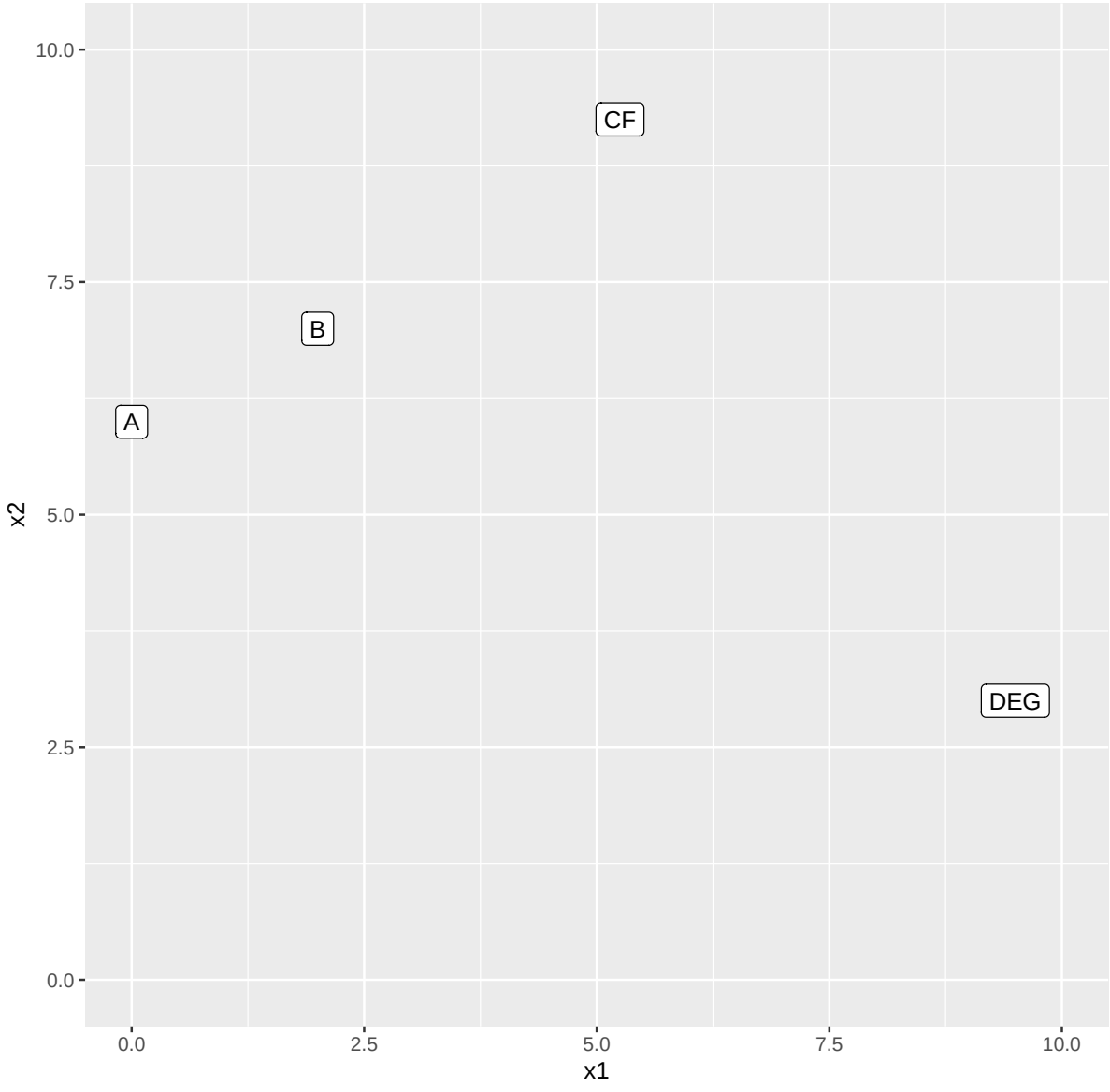
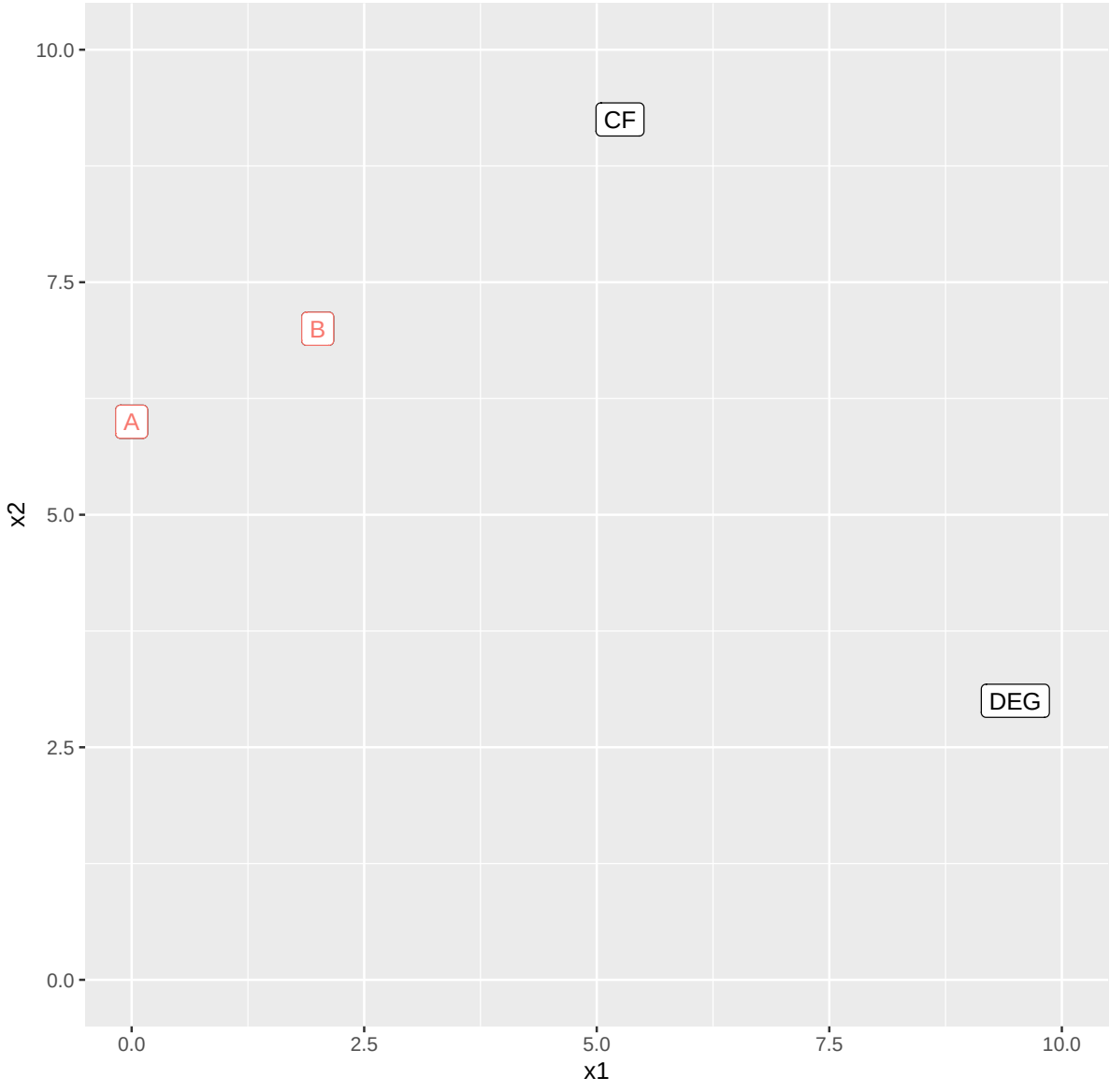


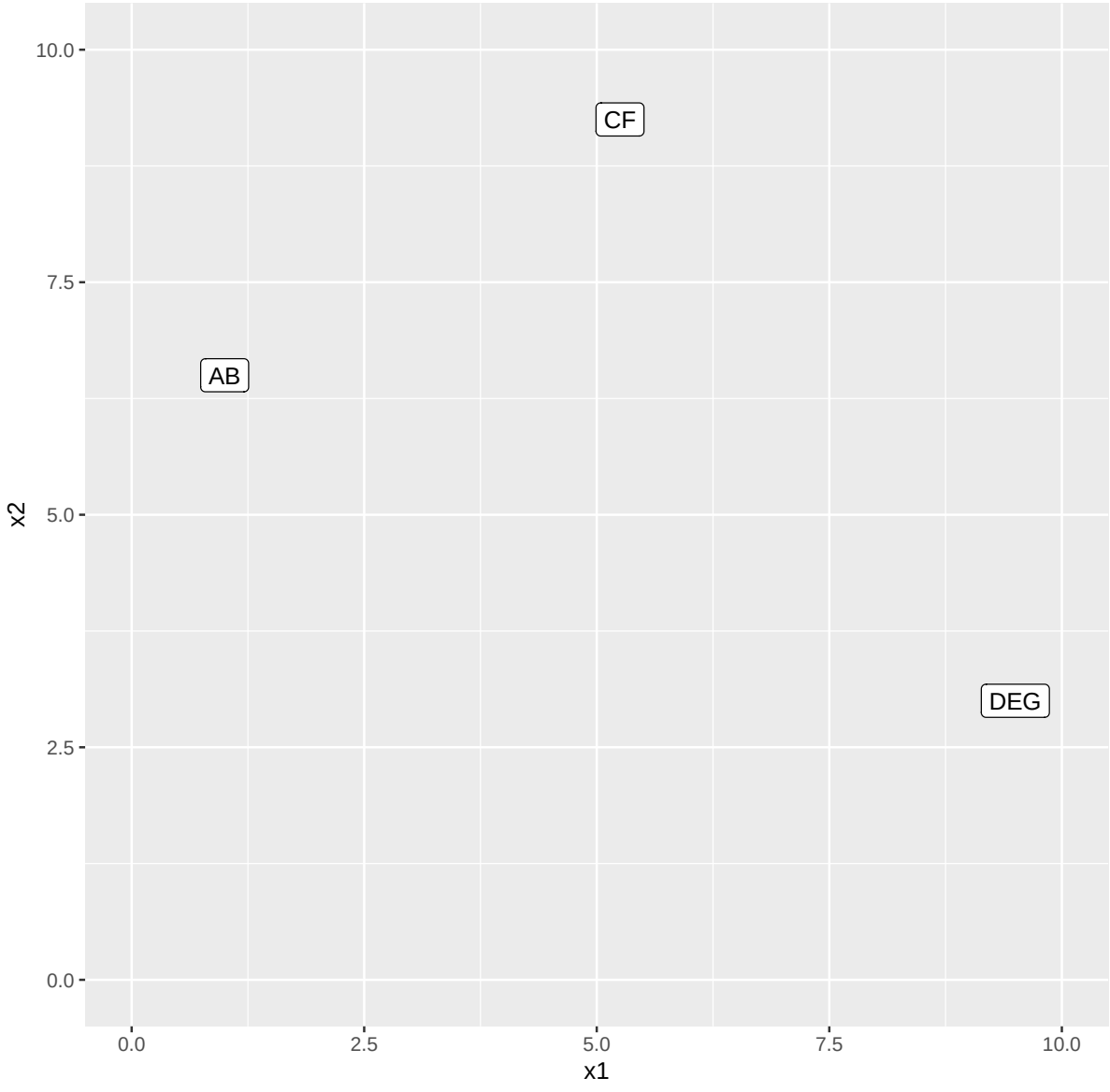
Group the pair



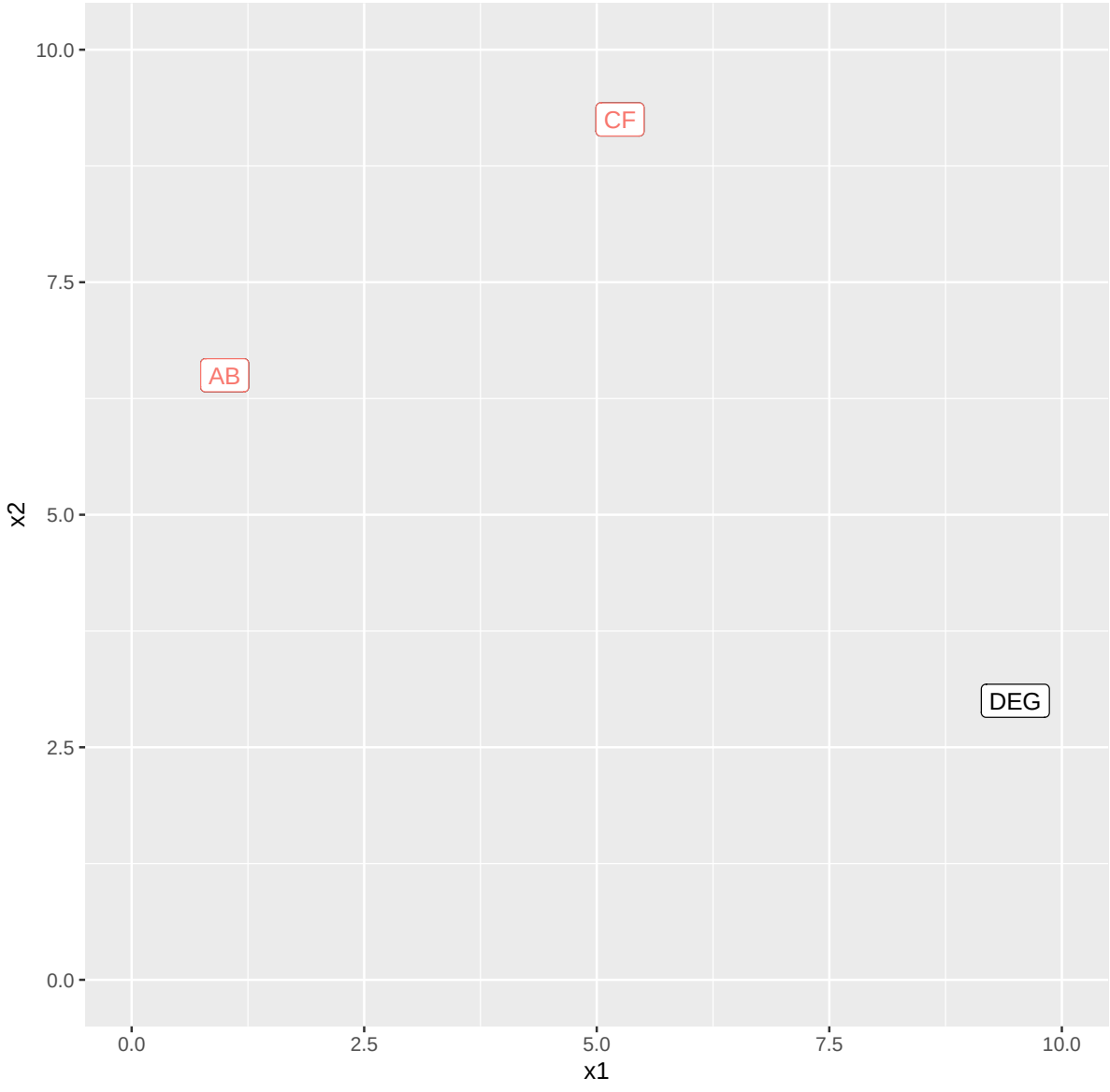
Identify the pair with the smallest distance.



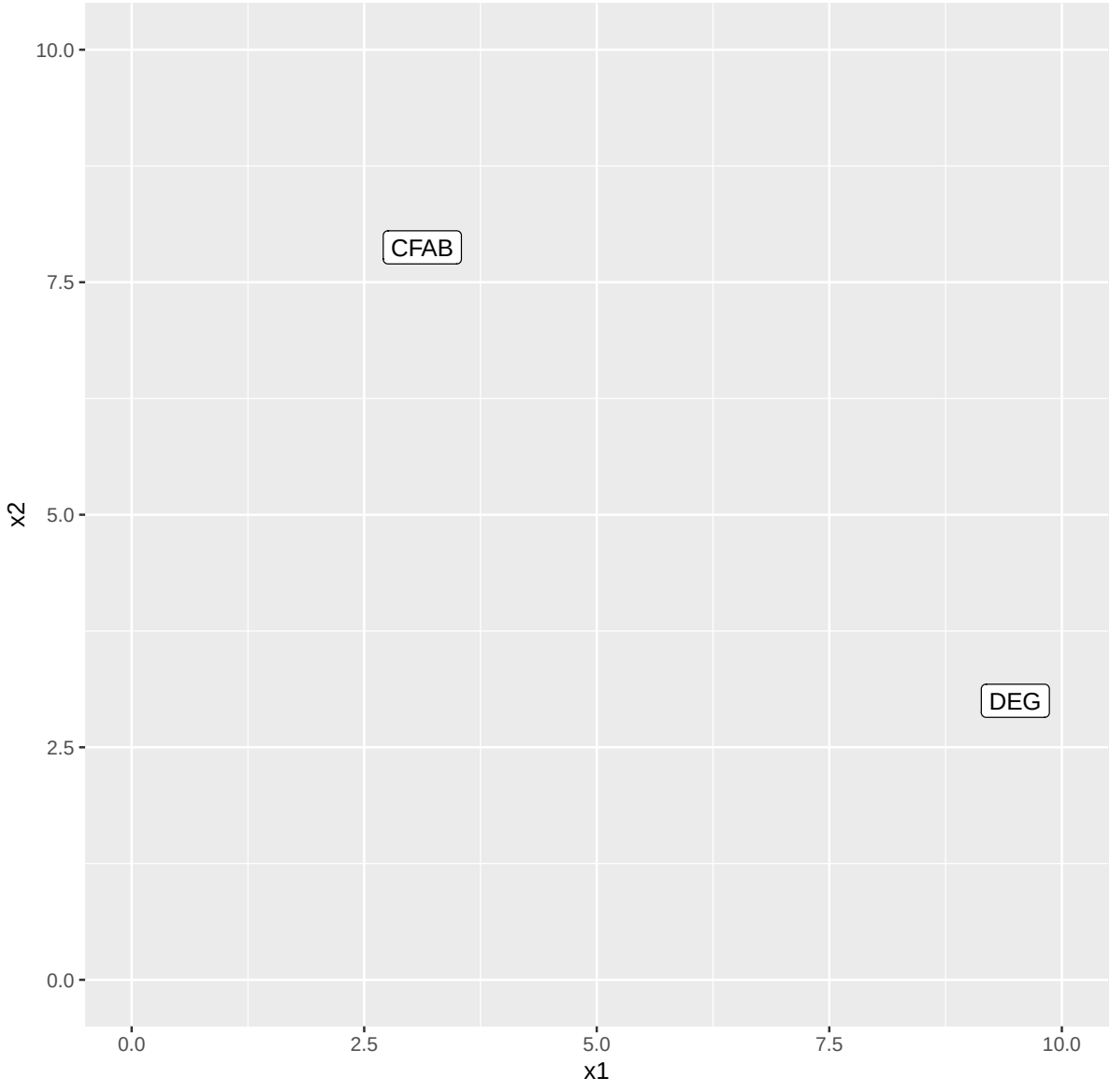
Group the pair



Identify the pair with the smallest distance.



Group the pair



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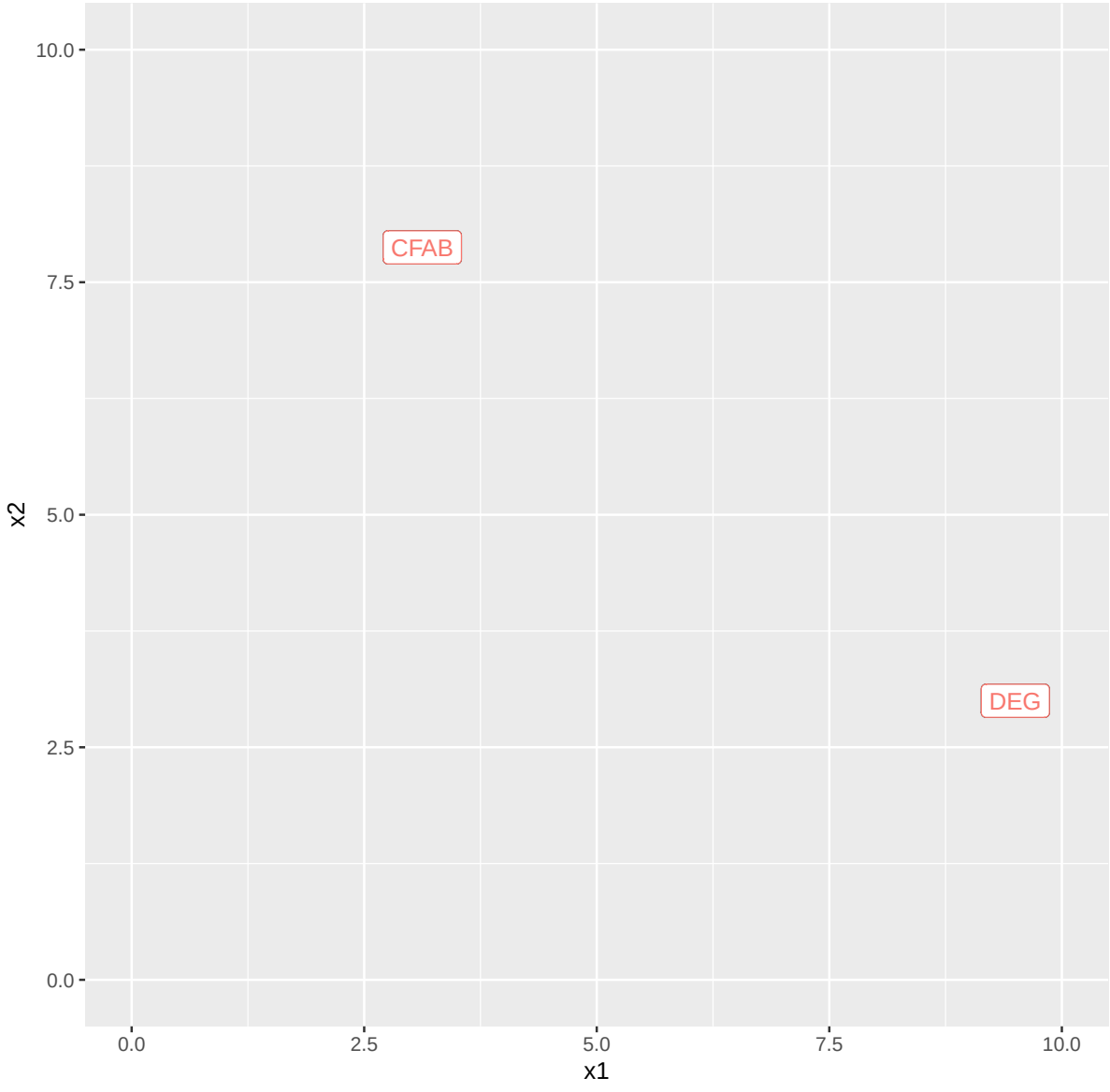
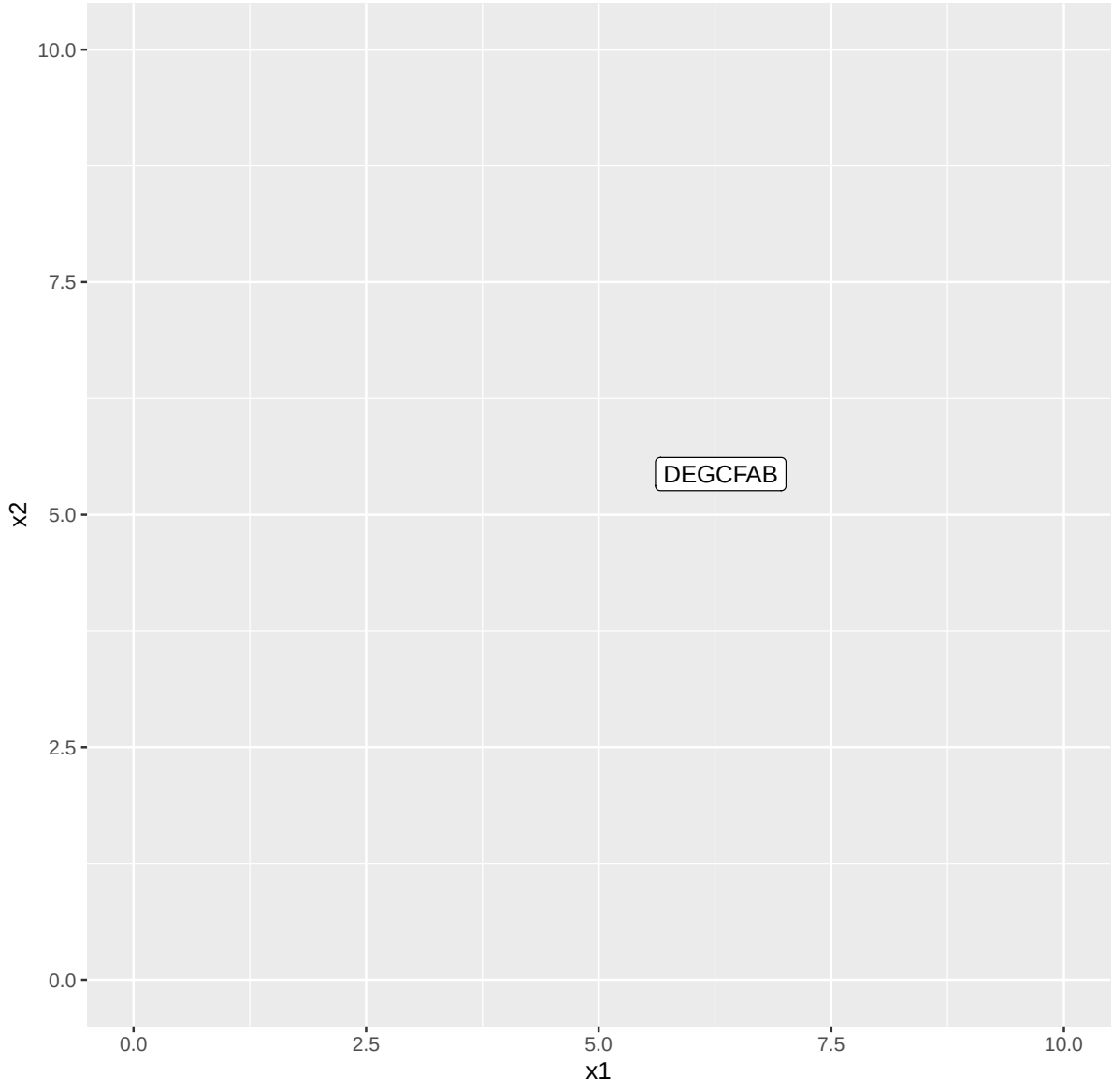
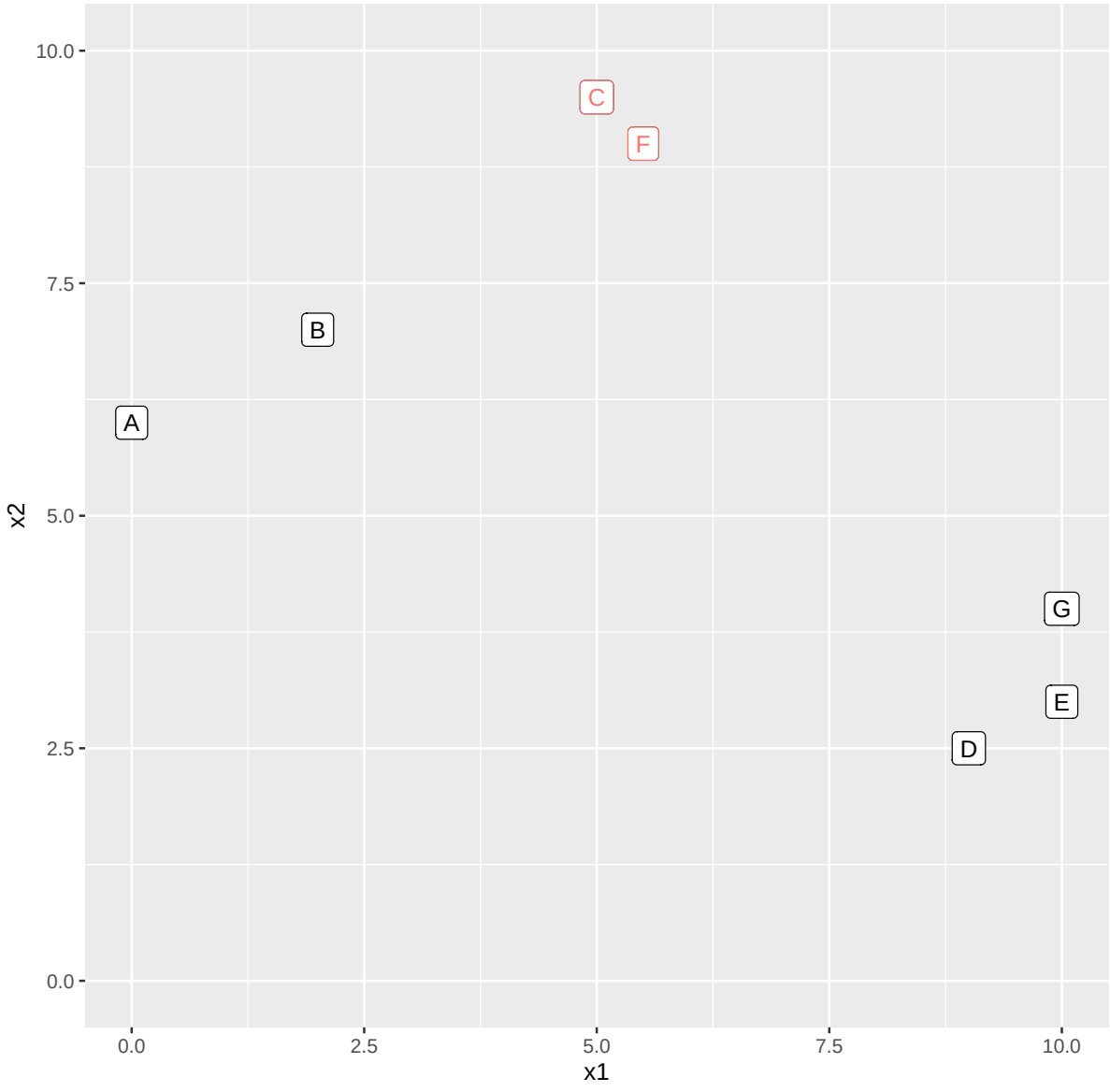


Group the pair

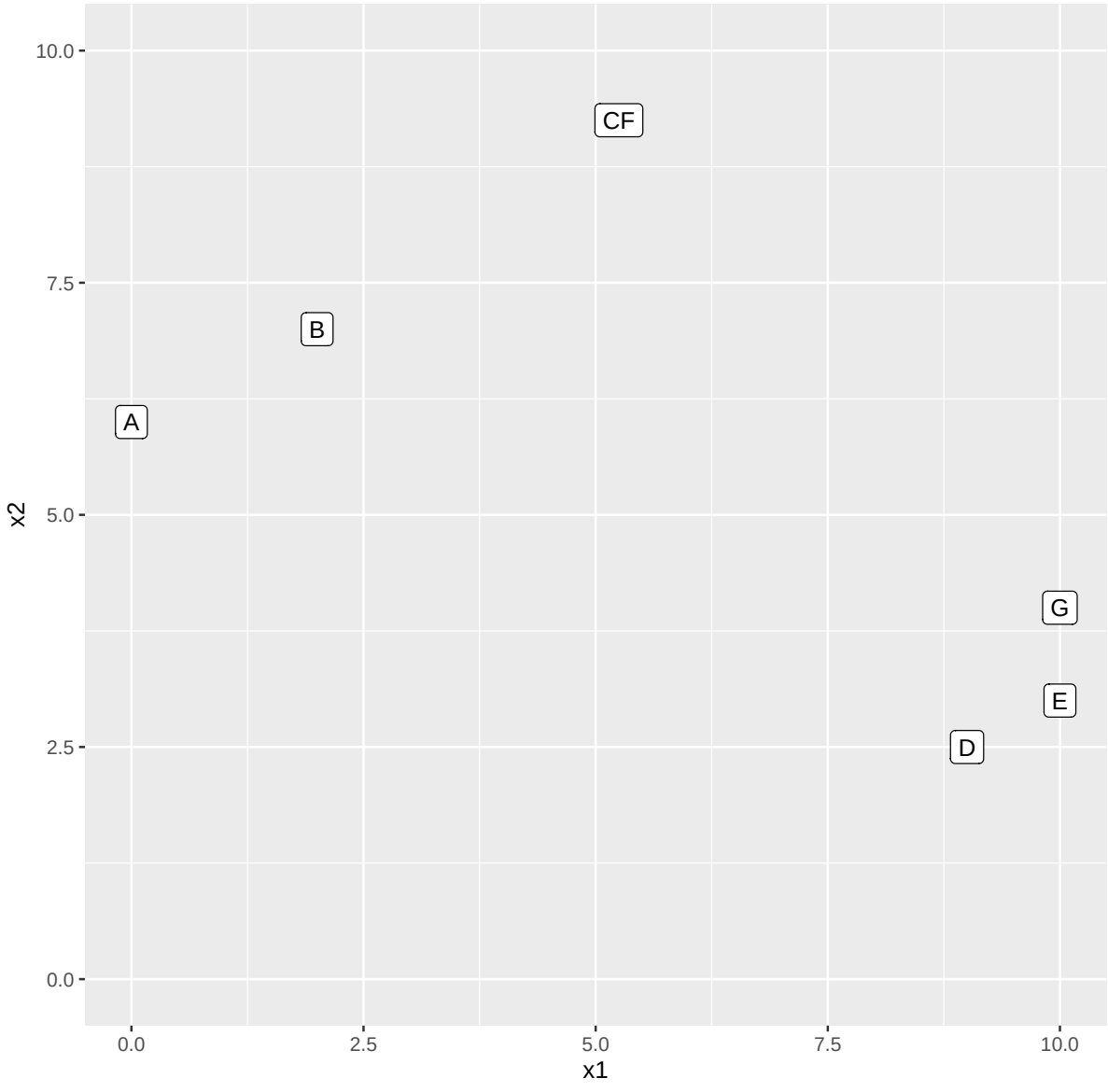


Dendrogram



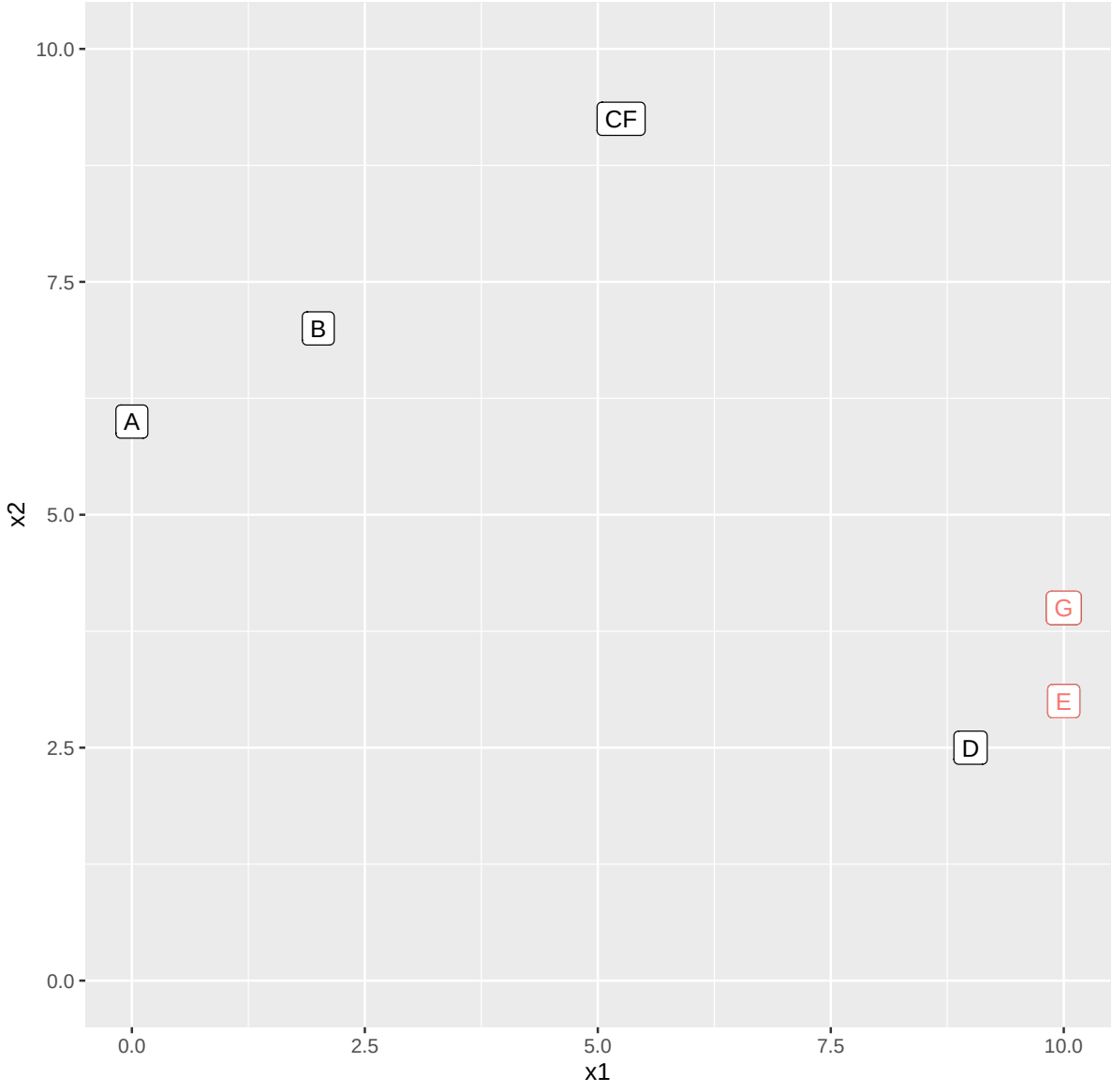
- Distance: 0.71

Group the pair



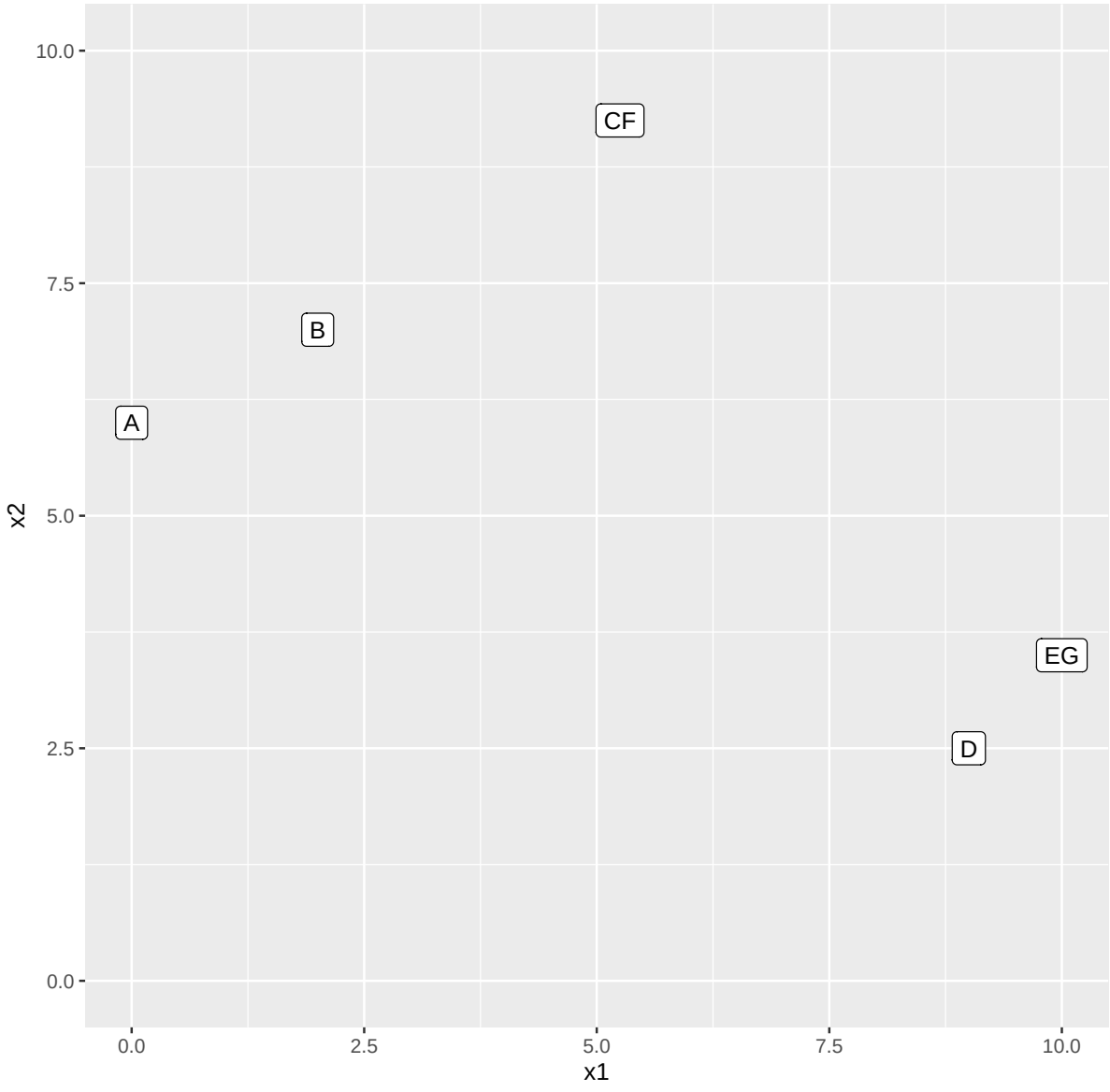
- Distance: 0.71

Identify the pair with the smallest distance.



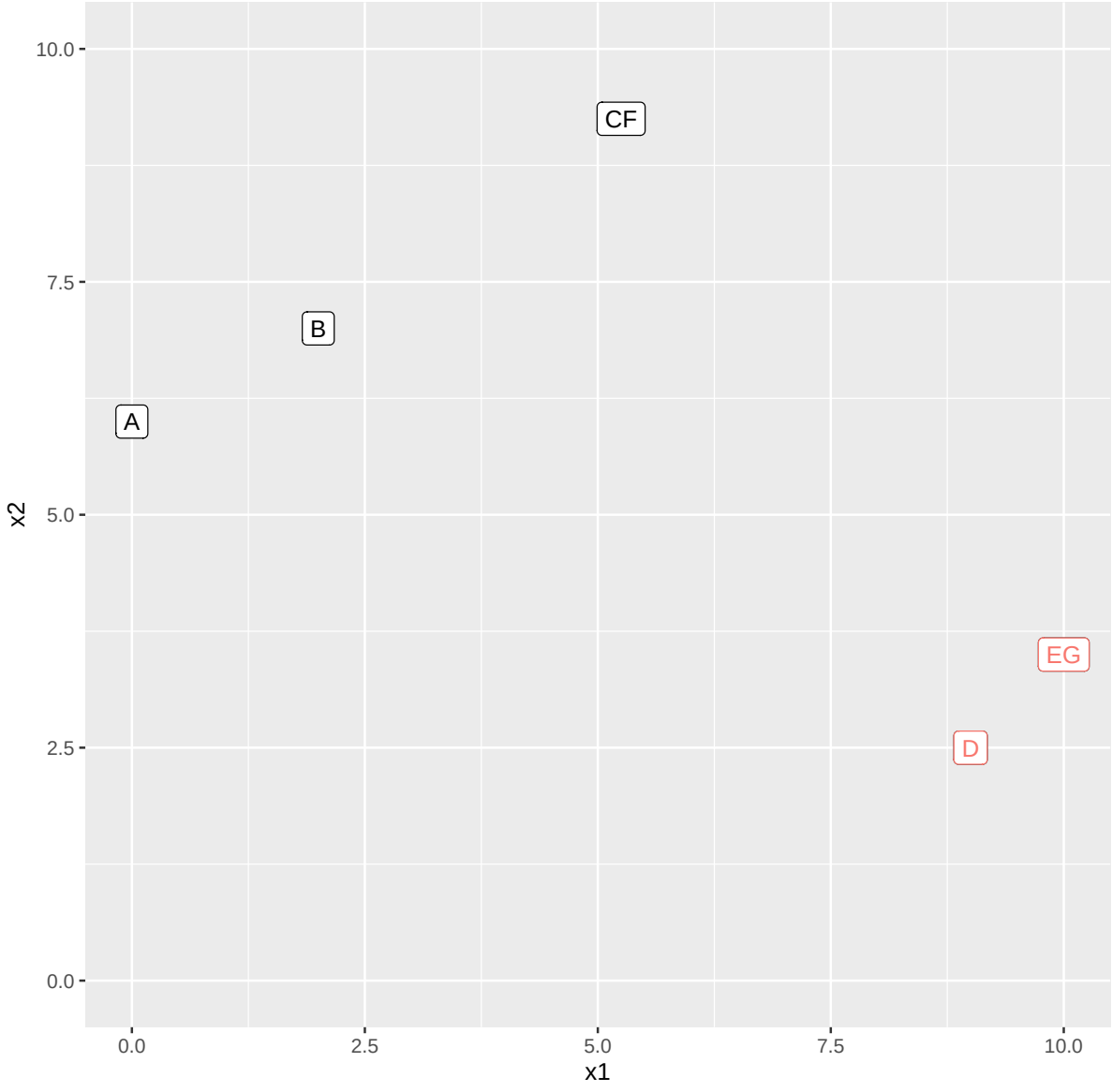
- Distance: 1

Group the pair



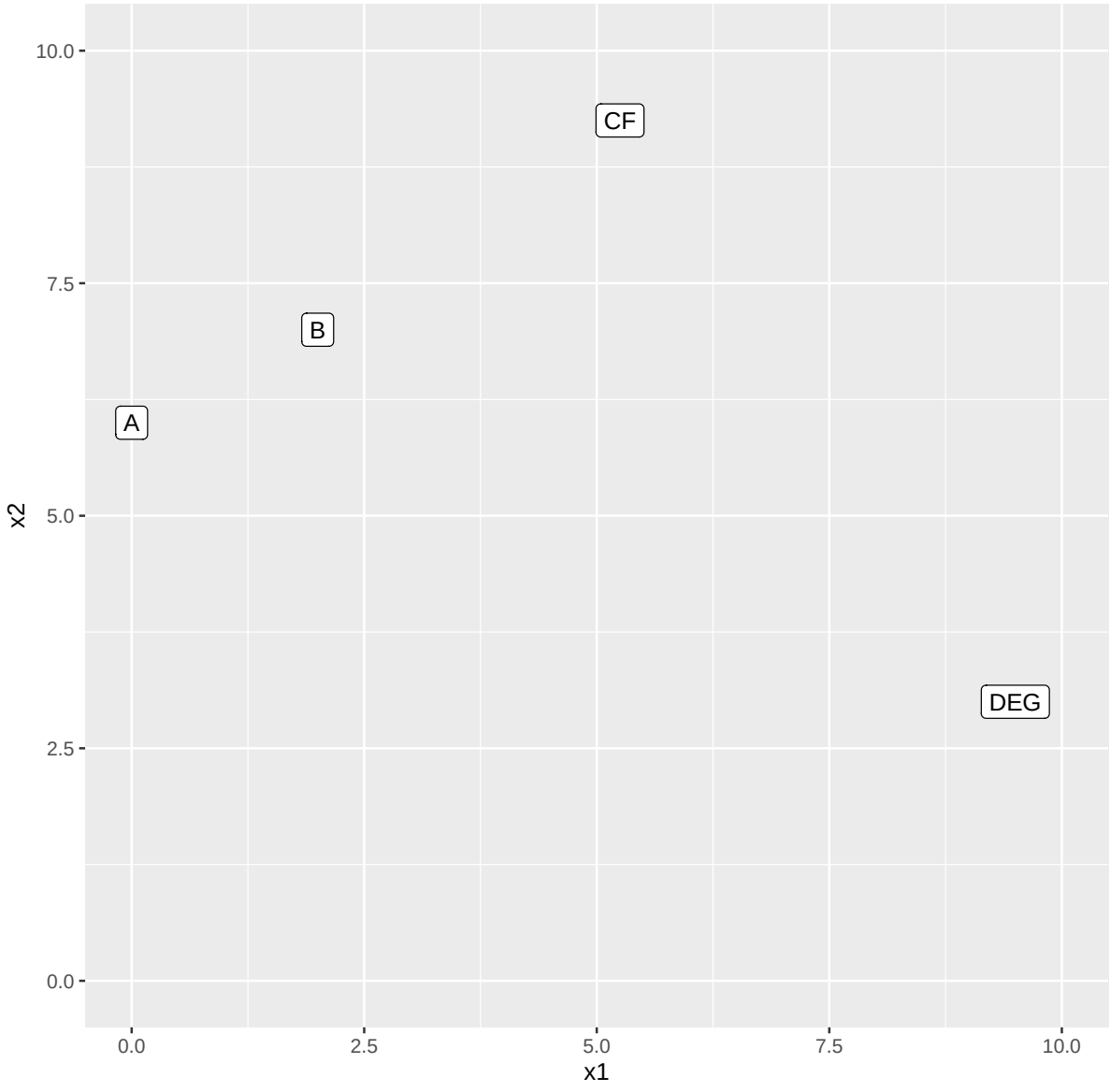
- Distance: 1

Identify the pair with the smallest distance.



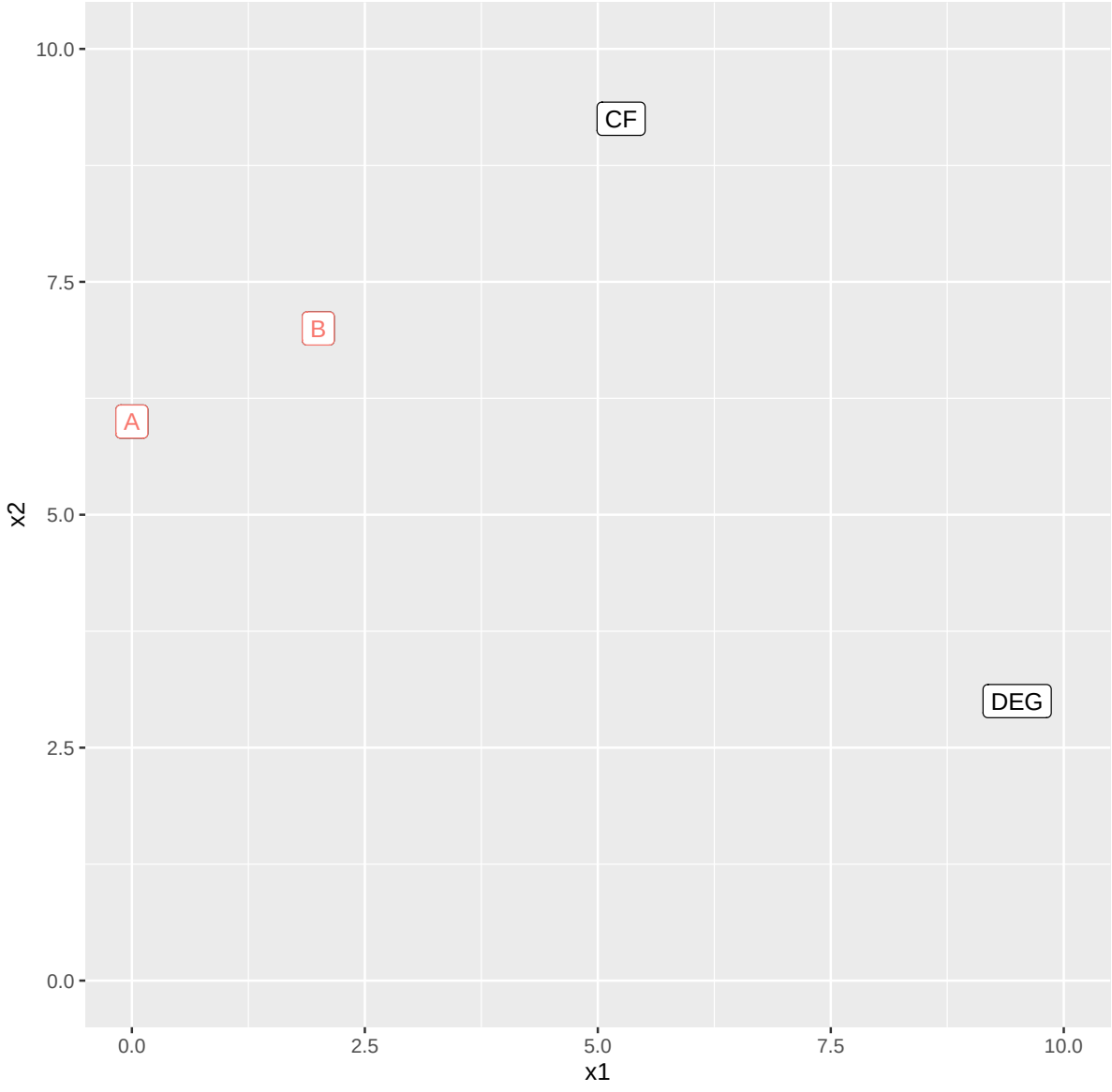
- Distance: 1.41

Group the pair



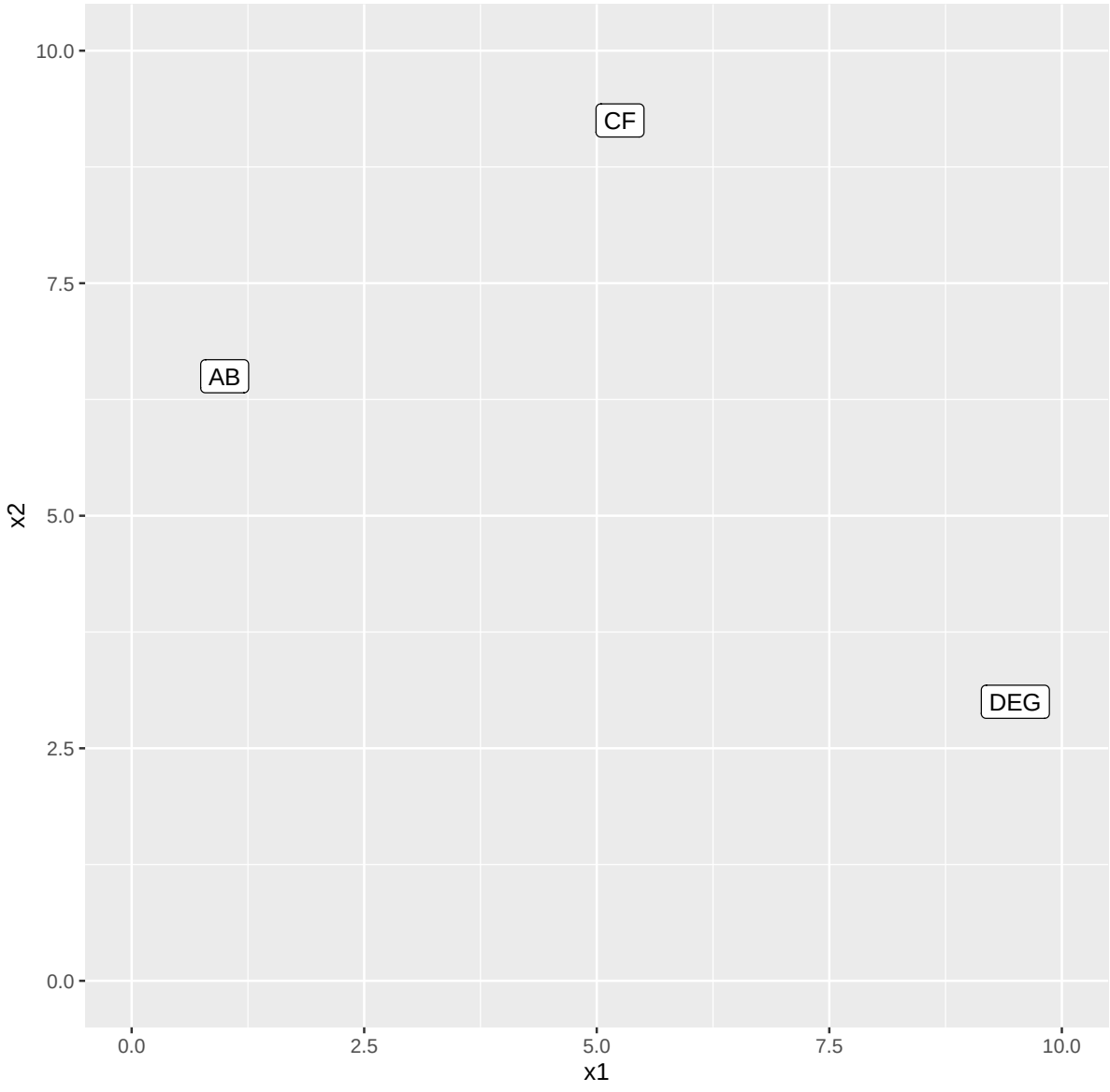
- Distance: 1.41

Identify the pair with the smallest distance.



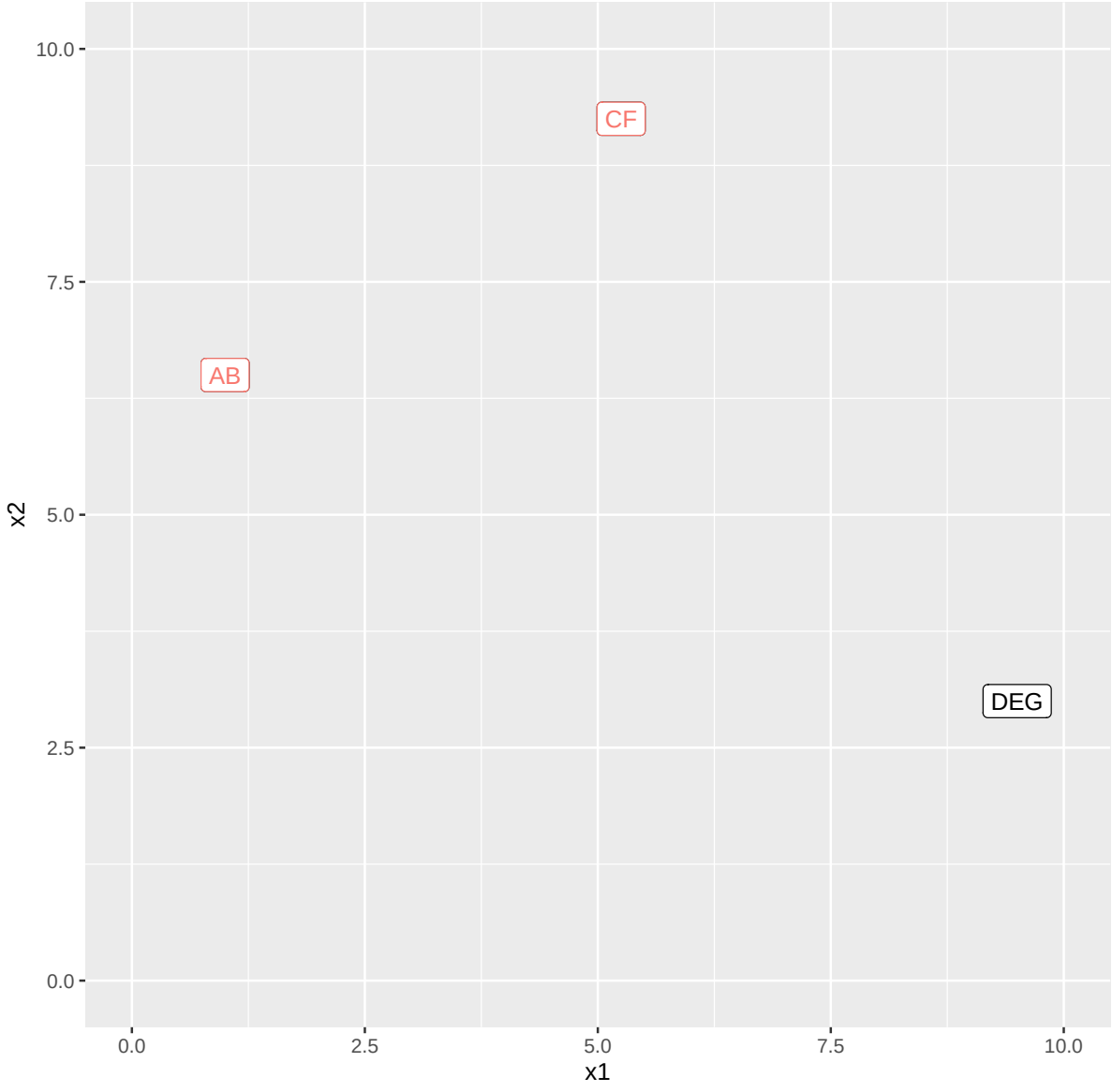
- Distance: 2.24

Group the pair



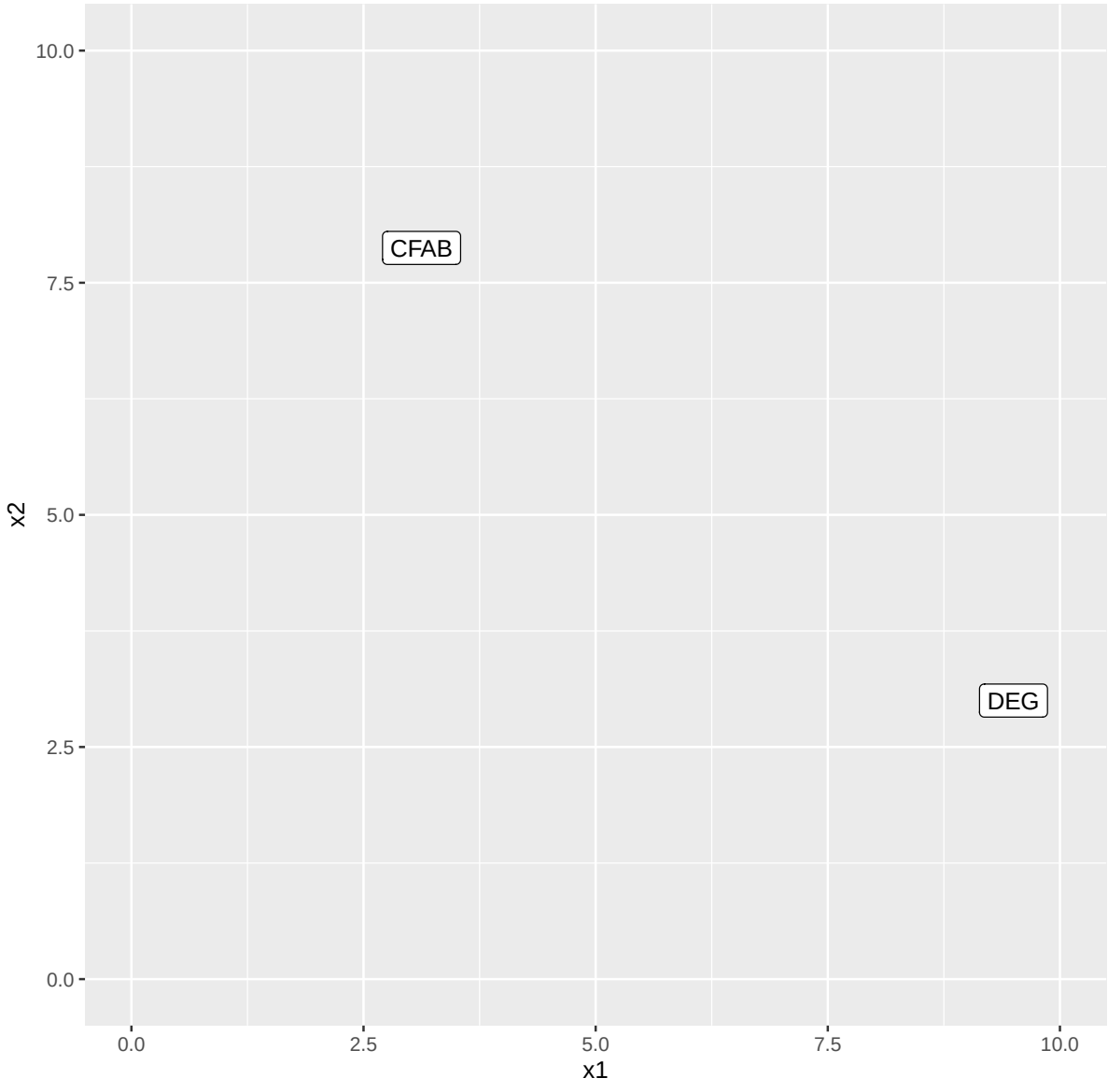
- Distance: 2.24

Identify the pair with the smallest distance.



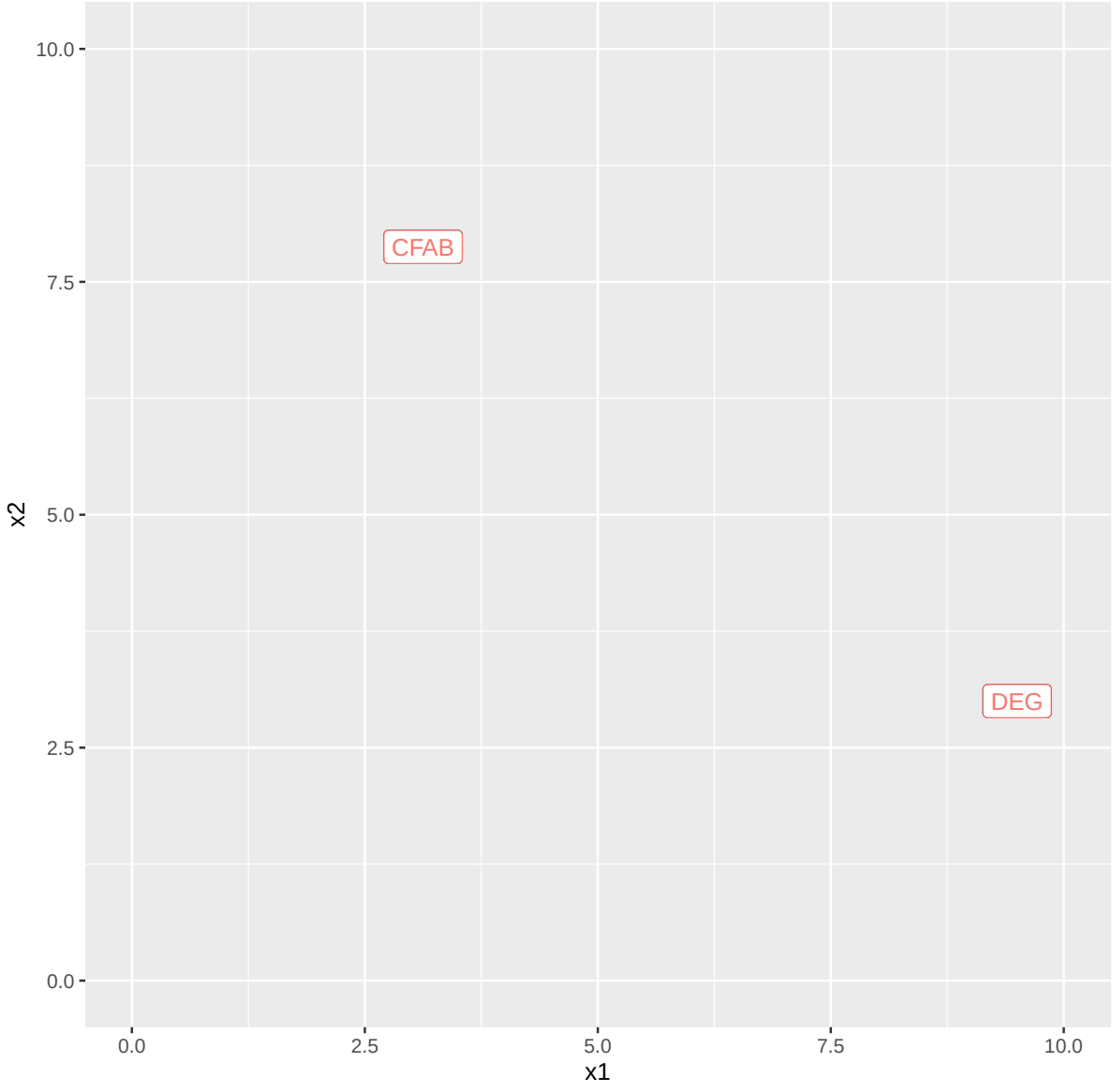
- Distance: 5.06

Group the pair



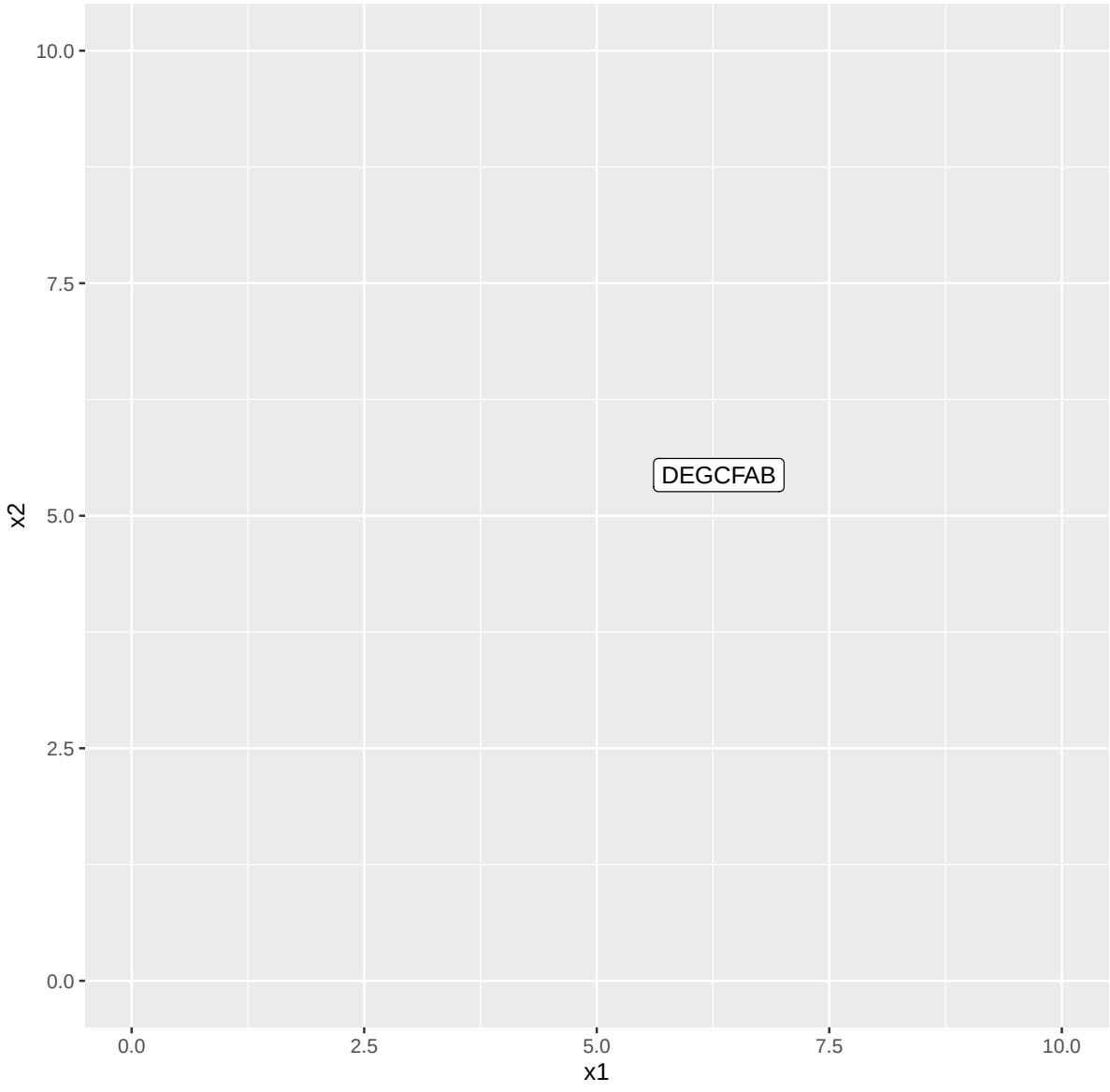
- Distance: 5.06

Identify the pair with the smallest distance.



- Distance: 8.03

Group the pair



- Distance: 8.03

Dendrogram

Linkages

Linkage	*Description*
Complete	Maximal intercluster dissimilarity. Compute all pairwise dissimilarities between the observations in cluster A and the observations in cluster B, and record the *largest* of these dissimilarities.
Single	Minimal intercluster dissimilarity. Compute all pairwise dissimilarities between the observations in cluster A and the observations in cluster B, and record the *smallest* of these dissimilarities. Single linkage can result in extended, trailing clusters in which single observations are fused one-at-a-time.
Average	Mean intercluster dissimilarity. Compute all pairwise dissimilarities between the observations in cluster A and the observations in cluster B, and record the *average* of these dissimilarities.
Centroid	Dissimilarity between the centroid for cluster A (a mean vector of length p) and the centroid for cluster B. Centroid linkage can result in undesirable *inversions*.

Example

You are given the following four pairs of observations: $x_1 = (1,0)$, $x_2 = (1,1)$, $x_3 = (2, 1)$, and $x_4 = (5,10)$.

Calculate the intercluster dissimilarity between x_1, x_2 and x_4 with different linkages and Euclidean distance.

Example

i	X_i
1	9
2	15
3	4
4	2
5	18

Draw the dendrogram of the hierarchical cluster for the data.

Example