Question 2: Iris Data Collection

The maximum marks for Question 2 is 4

Look at the Iris database - `Retica_sample_iris_DB`. It has iris captures from users numbered `0000` to `0011`. Each user has Left and Right iris samples and the numbers of samples vary from 1 to 5.

2a. Use this database to create a list of 20 mated and 20 non mated iris comparisons. Write your list in the textbox below: (1 mark)

Mated
0001_L_000 vs 0001_L_001
0001_L_000 vs 0001_L_002
0001_L_000 vs 0001_L_003
0001_L_000 vs 0001_L_004
0001_R_000 vs 0001_R_001
0001_R_000 vs 0001_R_002
0001_R_000 vs 0001_R_003
0001_R_000 vs 0001_R_004
0002_L_000 vs 0002_L_001
0002_L_000 vs 0002_L_002
0002_R_000 vs 0002_R_001
0002_R_000 vs 0002_R_002
0004_L_000 vs 0004_L_001
0004_L_000 vs 0004_L_002
0004_R_000 vs 0004_R_001
0004_R_000 vs 0004_R_002
0007_L_000 vs 0007_L_001
0007_R_000 vs 0007_R_001
0008_L_000 vs 0008_L_001
0008_R_000 vs 0008_R_001

Non Mated
0001_L_000 vs 0011_R_002
0001_L_000 vs 0011_L_001
0001_L_000 vs 0010_R_002
0001_L_000 vs 0010_R_001
0001_R_000 vs 0010_R_000
0001_R_000 vs 0010_L_002
0001_R_000 vs 0010_L_001
0001_R_000 vs 0010_L_000
0002_L_000 vs 0009_R_001
0002_L_000 vs 0009_R_000
0002_R_000 vs 0009_L_001
0002_R_000 vs 0009_L_000
0004_L_000 vs 0008_R_001
0004_L_000 vs 0008_R_000
0004_R_000 vs 0008_L_001
0004_R_000 vs 0008_L_000
0007_L_000 vs 0007_R_001
0007_R_000 vs 0000_L_000
0008_L_000 vs 0000_R_000
0008_R_000 vs 0001_L_001

✓ Mated Comparisons data collection

Open the `IrisAlgorithmDemo` application.

Go to `Tools` on the menu bar and select `Clear Database` to empty the RAM of any existing images.

Click `Enrol` and enrol the iris sample based on your mated comparison list. Click `Identify` and choose the iris sample you want to compare with from your list. Note the score on the bottom right panel of the application screen.

2b. Repeat this process and record all the 20 mated scores below:(0.5 marks)

Use the format :

001_L_001 vs 001_L_002 = 791

002_R_001 vs 002_R_002 = 403

and so on……

Mated
0001_L_000 vs 0001_L_001 = 791
0001_L_000 vs 0001_L_002 = 566
0001_L_000 vs 0001_L_003 = 746
0001_L_000 vs 0001_L_004 = 618
0001_R_000 vs 0001_R_001 = 589
0001_R_000 vs 0001_R_002 = 541
0001_R_000 vs 0001_R_003 = 612
0001_R_000 vs 0001_R_004 = 638
0002_L_000 vs 0002_L_001 = 482
0002_L_000 vs 0002_L_002 = 522
0002_R_000 vs 0002_R_001 = 693
0002_R_000 vs 0002_R_002 = 737
0004_L_000 vs 0004_L_001 = 503
0004_L_000 vs 0004_L_002 = 551
0004_R_000 vs 0004_R_001 = 443
0004_R_000 vs 0004_R_002 = 881
0007_L_000 vs 0007_L_001 = 316
0007_R_000 vs 0007_R_001 = 427
0008_L_000 vs 0008_L_001 = 732
0008_R_000 vs 0008_R_001 = 777

2c. Use the codeblock below to create and display a dataframe called `iris_mated_dataframe` that has all the mated comparisons and the scores:(0.5 mark)

Code Start Over Run Code

```
comparisons_col1<-c(rep("0001_L_000", times =4), rep("0001_R_000", times =4), rep("0002_L_000", t
rep("0002_R_000", times=2), rep("0004_L_000", times=2), rep("0004_R_000", times=2), rep("0007_L_0
rep("0007_R_000", times=1), rep("0008_L_000", times=1), rep("0008_R_000", times=1) )
comparisons_col2<-c("0001_L_001", "0001_L_002", "0001_L_003", "0001_L_004", "0001_R_001", "0001_R
"0001_R_003", "0001_R_004", "0002_L_001", "0002_L_002", "0002_R_001", "0002_R_002", "0004_L_001",
"0004_R_002", "0007_L_001", "0007_R_001", "0008_L_001", "0008_R_001")
comparisons_score<-c(791, 566, 746, 618, 589, 541, 612, 638, 482, 522, 693, 737, 503, 551, 443, 8




iris_mated_dataframe<-as.data.frame(cbind(comparisons_col1,comparisons_col2,comparisons_score))
iris_mated_dataframe
```

comparisons_col1 <chr>	comparisons_col2 <chr>	comparisons_score <chr>
0001_L_000	0001_L_001	791
0001_L_000	0001_L_002	566
0001_L_000	0001_L_003	746
0001_L_000	0001_L_004	618
0001_R_000	0001_R_001	589
0001_R_000	0001_R_002	541
0001_R_000	0001_R_003	612
0001_R_000	0001_R_004	638
0002_L_000	0002_L_001	482
0002_L_000	0002_L_002	522

1-10 of 20 rows Previous 1 2 Next

✓ Non mated comparisons data collection.

The iris comparator will not give a non mated score for security reasons. We will simulate the non mated scores by generating them using a normal distribution. Choose the mean as `300` and standard deviation as `50`.

2d. Use the code block below to generate 20 non mated scores and assign it to a variable called `iris_nonmated_dataframe`. The dataframe must have the non mated comparisons and generated scores (0.5 mark)

Code Start Over Run Code

```
comparisons_col1<- c(rep("0001_L_000", times =4), rep("0001_R_000", times =4), rep("0002_L_000",
rep("0002_R_000", times=2), rep("0004_L_000", times=2), rep("0004_R_000", times=2), rep("0007_L_0
rep("0007_R_000", times=1), rep("0008_L_000", times=1), rep("0008_R_000", times=1) )
comparisons_col2<- c("0011_R_002", "0011_L_001", "0010_R_002", "0010_R_001", "0010_R_000", "0010_
"0010_L_001", "0010_L_000","0009_R_001", "0009_R_000", "0009_L_001","0009_L_000", "0008_R_001", "
"0008_L_001", "0008_L_000", "0007_R_001", "0000_L_000", "0000_R_000", "0001_L_001")
comparisons_score<-round(rnorm(20, mean = 300, sd=50),0) # change the number of generated outputs

iris_nonmated_dataframe<-as.data.frame(cbind(comparisons_col1,comparisons_col2,comparisons_score)
iris_nonmated_dataframe
```

comparisons_col1 <chr>	comparisons_col2 <chr>	comparisons_score <chr>
0001_L_000	0011_R_002	308
0001_L_000	0011_L_001	332
0001_L_000	0010_R_002	304
0001_L_000	0010_R_001	279
0001_R_000	0010_R_000	347
0001_R_000	0010_L_002	330
0001_R_000	0010_L_001	255
0001_R_000	0010_L_000	329
0002_L_000	0009_R_001	365
0002_L_000	0009_R_000	297

1-10 of 20 rows Previous 1 2 Next

✓ Data analysis

2e. Use the code block below to generate a plot of the mated and non mated distributions.(0.5 mark)

Code Start Over Run Code

```
# Copy the code for your mated and non mated database generation here.

comparisons_col1<-c(rep("0001_L_000", times =4), rep("0001_R_000", times =4), rep("0002_L_000", t
rep("0002_R_000", times=2), rep("0004_L_000", times=2), rep("0004_R_000", times=2), rep("0007_L_0
rep("0007_R_000", times=1), rep("0008_L_000", times=1), rep("0008_R_000", times=1) )
comparisons_col2<-c("0001_L_001", "0001_L_002", "0001_L_003", "0001_L_004", "0001_R_001", "0001_R
"0001_R_003", "0001_R_004", "0002_L_001", "0002_L_002", "0002_R_001", "0002_R_002", "0004_L_001",
"0004_R_002", "0007_L_001", "0007_R_001", "0008_L_001", "0008_R_001")
comparisons_score<-c(791, 566, 746, 618, 589, 541, 612, 638, 482, 522, 693, 737, 503, 551, 443, 8




iris_mated_dataframe<-as.data.frame(cbind(comparisons_col1,comparisons_col2,comparisons_score))
iris_mated_dataframe




comparisons_col1<- c(rep("0001_L_000", times =4), rep("0001_R_000", times =4), rep("0002_L_000",
rep("0002_R_000", times=2), rep("0004_L_000", times=2), rep("0004_R_000", times=2), rep("0007_L_0
rep("0007_R_000", times=1), rep("0008_L_000", times=1), rep("0008_R_000", times=1) )
comparisons_col2<- c("0011_R_002", "0011_L_001", "0010_R_002", "0010_R_001", "0010_R_000", "0010_
"0010_L_001", "0010_L_000","0009_R_001", "0009_R_000", "0009_L_001","0009_L_000", "0008_R_001", "
"0008_L_001", "0008_L_000", "0007_R_001", "0000_L_000", "0000_R_000", "0001_L_001")
comparisons_score<-round(rnorm(20, mean = 300, sd=50),0) # change the number of generated outputs

iris_nonmated_dataframe<-as.data.frame(cbind(comparisons_col1,comparisons_col2,comparisons_score)
iris_nonmated_dataframe


#observe the score distribution

mated_scores<-as.numeric(iris_mated_dataframe[,3])
nonmated_scores<-as.numeric(iris_nonmated_dataframe[,3])

mated_hist<-hist(mated_scores, plot=TRUE, breaks = seq(from=0, to=1000, by=30))
nonmated_hist<-hist(nonmated_scores, plot=TRUE, breaks = seq(from=0, to=1000, by=5))
mated_hist
nonmated_hist

plot(mated_hist$mids, mated_hist$counts, type='l', lwd=2, col=3, xlab = "mated scores", ylab = "C
lines(nonmated_hist$mids, nonmated_hist$counts, lwd=2, col=2)
title("Mated and Non Mated score distribution")
```

comparisons_col1 <chr>	comparisons_col2 <chr>	comparisons_score <chr>
0001_L_000	0001_L_001	791
0001_L_000	0001_L_002	566
0001_L_000	0001_L_003	746
0001_L_000	0001_L_004	618
0001_R_000	0001_R_001	589
0001_R_000	0001_R_002	541
0001_R_000	0001_R_003	612
0001_R_000	0001_R_004	638
0002_L_000	0002_L_001	482
0002_L_000	0002_L_002	522

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comparisons_col1 <chr>	comparisons_col2 <chr>	comparisons_score <chr>
0001_L_000	0011_R_002	351
0001_L_000	0011_L_001	298
0001_L_000	0010_R_002	287
0001_L_000	0010_R_001	273
0001_R_000	0010_R_000	345
0001_R_000	0010_L_002	236
0001_R_000	0010_L_001	275
0001_R_000	0010_L_000	230
0002_L_000	0009_R_001	207
0002_L_000	0009_R_000	299

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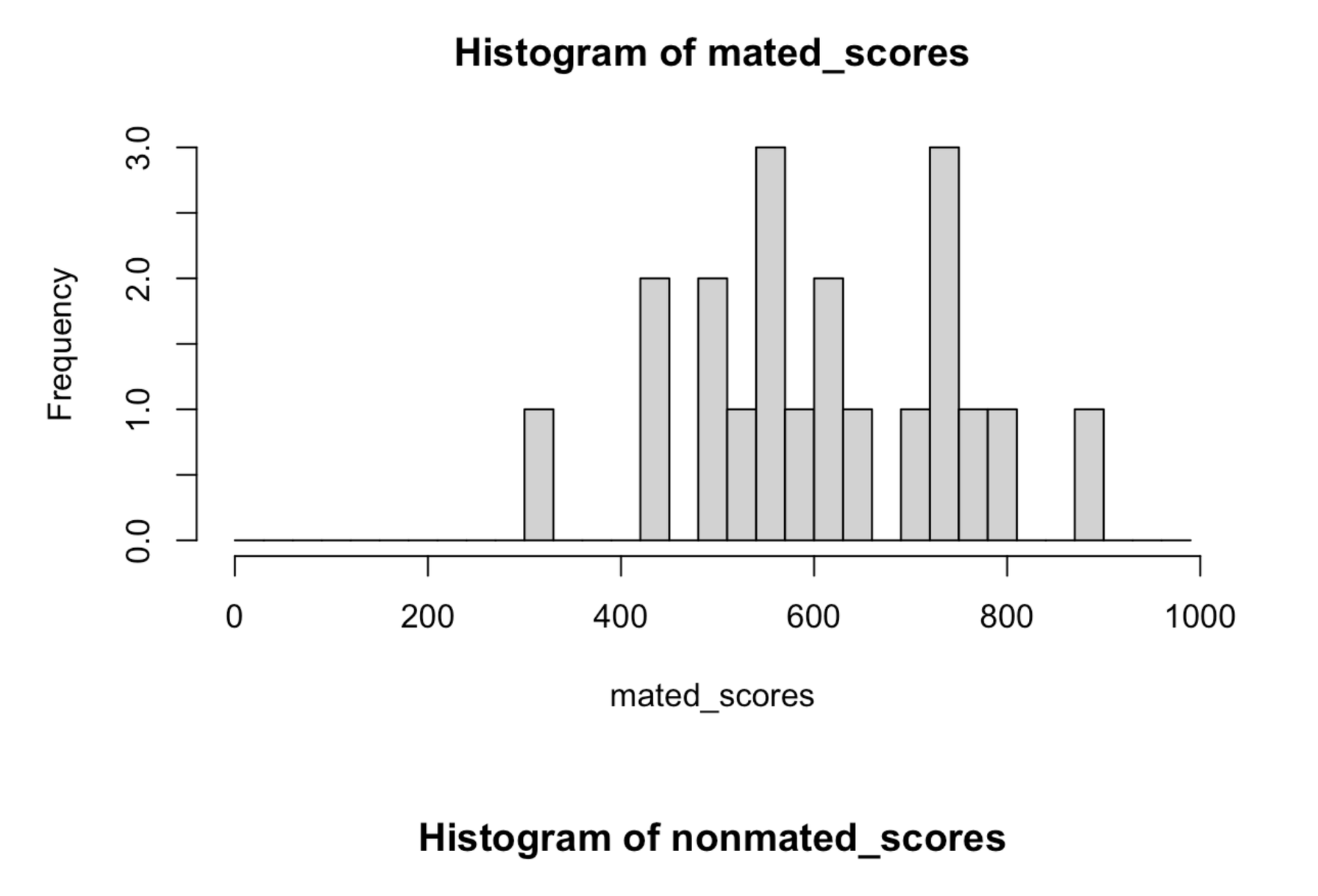
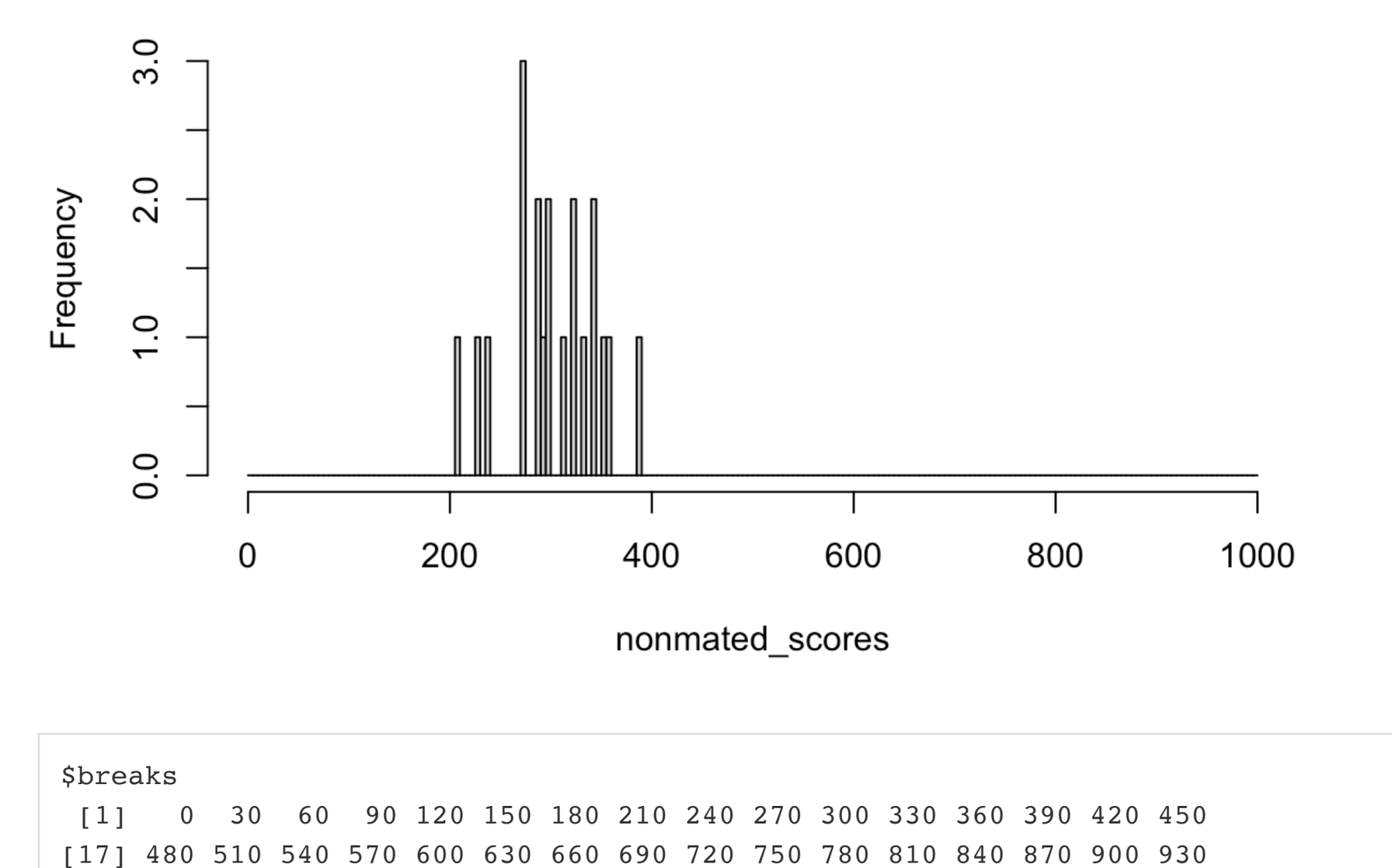
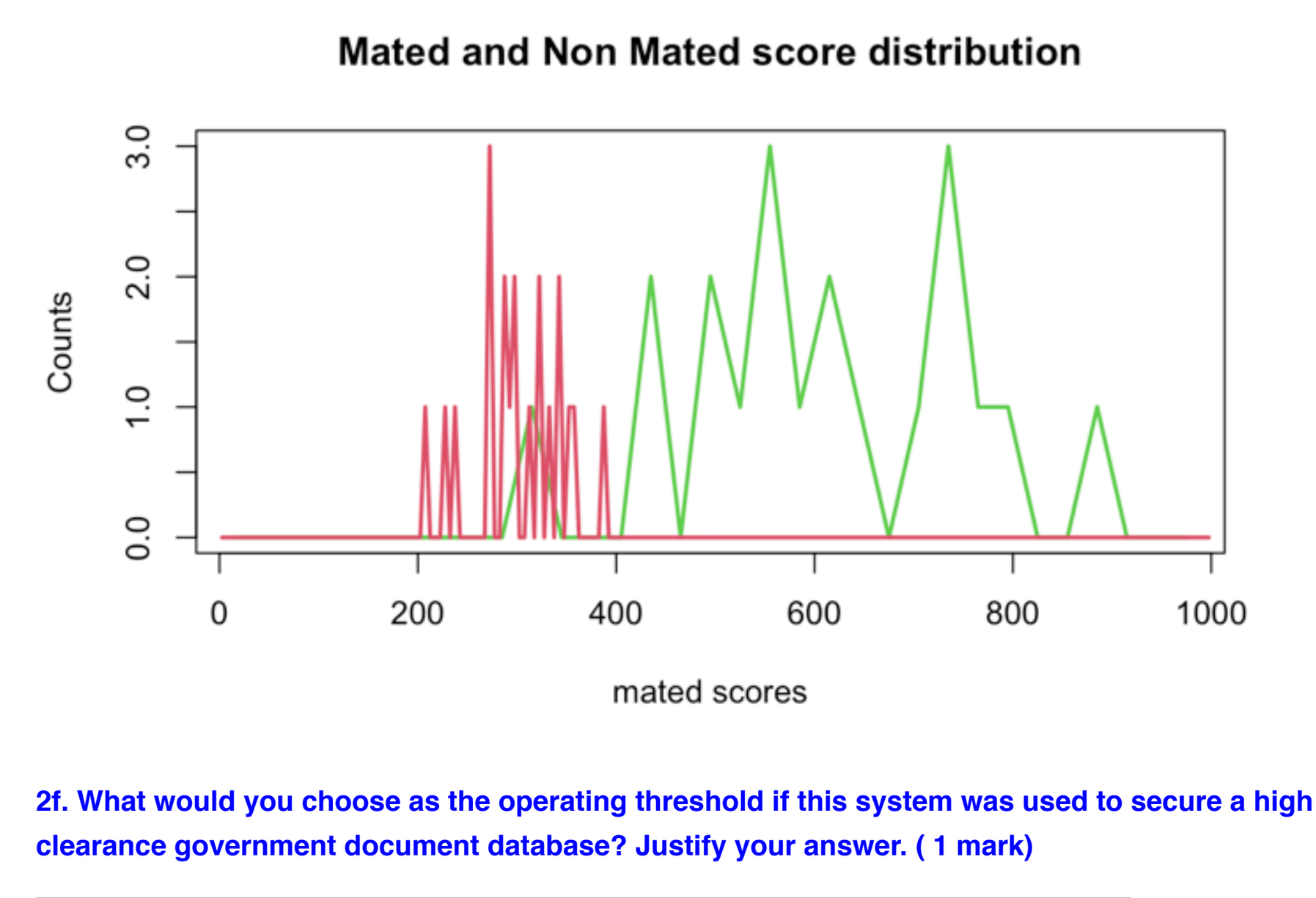





```
$breaks
 [1]   0  30  60  90 120 150 180 210 240 270 300 330 360 390 420 450
[17] 480 510 540 570 600 630 660 690 720 750 780 810 840 870 900 930
[33] 960 990

$counts
 [1] 0 0 0 0 0 0 0 0 0 0 1 0 0 0 2 0 2 1 3 1 2 1 0 1 3 1 1 0 0 1 0 0 0

$density
 [1] 0.000000000 0.000000000 0.000000000 0.000000000 0.000000000
 [6] 0.000000000 0.000000000 0.000000000 0.000000000 0.000000000
[11] 0.001666667 0.000000000 0.000000000 0.000000000 0.003333333
[16] 0.000000000 0.003333333 0.001666667 0.005000000 0.001666667
[21] 0.003333333 0.001666667 0.000000000 0.001666667 0.005000000
[26] 0.001666667 0.001666667 0.000000000 0.000000000 0.001666667
[31] 0.000000000 0.000000000 0.000000000

$mids
 [1]  15  45  75 105 135 165 195 225 255 285 315 345 375 405 435 465
[17] 495 525 555 585 615 645 675 705 735 765 795 825 855 885 915 945
[33] 975

$xname
[1] "mated_scores"

$equidist
[1] TRUE
```

```
$breaks
  [1]    0    5   10   15   20   25   30   35   40   45   50   55   60
 [14]   65   70   75   80   85   90   95  100  105  110  115  120  125
 [27]  130  135  140  145  150  155  160  165  170  175  180  185  190
 [40]  195  200  205  210  215  220  225  230  235  240  245  250  255
 [53]  260  265  270  275  280  285  290  295  300  305  310  315  320
 [66]  325  330  335  340  345  350  355  360  365  370  375  380  385
 [79]  390  395  400  405  410  415  420  425  430  435  440  445  450
 [92]  455  460  465  470  475  480  485  490  495  500  505  510  515
[105]  520  525  530  535  540  545  550  555  560  565  570  575  580
[118]  585  590  595  600  605  610  615  620  625  630  635  640  645
[131]  650  655  660  665  670  675  680  685  690  695  700  705  710
[144]  715  720  725  730  735  740  745  750  755  760  765  770  775
[157]  780  785  790  795  800  805  810  815  820  825  830  835  840
[170]  845  850  855  860  865  870  875  880  885  890  895  900  905
[183]  910  915  920  925  930  935  940  945  950  955  960  965  970
[196]  975  980  985  990  995 1000

$counts
  [1] 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
 [33] 0 0 0 0 0 0 0 0 0 1 0 0 0 1 0 1 0 0 0 0 0 0 3 0 0 2 1 2 0 0 1 0
 [65] 2 0 1 0 2 0 1 1 0 0 0 0 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
 [97] 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
[129] 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
[161] 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
[193] 0 0 0 0 0 0 0 0
```



2f. What would you choose as the operating threshold if this system was used to secure a high security clearance government document database? Justify your answer. (1 mark)

We would choose 450 as the threshold as the system being used is a high security database. Having a higher threshold would eliminate the possibility of a non-mated individual from accessing the system and accidental errors. We need to ensure that none of the non-mated individuals can access the system and operating threshold of 450 is well above any sample for non-mated individuals.

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