**MATLAB**

**MACHINE LEARNING**

**ONRAMP**

**Data science assignment**

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ROLL NO:29

SECTION:A

DEPARTMENT:ECE

CAMPUS:RR CAMPUS

SEM:5

% importing Data

% Instructions are in the task pane to the left. Complete and submit each task one at a time.

% Task 1

letter =readtable("J.txt");

%

% Task 2

x=letter.X;

y=letter.Y;

plot(x,y)

% Task 3

axis equal

% Task 4

letter2=readtable("M.txt");

x1=letter2.X;

y1=letter2.Y;

plot(x1,y1)

axis equal

%

% Further Practice

letter3=readtable("V.txt");

x3=letter3.X;

y3=letter3.Y;

plot(x3,y3)

axis equal

Processing data

Preprocessing Data

Instructions are in the task pane to the left. Complete and submit each task one at a time.

Do not edit. This code loads the data.

letter = readtable("M.txt")

**Task 1**

letter.X=letter.X\*1.5;

View the result

plot(letter.X,letter.Y)

axis equal

**Task 2**

letter.Time=(letter.Time-letter.Time(1))/1000;

View the result

plot(letter.Time,letter.X)

plot(letter.Time,letter.Y)

**Further Practice**

%%reading data

letter\_j=readtable("J.txt");

letter\_v=readtable("V.txt");

%%subtracting all values by the first value

letter\_j.Time=(letter\_j.Time-letter\_j.Time(1))/1000;

letter\_v.Time=(letter\_v.Time-letter\_v.Time(1))/1000;

%%plotting against time for input vector V

plot(letter\_v.Time,letter\_v.X);

plot(letter\_v.Time,letter\_v.Y);

%%plottting againstj time for input vector J

plot(letter\_j.Time,letter\_j.X);

plot(letter\_j.Time,letter\_j.Y);

2.4 Extracting features

Calculate Features

Instructions are in the task pane to the left. Complete and submit each task one at a time.

Do not edit. This code loads and preprocesses the data.

letter = readtable("M.txt");

letter.X = letter.X\*1.5;

letter.Time = (letter.Time - letter.Time(1))/1000

plot(letter.X,letter.Y)

axis equal

**Task 1**

dur=letter.Time(end);

**Task 2**

%%obtaining aspect ratio

%%divede range of column values by range of row values

aratio=range(letter.Y)/range(letter.X);

**Further Practice**

%%reading data

letter\_v=readtable("V.txt");

letter\_j=readtable("J.txt");

%%finding aspect ratios

aratio\_v=(range(letter\_j.Y)/range(letter\_j.X));

aratio\_j=(range(letter\_v.Y)/range(letter\_v.X));

View Features

Instructions are in the task pane to the left. Complete and submit each task one at a time.

Do not edit. This code loads the data.

load featuredata.mat

features

**Task 1**

scatter(features.AspectRatio,features.Duration);

xlabel("aspect ratio");

ylabel("duration");

title("scatter plot of aspect ratio");

**Task 2**

gscatter(features.AspectRatio,features.Duration,features.Character);

xlabel("aspect ratio");

ylabel("duration");

title("scatter plot of aspect ratio");

**Further Practice**

%% zoomed in scatter plot using scatter and xlim and ylim

scatter(features.AspectRatio,features.Duration);

xlabel("aspect ratio");

ylabel("duration");

xlim([0 6]);

ylim([0 1.5]);

title("scatter plot of aspect ratio");

%% zoomed in scatter plot using gscatter and xlim and ylim

gscatter(features.AspectRatio,features.Duration,features.Character);

xlabel("aspect ratio");

ylabel("duration");

xlim([0 6]);

ylim([0 1.5]);

title("scatter plot of aspect ratio");

Fit a Model

Instructions are in the task pane to the left. Complete and submit each task one at a time.

Do not edit. This code loads the data.

load featuredata.mat

features

testdata

**Task 1**

knnmodel=fitcknn(features,"Character");

**Task 2**

predictions=predict(knnmodel,testdata);

**Task 3**

knnmodel=fitcknn(features,'Character',"NumNeighbors",5);

predictions=predict(knnmodel,testdata);

**Further Practice**

[predictions,testdata.Character]

Evaluate the Model

Instructions are in the task pane to the left. Complete and submit each task one at a time.

Do not edit. This code loads the data.

load featuredata.mat

testdata

knnmodel = fitcknn(features,"Character","NumNeighbors",5);

predictions = predict(knnmodel,testdata)

**Task 1**

iscorrect=predictions==testdata.Character;

**Task 2**

accuracy=sum(iscorrect)/numel(iscorrect)

**Task 3**

iswrong=predictions~=testdata.Character;

misclassrate=sum(iswrong)/numel(iswrong);

**Task 4**

confusionchart(testdata.Character,predictions);

**Further Practice**

wrong\_pred=[testdata.Character(iswrong) predictions(iswrong)]

Apply Model to Many Letters

Instructions are in the task pane to the left. Complete and submit each task one at a time.

Do not edit. This code loads the data.

load featuredata13letters.mat

features

testdata

**Task 1**

gscatter(features.AspectRatio,features.Duration,features.Character)

xlabel("aspect ratio");

ylabel("features");

title("features vs aspect ratio");

ylim([0 2]);

xlim([0 20]);

**Task 2**

knnmodel=fitcknn(features,"Character","NumNeighbors",5);

predictions=predict(knnmodel,testdata);

**Task 3**

%%misclassification rate

iswrong=predictions~=testdata.Character;

misclass=sum(iswrong)/numel(iswrong);

confusionchart(testdata.Character,predictions)

**Further Practice**

Section 3

# Make a Datastore

Instructions are in the task pane to the left. Complete and submit each task one at a time.

## **Task 1**

letterds=datastore("\*\_M\_\*.txt");

## **Task 2**

data=read(letterds);

## **Task 3**

plot(data.X,data.Y);

## **Task 4**

data2=read(letterds);

plot(data2.X,data2.Y);

## **Task 5**

data=readall(letterds);

plot(data.X,data.Y);

## **Further Practice**

letterv=datastore("\*\_V\_\*.txt");

data1=read(letterv);

plot(data1.X,data1.Y);

data2=read(letterv);

plot(data2.X,data2.Y);

data=readall(letterv);

plot(data.X,data.Y);

# Add a Preprocessing Function

Instructions are in the task pane to the left. Complete and submit each task one at a time.

Do not edit. This code creates a datastore, imports data, and visualizes it.

letterds = datastore("\*\_M\_\*.txt");

data = read(letterds);

data = scale(data);

plot(data.X,data.Y)

axis equal

plot(data.Time,data.Y)

ylabel("Vertical position")

xlabel("Time")

## **Task 2**

preprocds=transform(letterds,@scale);

## **Task 3**

data=readall(preprocds);

plot(data.Time,data.Y);

title("transformed y vs time");

xlabel("time");

ylabel("y")

## **Further Practice**

plot(data.X,data.Y);

title("transfomed y vs x");

xlabel("x");

ylabel("y");

## **Tasks 1, 4, & 5**

function data=scale(data)

data.Time=(data.Time-data.Time(1))/1000;

data.X=1.5\*data.X;

data.X=data.X-mean(data.X,"omitnan");

data.Y=data.Y-mean(data.Y,"omitnan");

end

# Calculate Basic Statistics

Instructions are in the task pane to the left. Complete and submit each task one at a time.

Do not edit. This code loads and plots the data.

load sampleletters.mat

plot(b1.Time,b1.X)

hold on

plot(b2.Time,b2.X)

hold off

plot(b1.Time,b1.Y)

hold on

plot(b2.Time,b2.Y)

hold off

## **Task 1**

aratiob=range(b1.Y)/range(b1.X);

## **Task 2**

medxb=median(b1.X,"omitnan");

medyb=median(b1.Y,"omitnan");

## **Task 3**

devxb=mad(b1.X);

devyb=mad(b1.Y);

## **Task 4**

aratiov=range(v1.Y)/range(v1.X);

medxd=median(d1.X,"omitnan");

medyd=median(d1.Y,"omitnan");

devxm=mad(m1.X);

devym=mad(m1.Y);

## **Further Practice**

plot(b1.X,b1.Y,b2.X,b2.Y)

axis([-1 1 -1 1])

axis equal

plot(d1.X,d1.Y,d2.X,d2.Y)

axis([-1 1 -1 1])

axis equal

# Find Peaks in Signals

Instructions are in the task pane to the left. Complete and submit each task one at a time.

Do not edit. This code loads and plots the data.

load sampleletters.mat

plot(m1.Time,m1.X)

## **Task 1**

idxmin=islocalmin(m1.X);

idxmax=islocalmax(m1.X);

Visualize the results

plot(m1.Time,m1.X)

hold on

plot(m1.Time(idxmin),m1.X(idxmin),"o")

plot(m1.Time(idxmax),m1.X(idxmax),"s")

hold off

## **Task 2**

[idxmin,prom]=islocalmin(m1.X);

plot(m1.Time,prom);

## **Task 3**

idxmin=islocalmin(m1.X,"MinProminence",0.1)

idxmax=islocalmax(m1.X,"MinProminence",0.1)

plot(m1.Time,m1.X)

hold on

plot(m1.Time(idxmin),m1.X(idxmin),"o")

plot(m1.Time(idxmax),m1.X(idxmax),"s")

hold off

## **Further Practice**

minsum=sum(idxmin);

maxsum=sum(idxmax);

# Calculating Derivatives

Instructions are in the task pane to the left. Complete and submit each task one at a time.

Do not edit. This code loads and plots the data.

load sampleletters.mat

plot(m2.Time,m2.X)

grid

## **Task 1**

dX=diff(m2.X);

dT=diff(m2.Time);

## **Task 2**

dXdT=dX./dT;

## **Task 3**

plot(m2.Time(1:end-1),dXdT)

## **Task 4**

dY=diff(m2.Y);

dT=diff(m2.Time);

dYdT=dY./dT;

maxdx=max(dXdT)

maxdy=max(dYdT)

## **Task 5**

dYdT=standardizeMissing(dYdT,Inf);

## **Further Practice**

dYdT = standardizeMissing(dYdT,[-Inf 0 Inf]);

dXdT = standardizeMissing(dXdT,[-Inf 0 Inf]);

Calculating Correlations

Instructions are in the task pane to the left. Complete and submit each task one at a time.

Do not edit. This code loads and plots the data.

load sampleletters.mat

plot(v2.X,v2.Y,"o-")

**Task 1**

C=corr(v2.X,v2.Y)

C = NaN

**Task 2**

C=corr(v2.X,v2.Y,"Rows","complete");

**Task 3**

M=[v2.X(1:11),v2.Y(1:11),v2.X(12:22),v2.Y(12:22)]

M = 11×4

-0.2803 -0.0879 -0.0476 -0.6307  
 -0.2803 -0.0724 0.0222 -0.5376  
 -0.2803 -0.0724 0.1152 -0.3515  
 -0.3035 -0.0103 0.2315 -0.0103  
 -0.3268 0.0517 0.3478 0.3619  
 -0.3268 0.0362 0.4176 0.5790  
 -0.3035 -0.0258 0.4409 0.6720  
 -0.2337 -0.1809 0.4409 0.6565  
 -0.2105 -0.3515 0.4176 0.5790  
 -0.1407 -0.5066 0.3943 0.5014

**Task 4**

Cmat=corr(M,"Rows","complete")

Cmat = 4×4

1.0000 -0.9896 0.2166 0.2231  
 -0.9896 1.0000 -0.2465 -0.2548  
 0.2166 -0.2465 1.0000 0.9956  
 0.2231 -0.2548 0.9956 1.0000

**Further Practice**

l\_m=[m2.X(1:11),m2.Y(1:11),m2.X(12:22),m2.Y(12:22)]

l\_m = 11×4

-0.2870 0.6188 -0.3613 -0.3214  
 -0.2870 0.6353 -0.2870 -0.1730  
 -0.2870 0.6353 -0.1633 0.0745  
 -0.2870 0.6518 -0.0643 0.2394  
 -0.2623 0.6353 0.0594 0.3714  
 -0.2870 0.5363 0.1336 0.3549  
 -0.3118 0.2559 0.1336 0.2229  
 -0.3613 -0.0740 0.0841 -0.0080  
 -0.4107 -0.2884 0.0099 -0.1895  
 -0.4355 -0.4039 -0.0396 -0.3049

Cmat=corr(l\_,"Rows","complete")

Cmat = 4×4

1.0000 0.9805 -0.2277 0.6396  
 0.9805 1.0000 -0.3546 0.5553  
 -0.2277 -0.3546 1.0000 0.5687  
 0.6396 0.5553 0.5687 1.0000

Create a Feature Extraction Function

Instructions are in the task pane to the left. Complete and submit each task one at a time.

Do not edit. This code loads the data and calculates some features for one letter.

load sampleletters.mat

letter = b1;

aratio = range(letter.Y)/range(letter.X)

aratio = 2.0952

idxmin = islocalmin(letter.X,"MinProminence",0.1);

numXmin = nnz(idxmin)

numXmin = 0

idxmax = islocalmax(letter.Y,"MinProminence",0.1);

numYmax = nnz(idxmax)

numYmax = 1

dT = diff(letter.Time);

dXdT = diff(letter.X)./dT;

dYdT = diff(letter.Y)./dT;

avgdX = mean(dXdT,"omitnan")

avgdX = -0.3069

avgdY = mean(dYdT,"omitnan")

avgdY = -1.3805

corrXY = corr(letter.X,letter.Y,"rows","complete")

corrXY = 0.1588

featurenames = ["AspectRatio","NumMinX","NumMinY","AvgU","AvgV","CorrXY"];

**Task 1**

feat=table(aratio,numXmin,numYmax,avgdX,avgdY,corrXY)

feat = 1×6 table

|  | **aratio** | **numXmin** | **numYmax** | **avgdX** | **avgdY** | **corrXY** |
| --- | --- | --- | --- | --- | --- | --- |
| **1** | 2.0952 | 0 | 1 | -0.3069 | -1.3805 | 0.1588 |

**Task 2**

featurenames=["aratio","numXmin","numYmax","avgdX","avgdY","corrXY"];

feat=table(aratio,numXmin,numYmax,avgdX,avgdY,corrXY,'VariableNames',featurenames)

feat = 1×6 table

|  | **aratio** | **numXmin** | **numYmax** | **avgdX** | **avgdY** | **corrXY** |
| --- | --- | --- | --- | --- | --- | --- |
| **1** | 2.0952 | 0 | 1 | -0.3069 | -1.3805 | 0.1588 |

**Task 3 (continued below)**

letter=b2

letter = 22×4 table

|  | **Time** | **X** | **Y** | **P** |
| --- | --- | --- | --- | --- |
| **1** | 0 | -0.1480 | 0.8771 | 0.0090 |
| **2** | 0.0277 | -0.1679 | 0.9303 | 0.1240 |
| **3** | 0.0277 | -0.1679 | 0.9303 | 0.1240 |
| **4** | 0.0596 | -0.1878 | 0.9568 | 0.2040 |
| **5** | 0.0979 | -0.2077 | 0.9303 | 0.2820 |
| **6** | 0.1340 | -0.2077 | 0.8373 | 0.3760 |
| **7** | 0.1787 | -0.1480 | 0.5053 | 0.5770 |
| **8** | 0.2362 | -0.1281 | -0.0259 | 0.9050 |
| **9** | 0.2745 | -0.1480 | -0.3845 | 1.0000 |
| **10** | 0.4830 | -0.0882 | -0.3181 | 1.0000 |
| **11** | 0.5213 | 0.0114 | -0.1853 | 1.0000 |
| **12** | 0.5596 | 0.1309 | -0.0790 | 1.0000 |
| **13** | 0.5936 | 0.2703 | -0.0790 | 1.0000 |
| **14** | 0.6319 | 0.3301 | -0.1853 | 1.0000 |
| **15** | 0.6660 | 0.3500 | -0.3181 | 1.0000 |
| **16** | 0.6979 | 0.3102 | -0.5571 | 1.0000 |
| **17** | 0.7362 | 0.2106 | -0.7431 | 1.0000 |
| **18** | 0.8213 | 0.0512 | -0.8360 | 1.0000 |
| **19** | 0.8426 | 0.0114 | -0.8227 | 1.0000 |
| **20** | 0.9255 | -0.0484 | -0.7431 | 1.0000 |
| **21** | 0.9979 | -0.0285 | -0.6899 | 0.0050 |
| **22** | 1.0000 | NaN | NaN | NaN |

featB2=extract(b2)

aratio = 3.2143

numXmin = 0

numYmax = 1

avgdX = 0.1848

avgdY = -1.9887

corrXY = -0.5879

feat = 1×6 table

|  | **AspectRatio** | **NumMinX** | **NumMinY** | **AvgU** | **AvgV** | **CorrXY** |
| --- | --- | --- | --- | --- | --- | --- |
| **1** | 3.2143 | 0 | 1 | 0.1848 | -1.9887 | -0.5879 |

featB2 = 1×6 table

|  | **AspectRatio** | **NumMinX** | **NumMinY** | **AvgU** | **AvgV** | **CorrXY** |
| --- | --- | --- | --- | --- | --- | --- |
| **1** | 3.2143 | 0 | 1 | 0.1848 | -1.9887 | -0.5879 |

**Further Practice**

letter=m2

letter = 36×4 table

|  | **Time** | **X** | **Y** | **P** |
| --- | --- | --- | --- | --- |
| **1** | 0 | -0.2870 | 0.6188 | 0.0010 |
| **2** | 0 | -0.2870 | 0.6353 | 0.0340 |
| **3** | 0 | -0.2870 | 0.6353 | 0.0340 |
| **4** | 0.0250 | -0.2870 | 0.6518 | 0.1140 |
| **5** | 0.0537 | -0.2623 | 0.6353 | 0.2920 |
| **6** | 0.0864 | -0.2870 | 0.5363 | 0.4740 |
| **7** | 0.1190 | -0.3118 | 0.2559 | 0.7410 |
| **8** | 0.1536 | -0.3613 | -0.0740 | 0.9780 |
| **9** | 0.1804 | -0.4107 | -0.2884 | 1.0000 |
| **10** | 0.2150 | -0.4355 | -0.4039 | 1.0000 |
| **11** | 0.2457 | -0.4107 | -0.4204 | 1.0000 |
| **12** | 0.2764 | -0.3613 | -0.3214 | 1.0000 |
| **13** | 0.3090 | -0.2870 | -0.1730 | 1.0000 |
| **14** | 0.3436 | -0.1633 | 0.0745 | 1.0000 |
| **15** | 0.3724 | -0.0643 | 0.2394 | 0.9950 |
| **16** | 0.4050 | 0.0594 | 0.3714 | 1.0000 |
| **17** | 0.4395 | 0.1336 | 0.3549 | 1.0000 |
| **18** | 0.4702 | 0.1336 | 0.2229 | 1.0000 |
| **19** | 0.5029 | 0.0841 | -0.0080 | 1.0000 |
| **20** | 0.5355 | 0.0099 | -0.1895 | 1.0000 |
| **21** | 0.5681 | -0.0396 | -0.3049 | 1.0000 |
| **22** | 0.5969 | -0.0148 | -0.2884 | 1.0000 |
| **23** | 0.6296 | 0.0594 | -0.1895 | 1.0000 |
| **24** | 0.6622 | 0.1831 | -0.0080 | 1.0000 |
| **25** | 0.6967 | 0.3316 | 0.1075 | 1.0000 |
| **26** | 0.7274 | 0.4058 | 0.1404 | 1.0000 |
| **27** | 0.7582 | 0.4305 | 0.0910 | 1.0000 |
| **28** | 0.7927 | 0.4058 | -0.0410 | 1.0000 |
| **29** | 0.8234 | 0.3316 | -0.2060 | 1.0000 |
| **30** | 0.8522 | 0.2821 | -0.3214 | 1.0000 |
| **31** | 0.8887 | 0.2821 | -0.4369 | 1.0000 |
| **32** | 0.9175 | 0.3068 | -0.4699 | 1.0000 |
| **33** | 0.9501 | 0.3563 | -0.5029 | 0.8230 |
| **34** | 0.9827 | 0.3811 | -0.4699 | 0.3880 |
| **35** | 0.9981 | 0.3811 | -0.4534 | 0.0070 |
| **36** | 1.0000 | NaN | NaN | NaN |

featm2=extract(m2)

aratio = 1.3333

numXmin = 2

numYmax = 2

avgdX = 0.6382

avgdY = Inf

corrXY = -0.3271

feat = 1×6 table

|  | **AspectRatio** | **NumMinX** | **NumMinY** | **AvgU** | **AvgV** | **CorrXY** |
| --- | --- | --- | --- | --- | --- | --- |
| **1** | 1.3333 | 2 | 2 | 0.6382 | Inf | -0.3271 |

featm2 = 1×6 table

|  | **AspectRatio** | **NumMinX** | **NumMinY** | **AvgU** | **AvgV** | **CorrXY** |
| --- | --- | --- | --- | --- | --- | --- |
| **1** | 1.3333 | 2 | 2 | 0.6382 | Inf | -0.3271 |

**Task 3**

function feat=extract(letter)

aratio = range(letter.Y)/range(letter.X)

idxmin = islocalmin(letter.X,"MinProminence",0.1);

numXmin = nnz(idxmin)

idxmax = islocalmax(letter.Y,"MinProminence",0.1);

numYmax = nnz(idxmax)

dT = diff(letter.Time);

dXdT = diff(letter.X)./dT;

dYdT = diff(letter.Y)./dT;

avgdX = mean(dXdT,"omitnan")

avgdY = mean(dYdT,"omitnan")

corrXY = corr(letter.X,letter.Y,"rows","complete")

featurenames = ["AspectRatio","NumMinX","NumMinY","AvgU","AvgV","CorrXY"];

feat=table(aratio,numXmin,numYmax,avgdX,avgdY,corrXY,'VariableNames',featurenames)

end

Add a Feature Extraction Function

Instructions are in the task pane to the left. Complete and submit each task one at a time.

Do not edit. This code creates a datastore and adds a preprocessing function as a transformation to it.

letterds = datastore("\*.txt");

preprocds = transform(letterds,@scale)

preprocds =

TransformedDatastore with properties:  
  
 UnderlyingDatastores: {matlab.io.datastore.TabularTextDatastore}  
 SupportedOutputFormats: ["txt" "csv" "xlsx" "xls" "parquet" "parq" "png" "jpg" "jpeg" "tif" "tiff" "wav" "flac" "ogg" "mp4" "m4a"]  
 Transforms: {@scale}  
 IncludeInfo: 0

**Task 1**

featds=transform(preprocds,@extract)

featds =

TransformedDatastore with properties:  
  
 UnderlyingDatastores: {matlab.io.datastore.TabularTextDatastore}  
 SupportedOutputFormats: ["txt" "csv" "xlsx" "xls" "parquet" "parq" "png" "jpg" "jpeg" "tif" "tiff" "wav" "flac" "ogg" "mp4" "m4a"]  
 Transforms: {@scale @extract}  
 IncludeInfo: [0 0]

**Task 2**

data=readall(featds)

data = 12×6 table

|  | **AspectRatio** | **NumMinX** | **NumMinY** | **AvgU** | **AvgV** | **CorrXY** |
| --- | --- | --- | --- | --- | --- | --- |
| **1** | 1.1064 | 0 | 2 | 0.8560 | -1.2876 | 0.0663 |
| **2** | 1.6042 | 0 | 0 | 0.7280 | 0.0618 | -0.2398 |
| **3** | 1.5467 | 0 | 2 | 0.7580 | -1.1176 | -0.1311 |
| **4** | 2.4516 | 0 | 0 | 0.6497 | 0.4364 | 0.1100 |
| **5** | 1.1481 | 0 | 3 | 0.9132 | -0.9738 | -0.3512 |
| **6** | 1.0167 | 0 | 3 | 1.1859 | -0.5601 | -0.2444 |
| **7** | 1.9608 | 0 | 0 | 0.8255 | 0.2923 | 0.3406 |
| **8** | 2.1505 | 0 | 0 | 0.7408 | 0.5508 | 0.3160 |
| **9** | 0.7901 | 0 | 2 | 1.1039 | -0.8195 | -0.4168 |
| **10** | 0.7024 | 0 | 2 | 1.1855 | -0.5873 | -0.3844 |
| **11** | 2.3529 | 0 | 1 | 1.1765 | -0.4227 | -0.3772 |
| **12** | 1.8400 | 0 | 0 | 0.6982 | 0.0190 | -0.6220 |

scatter(data.AspectRatio,data.CorrXY)

**Task 3**

knownchar=extractBetween(letterds.Files,"\_","\_")

knownchar = 12×1 cell

'M'   
'V'   
'M'   
'V'   
'M'   
'M'   
'V'   
'V'   
'M'   
'M'

**Task 4**

knownchar=categorical(knownchar);

**Task 5**

data.Character=knownchar

data = 12×7 table

|  | **AspectRatio** | **NumMinX** | **NumMinY** | **AvgU** | **AvgV** | **CorrXY** | **Character** |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **1** | 1.1064 | 0 | 2 | 0.8560 | -1.2876 | 0.0663 | M |
| **2** | 1.6042 | 0 | 0 | 0.7280 | 0.0618 | -0.2398 | V |
| **3** | 1.5467 | 0 | 2 | 0.7580 | -1.1176 | -0.1311 | M |
| **4** | 2.4516 | 0 | 0 | 0.6497 | 0.4364 | 0.1100 | V |
| **5** | 1.1481 | 0 | 3 | 0.9132 | -0.9738 | -0.3512 | M |
| **6** | 1.0167 | 0 | 3 | 1.1859 | -0.5601 | -0.2444 | M |
| **7** | 1.9608 | 0 | 0 | 0.8255 | 0.2923 | 0.3406 | V |
| **8** | 2.1505 | 0 | 0 | 0.7408 | 0.5508 | 0.3160 | V |
| **9** | 0.7901 | 0 | 2 | 1.1039 | -0.8195 | -0.4168 | M |
| **10** | 0.7024 | 0 | 2 | 1.1855 | -0.5873 | -0.3844 | M |
| **11** | 2.3529 | 0 | 1 | 1.1765 | -0.4227 | -0.3772 | V |
| **12** | 1.8400 | 0 | 0 | 0.6982 | 0.0190 | -0.6220 | V |

gscatter(data.AspectRatio,data.CorrXY,data.Character)

**Further Practice**

**Local Functions**

function data = scale(data)

% Normalize time [0 1]

data.Time = (data.Time - data.Time(1))/(data.Time(end) - data.Time(1));

% Fix aspect ratio

data.X = 1.5\*data.X;

% Center X & Y at (0,0)

data.X = data.X - mean(data.X,"omitnan");

data.Y = data.Y - mean(data.Y,"omitnan");

% Scale to have bounding box area = 1

scl = 1/sqrt(range(data.X)\*range(data.Y));

data.X = scl\*data.X;

data.Y = scl\*data.Y;

end

function feat = extract(letter)

% Aspect ratio

aratio = range(letter.Y)/range(letter.X);

% Local max/mins

idxmin = islocalmin(letter.X,"MinProminence",0.1);

numXmin = nnz(idxmin);

idxmax = islocalmax(letter.Y,"MinProminence",0.1);

numYmax = nnz(idxmax);

% Velocity

dT = diff(letter.Time);

dXdT = diff(letter.X)./dT;

dYdT = diff(letter.Y)./dT;

avgdX = mean(dXdT,"omitnan");

avgdY = mean(dYdT,"omitnan");

% Correlation

corrXY = corr(letter.X,letter.Y,"rows","complete");

% Put it all together into a table

featurenames = ["AspectRatio","NumMinX","NumMinY","AvgU","AvgV","CorrXY"];

feat = table(aratio,numXmin,numYmax,avgdX,avgdY,corrXY,'VariableNames',featurenames);

end

# Try Different Classification Models

Instructions are in the task pane to the left. Complete and submit each task one at a time.

Do not edit. This code loads and plots the data.

load letterdata.mat

traindata

traindata = 2906×26 table

|  | **AspectRatio** | **MADX** | **MADY** | **AvgU** | **MADU** | **AvgV** | **MADV** | **CorrXY** | **CorrXP** | **CorrXU** | **CorrXV** | **CorrYP** | **CorrYU** | **CorrYV** | **CorrPU** | **CorrPV** | **CorrUV** | **NumXMin** | **NumXMax** | **NumYMin** | **NumYMax** | **NumUMin** | **NumUMax** | **NumVMin** | **NumVMax** | **Character** |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **1** | 1.566666666666666 | 0.155515233386831 | 0.336313784929654 | 0.375629749176785 | 1.356955291449102 | -0.834791159714693 | 3.536352129032878 | -0.143943215070704 | -0.241943944979169 | 0.489190049231356 | 0.398785998787002 | 0.059255554751418 | -0.753907309152895 | 0.452733005396064 | -0.158674905928219 | -0.023781488845678 | 0.164114779118796 | 1 | 1 | 1 | 2 | 2 | 2 | 2 | 2 | A |
| **2** | 3.679012345679014 | 0.151472155234306 | 0.598794174384228 | 0.115518061859597 | 0.896651387683114 | -1.737334042446258 | 3.166493339486913 | -0.415115748092513 | 0.467391545338845 | 0.102332293719049 | 0.026030131140846 | -0.566821376806246 | 0.195254602621443 | 0.054540847248741 | 0.249538274222553 | -0.185783649543451 | 0.367232549930493 | 0 | 1 | 1 | 2 | 1 | 1 | 2 | 1 | B |
| **3** | 1.866666666666670 | 0.223734127835238 | 0.515178853324436 | 0.077192081229682 | 1.725724776447386 | -1.318271674335405 | 1.681208153383196 | 0.189991672839288 | -0.800096589750624 | 0.596185815624314 | 0.945232977382946 | -0.106096297757145 | -0.513204233059225 | 0.326348068135355 | -0.583473758818426 | -0.672122834565983 | 0.390232381271942 | 1 | 0 | 0 | 1 | 1 | 1 | 1 | 1 | C |
| **4** | 2.047619047619046 | 0.183839713491210 | 0.312862534367305 | 0.350000172229654 | 1.251323300301837 | -0.370601952342210 | 3.586774085887461 | 0.512998808888989 | 0.001919103533622 | 0.274517345044628 | 0.212845252724828 | 0.408700796387389 | -0.402359476356668 | 0.237025785671930 | 0.077936075919498 | 0.093178372192167 | 0.336559764707214 | 1 | 0 | 1 | 2 | 2 | 1 | 2 | 1 | D |
| **5** | 4.454545454545453 | 0.149509757641866 | 0.654045860414259 | 0.515190677306067 | 0.480955827298621 | -2.297276994562864 | 3.198968990793958 | -0.537026854445254 | 0.025278012411143 | 0.689939462431174 | 0.121118489068579 | -0.477627961053532 | -0.316415475399855 | 0.131438569863249 | 0.325871251533507 | 0.287507907601788 | 0.636593233766675 | 0 | 0 | 1 | 1 | 0 | 1 | 2 | 1 | H |
| **6** | 5.897435897435892 | 0.097382877431199 | 0.734385570305529 | 0.282262770170575 | 0.939392113971417 | -1.452040286051057 | 3.175526013521721 | -0.207870128764534 | -0.420809150524201 | 0.710549877804024 | 0.499743067556179 | -0.385200381719274 | -0.836928862817579 | 0.409957706916606 | -0.035783613711059 | -0.799449563295921 | -0.092705428037437 | 0 | 1 | 1 | 0 | 2 | 1 | 1 | 1 | I |
| **7** | 3.353535353535354 | 0.117965893475964 | 0.513097703751441 | 0.276176657953536 | 1.223728309800000 | -1.775041598928962 | 3.311261227550622 | 0.144840842744430 | -0.325226391478132 | 0.352959857927636 | 0.263926326274419 | -0.467683154473443 | -0.250832021542724 | -0.080744161571284 | -0.143587893074235 | 0.023581281892303 | 0.830754725704409 | 2 | 1 | 1 | 1 | 2 | 1 | 2 | 1 | K |
| **8** | 4.999999999999996 | 0.145620476312486 | 0.633322545479107 | 0.383926190674598 | 0.744284114509516 | -0.573976372160595 | 4.199993234702343 | 0.679916426882011 | 0.611709079377653 | 0.211256784606219 | 0.242617824211643 | 0.837228293326089 | -0.205596089116913 | 0.570860817050901 | -0.518428042106225 | 0.223465779062681 | 0.510864194273193 | 1 | 1 | 0 | 1 | 1 | 1 | 1 | 1 | L |
| **9** | 1.655172413793104 | 0.270575508533960 | 0.369923126689901 | 0.734773970513414 | 0.714004250265529 | -1.555710778423304 | 3.879731061609099 | 0.129059945481231 | 0.137534658429930 | 0.479298903667136 | 0.099990549380945 | -0.017442449718173 | 0.486644857760503 | 0.531641032924525 | 0.392332460377901 | 0.352825093910211 | 0.827131651915599 | 0 | 0 | 1 | 1 | 1 | 2 | 2 | 1 | N |
| **10** | 1.000000000000001 | 0.233884297520661 | 0.302066115702479 | 0.035126463779956 | 2.118325522724521 | 0.066134864439603 | 2.185548293391432 | 0.221240807429258 | -0.048013814789690 | 0.390036648728024 | 0.954408507890786 | -0.564776447061302 | -0.763074286024442 | 0.382602849207107 | 0.467100171309780 | 0.080088795847518 | 0.226298139674199 | 1 | 1 | 1 | 1 | 2 | 1 | 1 | 1 | O |
| **11** | 2.687499999999998 | 0.131917609889382 | 0.433378814619411 | 0.100075888964780 | 1.507028472351723 | -1.243992102039567 | 2.746863813970454 | -0.087345663566209 | -0.354577474099320 | 0.266320430663468 | 0.472389748722477 | -0.148879104660983 | -0.398213670780594 | 0.270392010392602 | -0.107741261666347 | -0.582357427285116 | 0.543406848898267 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 1 | Q |
| **12** | 1.806451612903222 | 0.213606835528107 | 0.356571410467705 | 0.754464339323587 | 0.888278670470307 | 0.550424068100372 | 2.219962124483462 | 0.771891942613180 | -0.251227719500477 | 0.846667180768007 | 0.588192404110842 | -0.640240602093021 | 0.729602835800214 | 0.571007343940115 | -0.170360535205183 | -0.026522605703568 | 0.831958300789829 | 0 | 0 | 1 | 0 | 0 | 1 | 1 | 1 | R |
| **13** | 2.261904761904771 | 0.167708859960811 | 0.544425335547299 | -0.626529495872754 | 1.356858683967437 | -1.534977387250805 | 1.206736947065177 | 0.409206412958063 | 0.092458583799063 | 0.634515139439643 | -0.369232695162064 | -0.172251283442256 | 0.213453982944892 | 0.279099654357155 | 0.291761763817667 | -0.721219881996520 | -0.545823484366422 | 1 | 1 | 0 | 0 | 2 | 1 | 1 | 0 | S |
| **14** | 1.508771929824561 | 0.253283448449179 | 0.384150613424467 | 0.660727431741267 | 0.804946665819343 | -1.350828749612806 | 3.372427054750992 | -0.202464888458361 | 0.243039653761135 | 0.499510059153848 | 0.340395824143318 | -0.303517552303499 | -0.705688479718058 | 0.360323601785492 | -0.016357774424200 | 0.162855688309420 | 0.294648524572968 | 0 | 0 | 1 | 1 | 2 | 1 | 2 | 1 | U |
| **15** | 1.604166666666665 | 0.249055676222306 | 0.420196020146744 | 0.835422703506810 | 0.416811208484924 | -0.006064308315132 | 2.718619680053494 | -0.239840622353237 | 0.347540325126317 | 0.578160272053438 | 0.717385307578529 | -0.708972233031744 | -0.569691897287185 | 0.389072771395368 | 0.731393274029195 | -0.147049406758707 | 0.290201846018619 | 0 | 0 | 1 | 0 | 0 | 1 | 1 | 1 | V |
| **16** | 1.021276595744681 | 0.336167639273466 | 0.311600061512129 | 1.040774036477780 | 0.608506599973280 | 0.136079664004742 | 2.678522785871374 | 0.042819689729790 | 0.134634621313915 | 0.424876696617163 | 0.659723453932673 | -0.797549900670450 | -0.632532205044125 | 0.290430155646504 | 0.719191199133372 | -0.075245788475246 | 0.378806437618107 | 0 | 0 | 2 | 1 | 1 | 2 | 2 | 2 | W |
| **17** | 2.074074074074075 | 0.240585400680540 | 0.472649117339505 | 0.806012489124643 | 2.397669437629807 | -4.927240346158849 | 3.792643215906760 | -0.122198675009153 | 0.071884665201135 | -0.149551517266688 | 0.377355269492827 | -0.110387593933125 | -0.134527536945973 | 0.353453529750942 | 0.377487442667081 | -0.620049526425803 | -0.417818790085665 | 0 | 1 | 1 | 1 | 1 | 1 | 2 | 1 | X |
| **18** | 3.133333333333324 | 0.207612201170585 | 0.477054265531315 | 0.118780397701911 | 1.125815328462553 | -2.073557563047639 | 2.910065470840567 | -0.069248897780999 | 0.684452458239446 | 0.064002586906120 | 0.090697284069524 | -0.201561831504081 | 0.546495293366640 | 0.383413093660461 | 0.011219698630232 | -0.169726454870872 | 0.492140742436315 | 0 | 2 | 1 | 1 | 2 | 2 | 2 | 1 | Y |
| **19** | 1.125925925925925 | 0.161232485740442 | 0.295272077175268 | 0.457872931260248 | 1.640355383907492 | -0.745064192770700 | 3.552076884481862 | -0.116075999904264 | 0.282649111966249 | 0.365859232356374 | 0.489052223197011 | -0.253607306363421 | -0.862474369817157 | 0.115086428472004 | 0.512829011617653 | 0.041318413299865 | 0.097110006322277 | 1 | 0 | 2 | 2 | 6 | 6 | 2 | 2 | A |
| **20** | 2.208333333333331 | 0.174571257896117 | 0.337716965063991 | 0.150291134841290 | 1.393626712091991 | -1.610042154723151 | 2.369922329350542 | -0.320518569813002 | 0.601023762359692 | -0.030602136524037 | -0.020101088338274 | -0.784639487123356 | 0.487531254398284 | -0.382419003274952 | -0.307572260874843 | 0.377090404610597 | 0.169046181304079 | 0 | 1 | 1 | 1 | 3 | 3 | 5 | 4 | B |
| **21** | 1.466666666666666 | 0.223574284589589 | 0.432862253655513 | 0.378872979180279 | 1.749404674147533 | -1.469525602554054 | 1.646694731877185 | -0.221784610064806 | -0.128550662647699 | 0.385826430132123 | 0.904420458418923 | -0.423944586356305 | -0.963449437235073 | -0.186438020345839 | 0.722453941802193 | 0.418189750661114 | 0.307024994888540 | 1 | 0 | 1 | 1 | 2 | 2 | 4 | 3 | C |
| **22** | 1.154471544715446 | 0.245475992212409 | 0.298131482614961 | 0.764572467288789 | 2.535865945628735 | -0.559053343786189 | 2.196865286725719 | 0.019139503561415 | 0.170863033353222 | 0.176385593357857 | 0.864089794885347 | -0.026641313522654 | -0.850933856089565 | 0.230656584309032 | 0.441393839921319 | 0.128389690584364 | 0.236456338079954 | 1 | 1 | 0 | 1 | 2 | 3 | 1 | 1 | E |
| **23** | 2.399999999999991 | 0.131492538883842 | 0.371942352611190 | 1.455164788506885 | 1.363881953058398 | 3.355824211549995 | 3.882785962083962 | 0.459332011376560 | 0.038132190304100 | 0.297723040640663 | -0.644988044793049 | 0.386402560928577 | 0.614357970182158 | -0.416992789696703 | -0.092530872850015 | 0.298561990538483 | -0.725256771535046 | 2 | 1 | 1 | 1 | 6 | 6 | 7 | 8 | F |
| **24** | 1.446540880503146 | 0.151932162511580 | 0.262733339217207 | 0.827255437693426 | 1.677040040017937 | -0.759241779135059 | 3.323807186515991 | -0.191036813599387 | 0.343920306758516 | 0.266828093318826 | 0.441454622649993 | -0.540862322314208 | -0.150774699978233 | -0.190999013095105 | 0.475545063780265 | 0.519043125380779 | 0.507243663306071 | 2 | 1 | 2 | 2 | 1 | 2 | 3 | 3 | G |
| **25** | 2.438095238095238 | 0.191879706171264 | 0.412745056245122 | 0.790509914842472 | 0.494313491666157 | -1.777533113019639 | 3.220299574521236 | -0.571945770116079 | 0.320712438186435 | 0.222656568836222 | -0.002750921178008 | -0.573637530062704 | 0.515402865659446 | -0.094707702166980 | -0.115902468006066 | -0.001344194860107 | -0.002728181246144 | 0 | 0 | 1 | 1 | 1 | 2 | 3 | 2 | H |
| **26** | 21.066666666666645 | 0.058873946569112 | 1.396391315554901 | 0.585511574273856 | 0.434817898290946 | -9.051541117437473 | 5.701776559002814 | -0.882260678867026 | 0.440997465576383 | 0.320364665107963 | 0.177548997704464 | -0.596811126349163 | -0.228865882090275 | 0.200744472113783 | 0.592361777399915 | -0.400484950726824 | -0.196072727657039 | 0 | 1 | 1 | 2 | 3 | 3 | 3 | 2 | I |
| **27** | 2.504504504504505 | 0.182051630131244 | 0.503869727522725 | -0.502640303747428 | 0.875153752571012 | -1.414548057687065 | 2.103044275948978 | 0.354215139428512 | -0.089315847833107 | 0.438479906435711 | -0.914616991794815 | -0.796064062189508 | 0.834030201034813 | -0.533191912588112 | -0.712704450029126 | 0.423021205333541 | -0.693876724626283 | 0 | 1 | 1 | 0 | 2 | 2 | 1 | 0 | J |
| **28** | 2.407407407407405 | 0.238155308438772 | 0.439984152526167 | 1.327316885963814 | 1.126412499125898 | -4.504368488924927 | 6.908125641779832 | 0.077460402744392 | 0.232007500541300 | 0.796341907159764 | 0.644390919614153 | -0.243797692852259 | 0.167818347663444 | 0.430857565681301 | 0.027902278931888 | 0.031644258332827 | 0.751866456811742 | 1 | 1 | 1 | 1 | 2 | 3 | 2 | 1 | K |
| **29** | 45.666666666668320 | 0.042703841493391 | 2.385934416700374 | -0.077619457908827 | 0.331403105832211 | -7.526306711234086 | 5.637518362219889 | 0.587503328817250 | -0.368407918694848 | 0.077515517334518 | -0.380255381080283 | -0.522921492890653 | -0.256554846028255 | -0.463701424767184 | -0.378638494657956 | -0.385723606227222 | 0.623092201198444 | 0 | 1 | 1 | 1 | 2 | 2 | 2 | 1 | L |
| **30** | 2.283333333333334 | 0.262330305985658 | 0.457230816151090 | 0.714066918862640 | 0.913213394319879 | -1.696704437524700 | 3.937475865801729 | -0.458183212211660 | 0.552671276083271 | 0.166297924749814 | -0.413887452497380 | -0.486923519225192 | 0.767454057087176 | 0.141438570470262 | -0.163804109959848 | -0.019176038474483 | 0.003178006075378 | 0 | 0 | 1 | 1 | 2 | 2 | 2 | 1 | N |
| **31** | 1.293333333333334 | 0.186497316464864 | 0.310695933250565 | -0.101777095458027 | 1.857977305831617 | 0.202029076118327 | 2.561856682559953 | 0.077709344414865 | 0.305145588858066 | 0.168538941497299 | 0.942492847812878 | -0.242689482696548 | -0.880377572403036 | 0.203601419477639 | 0.001165935164582 | 0.303664264783761 | 0.115022336989538 | 1 | 1 | 1 | 1 | 2 | 1 | 1 | 2 | O |
| **32** | 3.733333333333347 | 0.125000290588748 | 0.481520930156774 | 0.023440273719689 | 1.139587520857439 | -0.837870411508803 | 4.881852936011995 | 0.438090219381232 | 0.297011530816920 | 0.046677018163963 | -0.331463302061951 | -0.335014339889531 | 0.486260495854340 | 0.037724162952959 | -0.101370410440186 | 0.233691997437165 | 0.260097978158243 | 1 | 1 | 1 | 1 | 4 | 4 | 2 | 1 | P |
| **33** | 1.676190476190476 | 0.256353400486788 | 0.384728265691907 | 0.740567776144548 | 0.803383256062800 | 0.425322922668722 | 2.480252098624902 | 0.088369904612187 | 0.595833213687203 | -0.393919800533430 | 0.974301731178556 | -0.433790790257149 | -0.963348402269736 | 0.373025442467401 | 0.045742630294363 | 0.471526871328429 | -0.394723837386685 | 0 | 1 | 1 | 0 | 1 | 1 | 1 | 1 | U |
| **34** | 2.451612903225804 | 0.185514085674257 | 0.505829294350135 | 0.766949687306688 | 0.411520425353534 | 0.459445193126649 | 3.535167298519970 | 0.110033794169690 | 0.571144124115831 | -0.307893405998757 | 0.687930570326662 | -0.403182815657163 | -0.178336767699268 | 0.307751321941257 | -0.032405772974852 | 0.466006493562064 | -0.295737331355610 | 0 | 0 | 1 | 0 | 2 | 3 | 1 | 1 | V |
| **35** | 1.298245614035088 | 0.243105572110455 | 0.314833095292798 | 0.933449215502619 | 0.325743575787980 | -0.194607446637500 | 4.092023813663753 | 0.081496411851293 | 0.512941496839542 | 0.199132719112408 | 0.583751616852879 | -0.465082124530635 | -0.600440076853297 | 0.272262944033097 | 0.422369840248854 | 0.357822654796443 | -0.154213390833733 | 0 | 0 | 2 | 1 | 2 | 3 | 2 | 2 | W |
| **36** | 1.401360544217686 | 0.197707543313231 | 0.232853499892464 | 1.808893701884356 | 5.485840659237375 | -2.815520952169692 | 4.845582714598156 | -0.140076794179745 | 0.289183289841701 | 0.460709670183155 | 0.082105586965972 | -0.138957083541232 | 0.084968946621162 | 0.078418949994457 | 0.336985275638128 | -0.268030608214134 | 0.632686428645303 | 2 | 3 | 1 | 2 | 3 | 3 | 2 | 1 | Z |
| **37** | 1.060606060606061 | 0.247358850505284 | 0.324037243664035 | 0.722264468152127 | 1.235738684032295 | -1.204714114809140 | 3.686179931658546 | -0.338950079751561 | 0.421463643269954 | 0.466153514580117 | 0.401454921483006 | -0.374376593352820 | -0.704404080068226 | 0.244714713848493 | 0.440968006720109 | -0.200681858129271 | 0.328855287437124 | 1 | 0 | 2 | 2 | 2 | 2 | 2 | 1 | A |
| **38** | 1.225225225225226 | 0.183126660016785 | 0.367660054321764 | 0.515599612768149 | 1.362666831179407 | -1.000173521392588 | 3.214162969232842 | -0.210139355662289 | -0.072485743887030 | 0.558289588673060 | 0.395011679550111 | -0.300698287835146 | -0.738725709367945 | 0.342713037452632 | 0.146288282304330 | -0.281701829236096 | 0.329549660876768 | 1 | 0 | 2 | 2 | 2 | 2 | 2 | 1 | A |
| **39** | 2.071428571428572 | 0.189493181939905 | 0.382146102684003 | 0.255727244858175 | 1.348565468472086 | -1.429674780261135 | 3.082943034439084 | -0.404896925369703 | 0.609072321357561 | 0.041217816730853 | -0.156415900316311 | -0.625763550731173 | 0.586579963084135 | -0.168591830527634 | -0.160014450162801 | 0.346255797097406 | 0.068906784109277 | 0 | 1 | 2 | 1 | 2 | 2 | 2 | 1 | B |
| **40** | 2.608695652173917 | 0.175815339890870 | 0.482370555737271 | 0.192151214945507 | 1.068155871736462 | -2.222145148169977 | 3.430961646815677 | -0.489371978417919 | 0.628224700385917 | 0.043352044709088 | 0.164649956514862 | -0.634268327615193 | 0.444729302995182 | -0.288629490596684 | -0.139645094263086 | 0.065143556703233 | 0.081575271774061 | 0 | 1 | 2 | 1 | 3 | 3 | 2 | 1 | B |
| **41** | 1.296296296296294 | 0.235168819354018 | 0.418510992822159 | -0.231175502321835 | 2.011824067411547 | -0.854262647449830 | 1.641996723692459 | -0.029210755516780 | -0.370368168027053 | 0.197171293879065 | 0.892922924169890 | -0.304877158211517 | -0.811802380360337 | 0.022660036055855 | 0.441200380217051 | -0.166598361210505 | 0.290279434759755 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | C |
| **42** | 2.948717948717937 | 0.140410830380867 | 0.394205521664824 | 0.203515335077971 | 1.186492182985977 | -0.279428305288947 | 4.091157269815028 | 0.569415308424643 | -0.092441860130383 | 0.209210666093093 | 0.407012258307381 | 0.277431273004683 | -0.490142086547318 | 0.215502205888492 | 0.020194257741912 | -0.342622968502346 | 0.273501551731641 | 2 | 1 | 1 | 2 | 2 | 1 | 2 | 1 | D |
| **43** | 1.604166666666665 | 0.204434990933928 | 0.303211667587965 | 0.656022252215278 | 1.676084613644518 | -0.184135493061476 | 2.601062422634013 | -0.071809791640742 | 0.056171781404160 | 0.334484236658017 | 0.763005231315724 | -0.074177934690259 | -0.730375481712495 | 0.185777920761212 | 0.217889508228134 | -0.409737603362855 | 0.392488232605128 | 1 | 1 | 1 | 1 | 1 | 2 | 1 | 2 | E |
| **44** | 1.634408602150537 | 0.198091600557406 | 0.340461724797028 | 0.483113517526588 | 1.518052335926831 | -0.231521082383112 | 2.359178163724720 | -0.209832597847373 | -0.152037829323099 | 0.343079474118256 | 0.710572612158372 | 0.119815405886411 | -0.764032003827529 | 0.228981939799462 | 0.155921653805356 | -0.459168512560533 | 0.167605366285554 | 1 | 1 | 1 | 1 | 1 | 2 | 1 | 2 | E |
| **45** | 2.410256410256411 | 0.134413609710384 | 0.392496884137295 | 0.597349917680204 | 1.630985007336797 | -1.972590156218774 | 2.707739686999521 | 0.383395057708805 | 0.042224242690537 | 0.701568582201983 | 0.072634395531843 | -0.417266436188653 | 0.346790918490090 | 0.019930808287663 | -0.410074624385931 | -0.771778479828574 | 0.424851267674702 | 2 | 0 | 1 | 0 | 1 | 2 | 2 | 2 | F |
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| **47** | 1.370370370370371 | 0.145334211069854 | 0.291166824783979 | 0.600527235347362 | 1.719259712200212 | -0.429165562218592 | 2.505924608867001 | 0.069733144435617 | -0.188836190321328 | 0.433639290811229 | -0.026568169461010 | -0.612511266340575 | 0.052294033906303 | 0.041510240648881 | -0.059817218133159 | -0.176817443733536 | 0.451308333084018 | 2 | 2 | 2 | 2 | 3 | 3 | 2 | 3 | G |
| **48** | 2.416666666666666 | 0.167056102621936 | 0.462047029763772 | 0.657728419454361 | 0.450032685550446 | -1.565534051788810 | 3.287789997692432 | -0.609810785853736 | 0.412107798699852 | 0.628963351114729 | -0.009358347041340 | -0.607837673346578 | 0.102500868956690 | -0.035795843477533 | 0.171034512012567 | 0.137517232444911 | 0.194247094414659 | 0 | 0 | 2 | 1 | 2 | 2 | 2 | 1 | H |
| **49** | 2.114285714285714 | 0.173036542953362 | 0.428035304740156 | 0.739651502781318 | 0.576596836569957 | -1.392202471970425 | 3.314889736982746 | -0.520002122274671 | -0.056402057870995 | 0.773692336962922 | 0.097870776859602 | -0.495186328219851 | 0.044623187487951 | -0.089177305906428 | -0.373692912740810 | 0.080637865260618 | 0.314426521575542 | 0 | 0 | 2 | 1 | 2 | 2 | 2 | 1 | H |
| **50** | 8.814814814814770 | 0.102526329475326 | 0.958991522849057 | 0.389562247380618 | 0.420366533058406 | -1.902959281736265 | 1.850458909179647 | -0.913238073961640 | 0.508890309294955 | 0.082125219019460 | -0.742970401039188 | -0.432099051842664 | -0.087931879206852 | 0.742812797355051 | 0.231493412943254 | -0.584013181236028 | -0.654644232978860 | 0 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | I |
| **51** | 4.179487179487189 | 0.124138730794615 | 0.619261111821821 | -0.611370751378259 | 1.302341325537005 | -2.103783836397531 | 3.944969279625507 | 0.715084292812531 | -0.291275487622231 | 0.436457731119627 | -0.719941508179852 | -0.650541038358863 | 0.530594171578886 | 0.023320616896376 | -0.453557449061778 | -0.263376574700550 | -0.178114311042764 | 1 | 0 | 1 | 0 | 3 | 3 | 1 | 1 | J |
| **52** | 4.694444444444440 | 0.103540058557359 | 0.718702865761689 | -0.583444250394714 | 1.050128601588706 | -3.071026180588633 | 5.027472593921170 | 0.625120837574518 | -0.133898434721880 | 0.600764287538705 | -0.626687093668245 | -0.625965082621709 | 0.621130892734598 | -0.003789153821317 | -0.440889116018752 | -0.452571985651657 | -0.314575809884390 | 1 | 0 | 1 | 0 | 2 | 2 | 1 | 1 | J |
| **53** | 2.482758620689649 | 0.222169077658196 | 0.431102006496347 | 0.164790878400615 | 1.568567185542397 | -3.566517905829680 | 2.224783624400851 | -0.268848162483864 | -0.126436592964107 | 0.345430920798138 | 0.556400192229607 | -0.266322907236675 | -0.322870810042173 | 0.045715936576301 | 0.228686050112153 | -0.370380397770888 | 0.204998593002993 | 1 | 1 | 1 | 1 | 2 | 3 | 3 | 2 | K |
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| **56** | 1.148148148148147 | 0.245593822436154 | 0.299260620672202 | 0.919599337067703 | 0.819914907872302 | -1.055519504830522 | 3.635625261601847 | -0.351194975480769 | 0.609841829563019 | 0.344574920853586 | -0.077716283998322 | -0.294371898862808 | 0.799089057228409 | 0.405948068932135 | 0.224095564515916 | 0.126404505667291 | 0.629762313418689 | 0 | 0 | 2 | 3 | 3 | 2 | 3 | 2 | M |
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| **61** | 3.204301075268818 | 0.115354725547767 | 0.480774468483556 | 0.653246779435089 | 1.159474978040109 | -2.487249007512665 | 3.397036249184721 | -0.304752964892043 | 0.299670399831689 | 0.242204156950801 | -0.636168867912888 | -0.309115504946159 | 0.331474483038739 | 0.424968556879967 | 0.038992771682409 | -0.787149549757492 | 0.031913371755810 | 1 | 2 | 1 | 1 | 1 | 2 | 3 | 2 | P |
| **62** | 3.714285714285718 | 0.110535098100503 | 0.401658296388096 | 0.448939783356290 | 1.298364662398437 | -2.806290387116296 | 3.133457907703372 | 0.260297243557904 | 0.472370564166182 | 0.010198191483335 | -0.231249908870940 | 0.065541371159570 | 0.470885046378334 | 0.666654420014935 | 0.014952323573827 | -0.598387689251347 | 0.552723388463918 | 1 | 1 | 1 | 1 | 2 | 2 | 3 | 2 | P |
| **63** | 1.772727272727271 | 0.156906748161329 | 0.373414120624244 | 0.387707472728779 | 1.027044656366145 | 0.015142156540729 | 3.003193660323014 | -0.026550615283069 | 0.238339886783516 | 0.638141480677806 | 0.516321130472575 | -0.646055359034367 | -0.239031311603988 | 0.258834175731989 | 0.653200626262779 | 0.069719606903701 | 0.448619731382745 | 1 | 0 | 2 | 2 | 2 | 2 | 2 | 2 | Q |
| **64** | 2.294117647058819 | 0.151635579070357 | 0.408628928344973 | 0.593709979564673 | 0.807797673219693 | -0.135229282761005 | 3.186047325077921 | 0.114778446694811 | 0.061832350896146 | 0.570339508226907 | 0.537816711034956 | -0.654526161540861 | 0.106094246910314 | 0.232650196734049 | 0.287965033532966 | 0.116885252772281 | 0.807835930711091 | 1 | 0 | 1 | 1 | 1 | 2 | 2 | 2 | Q |
| **65** | 1.401709401709403 | 0.253174756742518 | 0.339428067046334 | 0.908920022786919 | 1.515215865407990 | 0.206855929604620 | 2.490454610641204 | 0.458109276214139 | 0.261621459095467 | 0.228956152575451 | -0.007621266547108 | -0.416987349101880 | 0.607430508045051 | 0.205621842044005 | 0.192706919029223 | 0.459502160998690 | 0.601214751239215 | 1 | 1 | 1 | 1 | 1 | 2 | 1 | 1 | R |
| **66** | 1.548387096774186 | 0.234234502641029 | 0.433290367906588 | -0.752634438349254 | 1.877204189541886 | -0.791482528680137 | 1.612377913601032 | 0.366243776131016 | -0.156078711892754 | 0.348632144184136 | -0.067056835835190 | -0.359541027786277 | 0.081618104337730 | 0.216484816714337 | -0.327473293952588 | -0.515025255304812 | -0.377220592208131 | 1 | 1 | 1 | 1 | 2 | 1 | 1 | 1 | S |
| **67** | 1.809523809523804 | 0.191427905208888 | 0.340280072067771 | 1.340787747185537 | 2.043115820898420 | -1.527525276353615 | 2.973317536722873 | 0.019885388365103 | 0.019613596119722 | 0.188499555563544 | 0.438381437232127 | -0.705716893784905 | -0.086701024520938 | 0.103629115876389 | -0.173168536211013 | -0.540552910735036 | 0.613769237016760 | 2 | 1 | 1 | 0 | 2 | 2 | 1 | 1 | T |
| **68** | 1.894736842105258 | 0.188170466901548 | 0.311552231182244 | 1.710514605192698 | 2.113440846861306 | -1.644434254814832 | 3.488919585832570 | -0.084869658143438 | -0.027642886054581 | 0.466204111331889 | 0.669324717991408 | -0.623102074351083 | -0.325372714254974 | 0.097573609517310 | -0.262722588516677 | -0.582412045000101 | 0.719920566108836 | 2 | 1 | 1 | 0 | 2 | 2 | 2 | 2 | T |
| **69** | 1.084967320261438 | 0.263541814024249 | 0.337019781696248 | 0.971174079995205 | 0.937349473640383 | -0.693207770642621 | 3.285906590485510 | -0.476065843420935 | 0.465690882875302 | 0.283297086479630 | 0.412825398381499 | -0.499183010054322 | -0.880751951171054 | 0.221468595441411 | 0.454091671539879 | -0.154196457555939 | -0.042927123805295 | 0 | 0 | 2 | 1 | 1 | 2 | 2 | 2 | U |
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| **71** | 1.485714285714285 | 0.286637500715682 | 0.341034279761141 | 0.842799892455910 | 0.881568045964400 | 0.235956859820498 | 2.776259350950672 | 0.057952785734032 | 0.439165144090926 | -0.028931733107894 | 0.609628901481634 | -0.484755439313464 | -0.849103548985514 | 0.456502202407661 | 0.384590829594097 | -0.049334559093430 | -0.290366084989461 | 0 | 0 | 2 | 2 | 3 | 3 | 3 | 3 | W |
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| **74** | 1.229629629629629 | 0.201730395673328 | 0.331854850932791 | 0.208158509219144 | 2.126403588173324 | -2.764716022612010 | 1.647471967816079 | 0.090808557753975 | -0.105865575257040 | 0.499248798412564 | 0.155245266339583 | -0.349718401500838 | 0.104817573812728 | 0.209103112315137 | -0.449418710398865 | -0.868223499677496 | 0.729409196010111 | 2 | 2 | 1 | 2 | 2 | 2 | 2 | 1 | X |
| **75** | 2.299999999999998 | 0.162063524139922 | 0.399004235983468 | 0.238813833199692 | 1.674750008027677 | -0.749524055993633 | 2.942571183525878 | 0.327266181502557 | -0.010731379616690 | 0.323424431824611 | -0.369651759851089 | -0.740791487634302 | 0.514512756212105 | 0.056733751940502 | -0.384469927841225 | -0.163366850128865 | 0.487580460099538 | 1 | 2 | 2 | 1 | 2 | 3 | 3 | 2 | Y |
| **76** | 2.533333333333337 | 0.183811095291645 | 0.502778538952162 | 0.398110877516691 | 1.477919604855578 | -1.290037044670441 | 3.175702131662768 | -0.152190358492909 | 0.410866184891107 | 0.162166043690710 | -0.307635798297757 | -0.550575620643146 | 0.404713467114065 | -0.109253874307174 | -0.468116964909410 | -0.225758212665428 | 0.184480654949336 | 1 | 1 | 2 | 1 | 2 | 2 | 2 | 2 | Y |
| **77** | 1.163120567375887 | 0.266332118029216 | 0.423639392420742 | 0.886761815773809 | 2.546435396549547 | -1.099670459034723 | 1.725420860396057 | 0.148271510182509 | 0.030667327118397 | 0.292279226444997 | 0.178689016990449 | -0.759154591102179 | 0.211804708048422 | 0.221209343646126 | -0.420945352060624 | -0.378227330973156 | 0.873652395330527 | 1 | 1 | 1 | 1 | 2 | 3 | 2 | 1 | Z |
| **78** | 1.648148148148150 | 0.211864918838388 | 0.350294776904523 | 0.643303743816077 | 1.458688326325155 | -1.411187494620173 | 3.347191566117082 | -0.270965462971616 | 0.722495707958774 | 0.009622185916136 | 0.478186266859499 | -0.269231211871541 | -0.585829662162727 | 0.163063855218911 | 0.209526494791575 | 0.325982730876632 | 0.175949635310939 | 3 | 1 | 1 | 2 | 4 | 4 | 4 | 3 | A |
| **79** | 1.891891891891891 | 0.173460216487357 | 0.395270021882374 | 0.252534217154834 | 1.404106654972124 | -1.681314135706923 | 3.132063329034976 | -0.248379568102450 | 0.529616362898263 | 0.005436565832674 | -0.255751046437935 | -0.705107302149706 | 0.457402794500832 | -0.127224894304164 | 0.075971528940003 | 0.338719790341221 | 0.323659828332062 | 0 | 1 | 2 | 1 | 4 | 4 | 4 | 3 | B |
| **80** | 1.677419354838705 | 0.226076872321664 | 0.484724141503229 | 0.316599304608897 | 1.573514556894933 | -1.522922068901992 | 1.287416036278973 | -0.262712844095825 | -0.002737433543938 | 0.295241230959336 | 0.936656701829368 | -0.809680346622578 | -0.872543312999112 | 0.013921186468364 | 0.787050526739963 | -0.072737618819543 | 0.114258540436664 | 1 | 0 | 0 | 0 | 1 | 1 | 2 | 2 | C |
| **81** | 2.888888888888886 | 0.112621379102990 | 0.426247204748278 | 0.045079181660014 | 1.422251998660605 | -0.893659491313014 | 4.215467307593162 | 0.201555611845796 | 0.091085280303011 | 0.068020303754631 | 0.444406249905199 | 0.115469775805697 | -0.423236693122513 | 0.173360939482663 | 0.706555153668399 | 0.143848521875275 | 0.103539153406679 | 3 | 1 | 1 | 2 | 7 | 7 | 5 | 4 | D |
| **82** | 2.044444444444441 | 0.144310589935222 | 0.299256356607072 | 0.821351437298958 | 1.815905961160305 | -1.502938275583500 | 3.144760237119100 | 0.342531121029543 | 0.090778242736825 | -0.641618546623758 | 0.098662171857152 | -0.216812856559599 | -0.439384656114088 | 0.232147631498113 | 0.312643892048306 | -0.605500243206739 | 0.135744889671588 | 1 | 0 | 1 | 1 | 2 | 2 | 4 | 4 | F |
| **83** | 1.333333333333333 | 0.302690088469281 | 0.319572131177155 | 1.141344290848191 | 0.934084030037120 | -1.855527566249815 | 3.286986600802241 | -0.456496227559648 | 0.284756917359748 | 0.209903680482045 | -0.015108123723933 | -0.482155027770089 | 0.562142960716495 | -0.162251484069428 | 0.265487309886717 | 0.483723023101207 | 0.291916618302677 | 0 | 0 | 1 | 1 | 5 | 4 | 2 | 1 | H |
| **84** | 5.128205128205138 | 0.153656620285502 | 0.635706045828951 | -1.152024300121530 | 1.175140972398088 | -2.832028970134404 | 5.277414919303292 | 0.582827003368676 | -0.448775753700991 | 0.259939809191705 | -0.875668601036793 | -0.822350415411885 | 0.752530917462053 | -0.309868194011524 | -0.613942616030829 | 0.423242075728070 | -0.170319026042040 | 1 | 0 | 1 | 0 | 4 | 4 | 2 | 2 | J |
| **85** | 7.666666666666659 | 0.123334078059299 | 0.968082428113522 | 0.054976834673228 | 0.723800828925134 | -3.331937503064790 | 2.132538797023756 | -0.709748675349447 | 0.648793641493506 | 0.150633578301751 | 0.086944322115557 | -0.719973266316451 | 0.293823107952315 | -0.365935991632367 | 0.091319151683342 | -0.198995099914649 | -0.818001389972982 | 0 | 1 | 0 | 0 | 2 | 2 | 4 | 3 | L |
| **86** | 1.170068027210882 | 0.269786955064882 | 0.290551288815723 | 0.883407103527179 | 1.301311276528744 | -1.002802239703253 | 4.457966871949441 | -0.064405993596360 | 0.381563178830147 | 0.157272789184735 | -0.299087307276957 | -0.036791534812193 | 0.814198253905091 | 0.268250892540407 | 0.420047983103912 | 0.281505385480750 | 0.664727340888572 | 1 | 1 | 2 | 2 | 3 | 2 | 3 | 2 | M |
| **87** | 2.072072072072072 | 0.133808232213783 | 0.499947363666046 | 0.448005286454019 | 1.195224970679874 | -1.515939859130160 | 2.781078772031986 | -0.620227159647497 | 0.232163223837564 | 0.247499609985668 | 0.377782348498416 | -0.409673286022854 | -0.412246390657218 | -0.035230311723585 | 0.702741685687016 | 0.134202273996633 | 0.470555864847095 | 1 | 0 | 2 | 1 | 4 | 4 | 3 | 2 | Q |
| **88** | 2.181818181818189 | 0.224294694402889 | 0.446792752589989 | 0.748000771733072 | 0.805845982614522 | -0.194624023577598 | 3.722272366740442 | 0.558648468379817 | 0.249312319348869 | 0.392409449102012 | 0.088424407997900 | -0.336721314105133 | 0.655421735963079 | 0.066250483516099 | 0.293550307861059 | 0.495127547770638 | 0.383018768405273 | 0 | 0 | 1 | 1 | 2 | 2 | 2 | 1 | R |
| **89** | 2.266666666666663 | 0.194508829379442 | 0.544553114875736 | -0.638025559019206 | 1.976660705228237 | -1.175602308588382 | 2.012575299281477 | -0.120730752932270 | -0.327524923666456 | 0.246604660202139 | -0.183741821949377 | -0.379060619892676 | -0.088136481266160 | 0.136150279620188 | -0.028370604647654 | -0.434268071506768 | -0.650796054036418 | 1 | 1 | 1 | 1 | 3 | 2 | 2 | 2 | S |
| **90** | 2.312500000000011 | 0.105793792756689 | 0.350616358728402 | 0.998452152074676 | 1.600374637520896 | -2.681942826287655 | 2.540266061386298 | 0.206732157336182 | 0.135166509774136 | 0.225466613646434 | 0.226677863027440 | -0.449187875164901 | 0.082541971904493 | -0.208914003804148 | -0.452106466226594 | -0.533546173939208 | 0.717325641205500 | 1 | 0 | 1 | 0 | 3 | 3 | 1 | 0 | T |
| **91** | 1.711111111111112 | 0.258686810581022 | 0.438326301673760 | 1.434001684418373 | 1.110687332800095 | -0.281943157629147 | 3.420556968798150 | -0.158637009694837 | 0.609897585844818 | -0.459244425938080 | 0.765852400362432 | -0.571885461982265 | -0.070889550699537 | 0.071480708863052 | -0.029673814368085 | 0.293292114764512 | -0.608374551521068 | 0 | 0 | 1 | 0 | 5 | 5 | 1 | 1 | V |
| **92** | 0.986111111111110 | 0.310323010299459 | 0.279628042530424 | 1.237246870443527 | 0.778441870564867 | -0.016239382754842 | 3.851240974954482 | 0.159126130561317 | 0.544532853421571 | -0.362385565069143 | 0.388826896747844 | -0.350924076809356 | -0.692200663413759 | 0.200863488041432 | 0.010639051293527 | 0.254151482617619 | 0.175256367726079 | 0 | 0 | 2 | 1 | 4 | 4 | 3 | 2 | W |
| **93** | 1.636363636363636 | 0.217007072350197 | 0.412857771250744 | 1.985316533879896 | 1.233129388327120 | -0.206848576131964 | 3.643288860091749 | -0.240264886543400 | 0.412032951696839 | -0.216241048598910 | -0.091375679489134 | -0.042003133232871 | -0.156853928248258 | 0.123897503390968 | -0.041667171708331 | 0.060709097845413 | -0.783324473632338 | 1 | 1 | 1 | 0 | 5 | 6 | 2 | 2 | X |
| **94** | 1.157894736842106 | 0.256315100498667 | 0.421050315341272 | 0.903017548088148 | 2.695631522951135 | -1.016834863289848 | 1.811221200550380 | 0.111057196449558 | 0.001518430238615 | 0.266703861001443 | 0.652408020372037 | -0.245584919183505 | -0.189056008568014 | 0.055159034640461 | 0.051366659335660 | -0.119724678586007 | 0.818364238738866 | 1 | 1 | 1 | 1 | 1 | 2 | 2 | 2 | Z |
| **95** | 1.290322580645160 | 0.159053887384062 | 0.329800805500233 | 0.450485982884245 | 1.188121584056812 | -0.553322363746253 | 3.161320950987526 | 0.085352579959789 | 0.142365606694361 | 0.558920903404638 | 0.405239082603951 | -0.484732644160786 | -0.689820911284849 | 0.248384354526340 | 0.617868228641498 | -0.160331159348564 | 0.263247059097998 | 1 | 0 | 2 | 2 | 2 | 2 | 2 | 2 | A |
| **96** | 2.393939393939394 | 0.191013726634200 | 0.423072357379442 | 0.145594378178725 | 1.212456306618452 | -1.500430946177751 | 2.461389336652533 | -0.561304804513985 | 0.661474623565695 | 0.066138151865421 | 0.070222553571667 | -0.758605500524837 | 0.292867638197624 | -0.135119921746350 | -0.303088132047207 | 0.044610337991338 | -0.098053680494890 | 0 | 1 | 2 | 1 | 2 | 2 | 2 | 1 | B |
| **97** | 2.799999999999997 | 0.171822995087430 | 0.458099906946634 | 0.159611933522381 | 1.089785604118822 | -1.773037493932014 | 2.573910402577184 | -0.544186716914672 | 0.617490868343102 | 0.049397390471123 | 0.111656186112778 | -0.739984369481573 | 0.384130632839432 | -0.325839398541256 | -0.477661179824474 | 0.380231217997869 | -0.034996340131326 | 0 | 1 | 2 | 1 | 3 | 3 | 2 | 1 | B |
| **98** | 1.809523809523809 | 0.240813716124078 | 0.472637053512857 | -0.339122937754638 | 1.588693791774469 | -1.698586804717878 | 2.197741121267028 | 0.605296500690596 | -0.906484658319956 | 0.352705669480069 | 0.693385837447305 | -0.589596663888047 | -0.579828514136283 | 0.060380091520849 | -0.221128359002001 | -0.558655507860416 | 0.720525654696764 | 1 | 0 | 1 | 1 | 1 | 1 | 2 | 2 | C |
| **99** | 2.701754385964899 | 0.160100788487651 | 0.351593888443470 | 0.155286833581708 | 1.128105636203374 | -0.524013356297423 | 3.780075755147323 | 0.536379124702135 | -0.211531693792665 | 0.336314163079022 | 0.088308044052074 | 0.103470605489600 | -0.007296028600219 | 0.381153296537353 | 0.273174224534070 | -0.323486246755797 | 0.488269490150018 | 1 | 0 | 1 | 2 | 2 | 1 | 1 | 1 | D |
| **100** | 1.644444444444446 | 0.147033968158767 | 0.294835988387576 | 0.285317188912363 | 1.266480945994115 | -0.405104248465344 | 3.162390398895038 | 0.415540096959707 | -0.109399211332866 | 0.426735057614243 | 0.250171806837544 | 0.013365393383067 | -0.263026111534078 | 0.333529314858250 | 0.403511672693751 | -0.190041949508488 | 0.438516729612360 | 1 | 0 | 2 | 1 | 2 | 1 | 2 | 1 | D |
| **⋮** |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |

## **Task 1**

histogram(traindata.Character)

## **Task 2**

boxplot(traindata.MADX,traindata.Character)

## **Further Practice**

classificationLearner

# Make Predictions with a Classification Model

Instructions are in the task pane to the left. Complete and submit each task one at a time.

Do not edit. This code loads the data and fits a kNN model.

load letterdata.mat

traindata

traindata = 2906×26 table

|  | **AspectRatio** | **MADX** | **MADY** | **AvgU** | **MADU** | **AvgV** | **MADV** | **CorrXY** | **CorrXP** | **CorrXU** | **CorrXV** | **CorrYP** | **CorrYU** | **CorrYV** | **CorrPU** | **CorrPV** | **CorrUV** | **NumXMin** | **NumXMax** | **NumYMin** | **NumYMax** | **NumUMin** | **NumUMax** | **NumVMin** | **NumVMax** | **Character** |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **1** | 1.566666666666666 | 0.155515233386831 | 0.336313784929654 | 0.375629749176785 | 1.356955291449102 | -0.834791159714693 | 3.536352129032878 | -0.143943215070704 | -0.241943944979169 | 0.489190049231356 | 0.398785998787002 | 0.059255554751418 | -0.753907309152895 | 0.452733005396064 | -0.158674905928219 | -0.023781488845678 | 0.164114779118796 | 1 | 1 | 1 | 2 | 2 | 2 | 2 | 2 | A |
| **2** | 3.679012345679014 | 0.151472155234306 | 0.598794174384228 | 0.115518061859597 | 0.896651387683114 | -1.737334042446258 | 3.166493339486913 | -0.415115748092513 | 0.467391545338845 | 0.102332293719049 | 0.026030131140846 | -0.566821376806246 | 0.195254602621443 | 0.054540847248741 | 0.249538274222553 | -0.185783649543451 | 0.367232549930493 | 0 | 1 | 1 | 2 | 1 | 1 | 2 | 1 | B |
| **3** | 1.866666666666670 | 0.223734127835238 | 0.515178853324436 | 0.077192081229682 | 1.725724776447386 | -1.318271674335405 | 1.681208153383196 | 0.189991672839288 | -0.800096589750624 | 0.596185815624314 | 0.945232977382946 | -0.106096297757145 | -0.513204233059225 | 0.326348068135355 | -0.583473758818426 | -0.672122834565983 | 0.390232381271942 | 1 | 0 | 0 | 1 | 1 | 1 | 1 | 1 | C |
| **4** | 2.047619047619046 | 0.183839713491210 | 0.312862534367305 | 0.350000172229654 | 1.251323300301837 | -0.370601952342210 | 3.586774085887461 | 0.512998808888989 | 0.001919103533622 | 0.274517345044628 | 0.212845252724828 | 0.408700796387389 | -0.402359476356668 | 0.237025785671930 | 0.077936075919498 | 0.093178372192167 | 0.336559764707214 | 1 | 0 | 1 | 2 | 2 | 1 | 2 | 1 | D |
| **5** | 4.454545454545453 | 0.149509757641866 | 0.654045860414259 | 0.515190677306067 | 0.480955827298621 | -2.297276994562864 | 3.198968990793958 | -0.537026854445254 | 0.025278012411143 | 0.689939462431174 | 0.121118489068579 | -0.477627961053532 | -0.316415475399855 | 0.131438569863249 | 0.325871251533507 | 0.287507907601788 | 0.636593233766675 | 0 | 0 | 1 | 1 | 0 | 1 | 2 | 1 | H |
| **6** | 5.897435897435892 | 0.097382877431199 | 0.734385570305529 | 0.282262770170575 | 0.939392113971417 | -1.452040286051057 | 3.175526013521721 | -0.207870128764534 | -0.420809150524201 | 0.710549877804024 | 0.499743067556179 | -0.385200381719274 | -0.836928862817579 | 0.409957706916606 | -0.035783613711059 | -0.799449563295921 | -0.092705428037437 | 0 | 1 | 1 | 0 | 2 | 1 | 1 | 1 | I |
| **7** | 3.353535353535354 | 0.117965893475964 | 0.513097703751441 | 0.276176657953536 | 1.223728309800000 | -1.775041598928962 | 3.311261227550622 | 0.144840842744430 | -0.325226391478132 | 0.352959857927636 | 0.263926326274419 | -0.467683154473443 | -0.250832021542724 | -0.080744161571284 | -0.143587893074235 | 0.023581281892303 | 0.830754725704409 | 2 | 1 | 1 | 1 | 2 | 1 | 2 | 1 | K |
| **8** | 4.999999999999996 | 0.145620476312486 | 0.633322545479107 | 0.383926190674598 | 0.744284114509516 | -0.573976372160595 | 4.199993234702343 | 0.679916426882011 | 0.611709079377653 | 0.211256784606219 | 0.242617824211643 | 0.837228293326089 | -0.205596089116913 | 0.570860817050901 | -0.518428042106225 | 0.223465779062681 | 0.510864194273193 | 1 | 1 | 0 | 1 | 1 | 1 | 1 | 1 | L |
| **9** | 1.655172413793104 | 0.270575508533960 | 0.369923126689901 | 0.734773970513414 | 0.714004250265529 | -1.555710778423304 | 3.879731061609099 | 0.129059945481231 | 0.137534658429930 | 0.479298903667136 | 0.099990549380945 | -0.017442449718173 | 0.486644857760503 | 0.531641032924525 | 0.392332460377901 | 0.352825093910211 | 0.827131651915599 | 0 | 0 | 1 | 1 | 1 | 2 | 2 | 1 | N |
| **10** | 1.000000000000001 | 0.233884297520661 | 0.302066115702479 | 0.035126463779956 | 2.118325522724521 | 0.066134864439603 | 2.185548293391432 | 0.221240807429258 | -0.048013814789690 | 0.390036648728024 | 0.954408507890786 | -0.564776447061302 | -0.763074286024442 | 0.382602849207107 | 0.467100171309780 | 0.080088795847518 | 0.226298139674199 | 1 | 1 | 1 | 1 | 2 | 1 | 1 | 1 | O |
| **11** | 2.687499999999998 | 0.131917609889382 | 0.433378814619411 | 0.100075888964780 | 1.507028472351723 | -1.243992102039567 | 2.746863813970454 | -0.087345663566209 | -0.354577474099320 | 0.266320430663468 | 0.472389748722477 | -0.148879104660983 | -0.398213670780594 | 0.270392010392602 | -0.107741261666347 | -0.582357427285116 | 0.543406848898267 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 1 | Q |
| **12** | 1.806451612903222 | 0.213606835528107 | 0.356571410467705 | 0.754464339323587 | 0.888278670470307 | 0.550424068100372 | 2.219962124483462 | 0.771891942613180 | -0.251227719500477 | 0.846667180768007 | 0.588192404110842 | -0.640240602093021 | 0.729602835800214 | 0.571007343940115 | -0.170360535205183 | -0.026522605703568 | 0.831958300789829 | 0 | 0 | 1 | 0 | 0 | 1 | 1 | 1 | R |
| **13** | 2.261904761904771 | 0.167708859960811 | 0.544425335547299 | -0.626529495872754 | 1.356858683967437 | -1.534977387250805 | 1.206736947065177 | 0.409206412958063 | 0.092458583799063 | 0.634515139439643 | -0.369232695162064 | -0.172251283442256 | 0.213453982944892 | 0.279099654357155 | 0.291761763817667 | -0.721219881996520 | -0.545823484366422 | 1 | 1 | 0 | 0 | 2 | 1 | 1 | 0 | S |
| **14** | 1.508771929824561 | 0.253283448449179 | 0.384150613424467 | 0.660727431741267 | 0.804946665819343 | -1.350828749612806 | 3.372427054750992 | -0.202464888458361 | 0.243039653761135 | 0.499510059153848 | 0.340395824143318 | -0.303517552303499 | -0.705688479718058 | 0.360323601785492 | -0.016357774424200 | 0.162855688309420 | 0.294648524572968 | 0 | 0 | 1 | 1 | 2 | 1 | 2 | 1 | U |
| **15** | 1.604166666666665 | 0.249055676222306 | 0.420196020146744 | 0.835422703506810 | 0.416811208484924 | -0.006064308315132 | 2.718619680053494 | -0.239840622353237 | 0.347540325126317 | 0.578160272053438 | 0.717385307578529 | -0.708972233031744 | -0.569691897287185 | 0.389072771395368 | 0.731393274029195 | -0.147049406758707 | 0.290201846018619 | 0 | 0 | 1 | 0 | 0 | 1 | 1 | 1 | V |
| **16** | 1.021276595744681 | 0.336167639273466 | 0.311600061512129 | 1.040774036477780 | 0.608506599973280 | 0.136079664004742 | 2.678522785871374 | 0.042819689729790 | 0.134634621313915 | 0.424876696617163 | 0.659723453932673 | -0.797549900670450 | -0.632532205044125 | 0.290430155646504 | 0.719191199133372 | -0.075245788475246 | 0.378806437618107 | 0 | 0 | 2 | 1 | 1 | 2 | 2 | 2 | W |
| **17** | 2.074074074074075 | 0.240585400680540 | 0.472649117339505 | 0.806012489124643 | 2.397669437629807 | -4.927240346158849 | 3.792643215906760 | -0.122198675009153 | 0.071884665201135 | -0.149551517266688 | 0.377355269492827 | -0.110387593933125 | -0.134527536945973 | 0.353453529750942 | 0.377487442667081 | -0.620049526425803 | -0.417818790085665 | 0 | 1 | 1 | 1 | 1 | 1 | 2 | 1 | X |
| **18** | 3.133333333333324 | 0.207612201170585 | 0.477054265531315 | 0.118780397701911 | 1.125815328462553 | -2.073557563047639 | 2.910065470840567 | -0.069248897780999 | 0.684452458239446 | 0.064002586906120 | 0.090697284069524 | -0.201561831504081 | 0.546495293366640 | 0.383413093660461 | 0.011219698630232 | -0.169726454870872 | 0.492140742436315 | 0 | 2 | 1 | 1 | 2 | 2 | 2 | 1 | Y |
| **19** | 1.125925925925925 | 0.161232485740442 | 0.295272077175268 | 0.457872931260248 | 1.640355383907492 | -0.745064192770700 | 3.552076884481862 | -0.116075999904264 | 0.282649111966249 | 0.365859232356374 | 0.489052223197011 | -0.253607306363421 | -0.862474369817157 | 0.115086428472004 | 0.512829011617653 | 0.041318413299865 | 0.097110006322277 | 1 | 0 | 2 | 2 | 6 | 6 | 2 | 2 | A |
| **20** | 2.208333333333331 | 0.174571257896117 | 0.337716965063991 | 0.150291134841290 | 1.393626712091991 | -1.610042154723151 | 2.369922329350542 | -0.320518569813002 | 0.601023762359692 | -0.030602136524037 | -0.020101088338274 | -0.784639487123356 | 0.487531254398284 | -0.382419003274952 | -0.307572260874843 | 0.377090404610597 | 0.169046181304079 | 0 | 1 | 1 | 1 | 3 | 3 | 5 | 4 | B |
| **21** | 1.466666666666666 | 0.223574284589589 | 0.432862253655513 | 0.378872979180279 | 1.749404674147533 | -1.469525602554054 | 1.646694731877185 | -0.221784610064806 | -0.128550662647699 | 0.385826430132123 | 0.904420458418923 | -0.423944586356305 | -0.963449437235073 | -0.186438020345839 | 0.722453941802193 | 0.418189750661114 | 0.307024994888540 | 1 | 0 | 1 | 1 | 2 | 2 | 4 | 3 | C |
| **22** | 1.154471544715446 | 0.245475992212409 | 0.298131482614961 | 0.764572467288789 | 2.535865945628735 | -0.559053343786189 | 2.196865286725719 | 0.019139503561415 | 0.170863033353222 | 0.176385593357857 | 0.864089794885347 | -0.026641313522654 | -0.850933856089565 | 0.230656584309032 | 0.441393839921319 | 0.128389690584364 | 0.236456338079954 | 1 | 1 | 0 | 1 | 2 | 3 | 1 | 1 | E |
| **23** | 2.399999999999991 | 0.131492538883842 | 0.371942352611190 | 1.455164788506885 | 1.363881953058398 | 3.355824211549995 | 3.882785962083962 | 0.459332011376560 | 0.038132190304100 | 0.297723040640663 | -0.644988044793049 | 0.386402560928577 | 0.614357970182158 | -0.416992789696703 | -0.092530872850015 | 0.298561990538483 | -0.725256771535046 | 2 | 1 | 1 | 1 | 6 | 6 | 7 | 8 | F |
| **24** | 1.446540880503146 | 0.151932162511580 | 0.262733339217207 | 0.827255437693426 | 1.677040040017937 | -0.759241779135059 | 3.323807186515991 | -0.191036813599387 | 0.343920306758516 | 0.266828093318826 | 0.441454622649993 | -0.540862322314208 | -0.150774699978233 | -0.190999013095105 | 0.475545063780265 | 0.519043125380779 | 0.507243663306071 | 2 | 1 | 2 | 2 | 1 | 2 | 3 | 3 | G |
| **25** | 2.438095238095238 | 0.191879706171264 | 0.412745056245122 | 0.790509914842472 | 0.494313491666157 | -1.777533113019639 | 3.220299574521236 | -0.571945770116079 | 0.320712438186435 | 0.222656568836222 | -0.002750921178008 | -0.573637530062704 | 0.515402865659446 | -0.094707702166980 | -0.115902468006066 | -0.001344194860107 | -0.002728181246144 | 0 | 0 | 1 | 1 | 1 | 2 | 3 | 2 | H |
| **26** | 21.066666666666645 | 0.058873946569112 | 1.396391315554901 | 0.585511574273856 | 0.434817898290946 | -9.051541117437473 | 5.701776559002814 | -0.882260678867026 | 0.440997465576383 | 0.320364665107963 | 0.177548997704464 | -0.596811126349163 | -0.228865882090275 | 0.200744472113783 | 0.592361777399915 | -0.400484950726824 | -0.196072727657039 | 0 | 1 | 1 | 2 | 3 | 3 | 3 | 2 | I |
| **27** | 2.504504504504505 | 0.182051630131244 | 0.503869727522725 | -0.502640303747428 | 0.875153752571012 | -1.414548057687065 | 2.103044275948978 | 0.354215139428512 | -0.089315847833107 | 0.438479906435711 | -0.914616991794815 | -0.796064062189508 | 0.834030201034813 | -0.533191912588112 | -0.712704450029126 | 0.423021205333541 | -0.693876724626283 | 0 | 1 | 1 | 0 | 2 | 2 | 1 | 0 | J |
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| **29** | 45.666666666668320 | 0.042703841493391 | 2.385934416700374 | -0.077619457908827 | 0.331403105832211 | -7.526306711234086 | 5.637518362219889 | 0.587503328817250 | -0.368407918694848 | 0.077515517334518 | -0.380255381080283 | -0.522921492890653 | -0.256554846028255 | -0.463701424767184 | -0.378638494657956 | -0.385723606227222 | 0.623092201198444 | 0 | 1 | 1 | 1 | 2 | 2 | 2 | 1 | L |
| **30** | 2.283333333333334 | 0.262330305985658 | 0.457230816151090 | 0.714066918862640 | 0.913213394319879 | -1.696704437524700 | 3.937475865801729 | -0.458183212211660 | 0.552671276083271 | 0.166297924749814 | -0.413887452497380 | -0.486923519225192 | 0.767454057087176 | 0.141438570470262 | -0.163804109959848 | -0.019176038474483 | 0.003178006075378 | 0 | 0 | 1 | 1 | 2 | 2 | 2 | 1 | N |
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| **32** | 3.733333333333347 | 0.125000290588748 | 0.481520930156774 | 0.023440273719689 | 1.139587520857439 | -0.837870411508803 | 4.881852936011995 | 0.438090219381232 | 0.297011530816920 | 0.046677018163963 | -0.331463302061951 | -0.335014339889531 | 0.486260495854340 | 0.037724162952959 | -0.101370410440186 | 0.233691997437165 | 0.260097978158243 | 1 | 1 | 1 | 1 | 4 | 4 | 2 | 1 | P |
| **33** | 1.676190476190476 | 0.256353400486788 | 0.384728265691907 | 0.740567776144548 | 0.803383256062800 | 0.425322922668722 | 2.480252098624902 | 0.088369904612187 | 0.595833213687203 | -0.393919800533430 | 0.974301731178556 | -0.433790790257149 | -0.963348402269736 | 0.373025442467401 | 0.045742630294363 | 0.471526871328429 | -0.394723837386685 | 0 | 1 | 1 | 0 | 1 | 1 | 1 | 1 | U |
| **34** | 2.451612903225804 | 0.185514085674257 | 0.505829294350135 | 0.766949687306688 | 0.411520425353534 | 0.459445193126649 | 3.535167298519970 | 0.110033794169690 | 0.571144124115831 | -0.307893405998757 | 0.687930570326662 | -0.403182815657163 | -0.178336767699268 | 0.307751321941257 | -0.032405772974852 | 0.466006493562064 | -0.295737331355610 | 0 | 0 | 1 | 0 | 2 | 3 | 1 | 1 | V |
| **35** | 1.298245614035088 | 0.243105572110455 | 0.314833095292798 | 0.933449215502619 | 0.325743575787980 | -0.194607446637500 | 4.092023813663753 | 0.081496411851293 | 0.512941496839542 | 0.199132719112408 | 0.583751616852879 | -0.465082124530635 | -0.600440076853297 | 0.272262944033097 | 0.422369840248854 | 0.357822654796443 | -0.154213390833733 | 0 | 0 | 2 | 1 | 2 | 3 | 2 | 2 | W |
| **36** | 1.401360544217686 | 0.197707543313231 | 0.232853499892464 | 1.808893701884356 | 5.485840659237375 | -2.815520952169692 | 4.845582714598156 | -0.140076794179745 | 0.289183289841701 | 0.460709670183155 | 0.082105586965972 | -0.138957083541232 | 0.084968946621162 | 0.078418949994457 | 0.336985275638128 | -0.268030608214134 | 0.632686428645303 | 2 | 3 | 1 | 2 | 3 | 3 | 2 | 1 | Z |
| **37** | 1.060606060606061 | 0.247358850505284 | 0.324037243664035 | 0.722264468152127 | 1.235738684032295 | -1.204714114809140 | 3.686179931658546 | -0.338950079751561 | 0.421463643269954 | 0.466153514580117 | 0.401454921483006 | -0.374376593352820 | -0.704404080068226 | 0.244714713848493 | 0.440968006720109 | -0.200681858129271 | 0.328855287437124 | 1 | 0 | 2 | 2 | 2 | 2 | 2 | 1 | A |
| **38** | 1.225225225225226 | 0.183126660016785 | 0.367660054321764 | 0.515599612768149 | 1.362666831179407 | -1.000173521392588 | 3.214162969232842 | -0.210139355662289 | -0.072485743887030 | 0.558289588673060 | 0.395011679550111 | -0.300698287835146 | -0.738725709367945 | 0.342713037452632 | 0.146288282304330 | -0.281701829236096 | 0.329549660876768 | 1 | 0 | 2 | 2 | 2 | 2 | 2 | 1 | A |
| **39** | 2.071428571428572 | 0.189493181939905 | 0.382146102684003 | 0.255727244858175 | 1.348565468472086 | -1.429674780261135 | 3.082943034439084 | -0.404896925369703 | 0.609072321357561 | 0.041217816730853 | -0.156415900316311 | -0.625763550731173 | 0.586579963084135 | -0.168591830527634 | -0.160014450162801 | 0.346255797097406 | 0.068906784109277 | 0 | 1 | 2 | 1 | 2 | 2 | 2 | 1 | B |
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| **41** | 1.296296296296294 | 0.235168819354018 | 0.418510992822159 | -0.231175502321835 | 2.011824067411547 | -0.854262647449830 | 1.641996723692459 | -0.029210755516780 | -0.370368168027053 | 0.197171293879065 | 0.892922924169890 | -0.304877158211517 | -0.811802380360337 | 0.022660036055855 | 0.441200380217051 | -0.166598361210505 | 0.290279434759755 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | C |
| **42** | 2.948717948717937 | 0.140410830380867 | 0.394205521664824 | 0.203515335077971 | 1.186492182985977 | -0.279428305288947 | 4.091157269815028 | 0.569415308424643 | -0.092441860130383 | 0.209210666093093 | 0.407012258307381 | 0.277431273004683 | -0.490142086547318 | 0.215502205888492 | 0.020194257741912 | -0.342622968502346 | 0.273501551731641 | 2 | 1 | 1 | 2 | 2 | 1 | 2 | 1 | D |
| **43** | 1.604166666666665 | 0.204434990933928 | 0.303211667587965 | 0.656022252215278 | 1.676084613644518 | -0.184135493061476 | 2.601062422634013 | -0.071809791640742 | 0.056171781404160 | 0.334484236658017 | 0.763005231315724 | -0.074177934690259 | -0.730375481712495 | 0.185777920761212 | 0.217889508228134 | -0.409737603362855 | 0.392488232605128 | 1 | 1 | 1 | 1 | 1 | 2 | 1 | 2 | E |
| **44** | 1.634408602150537 | 0.198091600557406 | 0.340461724797028 | 0.483113517526588 | 1.518052335926831 | -0.231521082383112 | 2.359178163724720 | -0.209832597847373 | -0.152037829323099 | 0.343079474118256 | 0.710572612158372 | 0.119815405886411 | -0.764032003827529 | 0.228981939799462 | 0.155921653805356 | -0.459168512560533 | 0.167605366285554 | 1 | 1 | 1 | 1 | 1 | 2 | 1 | 2 | E |
| **45** | 2.410256410256411 | 0.134413609710384 | 0.392496884137295 | 0.597349917680204 | 1.630985007336797 | -1.972590156218774 | 2.707739686999521 | 0.383395057708805 | 0.042224242690537 | 0.701568582201983 | 0.072634395531843 | -0.417266436188653 | 0.346790918490090 | 0.019930808287663 | -0.410074624385931 | -0.771778479828574 | 0.424851267674702 | 2 | 0 | 1 | 0 | 1 | 2 | 2 | 2 | F |
| **46** | 1.284848484848481 | 0.187386973538921 | 0.285160144009295 | 0.563056469321677 | 1.899489546605774 | -0.812778549730170 | 2.676714661180001 | 0.086405076908962 | 0.036283386170905 | 0.332412628184379 | 0.059050888794096 | -0.649931889459895 | 0.142872166179857 | -0.059606098132466 | 0.235338583497859 | 0.230659801426907 | 0.474637312818205 | 2 | 1 | 2 | 2 | 3 | 3 | 2 | 2 | G |
| **47** | 1.370370370370371 | 0.145334211069854 | 0.291166824783979 | 0.600527235347362 | 1.719259712200212 | -0.429165562218592 | 2.505924608867001 | 0.069733144435617 | -0.188836190321328 | 0.433639290811229 | -0.026568169461010 | -0.612511266340575 | 0.052294033906303 | 0.041510240648881 | -0.059817218133159 | -0.176817443733536 | 0.451308333084018 | 2 | 2 | 2 | 2 | 3 | 3 | 2 | 3 | G |
| **48** | 2.416666666666666 | 0.167056102621936 | 0.462047029763772 | 0.657728419454361 | 0.450032685550446 | -1.565534051788810 | 3.287789997692432 | -0.609810785853736 | 0.412107798699852 | 0.628963351114729 | -0.009358347041340 | -0.607837673346578 | 0.102500868956690 | -0.035795843477533 | 0.171034512012567 | 0.137517232444911 | 0.194247094414659 | 0 | 0 | 2 | 1 | 2 | 2 | 2 | 1 | H |
| **49** | 2.114285714285714 | 0.173036542953362 | 0.428035304740156 | 0.739651502781318 | 0.576596836569957 | -1.392202471970425 | 3.314889736982746 | -0.520002122274671 | -0.056402057870995 | 0.773692336962922 | 0.097870776859602 | -0.495186328219851 | 0.044623187487951 | -0.089177305906428 | -0.373692912740810 | 0.080637865260618 | 0.314426521575542 | 0 | 0 | 2 | 1 | 2 | 2 | 2 | 1 | H |
| **50** | 8.814814814814770 | 0.102526329475326 | 0.958991522849057 | 0.389562247380618 | 0.420366533058406 | -1.902959281736265 | 1.850458909179647 | -0.913238073961640 | 0.508890309294955 | 0.082125219019460 | -0.742970401039188 | -0.432099051842664 | -0.087931879206852 | 0.742812797355051 | 0.231493412943254 | -0.584013181236028 | -0.654644232978860 | 0 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | I |
| **51** | 4.179487179487189 | 0.124138730794615 | 0.619261111821821 | -0.611370751378259 | 1.302341325537005 | -2.103783836397531 | 3.944969279625507 | 0.715084292812531 | -0.291275487622231 | 0.436457731119627 | -0.719941508179852 | -0.650541038358863 | 0.530594171578886 | 0.023320616896376 | -0.453557449061778 | -0.263376574700550 | -0.178114311042764 | 1 | 0 | 1 | 0 | 3 | 3 | 1 | 1 | J |
| **52** | 4.694444444444440 | 0.103540058557359 | 0.718702865761689 | -0.583444250394714 | 1.050128601588706 | -3.071026180588633 | 5.027472593921170 | 0.625120837574518 | -0.133898434721880 | 0.600764287538705 | -0.626687093668245 | -0.625965082621709 | 0.621130892734598 | -0.003789153821317 | -0.440889116018752 | -0.452571985651657 | -0.314575809884390 | 1 | 0 | 1 | 0 | 2 | 2 | 1 | 1 | J |
| **53** | 2.482758620689649 | 0.222169077658196 | 0.431102006496347 | 0.164790878400615 | 1.568567185542397 | -3.566517905829680 | 2.224783624400851 | -0.268848162483864 | -0.126436592964107 | 0.345430920798138 | 0.556400192229607 | -0.266322907236675 | -0.322870810042173 | 0.045715936576301 | 0.228686050112153 | -0.370380397770888 | 0.204998593002993 | 1 | 1 | 1 | 1 | 2 | 3 | 3 | 2 | K |
| **54** | 1.980392156862743 | 0.177885759495088 | 0.426614352891731 | 0.691631568257437 | 0.859168738483262 | 0.021465283553207 | 2.840682758161145 | 0.124954678408620 | 0.181926247218760 | 0.269380297912586 | 0.116044219812507 | 0.532344752817168 | -0.630186690286950 | 0.151033190192530 | 0.094446579234884 | 0.000670434269360 | 0.318445063707812 | 1 | 1 | 0 | 1 | 1 | 2 | 1 | 1 | L |
| **55** | 2.215686274509801 | 0.163264525422518 | 0.439942197557189 | 0.961118781116038 | 1.065915276004208 | -0.144056213226150 | 3.039134216089945 | 0.337090813923823 | 0.251040008936179 | -0.153758373953480 | 0.132545346517393 | 0.519669365845351 | -0.762976374874610 | 0.183298990569146 | -0.330798285033771 | 0.108872448849319 | 0.216892621349417 | 1 | 1 | 1 | 1 | 2 | 2 | 1 | 1 | L |
| **56** | 1.148148148148147 | 0.245593822436154 | 0.299260620672202 | 0.919599337067703 | 0.819914907872302 | -1.055519504830522 | 3.635625261601847 | -0.351194975480769 | 0.609841829563019 | 0.344574920853586 | -0.077716283998322 | -0.294371898862808 | 0.799089057228409 | 0.405948068932135 | 0.224095564515916 | 0.126404505667291 | 0.629762313418689 | 0 | 0 | 2 | 3 | 3 | 2 | 3 | 2 | M |
| **57** | 1.016666666666665 | 0.268910316162523 | 0.258808961087551 | 1.109652646633964 | 1.012211606297039 | -0.587746901453374 | 3.371800506864604 | -0.244369475267129 | 0.392166559065571 | 0.110553060263352 | -0.160751910987575 | -0.239646261664944 | 0.867470711434498 | 0.525897089871890 | -0.297607948547343 | -0.121563941916172 | 0.751487841640114 | 0 | 0 | 2 | 3 | 2 | 2 | 3 | 2 | M |
| **58** | 2.309523809523809 | 0.205787555993749 | 0.467453108875061 | 0.754217308322385 | 0.424270987471308 | -1.825328039833760 | 3.719785775129048 | -0.526690812761141 | 0.411794636442664 | 0.329225958853461 | -0.078201673129230 | -0.472680686368021 | 0.381958660557717 | 0.111840494301447 | 0.212354166759991 | 0.142478275656105 | 0.444766332257356 | 0 | 0 | 1 | 1 | 3 | 4 | 2 | 1 | N |
| **59** | 1.898989898989899 | 0.178265396171463 | 0.420643785702837 | 0.718561574681995 | 0.300121109031017 | -1.861030295482293 | 3.419888624443868 | -0.696106052884443 | 0.361590511997832 | 0.434230454161195 | -0.009743066018041 | -0.368882891518546 | 0.234660607317665 | 0.032370382852439 | -0.149565092227018 | 0.124852061744272 | -0.088416349103610 | 0 | 0 | 1 | 2 | 3 | 3 | 2 | 1 | N |
| **60** | 1.549019607843135 | 0.215519943085230 | 0.370190161888853 | 0.019315667716704 | 1.501503578469118 | -0.606957298873184 | 2.929918440711674 | 0.078014211301171 | 0.449528100278173 | 0.148288472667085 | 0.925459807626144 | -0.434969383795669 | -0.832838161780654 | 0.114061890635052 | 0.207293414291291 | 0.285099995521087 | 0.250874482587280 | 1 | 1 | 1 | 1 | 2 | 1 | 1 | 1 | O |
| **61** | 3.204301075268818 | 0.115354725547767 | 0.480774468483556 | 0.653246779435089 | 1.159474978040109 | -2.487249007512665 | 3.397036249184721 | -0.304752964892043 | 0.299670399831689 | 0.242204156950801 | -0.636168867912888 | -0.309115504946159 | 0.331474483038739 | 0.424968556879967 | 0.038992771682409 | -0.787149549757492 | 0.031913371755810 | 1 | 2 | 1 | 1 | 1 | 2 | 3 | 2 | P |
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| **63** | 1.772727272727271 | 0.156906748161329 | 0.373414120624244 | 0.387707472728779 | 1.027044656366145 | 0.015142156540729 | 3.003193660323014 | -0.026550615283069 | 0.238339886783516 | 0.638141480677806 | 0.516321130472575 | -0.646055359034367 | -0.239031311603988 | 0.258834175731989 | 0.653200626262779 | 0.069719606903701 | 0.448619731382745 | 1 | 0 | 2 | 2 | 2 | 2 | 2 | 2 | Q |
| **64** | 2.294117647058819 | 0.151635579070357 | 0.408628928344973 | 0.593709979564673 | 0.807797673219693 | -0.135229282761005 | 3.186047325077921 | 0.114778446694811 | 0.061832350896146 | 0.570339508226907 | 0.537816711034956 | -0.654526161540861 | 0.106094246910314 | 0.232650196734049 | 0.287965033532966 | 0.116885252772281 | 0.807835930711091 | 1 | 0 | 1 | 1 | 1 | 2 | 2 | 2 | Q |
| **65** | 1.401709401709403 | 0.253174756742518 | 0.339428067046334 | 0.908920022786919 | 1.515215865407990 | 0.206855929604620 | 2.490454610641204 | 0.458109276214139 | 0.261621459095467 | 0.228956152575451 | -0.007621266547108 | -0.416987349101880 | 0.607430508045051 | 0.205621842044005 | 0.192706919029223 | 0.459502160998690 | 0.601214751239215 | 1 | 1 | 1 | 1 | 1 | 2 | 1 | 1 | R |
| **66** | 1.548387096774186 | 0.234234502641029 | 0.433290367906588 | -0.752634438349254 | 1.877204189541886 | -0.791482528680137 | 1.612377913601032 | 0.366243776131016 | -0.156078711892754 | 0.348632144184136 | -0.067056835835190 | -0.359541027786277 | 0.081618104337730 | 0.216484816714337 | -0.327473293952588 | -0.515025255304812 | -0.377220592208131 | 1 | 1 | 1 | 1 | 2 | 1 | 1 | 1 | S |
| **67** | 1.809523809523804 | 0.191427905208888 | 0.340280072067771 | 1.340787747185537 | 2.043115820898420 | -1.527525276353615 | 2.973317536722873 | 0.019885388365103 | 0.019613596119722 | 0.188499555563544 | 0.438381437232127 | -0.705716893784905 | -0.086701024520938 | 0.103629115876389 | -0.173168536211013 | -0.540552910735036 | 0.613769237016760 | 2 | 1 | 1 | 0 | 2 | 2 | 1 | 1 | T |
| **68** | 1.894736842105258 | 0.188170466901548 | 0.311552231182244 | 1.710514605192698 | 2.113440846861306 | -1.644434254814832 | 3.488919585832570 | -0.084869658143438 | -0.027642886054581 | 0.466204111331889 | 0.669324717991408 | -0.623102074351083 | -0.325372714254974 | 0.097573609517310 | -0.262722588516677 | -0.582412045000101 | 0.719920566108836 | 2 | 1 | 1 | 0 | 2 | 2 | 2 | 2 | T |
| **69** | 1.084967320261438 | 0.263541814024249 | 0.337019781696248 | 0.971174079995205 | 0.937349473640383 | -0.693207770642621 | 3.285906590485510 | -0.476065843420935 | 0.465690882875302 | 0.283297086479630 | 0.412825398381499 | -0.499183010054322 | -0.880751951171054 | 0.221468595441411 | 0.454091671539879 | -0.154196457555939 | -0.042927123805295 | 0 | 0 | 2 | 1 | 1 | 2 | 2 | 2 | U |
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| **71** | 1.485714285714285 | 0.286637500715682 | 0.341034279761141 | 0.842799892455910 | 0.881568045964400 | 0.235956859820498 | 2.776259350950672 | 0.057952785734032 | 0.439165144090926 | -0.028931733107894 | 0.609628901481634 | -0.484755439313464 | -0.849103548985514 | 0.456502202407661 | 0.384590829594097 | -0.049334559093430 | -0.290366084989461 | 0 | 0 | 2 | 2 | 3 | 3 | 3 | 3 | W |
| **72** | 1.365853658536588 | 0.272093165106547 | 0.285125068872516 | 0.723650451729625 | 0.877615365882750 | 0.423224423804420 | 2.606194017198959 | 0.154669512484694 | 0.419775647919485 | -0.086308773039771 | 0.655500513424610 | -0.519181223357056 | -0.890042315318736 | 0.335909692042655 | 0.416081400864206 | 0.128026963332397 | 0.006459175458364 | 0 | 1 | 2 | 1 | 1 | 2 | 2 | 2 | W |
| **73** | 1.406250000000000 | 0.206112740350260 | 0.258396089533260 | 0.200703173126320 | 2.435291550914122 | -2.482830339417463 | 2.752063685381014 | 0.367307935484256 | -0.069471587283190 | 0.148971038999148 | 0.087712306651924 | -0.287798587608108 | 0.351765084904365 | 0.550089033108010 | -0.591880156073766 | -0.659872843102703 | 0.734211298426654 | 2 | 2 | 1 | 2 | 3 | 4 | 3 | 3 | X |
| **74** | 1.229629629629629 | 0.201730395673328 | 0.331854850932791 | 0.208158509219144 | 2.126403588173324 | -2.764716022612010 | 1.647471967816079 | 0.090808557753975 | -0.105865575257040 | 0.499248798412564 | 0.155245266339583 | -0.349718401500838 | 0.104817573812728 | 0.209103112315137 | -0.449418710398865 | -0.868223499677496 | 0.729409196010111 | 2 | 2 | 1 | 2 | 2 | 2 | 2 | 1 | X |
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| **76** | 2.533333333333337 | 0.183811095291645 | 0.502778538952162 | 0.398110877516691 | 1.477919604855578 | -1.290037044670441 | 3.175702131662768 | -0.152190358492909 | 0.410866184891107 | 0.162166043690710 | -0.307635798297757 | -0.550575620643146 | 0.404713467114065 | -0.109253874307174 | -0.468116964909410 | -0.225758212665428 | 0.184480654949336 | 1 | 1 | 2 | 1 | 2 | 2 | 2 | 2 | Y |
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| **79** | 1.891891891891891 | 0.173460216487357 | 0.395270021882374 | 0.252534217154834 | 1.404106654972124 | -1.681314135706923 | 3.132063329034976 | -0.248379568102450 | 0.529616362898263 | 0.005436565832674 | -0.255751046437935 | -0.705107302149706 | 0.457402794500832 | -0.127224894304164 | 0.075971528940003 | 0.338719790341221 | 0.323659828332062 | 0 | 1 | 2 | 1 | 4 | 4 | 4 | 3 | B |
| **80** | 1.677419354838705 | 0.226076872321664 | 0.484724141503229 | 0.316599304608897 | 1.573514556894933 | -1.522922068901992 | 1.287416036278973 | -0.262712844095825 | -0.002737433543938 | 0.295241230959336 | 0.936656701829368 | -0.809680346622578 | -0.872543312999112 | 0.013921186468364 | 0.787050526739963 | -0.072737618819543 | 0.114258540436664 | 1 | 0 | 0 | 0 | 1 | 1 | 2 | 2 | C |
| **81** | 2.888888888888886 | 0.112621379102990 | 0.426247204748278 | 0.045079181660014 | 1.422251998660605 | -0.893659491313014 | 4.215467307593162 | 0.201555611845796 | 0.091085280303011 | 0.068020303754631 | 0.444406249905199 | 0.115469775805697 | -0.423236693122513 | 0.173360939482663 | 0.706555153668399 | 0.143848521875275 | 0.103539153406679 | 3 | 1 | 1 | 2 | 7 | 7 | 5 | 4 | D |
| **82** | 2.044444444444441 | 0.144310589935222 | 0.299256356607072 | 0.821351437298958 | 1.815905961160305 | -1.502938275583500 | 3.144760237119100 | 0.342531121029543 | 0.090778242736825 | -0.641618546623758 | 0.098662171857152 | -0.216812856559599 | -0.439384656114088 | 0.232147631498113 | 0.312643892048306 | -0.605500243206739 | 0.135744889671588 | 1 | 0 | 1 | 1 | 2 | 2 | 4 | 4 | F |
| **83** | 1.333333333333333 | 0.302690088469281 | 0.319572131177155 | 1.141344290848191 | 0.934084030037120 | -1.855527566249815 | 3.286986600802241 | -0.456496227559648 | 0.284756917359748 | 0.209903680482045 | -0.015108123723933 | -0.482155027770089 | 0.562142960716495 | -0.162251484069428 | 0.265487309886717 | 0.483723023101207 | 0.291916618302677 | 0 | 0 | 1 | 1 | 5 | 4 | 2 | 1 | H |
| **84** | 5.128205128205138 | 0.153656620285502 | 0.635706045828951 | -1.152024300121530 | 1.175140972398088 | -2.832028970134404 | 5.277414919303292 | 0.582827003368676 | -0.448775753700991 | 0.259939809191705 | -0.875668601036793 | -0.822350415411885 | 0.752530917462053 | -0.309868194011524 | -0.613942616030829 | 0.423242075728070 | -0.170319026042040 | 1 | 0 | 1 | 0 | 4 | 4 | 2 | 2 | J |
| **85** | 7.666666666666659 | 0.123334078059299 | 0.968082428113522 | 0.054976834673228 | 0.723800828925134 | -3.331937503064790 | 2.132538797023756 | -0.709748675349447 | 0.648793641493506 | 0.150633578301751 | 0.086944322115557 | -0.719973266316451 | 0.293823107952315 | -0.365935991632367 | 0.091319151683342 | -0.198995099914649 | -0.818001389972982 | 0 | 1 | 0 | 0 | 2 | 2 | 4 | 3 | L |
| **86** | 1.170068027210882 | 0.269786955064882 | 0.290551288815723 | 0.883407103527179 | 1.301311276528744 | -1.002802239703253 | 4.457966871949441 | -0.064405993596360 | 0.381563178830147 | 0.157272789184735 | -0.299087307276957 | -0.036791534812193 | 0.814198253905091 | 0.268250892540407 | 0.420047983103912 | 0.281505385480750 | 0.664727340888572 | 1 | 1 | 2 | 2 | 3 | 2 | 3 | 2 | M |
| **87** | 2.072072072072072 | 0.133808232213783 | 0.499947363666046 | 0.448005286454019 | 1.195224970679874 | -1.515939859130160 | 2.781078772031986 | -0.620227159647497 | 0.232163223837564 | 0.247499609985668 | 0.377782348498416 | -0.409673286022854 | -0.412246390657218 | -0.035230311723585 | 0.702741685687016 | 0.134202273996633 | 0.470555864847095 | 1 | 0 | 2 | 1 | 4 | 4 | 3 | 2 | Q |
| **88** | 2.181818181818189 | 0.224294694402889 | 0.446792752589989 | 0.748000771733072 | 0.805845982614522 | -0.194624023577598 | 3.722272366740442 | 0.558648468379817 | 0.249312319348869 | 0.392409449102012 | 0.088424407997900 | -0.336721314105133 | 0.655421735963079 | 0.066250483516099 | 0.293550307861059 | 0.495127547770638 | 0.383018768405273 | 0 | 0 | 1 | 1 | 2 | 2 | 2 | 1 | R |
| **89** | 2.266666666666663 | 0.194508829379442 | 0.544553114875736 | -0.638025559019206 | 1.976660705228237 | -1.175602308588382 | 2.012575299281477 | -0.120730752932270 | -0.327524923666456 | 0.246604660202139 | -0.183741821949377 | -0.379060619892676 | -0.088136481266160 | 0.136150279620188 | -0.028370604647654 | -0.434268071506768 | -0.650796054036418 | 1 | 1 | 1 | 1 | 3 | 2 | 2 | 2 | S |
| **90** | 2.312500000000011 | 0.105793792756689 | 0.350616358728402 | 0.998452152074676 | 1.600374637520896 | -2.681942826287655 | 2.540266061386298 | 0.206732157336182 | 0.135166509774136 | 0.225466613646434 | 0.226677863027440 | -0.449187875164901 | 0.082541971904493 | -0.208914003804148 | -0.452106466226594 | -0.533546173939208 | 0.717325641205500 | 1 | 0 | 1 | 0 | 3 | 3 | 1 | 0 | T |
| **91** | 1.711111111111112 | 0.258686810581022 | 0.438326301673760 | 1.434001684418373 | 1.110687332800095 | -0.281943157629147 | 3.420556968798150 | -0.158637009694837 | 0.609897585844818 | -0.459244425938080 | 0.765852400362432 | -0.571885461982265 | -0.070889550699537 | 0.071480708863052 | -0.029673814368085 | 0.293292114764512 | -0.608374551521068 | 0 | 0 | 1 | 0 | 5 | 5 | 1 | 1 | V |
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| **93** | 1.636363636363636 | 0.217007072350197 | 0.412857771250744 | 1.985316533879896 | 1.233129388327120 | -0.206848576131964 | 3.643288860091749 | -0.240264886543400 | 0.412032951696839 | -0.216241048598910 | -0.091375679489134 | -0.042003133232871 | -0.156853928248258 | 0.123897503390968 | -0.041667171708331 | 0.060709097845413 | -0.783324473632338 | 1 | 1 | 1 | 0 | 5 | 6 | 2 | 2 | X |
| **94** | 1.157894736842106 | 0.256315100498667 | 0.421050315341272 | 0.903017548088148 | 2.695631522951135 | -1.016834863289848 | 1.811221200550380 | 0.111057196449558 | 0.001518430238615 | 0.266703861001443 | 0.652408020372037 | -0.245584919183505 | -0.189056008568014 | 0.055159034640461 | 0.051366659335660 | -0.119724678586007 | 0.818364238738866 | 1 | 1 | 1 | 1 | 1 | 2 | 2 | 2 | Z |
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| **96** | 2.393939393939394 | 0.191013726634200 | 0.423072357379442 | 0.145594378178725 | 1.212456306618452 | -1.500430946177751 | 2.461389336652533 | -0.561304804513985 | 0.661474623565695 | 0.066138151865421 | 0.070222553571667 | -0.758605500524837 | 0.292867638197624 | -0.135119921746350 | -0.303088132047207 | 0.044610337991338 | -0.098053680494890 | 0 | 1 | 2 | 1 | 2 | 2 | 2 | 1 | B |
| **97** | 2.799999999999997 | 0.171822995087430 | 0.458099906946634 | 0.159611933522381 | 1.089785604118822 | -1.773037493932014 | 2.573910402577184 | -0.544186716914672 | 0.617490868343102 | 0.049397390471123 | 0.111656186112778 | -0.739984369481573 | 0.384130632839432 | -0.325839398541256 | -0.477661179824474 | 0.380231217997869 | -0.034996340131326 | 0 | 1 | 2 | 1 | 3 | 3 | 2 | 1 | B |
| **98** | 1.809523809523809 | 0.240813716124078 | 0.472637053512857 | -0.339122937754638 | 1.588693791774469 | -1.698586804717878 | 2.197741121267028 | 0.605296500690596 | -0.906484658319956 | 0.352705669480069 | 0.693385837447305 | -0.589596663888047 | -0.579828514136283 | 0.060380091520849 | -0.221128359002001 | -0.558655507860416 | 0.720525654696764 | 1 | 0 | 1 | 1 | 1 | 1 | 2 | 2 | C |
| **99** | 2.701754385964899 | 0.160100788487651 | 0.351593888443470 | 0.155286833581708 | 1.128105636203374 | -0.524013356297423 | 3.780075755147323 | 0.536379124702135 | -0.211531693792665 | 0.336314163079022 | 0.088308044052074 | 0.103470605489600 | -0.007296028600219 | 0.381153296537353 | 0.273174224534070 | -0.323486246755797 | 0.488269490150018 | 1 | 0 | 1 | 2 | 2 | 1 | 1 | 1 | D |
| **100** | 1.644444444444446 | 0.147033968158767 | 0.294835988387576 | 0.285317188912363 | 1.266480945994115 | -0.405104248465344 | 3.162390398895038 | 0.415540096959707 | -0.109399211332866 | 0.426735057614243 | 0.250171806837544 | 0.013365393383067 | -0.263026111534078 | 0.333529314858250 | 0.403511672693751 | -0.190041949508488 | 0.438516729612360 | 1 | 0 | 2 | 1 | 2 | 1 | 2 | 1 | D |
| **⋮** |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |

knnmodel = fitcknn(traindata,"Character","NumNeighbors",5,"Standardize",true,"DistanceWeight","squaredinverse");

testdata

testdata = 968×26 table

|  | **AspectRatio** | **MADX** | **MADY** | **AvgU** | **MADU** | **AvgV** | **MADV** | **CorrXY** | **CorrXP** | **CorrXU** | **CorrXV** | **CorrYP** | **CorrYU** | **CorrYV** | **CorrPU** | **CorrPV** | **CorrUV** | **NumXMin** | **NumXMax** | **NumYMin** | **NumYMax** | **NumUMin** | **NumUMax** | **NumVMin** | **NumVMax** | **Character** |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **1** | 1.405405405405405 | 0.197169422944323 | 0.315278077450562 | 0.676772395532966 | 1.939177839168160 | -0.556798271601414 | 2.351323750216454 | -0.111210697254093 | -0.334064498713704 | 0.639906042605021 | 0.734469797288685 | 0.245445447374846 | -0.741999619690661 | 0.480497299598525 | -0.375839045921709 | -0.526880073122734 | 0.132302384532342 | 1 | 1 | 1 | 1 | 1 | 2 | 1 | 1 | E |
| **2** | 2.774193548387111 | 0.131421220782920 | 0.475718469114718 | 0.425123964981858 | 1.286213689388807 | -1.982892289161660 | 3.308047025855674 | 0.402772445399980 | -0.486445927469113 | 0.065055747023347 | 0.531482309715430 | -0.088610707643932 | -0.466985452030224 | 0.385788756212317 | 0.368760637289319 | -0.405411960760232 | 0.143773492074333 | 1 | 0 | 1 | 1 | 2 | 1 | 1 | 1 | F |
| **3** | 2.577777777777794 | 0.168337767695198 | 0.434642124701036 | -0.834969749715341 | 1.925548450364925 | -1.412360507434341 | 2.471744173197755 | 0.299515056980770 | 0.037656399066453 | 0.261095181472653 | 0.094769480161049 | -0.201187682004459 | 0.065663890639434 | 0.413313117322987 | 0.011105353980283 | -0.580407439927837 | 0.020240407861625 | 1 | 1 | 1 | 2 | 2 | 1 | 3 | 2 | G |
| **4** | 3.820512820512805 | 0.106944456417853 | 0.589232711789452 | -0.797682590081084 | 0.854744816982911 | -3.179170298421427 | 3.410587290929737 | 0.641704622757201 | 0.274413497077880 | 0.857635666100609 | -0.607463274798009 | -0.318646981812194 | 0.708679673806995 | 0.119037453167992 | 0.027768963462513 | -0.596439861348609 | -0.411295220474599 | 1 | 0 | 1 | 1 | 1 | 1 | 1 | 1 | J |
| **5** | 1.106382978723405 | 0.280636929614215 | 0.256200743204593 | 0.991474487506619 | 0.864995661252086 | -0.597752415292249 | 3.489796161022245 | 0.066304714879732 | 0.054995279632835 | 0.409753327229605 | -0.089025540979459 | 0.081526950452760 | 0.552022612470876 | 0.450231070068287 | 0.508956528028029 | 0.499966685137185 | 0.829772865202056 | 0 | 0 | 2 | 2 | 1 | 2 | 2 | 2 | M |
| **6** | 2.942528735632177 | 0.184606359548993 | 0.445814842519088 | 0.285927332769424 | 1.021863307709911 | -0.541487876039929 | 4.088613787004586 | 0.623979905661609 | 0.462148945350348 | 0.108602098737966 | -0.031232398958195 | -0.122190496156409 | 0.413274723133449 | 0.157769958090115 | 0.246677143039360 | 0.162179784145227 | 0.732219031087325 | 1 | 1 | 1 | 1 | 0 | 1 | 2 | 1 | P |
| **7** | 3.936507936507926 | 0.117234520795460 | 0.562763570852589 | 0.843335489735165 | 1.489690802287656 | -4.184760840259847 | 4.611072623795068 | -0.105725620896804 | -0.359235152940566 | 0.553282928297359 | 0.755144823491169 | -0.287372462577395 | -0.549553311462664 | -0.190771620601711 | -0.269958931687147 | -0.700402901901084 | 0.691254174211264 | 2 | 1 | 1 | 1 | 3 | 2 | 1 | 1 | T |
| **8** | 2.399999999999994 | 0.175025179441097 | 0.467081554455378 | 1.310033980019589 | 2.153936242762605 | -2.206513829938098 | 3.045207216939416 | -0.267732724185295 | 0.119895391494924 | 0.573697556815449 | 0.333106634723385 | -0.231161990840867 | 0.002123994990610 | 0.371086882396243 | -0.400687461886423 | -0.613185619954512 | 0.792870446041227 | 2 | 2 | 1 | 0 | 2 | 2 | 1 | 2 | Z |
| **9** | 2.245614035087713 | 0.188798497018330 | 0.300663159513878 | 0.062029827349357 | 1.669329733350576 | -1.418702354108693 | 2.473415098317632 | 0.311061226745379 | -0.329414228140767 | 0.075906338604132 | 0.225378623272962 | -0.648893014580156 | -0.622353073770264 | -0.503811910380704 | 0.152331173155305 | 0.695881852375806 | 0.036971047385645 | 1 | 0 | 2 | 1 | 3 | 3 | 4 | 3 | D |
| **10** | 1.546666666666667 | 0.243260658978860 | 0.329674604462622 | 0.752046497508043 | 0.920779923849822 | -1.155733778192158 | 4.179482298014933 | -0.131051127850549 | -0.014165465259955 | 0.247499379432622 | -0.183789659103964 | -0.280151944166934 | 0.484253969441976 | 0.273143589731612 | -0.291630662601810 | -0.151490297946076 | 0.752456928251392 | 0 | 0 | 2 | 2 | 3 | 2 | 3 | 2 | M |
| **11** | 2.228070175438595 | 0.176519163499198 | 0.390593026145059 | -0.029486610799849 | 1.679392507296984 | -1.765886743621915 | 3.827543501652472 | 0.077258928723840 | 0.167691163015979 | 0.046377106479208 | 0.200553609748844 | -0.555875016015455 | -0.351552650522661 | 0.265548135344432 | 0.432842868186460 | -0.169481435878911 | 0.355740778785408 | 1 | 1 | 2 | 2 | 2 | 1 | 4 | 3 | Q |
| **12** | 1.977777777777780 | 0.168791039907977 | 0.465490204781535 | 0.628029855214664 | 1.200660620545164 | -0.405165595818630 | 3.582931762585353 | 0.647574262891504 | 0.055534946661565 | 0.604052261136696 | 0.054317701815258 | -0.440416306976801 | 0.526333702451661 | -0.002166916942614 | 0.535549590910967 | 0.667698288358081 | 0.487514450511470 | 1 | 0 | 1 | 0 | 3 | 3 | 1 | 1 | R |
| **13** | 1.847619047619048 | 0.219670065763593 | 0.421760140798409 | -0.606039248443243 | 1.976575065905092 | -1.037534840290673 | 1.767802772215623 | 0.013978194660858 | -0.123664412202802 | 0.103008848427174 | 0.013741836294354 | -0.367289178245252 | 0.084592411690196 | 0.296271727998228 | -0.373083926718659 | -0.082786395002930 | -0.260921815169552 | 1 | 1 | 1 | 1 | 2 | 1 | 2 | 2 | S |
| **14** | 1.940740740740738 | 0.139687734033652 | 0.288314518110520 | 1.103727251744505 | 1.424034943306354 | -2.384329916396768 | 3.250890478822172 | 0.322798080984557 | 0.411809737723555 | 0.097193360436263 | 0.278172372650021 | -0.346076115311086 | -0.050753607694665 | -0.150169764147146 | 0.049886971672731 | 0.306423577051653 | 0.868619568405267 | 2 | 1 | 1 | 0 | 3 | 2 | 2 | 1 | T |
| **15** | 2.529411764705879 | 0.169965969503310 | 0.457733928852043 | 0.298981494277297 | 1.798823241011260 | -4.951420892264957 | 2.349819616297219 | 0.191523556735688 | -0.236516644211985 | 0.235846011227413 | -0.144345619277894 | -0.650050572769433 | -0.114122841513616 | -0.542375204595484 | 0.519789265220200 | 0.446228277551194 | 0.116411333458072 | 0 | 1 | 1 | 1 | 2 | 2 | 3 | 2 | X |
| **16** | 4.399999999999990 | 0.172876953897817 | 0.623060858780833 | 0.103326837201738 | 0.934765554658543 | -2.409797256419337 | 3.410759549671683 | -0.235968414526571 | 0.671733608258213 | -0.016537688070335 | 0.044651746732397 | -0.486051340997222 | 0.534277445616260 | 0.179127095756730 | -0.417190923174725 | -0.334370820492682 | 0.209429332566134 | 0 | 1 | 1 | 1 | 2 | 2 | 2 | 1 | Y |
| **17** | 1.428571428571430 | 0.206774549414850 | 0.428788263598714 | 0.347838770897428 | 1.462577531595711 | -0.807089933968806 | 1.705475186061308 | 0.006004782768646 | -0.536710823225558 | 0.558260929574404 | 0.923176524933453 | -0.582868245127523 | -0.686669826564253 | 0.173306742827903 | 0.141089328307886 | -0.634159801793411 | 0.498972399204271 | 1 | 0 | 1 | 1 | 1 | 1 | 1 | 1 | C |
| **18** | 2.016260162601622 | 0.124269407090457 | 0.328524163807050 | 0.111103625651157 | 1.451972410800256 | -0.847666437694230 | 3.620005781729839 | -0.025665953917106 | -0.215798285041405 | 0.618076108164513 | 0.321621076386692 | 0.166930259258131 | -0.427072038120278 | 0.392362855663332 | -0.017455764120211 | -0.138708569440033 | 0.308108006738530 | 2 | 1 | 1 | 2 | 2 | 1 | 2 | 1 | D |
| **19** | 2.851851851851849 | 0.142015477616892 | 0.343250933563824 | 0.600937627461172 | 1.259366762087823 | -3.014772192519995 | 3.623470643673657 | 0.222391638860839 | 0.170831220876844 | 0.412273377345662 | 0.276018038600370 | -0.480152520428181 | 0.473639094950670 | -0.183101400077582 | -0.488999965861567 | -0.446900926300619 | 0.370522348120718 | 1 | 0 | 1 | 0 | 1 | 1 | 3 | 3 | F |
| **20** | 14.266666666666758 | 0.063246237319965 | 1.331480379858093 | 0.573573781166584 | 0.424713602276791 | -3.163398149037732 | 4.195436096878431 | -0.266237733409507 | 0.399902738366837 | -0.380699360336655 | 0.233911024127058 | -0.298370083661790 | 0.357468938302696 | 0.477181999836130 | 0.542455723089964 | -0.451603982991640 | -0.560397342934015 | 1 | 1 | 1 | 1 | 2 | 3 | 1 | 1 | I |
| **21** | 2.020202020202021 | 0.232828718813746 | 0.390078347702487 | -0.464283957442572 | 2.074027075786066 | -3.836634688004172 | 1.943263148347858 | -0.180887291903223 | -0.066888045166262 | -0.058914216825753 | 0.255946961311037 | -0.393406104421241 | -0.307588019486698 | 0.101731523900820 | -0.137665107109637 | -0.421899302769256 | 0.246022962609100 | 1 | 1 | 1 | 1 | 2 | 2 | 3 | 2 | K |
| **22** | 1.975308641975303 | 0.218825789711576 | 0.409287486527713 | -0.010338243847543 | 1.316147444657464 | -0.044533598371717 | 3.069509999229578 | 0.025251059092553 | 0.371027649957347 | 0.295544655203591 | 0.921615857235165 | -0.521578199184862 | -0.810453935441518 | 0.427096435379412 | 0.532905273966797 | 0.170018857810562 | 0.101519818448334 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | O |
| **23** | 1.276595744680850 | 0.290974149322429 | 0.357446589763838 | 0.666345316403260 | 1.448579390136190 | 0.899081518774028 | 2.324935400019553 | 0.651307733385752 | 0.247496842821382 | 0.273292205125020 | -0.129844111540388 | -0.259378383373893 | 0.506275818367594 | 0.280145343687424 | 0.295378794858224 | 0.275544876354080 | 0.633519830113116 | 1 | 1 | 1 | 0 | 2 | 1 | 1 | 1 | R |
| **24** | 1.777777777777771 | 0.178833792470156 | 0.481634527089072 | -0.625252774653288 | 1.628446477621205 | -1.105924830584893 | 1.699615927249534 | 0.461710889302480 | 0.070777063170490 | 0.660944819498834 | -0.377263607289953 | -0.376355716794802 | 0.277779790431678 | 0.230580097729814 | -0.242007867545203 | -0.507591214245798 | -0.429949316067272 | 1 | 2 | 1 | 1 | 2 | 1 | 1 | 0 | S |
| **25** | 1.960784313725488 | 0.231916210366533 | 0.379649902071973 | 0.918739395132969 | 0.544792604411368 | 0.312768183880878 | 2.756925716404028 | 0.340584023170764 | 0.701033009708324 | -0.579050908390786 | 0.496917784346033 | -0.035126538118373 | -0.356358273960406 | 0.305813045818202 | -0.278866210427961 | 0.687475173431102 | -0.594095246843505 | 0 | 0 | 1 | 0 | 1 | 2 | 1 | 1 | V |
| **26** | 2.150537634408603 | 0.215182195306843 | 0.438544705873381 | 0.805603010471308 | 0.303411796568282 | 0.612173818433303 | 3.024666685843771 | 0.316006499309291 | 0.503850886180941 | -0.543377147877520 | 0.668893849340526 | -0.309535935375271 | -0.527573318910261 | 0.463312539773752 | 0.427364792036445 | 0.350394259267306 | -0.219566158668556 | 0 | 0 | 1 | 0 | 3 | 3 | 1 | 1 | V |
| **27** | 1.580952380952381 | 0.237124215160031 | 0.423251283025877 | 1.139156079605661 | 2.382242530649974 | -1.167989249383562 | 1.555887864394099 | -0.337406267807576 | 0.116051068002437 | 0.123657505174539 | -0.212421883485678 | -0.440302392793854 | 0.313128096436913 | 0.142768313788127 | -0.501330899419926 | -0.573796306410339 | 0.720503419962266 | 1 | 1 | 2 | 1 | 2 | 3 | 2 | 1 | Z |
| **28** | 1.045751633986926 | 0.238647675710483 | 0.295243230779200 | 0.416872907407966 | 2.834184603942520 | -0.477034009420981 | 2.393476551030632 | 0.335054658986521 | -0.154366125543537 | 0.135087054774342 | 0.878621377639807 | -0.133195110386803 | -0.659531203551983 | 0.039897466304340 | -0.323553616240730 | -0.340069490641269 | 0.434700033012955 | 1 | 1 | 1 | 1 | 3 | 4 | 3 | 3 | E |
| **29** | 2.716049382716050 | 0.185139274034745 | 0.452674993305129 | -0.726001012616856 | 2.055699335674618 | -1.578180950303500 | 3.136661301674776 | 0.247850709825767 | -0.034601026665580 | 0.293154310112515 | -0.091229239173718 | -0.611063574191169 | 0.092488387146373 | -0.046243819610130 | 0.524632407141162 | 0.123612455885724 | -0.122430801403358 | 1 | 1 | 2 | 1 | 3 | 2 | 3 | 3 | G |
| **30** | 8.933333333333326 | 0.090739990896523 | 0.927006267765402 | -0.040680852621036 | 0.590252082442153 | -5.429193365457921 | 3.422609025626881 | -0.861422443331597 | 0.656736536378626 | 0.424428544398214 | -0.762494934176317 | -0.784826907008957 | -0.027673027926986 | 0.403729299368660 | -0.070664836630701 | -0.366238229454790 | -0.776861522266882 | 0 | 1 | 1 | 0 | 2 | 3 | 4 | 4 | I |
| **31** | 2.370370370370372 | 0.142052449856734 | 0.358462166483214 | 2.083825942548491 | 2.167047043715673 | -3.497671478286102 | 3.730555279236369 | -0.257647772476448 | 0.385007925534083 | 0.025573938864719 | 0.063402870441775 | -0.431778906854145 | 0.221606930813411 | 0.163977765917911 | 0.277315347437830 | -0.004872698938200 | 0.512660915431084 | 2 | 1 | 1 | 1 | 4 | 3 | 3 | 2 | K |
| **32** | 1.440860215053765 | 0.335365943845128 | 0.333713544757573 | 0.941368369747347 | 1.197339715313829 | -1.277335814579199 | 3.258351839645908 | -0.059602001090067 | 0.514023681356672 | 0.139051142686515 | -0.290993335588559 | -0.063094371329349 | 0.856937051356242 | 0.298496498964624 | 0.341298010902413 | 0.141219579636061 | 0.484628433737079 | 0 | 1 | 1 | 1 | 3 | 4 | 2 | 1 | N |
| **33** | 1.261261261261261 | 0.195001716222538 | 0.340373445098590 | -0.209637975556753 | 1.943428099075233 | -0.171418881681567 | 2.309779056852482 | 0.128873127492457 | 0.174678183348819 | 0.103068161293006 | 0.928409089068863 | -0.479637828695270 | -0.887847105932149 | 0.012776706263177 | 0.378850272269506 | 0.301281633794844 | 0.311841064800749 | 1 | 1 | 1 | 0 | 3 | 2 | 2 | 1 | O |
| **34** | 1.944444444444446 | 0.156952649708015 | 0.292318282169003 | -0.317840626330141 | 1.376476097199234 | -0.393574403195871 | 3.878568713317809 | 0.523366317668014 | 0.205665813285946 | -0.007769797801268 | -0.210934089209919 | -0.321909614738306 | 0.427641063144735 | 0.067580050879716 | 0.051163891349940 | 0.297786983957277 | 0.357867141698770 | 1 | 1 | 1 | 1 | 6 | 5 | 2 | 2 | P |
| **35** | 1.521367521367522 | 0.275593048546924 | 0.387425449404327 | 0.928894194697063 | 1.125477176728743 | -1.488451310818312 | 3.441848159601074 | -0.268675052441410 | 0.742992207240029 | -0.262434620923350 | 0.454068142098910 | -0.210424586186752 | -0.444038698146078 | 0.038615769100744 | 0.016168135900642 | 0.523150942371933 | 0.328927721083996 | 0 | 0 | 1 | 1 | 2 | 3 | 4 | 3 | U |
| **36** | 2.036036036036036 | 0.185825591220139 | 0.437888790645517 | -0.521885363926982 | 1.295746860961823 | -2.850803591426832 | 1.376934952162725 | 0.636265765497348 | -0.132528231220992 | 0.171261470376020 | -0.135631229636664 | -0.384459127422927 | 0.281561100565348 | -0.101378862824263 | -0.284847011210998 | -0.482805255980236 | 0.302613534822401 | 0 | 1 | 1 | 1 | 1 | 2 | 2 | 1 | Y |
| **37** | 1.565217391304346 | 0.144683470978378 | 0.380262204900821 | 0.162878202059075 | 1.318373853152075 | -1.153100060783205 | 3.003418965142715 | -0.134221440376954 | -0.029001763082629 | 0.627262424498459 | 0.448748861149406 | -0.537519848350707 | -0.662243590747405 | 0.293910296636873 | 0.381354288063066 | -0.347468719714447 | 0.366437844982451 | 1 | 0 | 2 | 2 | 2 | 1 | 2 | 1 | A |
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| **39** | 1.205128205128206 | 0.212180111928900 | 0.251803749792623 | 0.771266466668139 | 1.709209683383181 | -0.174834298963680 | 2.114951765222354 | 0.190201590574829 | -0.108958134790103 | 0.423322094242498 | 0.843391046192821 | 0.016257703353537 | -0.710351432555248 | 0.190442253728951 | -0.020257785242980 | -0.282402739190082 | 0.526841726836731 | 1 | 1 | 1 | 1 | 1 | 2 | 2 | 1 | E |
| **40** | 4.311111111111098 | 0.099891757632790 | 0.750509501791331 | 0.524748583476291 | 0.529746189033208 | -2.048676007402999 | 2.295536973992145 | -0.654804816885888 | -0.250714970928831 | 0.940215132895801 | 0.598194243853235 | -0.335678825648299 | -0.562959065431553 | 0.180890837798150 | -0.656086324558677 | -0.877957524990175 | 0.662449092647739 | 0 | 0 | 1 | 1 | 2 | 1 | 1 | 0 | L |
| **41** | 1.884057971014492 | 0.188114356881169 | 0.423311173073375 | -0.314919109741056 | 1.613570768731780 | -0.492418445857723 | 2.978113516433997 | -0.188121378564642 | 0.521728440225467 | 0.273386253687767 | 0.941026657861021 | -0.634683229737672 | -0.825887430069706 | 0.059433229280263 | 0.290639527920465 | 0.318448455833729 | 0.167024039679079 | 1 | 1 | 1 | 1 | 3 | 3 | 1 | 1 | O |
| **42** | 2.186666666666660 | 0.127307759775621 | 0.403828106739696 | 0.133701564565752 | 1.201069011986150 | -1.425895506367511 | 3.041415344086214 | -0.269600555978545 | -0.207056551052780 | 0.543836858795157 | 0.285033383269348 | -0.354320242981503 | -0.502490432493060 | 0.390245446050336 | 0.184071517581064 | -0.451121628944864 | 0.487574571472246 | 1 | 0 | 2 | 2 | 2 | 1 | 2 | 1 | Q |
| **43** | 1.884057971014487 | 0.188735974632293 | 0.439910918315869 | 0.998056683164717 | 1.091374429608211 | -0.201128897512106 | 3.014575508683182 | -0.374957456776806 | 0.328780317117577 | 0.043820512254632 | -0.045046960529944 | -0.636266381149408 | 0.787826116640897 | 0.095124423974477 | -0.243309248496991 | 0.285840643349703 | 0.082107876791763 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | R |
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| **45** | 2.456140350877191 | 0.216480367242418 | 0.335957215087061 | 0.612310294751556 | 0.373495061373621 | 0.503331566302159 | 2.852697538836446 | 0.213880333140168 | 0.410500916691417 | 0.106237387000220 | 0.501113949039530 | -0.555741631416904 | -0.509144469490513 | 0.647930791353289 | 0.545490415200857 | -0.098591513910395 | -0.452246696253987 | 0 | 0 | 1 | 1 | 3 | 4 | 1 | 1 | V |
| **46** | 0.989898989898991 | 0.207007863884605 | 0.331009775350820 | -0.104539475093758 | 2.226948494909426 | -1.021520907713938 | 1.712622145327848 | -0.167073438806723 | -0.443286759608504 | 0.268332782316176 | 0.262576982993283 | -0.042074323627508 | -0.732091678644059 | 0.323248189711868 | -0.179151714349300 | -0.028595713714890 | 0.171163581690936 | 1 | 0 | 1 | 1 | 3 | 2 | 2 | 2 | A |
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| **48** | 1.777777777777781 | 0.223765432098765 | 0.495149911816579 | 0.139926655758459 | 1.443617834754092 | -1.142697681369557 | 1.431625143881004 | 0.332658717127702 | -0.684891926980515 | 0.486527301374709 | 0.962562032145783 | 0.099721779228782 | -0.667253759088866 | 0.477692525426958 | -0.661871850010147 | -0.564471753666390 | 0.258710456505063 | 1 | 0 | 0 | 0 | 1 | 1 | 1 | 1 | C |
| **49** | 2.385964912280707 | 0.160517251644038 | 0.302090095755738 | -0.372420226084974 | 1.378685223690358 | -2.105493464502369 | 2.630872683043842 | 0.510104571504073 | -0.597652291277835 | -0.057845634622139 | 0.079860139275284 | -0.341126569311387 | -0.784822611826827 | 0.013246217764388 | -0.274617481982277 | 0.232840062277989 | -0.085371346786445 | 1 | 0 | 1 | 1 | 3 | 3 | 3 | 2 | D |
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| **51** | 2.888888888888892 | 0.172282577048474 | 0.502263863457195 | -0.596888404111615 | 0.372896335189346 | -2.081566296845637 | 1.475650115350005 | 0.997786113932899 | -0.299286429672928 | 0.235762269741416 | 0.019466183314449 | -0.336173448318176 | 0.278371451446138 | 0.075535179461426 | -0.721019873451032 | -0.745102910023326 | 0.841947704581663 | 1 | 0 | 1 | 1 | 3 | 2 | 2 | 1 | I |
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| **54** | 1.849462365591398 | 0.202830611474086 | 0.304649319381921 | -0.071669968918986 | 1.547240326033226 | -0.051152316739631 | 3.177483835032811 | 0.640846971464390 | 0.324370051970535 | 0.172000461202588 | -0.204749372140181 | -0.262337458056826 | 0.424212652256929 | 0.182378807493869 | 0.175790005462998 | 0.048738210222473 | 0.483051698233464 | 1 | 1 | 2 | 1 | 2 | 1 | 2 | 1 | P |
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| **58** | 1.346153846153846 | 0.268017333483147 | 0.262440166618522 | 1.093118267411630 | 0.879180178254665 | 0.360092037524474 | 2.596680198681509 | 0.476511643427417 | -0.350159734592933 | 0.455534493079037 | 0.848925236843567 | -0.644624339702652 | -0.120067112970690 | 0.551060585481949 | 0.314327185251498 | -0.293821184305205 | 0.643903025937688 | 0 | 0 | 1 | 0 | 1 | 2 | 1 | 1 | V |
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| **61** | 1.485714285714285 | 0.179774012525175 | 0.348957889255046 | 0.004099878991500 | 1.556178107653084 | -1.207431858610594 | 2.838907909942086 | 0.109449163869877 | -0.574485089773087 | 0.248963337495013 | 0.347197299038947 | -0.363718820250009 | -0.669906148668454 | 0.207959958341205 | 0.215884280058156 | -0.278241823297922 | 0.478208769234667 | 1 | 0 | 1 | 2 | 2 | 2 | 3 | 3 | A |
| **62** | 1.843137254901959 | 0.165107648515751 | 0.297482322475948 | 0.057229981686896 | 1.488955969786300 | -0.387924796517810 | 3.322746470155838 | 0.544252343804592 | -0.365690408303480 | 0.268847383345322 | 0.287545601333056 | 0.100752756338149 | -0.274646903605271 | 0.238560892188142 | 0.456877276265628 | 0.083218863703800 | 0.433771762934954 | 1 | 0 | 1 | 2 | 2 | 1 | 2 | 1 | D |
| **63** | 2.777777777777775 | 0.099687500000000 | 0.435885416666666 | -0.743544163777345 | 2.396811963118120 | -2.969535779127825 | 2.263613955974434 | 0.030607949715107 | 0.540497775421929 | 0.508392542423776 | -0.595498326285640 | -0.288004940450542 | 0.586309176534864 | 0.642972920178709 | -0.116623174608051 | -0.915227272394637 | 0.207709409503634 | 1 | 1 | 1 | 0 | 2 | 1 | 3 | 2 | J |
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| **67** | 5.392156862745104 | 0.086711766926647 | 0.771969200225406 | -0.920057364700089 | 1.329092433304542 | -4.915405650555043 | 4.200559882120633 | 0.633076890248449 | 0.109243591104535 | 0.887035150655894 | -0.461378588653954 | -0.319654808467229 | 0.824685456094584 | 0.248919436763033 | 0.075835565362458 | -0.684231193550490 | -0.296269850354847 | 1 | 0 | 1 | 1 | 2 | 2 | 2 | 1 | J |
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| **76** | 6.512820512820524 | 0.097437024587602 | 0.733138598694347 | 0.610701352425213 | 1.083271314544786 | -1.899476894109753 | 4.113216794180488 | 0.251517919506218 | -0.041280173875111 | 0.456461858200362 | 0.560359878049530 | -0.112155063823613 | -0.600505495171468 | 0.505454157527580 | 0.033160987275713 | -0.508295753678067 | -0.021614139464647 | 2 | 2 | 3 | 3 | 3 | 4 | 3 | 4 | I |
| **77** | 1.757575757575755 | 0.152352273483878 | 0.329321874692707 | 0.735020502984831 | 0.800531174786279 | -0.070682239428996 | 2.970997554061481 | 0.029653881780928 | 0.187446993255764 | 0.468883051707692 | 0.212364485262124 | 0.210385578268554 | -0.365331360876678 | 0.301328316338933 | -0.266703901015968 | -0.073253901597642 | 0.648678075108928 | 1 | 1 | 2 | 2 | 2 | 3 | 2 | 2 | L |
| **78** | 0.592592592592593 | 0.246865043425124 | 0.246294257197552 | 0.765245461577175 | 2.509433717655169 | -0.552026688200883 | 1.273293818520952 | 0.267542686471953 | -0.242998279168848 | 0.496555208376011 | 0.361947602851326 | -0.431980961003987 | -0.001919859587570 | 0.165988558133054 | 0.031849182076066 | -0.280337956224772 | 0.863961214039495 | 1 | 1 | 2 | 1 | 2 | 2 | 2 | 2 | Z |
| **79** | 1.628415300546448 | 0.129035783336515 | 0.387852438522251 | 0.240912583356834 | 1.388348135724379 | -0.511518418908796 | 3.008416509976465 | -0.437756124455364 | 0.275233655018018 | 0.363063733063438 | 0.360545368657296 | -0.611644250116675 | -0.411111874082096 | 0.059740734659595 | 0.364265521973274 | -0.227366172399153 | 0.318828558812343 | 1 | 0 | 2 | 2 | 2 | 2 | 4 | 4 | Q |
| **80** | 1.161904761904762 | 0.189960758509789 | 0.301057532866505 | 0.910868848499520 | 2.028916332566543 | -0.302103839034871 | 1.790688012840226 | -0.058387593586913 | 0.262563383702746 | 0.442568315538370 | 0.172785873938278 | -0.609420782034439 | 0.342139455426040 | 0.055067642444528 | -0.083290725875893 | -0.045302909131108 | 0.697431417259431 | 2 | 2 | 1 | 0 | 2 | 3 | 2 | 2 | Z |
| **81** | 1.901234567901232 | 0.201675658218590 | 0.361960582174686 | -0.434967041820694 | 1.234140741131116 | -1.589222906898375 | 2.759847007978477 | 0.555149747078759 | -0.391732580696072 | 0.014164410526291 | -0.044653637642192 | -0.657681190517106 | -0.302894950267740 | -0.146588128395081 | -0.110308621289864 | -0.173933572304183 | 0.078615245684876 | 1 | 0 | 2 | 1 | 4 | 4 | 2 | 1 | D |
| **82** | 3.263157894736843 | 0.226204378526915 | 0.518169016673839 | 0.692767280505653 | 0.770864020827600 | -1.873122728607331 | 4.240235647826617 | -0.521903208725128 | 0.303676073319588 | 0.195873607422430 | 0.159543477939401 | -0.580842550664723 | -0.059869904164813 | -0.029648279963854 | 0.301734303851252 | -0.153294766523697 | 0.561425909092327 | 0 | 0 | 2 | 2 | 1 | 1 | 3 | 3 | H |
| **83** | 1.028571428571429 | 0.325566076407343 | 0.291596966714912 | 1.019794163537818 | 1.220828737560632 | -0.764240763607110 | 3.883100674545016 | 0.061892500521769 | 0.216064405872004 | 0.061787099441297 | -0.130592074210948 | -0.122509880650361 | 0.684831429326236 | 0.330719400682569 | 0.249460438717514 | 0.253522466939938 | 0.852906621021717 | 0 | 0 | 3 | 2 | 4 | 4 | 3 | 2 | M |
| **84** | 3.699999999999997 | 0.160317407730582 | 0.424790188843070 | 0.124702742392933 | 1.054298833099819 | -1.169648104235597 | 5.331755495964363 | 0.619112318503686 | 0.201437471999076 | 0.069865755383417 | -0.029875713566648 | -0.198442987126526 | 0.468482931648132 | 0.172419475310450 | 0.103072332804278 | 0.125339893532703 | 0.411822732594136 | 1 | 1 | 1 | 1 | 2 | 1 | 2 | 1 | P |
| **85** | 1.419354838709676 | 0.248869971493522 | 0.393717581447428 | 1.486675165265364 | 0.860119997469663 | 0.013251437520962 | 3.061209060883094 | 0.271389289170443 | 0.210834742858389 | -0.545808925682325 | 0.581592097311285 | -0.396371019750090 | 0.069624965334661 | 0.203065175871820 | 0.203367879368286 | -0.049460297818632 | -0.038504950173139 | 0 | 0 | 1 | 0 | 4 | 4 | 2 | 1 | V |
| **86** | 2.173913043478261 | 0.143981176870353 | 0.437833766321159 | -0.416468830053899 | 2.075544184144734 | -4.476884499331678 | 4.126535980787142 | -0.031142205776258 | 0.377607215720900 | 0.228170036691900 | -0.125335230164667 | -0.474152933762918 | 0.445504606051681 | -0.103496537752346 | -0.132460841009039 | -0.270449932564325 | 0.010839695824241 | 1 | 1 | 2 | 1 | 2 | 1 | 2 | 1 | B |
| **87** | 1.706214689265532 | 0.155657840560286 | 0.346154112384579 | 0.541671792386262 | 1.502391306173156 | -0.951306105401096 | 2.471819870792550 | 0.385553789946729 | -0.129738868085542 | 0.320813019742785 | 0.286017760638327 | -0.402934830823794 | -0.135773033032242 | 0.169403235641348 | 0.150947929176526 | -0.542690868261245 | 0.218116558811610 | 1 | 0 | 1 | 1 | 2 | 2 | 1 | 2 | F |
| **88** | 1.860215053763444 | 0.110984654133347 | 0.324327646307425 | 0.262942476208043 | 1.605683170831915 | -0.194507938641747 | 3.046499068378532 | 0.262524305925994 | -0.429583576487693 | 0.610610059612006 | 0.633490105091480 | -0.504019558166316 | -0.076397204437891 | 0.268471905475205 | -0.090049027579827 | -0.225079780024314 | 0.523260376342238 | 3 | 2 | 2 | 2 | 3 | 2 | 3 | 3 | Q |
| **89** | 1.513513513513514 | 0.288973409819233 | 0.441801302521653 | 0.759880188619204 | 1.037417782262979 | -1.274827769968405 | 3.537343551744805 | -0.237876528233777 | 0.299572908564124 | 0.168145386483918 | 0.285800238659265 | -0.274551924470865 | -0.488795802827015 | 0.247219912046075 | 0.123377529645071 | 0.025895351769769 | 0.699545674136649 | 1 | 1 | 1 | 1 | 2 | 1 | 2 | 1 | U |
| **90** | 2.250000000000005 | 0.193469387755102 | 0.365014577259476 | 0.799408409197011 | 1.818996804914324 | 0.371998742678890 | 3.137497166741096 | 0.251194440809648 | -0.286531492092008 | 0.735581736490340 | 0.579992302440283 | -0.474455953342067 | 0.479808550371094 | 0.269557658275418 | -0.362733610706178 | -0.459157120879277 | 0.881752931991757 | 2 | 1 | 2 | 1 | 2 | 2 | 2 | 2 | Y |
| **91** | 0.715277777777778 | 0.285824621811341 | 0.240265598524416 | 2.355361315713747 | 3.399538106975414 | -0.809100642504859 | 1.617669735606919 | -0.031237940806856 | -0.044725325630698 | 0.528787920347544 | 0.171152924937948 | -0.060986943699848 | 0.356885566451330 | 0.204540920750052 | -0.030134224285373 | -0.148044120284617 | 0.781856915995101 | 2 | 2 | 1 | 0 | 2 | 3 | 2 | 3 | Z |
| **92** | 2.986666666666677 | 0.155744938352741 | 0.377937906197521 | -0.830954574638428 | 2.003452205517366 | -3.364870940604014 | 3.491675119980315 | 0.670091408319143 | -0.172927442203677 | 0.061053820538104 | 0.719627192233752 | -0.418502380604375 | -0.425585461253978 | 0.410148185021880 | 0.263127689937286 | -0.357645346242030 | 0.109279707025955 | 2 | 1 | 2 | 3 | 2 | 2 | 5 | 5 | F |
| **93** | 2.126984126984127 | 0.210254039153976 | 0.338873329297678 | -0.637019224724891 | 1.903840405829572 | -0.713278955571319 | 3.131886337596193 | 0.341732260291364 | -0.450842682439805 | 0.247723141915085 | 0.069408748244248 | -0.667422475513110 | 0.072366208275277 | 0.210303730932628 | -0.261715632113330 | 0.098371880908705 | 0.090442227154160 | 1 | 1 | 2 | 2 | 2 | 1 | 2 | 3 | G |
| **94** | 5.851851851851872 | 0.150080773031545 | 0.907961374153335 | -0.504947852096908 | 0.414823855250001 | -3.064056265315970 | 2.506096783998555 | 0.997168925149364 | -0.594168750111163 | -0.078695624018151 | -0.209369500487807 | -0.627232513456598 | -0.025700030568063 | -0.158690617927975 | -0.558411298081391 | -0.466344436232085 | 0.961576165449287 | 0 | 0 | 1 | 0 | 1 | 0 | 2 | 1 | L |
| **95** | 1.175757575757576 | 0.249162850010259 | 0.308389163569387 | 0.665708579686737 | 1.477840359964930 | -1.468320486920732 | 4.233062064808800 | -0.039198348959432 | 0.173694422944983 | 0.167963897245276 | 0.001917127626576 | -0.567436755684252 | 0.635638323853835 | 0.248547260146237 | -0.443819072841683 | -0.157990826961895 | 0.869065423635967 | 2 | 2 | 2 | 2 | 3 | 2 | 3 | 2 | M |
| **96** | 1.609756097560975 | 0.282816799577964 | 0.357652400344969 | 0.860095103600279 | 0.923728554227436 | -0.329364239351743 | 2.783384410586935 | 0.343659997760558 | 0.224532859629405 | 0.362394924742542 | 0.228136439484587 | -0.630868180726116 | 0.355670321516083 | 0.176572594580703 | 0.390133537976408 | 0.190054317185793 | 0.462227813323224 | 0 | 0 | 1 | 1 | 1 | 1 | 2 | 1 | R |
| **97** | 1.274853801169591 | 0.312044014115279 | 0.328205049932437 | 1.027708998847520 | 1.102509452768020 | -1.054834706088035 | 3.228894956107113 | 0.030635323952007 | 0.469297558447451 | -0.132506973245821 | 0.445381652140773 | -0.325801668596929 | -0.742145518833758 | 0.164879966908232 | 0.479866167406539 | 0.280810822343280 | 0.270977612460998 | 0 | 0 | 1 | 1 | 1 | 2 | 2 | 1 | U |
| **98** | 1.521739130434784 | 0.258965347570357 | 0.418068816753598 | -0.419514939102463 | 2.788385297183907 | -3.849200175156579 | 2.571334376434119 | 0.043465747272446 | -0.030651161753495 | 0.047966373538978 | -0.059163228076987 | -0.580394595017737 | -0.337371257177611 | -0.269182631213894 | 0.376024941322159 | -0.519359421846192 | 0.273289676454930 | 0 | 1 | 1 | 1 | 1 | 1 | 2 | 1 | X |
| **99** | 18.222222222222435 | 0.076493271129114 | 1.290469814789305 | 0 | 0 | -2.441622954880871 | 5.078413599734651 | 0.827375616721705 | -0.004471223280200 | NaN | 0.686878297286617 | -0.171682150800891 | NaN | 0.627655527158422 | NaN | -0.439260685168221 | NaN | 0 | 0 | 1 | 0 | 0 | 0 | 1 | 1 | I |
| **100** | 1.377777777777775 | 0.243750287197699 | 0.306758553184482 | 0.793171684281060 | 1.437774518090699 | -0.252004705716399 | 2.411973548048855 | 0.424618087534837 | 0.269815099700418 | 0.347037125232257 | 0.148337104323247 | 0.415688895800852 | -0.411639494083106 | 0.211598457127453 | 0.103635069425582 | 0.013324086273383 | 0.468358729973358 | 1 | 1 | 1 | 1 | 2 | 2 | 2 | 1 | L |
| **⋮** |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |

## **Task 1**

predLetter = predict(knnmodel,testdata)

predLetter = 968×1 categorical

E   
F   
G   
J   
M   
P   
T   
Z   
D   
M

## **Task 2**

misclassrate = sum(predLetter ~= testdata.Character)/numel(predLetter)

misclassrate =

0.167355371900826

## **Task 3**

testloss = loss(knnmodel,testdata)

testloss =

0.162804198599323

## **Further Practice**

resubLoss(knnmodel)

ans =

0

# Investigate Misclassifications

Instructions are in the task pane to the left. Complete and submit each task one at a time.

Do not edit. This code loads the data and a trained kNN model and makes a confusion chart.

load letterdata.mat

load predmodel.mat

testdata

testdata = 968×26 table

|  | **AspectRatio** | **MADX** | **MADY** | **AvgU** | **MADU** | **AvgV** | **MADV** | **CorrXY** | **CorrXP** | **CorrXU** | **CorrXV** | **CorrYP** | **CorrYU** | **CorrYV** | **CorrPU** | **CorrPV** | **CorrUV** | **NumXMin** | **NumXMax** | **NumYMin** | **NumYMax** | **NumUMin** | **NumUMax** | **NumVMin** | **NumVMax** | **Character** |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **1** | 1.405405405405405 | 0.197169422944323 | 0.315278077450562 | 0.676772395532966 | 1.939177839168160 | -0.556798271601414 | 2.351323750216454 | -0.111210697254093 | -0.334064498713704 | 0.639906042605021 | 0.734469797288685 | 0.245445447374846 | -0.741999619690661 | 0.480497299598525 | -0.375839045921709 | -0.526880073122734 | 0.132302384532342 | 1 | 1 | 1 | 1 | 1 | 2 | 1 | 1 | E |
| **2** | 2.774193548387111 | 0.131421220782920 | 0.475718469114718 | 0.425123964981858 | 1.286213689388807 | -1.982892289161660 | 3.308047025855674 | 0.402772445399980 | -0.486445927469113 | 0.065055747023347 | 0.531482309715430 | -0.088610707643932 | -0.466985452030224 | 0.385788756212317 | 0.368760637289319 | -0.405411960760232 | 0.143773492074333 | 1 | 0 | 1 | 1 | 2 | 1 | 1 | 1 | F |
| **3** | 2.577777777777794 | 0.168337767695198 | 0.434642124701036 | -0.834969749715341 | 1.925548450364925 | -1.412360507434341 | 2.471744173197755 | 0.299515056980770 | 0.037656399066453 | 0.261095181472653 | 0.094769480161049 | -0.201187682004459 | 0.065663890639434 | 0.413313117322987 | 0.011105353980283 | -0.580407439927837 | 0.020240407861625 | 1 | 1 | 1 | 2 | 2 | 1 | 3 | 2 | G |
| **4** | 3.820512820512805 | 0.106944456417853 | 0.589232711789452 | -0.797682590081084 | 0.854744816982911 | -3.179170298421427 | 3.410587290929737 | 0.641704622757201 | 0.274413497077880 | 0.857635666100609 | -0.607463274798009 | -0.318646981812194 | 0.708679673806995 | 0.119037453167992 | 0.027768963462513 | -0.596439861348609 | -0.411295220474599 | 1 | 0 | 1 | 1 | 1 | 1 | 1 | 1 | J |
| **5** | 1.106382978723405 | 0.280636929614215 | 0.256200743204593 | 0.991474487506619 | 0.864995661252086 | -0.597752415292249 | 3.489796161022245 | 0.066304714879732 | 0.054995279632835 | 0.409753327229605 | -0.089025540979459 | 0.081526950452760 | 0.552022612470876 | 0.450231070068287 | 0.508956528028029 | 0.499966685137185 | 0.829772865202056 | 0 | 0 | 2 | 2 | 1 | 2 | 2 | 2 | M |
| **6** | 2.942528735632177 | 0.184606359548993 | 0.445814842519088 | 0.285927332769424 | 1.021863307709911 | -0.541487876039929 | 4.088613787004586 | 0.623979905661609 | 0.462148945350348 | 0.108602098737966 | -0.031232398958195 | -0.122190496156409 | 0.413274723133449 | 0.157769958090115 | 0.246677143039360 | 0.162179784145227 | 0.732219031087325 | 1 | 1 | 1 | 1 | 0 | 1 | 2 | 1 | P |
| **7** | 3.936507936507926 | 0.117234520795460 | 0.562763570852589 | 0.843335489735165 | 1.489690802287656 | -4.184760840259847 | 4.611072623795068 | -0.105725620896804 | -0.359235152940566 | 0.553282928297359 | 0.755144823491169 | -0.287372462577395 | -0.549553311462664 | -0.190771620601711 | -0.269958931687147 | -0.700402901901084 | 0.691254174211264 | 2 | 1 | 1 | 1 | 3 | 2 | 1 | 1 | T |
| **8** | 2.399999999999994 | 0.175025179441097 | 0.467081554455378 | 1.310033980019589 | 2.153936242762605 | -2.206513829938098 | 3.045207216939416 | -0.267732724185295 | 0.119895391494924 | 0.573697556815449 | 0.333106634723385 | -0.231161990840867 | 0.002123994990610 | 0.371086882396243 | -0.400687461886423 | -0.613185619954512 | 0.792870446041227 | 2 | 2 | 1 | 0 | 2 | 2 | 1 | 2 | Z |
| **9** | 2.245614035087713 | 0.188798497018330 | 0.300663159513878 | 0.062029827349357 | 1.669329733350576 | -1.418702354108693 | 2.473415098317632 | 0.311061226745379 | -0.329414228140767 | 0.075906338604132 | 0.225378623272962 | -0.648893014580156 | -0.622353073770264 | -0.503811910380704 | 0.152331173155305 | 0.695881852375806 | 0.036971047385645 | 1 | 0 | 2 | 1 | 3 | 3 | 4 | 3 | D |
| **10** | 1.546666666666667 | 0.243260658978860 | 0.329674604462622 | 0.752046497508043 | 0.920779923849822 | -1.155733778192158 | 4.179482298014933 | -0.131051127850549 | -0.014165465259955 | 0.247499379432622 | -0.183789659103964 | -0.280151944166934 | 0.484253969441976 | 0.273143589731612 | -0.291630662601810 | -0.151490297946076 | 0.752456928251392 | 0 | 0 | 2 | 2 | 3 | 2 | 3 | 2 | M |
| **11** | 2.228070175438595 | 0.176519163499198 | 0.390593026145059 | -0.029486610799849 | 1.679392507296984 | -1.765886743621915 | 3.827543501652472 | 0.077258928723840 | 0.167691163015979 | 0.046377106479208 | 0.200553609748844 | -0.555875016015455 | -0.351552650522661 | 0.265548135344432 | 0.432842868186460 | -0.169481435878911 | 0.355740778785408 | 1 | 1 | 2 | 2 | 2 | 1 | 4 | 3 | Q |
| **12** | 1.977777777777780 | 0.168791039907977 | 0.465490204781535 | 0.628029855214664 | 1.200660620545164 | -0.405165595818630 | 3.582931762585353 | 0.647574262891504 | 0.055534946661565 | 0.604052261136696 | 0.054317701815258 | -0.440416306976801 | 0.526333702451661 | -0.002166916942614 | 0.535549590910967 | 0.667698288358081 | 0.487514450511470 | 1 | 0 | 1 | 0 | 3 | 3 | 1 | 1 | R |
| **13** | 1.847619047619048 | 0.219670065763593 | 0.421760140798409 | -0.606039248443243 | 1.976575065905092 | -1.037534840290673 | 1.767802772215623 | 0.013978194660858 | -0.123664412202802 | 0.103008848427174 | 0.013741836294354 | -0.367289178245252 | 0.084592411690196 | 0.296271727998228 | -0.373083926718659 | -0.082786395002930 | -0.260921815169552 | 1 | 1 | 1 | 1 | 2 | 1 | 2 | 2 | S |
| **14** | 1.940740740740738 | 0.139687734033652 | 0.288314518110520 | 1.103727251744505 | 1.424034943306354 | -2.384329916396768 | 3.250890478822172 | 0.322798080984557 | 0.411809737723555 | 0.097193360436263 | 0.278172372650021 | -0.346076115311086 | -0.050753607694665 | -0.150169764147146 | 0.049886971672731 | 0.306423577051653 | 0.868619568405267 | 2 | 1 | 1 | 0 | 3 | 2 | 2 | 1 | T |
| **15** | 2.529411764705879 | 0.169965969503310 | 0.457733928852043 | 0.298981494277297 | 1.798823241011260 | -4.951420892264957 | 2.349819616297219 | 0.191523556735688 | -0.236516644211985 | 0.235846011227413 | -0.144345619277894 | -0.650050572769433 | -0.114122841513616 | -0.542375204595484 | 0.519789265220200 | 0.446228277551194 | 0.116411333458072 | 0 | 1 | 1 | 1 | 2 | 2 | 3 | 2 | X |
| **16** | 4.399999999999990 | 0.172876953897817 | 0.623060858780833 | 0.103326837201738 | 0.934765554658543 | -2.409797256419337 | 3.410759549671683 | -0.235968414526571 | 0.671733608258213 | -0.016537688070335 | 0.044651746732397 | -0.486051340997222 | 0.534277445616260 | 0.179127095756730 | -0.417190923174725 | -0.334370820492682 | 0.209429332566134 | 0 | 1 | 1 | 1 | 2 | 2 | 2 | 1 | Y |
| **17** | 1.428571428571430 | 0.206774549414850 | 0.428788263598714 | 0.347838770897428 | 1.462577531595711 | -0.807089933968806 | 1.705475186061308 | 0.006004782768646 | -0.536710823225558 | 0.558260929574404 | 0.923176524933453 | -0.582868245127523 | -0.686669826564253 | 0.173306742827903 | 0.141089328307886 | -0.634159801793411 | 0.498972399204271 | 1 | 0 | 1 | 1 | 1 | 1 | 1 | 1 | C |
| **18** | 2.016260162601622 | 0.124269407090457 | 0.328524163807050 | 0.111103625651157 | 1.451972410800256 | -0.847666437694230 | 3.620005781729839 | -0.025665953917106 | -0.215798285041405 | 0.618076108164513 | 0.321621076386692 | 0.166930259258131 | -0.427072038120278 | 0.392362855663332 | -0.017455764120211 | -0.138708569440033 | 0.308108006738530 | 2 | 1 | 1 | 2 | 2 | 1 | 2 | 1 | D |
| **19** | 2.851851851851849 | 0.142015477616892 | 0.343250933563824 | 0.600937627461172 | 1.259366762087823 | -3.014772192519995 | 3.623470643673657 | 0.222391638860839 | 0.170831220876844 | 0.412273377345662 | 0.276018038600370 | -0.480152520428181 | 0.473639094950670 | -0.183101400077582 | -0.488999965861567 | -0.446900926300619 | 0.370522348120718 | 1 | 0 | 1 | 0 | 1 | 1 | 3 | 3 | F |
| **20** | 14.266666666666758 | 0.063246237319965 | 1.331480379858093 | 0.573573781166584 | 0.424713602276791 | -3.163398149037732 | 4.195436096878431 | -0.266237733409507 | 0.399902738366837 | -0.380699360336655 | 0.233911024127058 | -0.298370083661790 | 0.357468938302696 | 0.477181999836130 | 0.542455723089964 | -0.451603982991640 | -0.560397342934015 | 1 | 1 | 1 | 1 | 2 | 3 | 1 | 1 | I |
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| **23** | 1.276595744680850 | 0.290974149322429 | 0.357446589763838 | 0.666345316403260 | 1.448579390136190 | 0.899081518774028 | 2.324935400019553 | 0.651307733385752 | 0.247496842821382 | 0.273292205125020 | -0.129844111540388 | -0.259378383373893 | 0.506275818367594 | 0.280145343687424 | 0.295378794858224 | 0.275544876354080 | 0.633519830113116 | 1 | 1 | 1 | 0 | 2 | 1 | 1 | 1 | R |
| **24** | 1.777777777777771 | 0.178833792470156 | 0.481634527089072 | -0.625252774653288 | 1.628446477621205 | -1.105924830584893 | 1.699615927249534 | 0.461710889302480 | 0.070777063170490 | 0.660944819498834 | -0.377263607289953 | -0.376355716794802 | 0.277779790431678 | 0.230580097729814 | -0.242007867545203 | -0.507591214245798 | -0.429949316067272 | 1 | 2 | 1 | 1 | 2 | 1 | 1 | 0 | S |
| **25** | 1.960784313725488 | 0.231916210366533 | 0.379649902071973 | 0.918739395132969 | 0.544792604411368 | 0.312768183880878 | 2.756925716404028 | 0.340584023170764 | 0.701033009708324 | -0.579050908390786 | 0.496917784346033 | -0.035126538118373 | -0.356358273960406 | 0.305813045818202 | -0.278866210427961 | 0.687475173431102 | -0.594095246843505 | 0 | 0 | 1 | 0 | 1 | 2 | 1 | 1 | V |
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| **28** | 1.045751633986926 | 0.238647675710483 | 0.295243230779200 | 0.416872907407966 | 2.834184603942520 | -0.477034009420981 | 2.393476551030632 | 0.335054658986521 | -0.154366125543537 | 0.135087054774342 | 0.878621377639807 | -0.133195110386803 | -0.659531203551983 | 0.039897466304340 | -0.323553616240730 | -0.340069490641269 | 0.434700033012955 | 1 | 1 | 1 | 1 | 3 | 4 | 3 | 3 | E |
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| **30** | 8.933333333333326 | 0.090739990896523 | 0.927006267765402 | -0.040680852621036 | 0.590252082442153 | -5.429193365457921 | 3.422609025626881 | -0.861422443331597 | 0.656736536378626 | 0.424428544398214 | -0.762494934176317 | -0.784826907008957 | -0.027673027926986 | 0.403729299368660 | -0.070664836630701 | -0.366238229454790 | -0.776861522266882 | 0 | 1 | 1 | 0 | 2 | 3 | 4 | 4 | I |
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| **32** | 1.440860215053765 | 0.335365943845128 | 0.333713544757573 | 0.941368369747347 | 1.197339715313829 | -1.277335814579199 | 3.258351839645908 | -0.059602001090067 | 0.514023681356672 | 0.139051142686515 | -0.290993335588559 | -0.063094371329349 | 0.856937051356242 | 0.298496498964624 | 0.341298010902413 | 0.141219579636061 | 0.484628433737079 | 0 | 1 | 1 | 1 | 3 | 4 | 2 | 1 | N |
| **33** | 1.261261261261261 | 0.195001716222538 | 0.340373445098590 | -0.209637975556753 | 1.943428099075233 | -0.171418881681567 | 2.309779056852482 | 0.128873127492457 | 0.174678183348819 | 0.103068161293006 | 0.928409089068863 | -0.479637828695270 | -0.887847105932149 | 0.012776706263177 | 0.378850272269506 | 0.301281633794844 | 0.311841064800749 | 1 | 1 | 1 | 0 | 3 | 2 | 2 | 1 | O |
| **34** | 1.944444444444446 | 0.156952649708015 | 0.292318282169003 | -0.317840626330141 | 1.376476097199234 | -0.393574403195871 | 3.878568713317809 | 0.523366317668014 | 0.205665813285946 | -0.007769797801268 | -0.210934089209919 | -0.321909614738306 | 0.427641063144735 | 0.067580050879716 | 0.051163891349940 | 0.297786983957277 | 0.357867141698770 | 1 | 1 | 1 | 1 | 6 | 5 | 2 | 2 | P |
| **35** | 1.521367521367522 | 0.275593048546924 | 0.387425449404327 | 0.928894194697063 | 1.125477176728743 | -1.488451310818312 | 3.441848159601074 | -0.268675052441410 | 0.742992207240029 | -0.262434620923350 | 0.454068142098910 | -0.210424586186752 | -0.444038698146078 | 0.038615769100744 | 0.016168135900642 | 0.523150942371933 | 0.328927721083996 | 0 | 0 | 1 | 1 | 2 | 3 | 4 | 3 | U |
| **36** | 2.036036036036036 | 0.185825591220139 | 0.437888790645517 | -0.521885363926982 | 1.295746860961823 | -2.850803591426832 | 1.376934952162725 | 0.636265765497348 | -0.132528231220992 | 0.171261470376020 | -0.135631229636664 | -0.384459127422927 | 0.281561100565348 | -0.101378862824263 | -0.284847011210998 | -0.482805255980236 | 0.302613534822401 | 0 | 1 | 1 | 1 | 1 | 2 | 2 | 1 | Y |
| **37** | 1.565217391304346 | 0.144683470978378 | 0.380262204900821 | 0.162878202059075 | 1.318373853152075 | -1.153100060783205 | 3.003418965142715 | -0.134221440376954 | -0.029001763082629 | 0.627262424498459 | 0.448748861149406 | -0.537519848350707 | -0.662243590747405 | 0.293910296636873 | 0.381354288063066 | -0.347468719714447 | 0.366437844982451 | 1 | 0 | 2 | 2 | 2 | 1 | 2 | 1 | A |
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| **39** | 1.205128205128206 | 0.212180111928900 | 0.251803749792623 | 0.771266466668139 | 1.709209683383181 | -0.174834298963680 | 2.114951765222354 | 0.190201590574829 | -0.108958134790103 | 0.423322094242498 | 0.843391046192821 | 0.016257703353537 | -0.710351432555248 | 0.190442253728951 | -0.020257785242980 | -0.282402739190082 | 0.526841726836731 | 1 | 1 | 1 | 1 | 1 | 2 | 2 | 1 | E |
| **40** | 4.311111111111098 | 0.099891757632790 | 0.750509501791331 | 0.524748583476291 | 0.529746189033208 | -2.048676007402999 | 2.295536973992145 | -0.654804816885888 | -0.250714970928831 | 0.940215132895801 | 0.598194243853235 | -0.335678825648299 | -0.562959065431553 | 0.180890837798150 | -0.656086324558677 | -0.877957524990175 | 0.662449092647739 | 0 | 0 | 1 | 1 | 2 | 1 | 1 | 0 | L |
| **41** | 1.884057971014492 | 0.188114356881169 | 0.423311173073375 | -0.314919109741056 | 1.613570768731780 | -0.492418445857723 | 2.978113516433997 | -0.188121378564642 | 0.521728440225467 | 0.273386253687767 | 0.941026657861021 | -0.634683229737672 | -0.825887430069706 | 0.059433229280263 | 0.290639527920465 | 0.318448455833729 | 0.167024039679079 | 1 | 1 | 1 | 1 | 3 | 3 | 1 | 1 | O |
| **42** | 2.186666666666660 | 0.127307759775621 | 0.403828106739696 | 0.133701564565752 | 1.201069011986150 | -1.425895506367511 | 3.041415344086214 | -0.269600555978545 | -0.207056551052780 | 0.543836858795157 | 0.285033383269348 | -0.354320242981503 | -0.502490432493060 | 0.390245446050336 | 0.184071517581064 | -0.451121628944864 | 0.487574571472246 | 1 | 0 | 2 | 2 | 2 | 1 | 2 | 1 | Q |
| **43** | 1.884057971014487 | 0.188735974632293 | 0.439910918315869 | 0.998056683164717 | 1.091374429608211 | -0.201128897512106 | 3.014575508683182 | -0.374957456776806 | 0.328780317117577 | 0.043820512254632 | -0.045046960529944 | -0.636266381149408 | 0.787826116640897 | 0.095124423974477 | -0.243309248496991 | 0.285840643349703 | 0.082107876791763 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | R |
| **44** | 2.090909090909088 | 0.187485715085969 | 0.367273128782608 | 0.845811893533103 | 1.492403975015998 | 0.407370704322066 | 2.455693236988095 | 0.031984308857096 | 0.226472371872804 | 0.233131725283866 | -0.198314193268218 | -0.562335954423502 | 0.782971916556272 | 0.304469909104686 | -0.054564983949660 | 0.411090357417073 | 0.300104469426178 | 1 | 1 | 1 | 1 | 1 | 2 | 1 | 2 | R |
| **45** | 2.456140350877191 | 0.216480367242418 | 0.335957215087061 | 0.612310294751556 | 0.373495061373621 | 0.503331566302159 | 2.852697538836446 | 0.213880333140168 | 0.410500916691417 | 0.106237387000220 | 0.501113949039530 | -0.555741631416904 | -0.509144469490513 | 0.647930791353289 | 0.545490415200857 | -0.098591513910395 | -0.452246696253987 | 0 | 0 | 1 | 1 | 3 | 4 | 1 | 1 | V |
| **46** | 0.989898989898991 | 0.207007863884605 | 0.331009775350820 | -0.104539475093758 | 2.226948494909426 | -1.021520907713938 | 1.712622145327848 | -0.167073438806723 | -0.443286759608504 | 0.268332782316176 | 0.262576982993283 | -0.042074323627508 | -0.732091678644059 | 0.323248189711868 | -0.179151714349300 | -0.028595713714890 | 0.171163581690936 | 1 | 0 | 1 | 1 | 3 | 2 | 2 | 2 | A |
| **47** | 1.861111111111111 | 0.185938553739552 | 0.378200330673328 | -0.253558448814169 | 1.774218143376062 | -0.849923682963858 | 3.570853137431704 | 0.247460747571674 | 0.225622763291962 | 0.213584062797174 | -0.311315328044495 | -0.407812273183597 | 0.542112313475125 | -0.016065956848196 | 0.075671840081835 | -0.186306549217960 | 0.261295250975878 | 1 | 1 | 2 | 1 | 2 | 1 | 3 | 2 | B |
| **48** | 1.777777777777781 | 0.223765432098765 | 0.495149911816579 | 0.139926655758459 | 1.443617834754092 | -1.142697681369557 | 1.431625143881004 | 0.332658717127702 | -0.684891926980515 | 0.486527301374709 | 0.962562032145783 | 0.099721779228782 | -0.667253759088866 | 0.477692525426958 | -0.661871850010147 | -0.564471753666390 | 0.258710456505063 | 1 | 0 | 0 | 0 | 1 | 1 | 1 | 1 | C |
| **49** | 2.385964912280707 | 0.160517251644038 | 0.302090095755738 | -0.372420226084974 | 1.378685223690358 | -2.105493464502369 | 2.630872683043842 | 0.510104571504073 | -0.597652291277835 | -0.057845634622139 | 0.079860139275284 | -0.341126569311387 | -0.784822611826827 | 0.013246217764388 | -0.274617481982277 | 0.232840062277989 | -0.085371346786445 | 1 | 0 | 1 | 1 | 3 | 3 | 3 | 2 | D |
| **50** | 1.508771929824563 | 0.188634372712629 | 0.306164630024023 | -0.718960625830100 | 1.767754833119614 | -0.636940099454690 | 2.300403765858256 | 0.541871802377283 | 0.261870137966030 | 0.518956598279372 | -0.109552238641147 | 0.056826761259428 | 0.403974795229267 | 0.313075545375382 | 0.003366732576280 | -0.339803597177012 | 0.303359877516617 | 1 | 1 | 2 | 2 | 2 | 1 | 2 | 3 | G |
| **51** | 2.888888888888892 | 0.172282577048474 | 0.502263863457195 | -0.596888404111615 | 0.372896335189346 | -2.081566296845637 | 1.475650115350005 | 0.997786113932899 | -0.299286429672928 | 0.235762269741416 | 0.019466183314449 | -0.336173448318176 | 0.278371451446138 | 0.075535179461426 | -0.721019873451032 | -0.745102910023326 | 0.841947704581663 | 1 | 0 | 1 | 1 | 3 | 2 | 2 | 1 | I |
| **52** | 1.944444444444447 | 0.182562022918104 | 0.443738784723977 | 0.378150605089128 | 1.203779289797235 | -1.777809762682490 | 4.027072755522325 | 0.098367957441687 | -0.148107553333023 | 0.403658889959762 | -0.295075648313185 | -0.328104764770538 | 0.350215433888396 | 0.249376564717688 | 0.221004533583884 | 0.037409378433188 | 0.708382353275822 | 1 | 0 | 1 | 1 | 1 | 1 | 2 | 1 | N |
| **53** | 1.353535353535355 | 0.210456633472532 | 0.342565054880042 | -0.024099356310436 | 1.817355219497297 | -0.306821681083118 | 2.251811400246922 | 0.043572506982429 | -0.313342896603891 | 0.174336250498350 | 0.985914952181940 | -0.548801589091854 | -0.876754831147672 | 0.057718043357155 | 0.468648580547919 | -0.248376722822182 | 0.050364314315492 | 1 | 1 | 1 | 1 | 2 | 1 | 1 | 1 | O |
| **54** | 1.849462365591398 | 0.202830611474086 | 0.304649319381921 | -0.071669968918986 | 1.547240326033226 | -0.051152316739631 | 3.177483835032811 | 0.640846971464390 | 0.324370051970535 | 0.172000461202588 | -0.204749372140181 | -0.262337458056826 | 0.424212652256929 | 0.182378807493869 | 0.175790005462998 | 0.048738210222473 | 0.483051698233464 | 1 | 1 | 2 | 1 | 2 | 1 | 2 | 1 | P |
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| **58** | 1.346153846153846 | 0.268017333483147 | 0.262440166618522 | 1.093118267411630 | 0.879180178254665 | 0.360092037524474 | 2.596680198681509 | 0.476511643427417 | -0.350159734592933 | 0.455534493079037 | 0.848925236843567 | -0.644624339702652 | -0.120067112970690 | 0.551060585481949 | 0.314327185251498 | -0.293821184305205 | 0.643903025937688 | 0 | 0 | 1 | 0 | 1 | 2 | 1 | 1 | V |
| **59** | 0.905982905982906 | 0.291587466841659 | 0.241746809656072 | 1.024104659147175 | 1.147993539553217 | -0.098041779552848 | 2.877862703882962 | 0.024577473903357 | 0.014380929415006 | 0.608544885815766 | 0.637873913637860 | -0.693367914127624 | -0.519933717363598 | 0.267742149136640 | 0.461713490763154 | -0.124894076860204 | 0.623571579612629 | 0 | 0 | 2 | 1 | 2 | 2 | 2 | 2 | W |
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| **61** | 1.485714285714285 | 0.179774012525175 | 0.348957889255046 | 0.004099878991500 | 1.556178107653084 | -1.207431858610594 | 2.838907909942086 | 0.109449163869877 | -0.574485089773087 | 0.248963337495013 | 0.347197299038947 | -0.363718820250009 | -0.669906148668454 | 0.207959958341205 | 0.215884280058156 | -0.278241823297922 | 0.478208769234667 | 1 | 0 | 1 | 2 | 2 | 2 | 3 | 3 | A |
| **62** | 1.843137254901959 | 0.165107648515751 | 0.297482322475948 | 0.057229981686896 | 1.488955969786300 | -0.387924796517810 | 3.322746470155838 | 0.544252343804592 | -0.365690408303480 | 0.268847383345322 | 0.287545601333056 | 0.100752756338149 | -0.274646903605271 | 0.238560892188142 | 0.456877276265628 | 0.083218863703800 | 0.433771762934954 | 1 | 0 | 1 | 2 | 2 | 1 | 2 | 1 | D |
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| **64** | 1.777777777777777 | 0.234310699588477 | 0.517661179698217 | 0.769149890357323 | 2.146546623467537 | -1.118906806987301 | 1.810262183636796 | 0.124025221930235 | -0.074451309023092 | 0.295772610449723 | 0.160674319639797 | -0.412173878975604 | 0.091069572275502 | 0.207533566678194 | -0.315797644443468 | -0.548241638874585 | 0.935159259511376 | 1 | 1 | 1 | 1 | 1 | 2 | 1 | 1 | Z |
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| **67** | 5.392156862745104 | 0.086711766926647 | 0.771969200225406 | -0.920057364700089 | 1.329092433304542 | -4.915405650555043 | 4.200559882120633 | 0.633076890248449 | 0.109243591104535 | 0.887035150655894 | -0.461378588653954 | -0.319654808467229 | 0.824685456094584 | 0.248919436763033 | 0.075835565362458 | -0.684231193550490 | -0.296269850354847 | 1 | 0 | 1 | 1 | 2 | 2 | 2 | 1 | J |
| **68** | 1.829059829059827 | 0.156066760278411 | 0.328133484018253 | 0.455090273035349 | 1.694364064257950 | -1.411612065307632 | 3.377398236928070 | -0.140345643929061 | -0.234064553336515 | 0.394600882527970 | -0.256903900853855 | -0.294547499025288 | -0.024013401607238 | -0.029406807079096 | 0.177647719592494 | 0.295650457551242 | 0.075200555883474 | 2 | 1 | 1 | 1 | 2 | 3 | 3 | 2 | K |
| **69** | 1.113924050632911 | 0.278865162819002 | 0.330767075255021 | 0.923720568996194 | 0.868894216036955 | -1.078372740808831 | 4.594078253750987 | -0.087067401899106 | 0.258948998533317 | 0.495993663434233 | -0.090651714601271 | -0.404685731252739 | 0.523322317292521 | 0.127997725926167 | 0.351829626531742 | 0.076661914575170 | 0.351420939971735 | 0 | 0 | 2 | 2 | 2 | 2 | 4 | 3 | M |
| **70** | 1.525114155251141 | 0.213861689523671 | 0.377234420360521 | 0.278112708294884 | 1.908417846940322 | 0.082932837852980 | 2.723631535098198 | -0.169954784762780 | 0.292741509839794 | 0.140732476439735 | -0.970546431665360 | -0.622299119470637 | 0.935771714173257 | 0.234500524574775 | -0.512969790845009 | -0.157096112189781 | 0.026244620673524 | 1 | 1 | 1 | 1 | 2 | 3 | 1 | 2 | O |
| **71** | 2.931034482758622 | 0.137161430868857 | 0.469799027141254 | 0.363373031005721 | 1.240261067735186 | -1.035122534664499 | 4.515324909200825 | -0.087406079334006 | 0.538905247000217 | -0.021462187730721 | -0.154162230429574 | -0.503685658510987 | 0.350947972781932 | -0.008038665218256 | -0.012415843339501 | 0.195851285389510 | -0.192313095754881 | 1 | 2 | 1 | 1 | 2 | 2 | 2 | 1 | P |
| **72** | 2.795698924731184 | 0.125992101088093 | 0.425382730874579 | -0.190997758942354 | 1.465258789321946 | -1.363687043896590 | 3.034264120067137 | -0.371892595254569 | -0.261903636566618 | 0.114747786694628 | 0.348305411668640 | -0.352089523317149 | -0.706428682246474 | 0.422914646193855 | 0.759453732321986 | -0.455407647476569 | -0.203030754584158 | 1 | 0 | 1 | 2 | 3 | 2 | 2 | 2 | Q |
| **73** | 1.497716894977168 | 0.213374311184566 | 0.326882448855700 | 0.772208458785066 | 0.584767093966982 | -0.910470307433820 | 2.997293875314903 | -0.480932010171858 | 0.133652636779661 | 0.762912890634804 | 0.490786782146145 | -0.705042158116020 | -0.766163296704369 | -0.158163332202997 | 0.564965376895829 | 0.003868112956862 | 0.615936611788887 | 0 | 0 | 2 | 1 | 3 | 3 | 3 | 2 | W |
| **74** | 3.318181818181815 | 0.157860538460538 | 0.430360495814963 | 0.196773699910224 | 1.377089749706668 | -0.600012467418893 | 4.440141418707611 | -0.441232547823153 | 0.139081213188242 | 0.252697467918920 | -0.213875770203317 | -0.631761755286901 | 0.357359618198526 | 0.185404993784405 | 0.042182649352537 | -0.084938717588132 | 0.072030888715822 | 2 | 1 | 2 | 1 | 2 | 2 | 2 | 3 | Y |
| **75** | 1.624999999999998 | 0.126408642106949 | 0.278977939632965 | 0.289736291941740 | 1.359655826623205 | -0.127145716615262 | 3.118652593538561 | 0.462463180010571 | -0.166528789070636 | 0.208526698636573 | 0.290991321206425 | 0.224002184199138 | -0.320433667345378 | 0.167035172895711 | -0.030325999621985 | -0.002071127098011 | 0.266292875840359 | 1 | 0 | 1 | 2 | 2 | 1 | 2 | 2 | D |
| **76** | 6.512820512820524 | 0.097437024587602 | 0.733138598694347 | 0.610701352425213 | 1.083271314544786 | -1.899476894109753 | 4.113216794180488 | 0.251517919506218 | -0.041280173875111 | 0.456461858200362 | 0.560359878049530 | -0.112155063823613 | -0.600505495171468 | 0.505454157527580 | 0.033160987275713 | -0.508295753678067 | -0.021614139464647 | 2 | 2 | 3 | 3 | 3 | 4 | 3 | 4 | I |
| **77** | 1.757575757575755 | 0.152352273483878 | 0.329321874692707 | 0.735020502984831 | 0.800531174786279 | -0.070682239428996 | 2.970997554061481 | 0.029653881780928 | 0.187446993255764 | 0.468883051707692 | 0.212364485262124 | 0.210385578268554 | -0.365331360876678 | 0.301328316338933 | -0.266703901015968 | -0.073253901597642 | 0.648678075108928 | 1 | 1 | 2 | 2 | 2 | 3 | 2 | 2 | L |
| **78** | 0.592592592592593 | 0.246865043425124 | 0.246294257197552 | 0.765245461577175 | 2.509433717655169 | -0.552026688200883 | 1.273293818520952 | 0.267542686471953 | -0.242998279168848 | 0.496555208376011 | 0.361947602851326 | -0.431980961003987 | -0.001919859587570 | 0.165988558133054 | 0.031849182076066 | -0.280337956224772 | 0.863961214039495 | 1 | 1 | 2 | 1 | 2 | 2 | 2 | 2 | Z |
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| **80** | 1.161904761904762 | 0.189960758509789 | 0.301057532866505 | 0.910868848499520 | 2.028916332566543 | -0.302103839034871 | 1.790688012840226 | -0.058387593586913 | 0.262563383702746 | 0.442568315538370 | 0.172785873938278 | -0.609420782034439 | 0.342139455426040 | 0.055067642444528 | -0.083290725875893 | -0.045302909131108 | 0.697431417259431 | 2 | 2 | 1 | 0 | 2 | 3 | 2 | 2 | Z |
| **81** | 1.901234567901232 | 0.201675658218590 | 0.361960582174686 | -0.434967041820694 | 1.234140741131116 | -1.589222906898375 | 2.759847007978477 | 0.555149747078759 | -0.391732580696072 | 0.014164410526291 | -0.044653637642192 | -0.657681190517106 | -0.302894950267740 | -0.146588128395081 | -0.110308621289864 | -0.173933572304183 | 0.078615245684876 | 1 | 0 | 2 | 1 | 4 | 4 | 2 | 1 | D |
| **82** | 3.263157894736843 | 0.226204378526915 | 0.518169016673839 | 0.692767280505653 | 0.770864020827600 | -1.873122728607331 | 4.240235647826617 | -0.521903208725128 | 0.303676073319588 | 0.195873607422430 | 0.159543477939401 | -0.580842550664723 | -0.059869904164813 | -0.029648279963854 | 0.301734303851252 | -0.153294766523697 | 0.561425909092327 | 0 | 0 | 2 | 2 | 1 | 1 | 3 | 3 | H |
| **83** | 1.028571428571429 | 0.325566076407343 | 0.291596966714912 | 1.019794163537818 | 1.220828737560632 | -0.764240763607110 | 3.883100674545016 | 0.061892500521769 | 0.216064405872004 | 0.061787099441297 | -0.130592074210948 | -0.122509880650361 | 0.684831429326236 | 0.330719400682569 | 0.249460438717514 | 0.253522466939938 | 0.852906621021717 | 0 | 0 | 3 | 2 | 4 | 4 | 3 | 2 | M |
| **84** | 3.699999999999997 | 0.160317407730582 | 0.424790188843070 | 0.124702742392933 | 1.054298833099819 | -1.169648104235597 | 5.331755495964363 | 0.619112318503686 | 0.201437471999076 | 0.069865755383417 | -0.029875713566648 | -0.198442987126526 | 0.468482931648132 | 0.172419475310450 | 0.103072332804278 | 0.125339893532703 | 0.411822732594136 | 1 | 1 | 1 | 1 | 2 | 1 | 2 | 1 | P |
| **85** | 1.419354838709676 | 0.248869971493522 | 0.393717581447428 | 1.486675165265364 | 0.860119997469663 | 0.013251437520962 | 3.061209060883094 | 0.271389289170443 | 0.210834742858389 | -0.545808925682325 | 0.581592097311285 | -0.396371019750090 | 0.069624965334661 | 0.203065175871820 | 0.203367879368286 | -0.049460297818632 | -0.038504950173139 | 0 | 0 | 1 | 0 | 4 | 4 | 2 | 1 | V |
| **86** | 2.173913043478261 | 0.143981176870353 | 0.437833766321159 | -0.416468830053899 | 2.075544184144734 | -4.476884499331678 | 4.126535980787142 | -0.031142205776258 | 0.377607215720900 | 0.228170036691900 | -0.125335230164667 | -0.474152933762918 | 0.445504606051681 | -0.103496537752346 | -0.132460841009039 | -0.270449932564325 | 0.010839695824241 | 1 | 1 | 2 | 1 | 2 | 1 | 2 | 1 | B |
| **87** | 1.706214689265532 | 0.155657840560286 | 0.346154112384579 | 0.541671792386262 | 1.502391306173156 | -0.951306105401096 | 2.471819870792550 | 0.385553789946729 | -0.129738868085542 | 0.320813019742785 | 0.286017760638327 | -0.402934830823794 | -0.135773033032242 | 0.169403235641348 | 0.150947929176526 | -0.542690868261245 | 0.218116558811610 | 1 | 0 | 1 | 1 | 2 | 2 | 1 | 2 | F |
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| **89** | 1.513513513513514 | 0.288973409819233 | 0.441801302521653 | 0.759880188619204 | 1.037417782262979 | -1.274827769968405 | 3.537343551744805 | -0.237876528233777 | 0.299572908564124 | 0.168145386483918 | 0.285800238659265 | -0.274551924470865 | -0.488795802827015 | 0.247219912046075 | 0.123377529645071 | 0.025895351769769 | 0.699545674136649 | 1 | 1 | 1 | 1 | 2 | 1 | 2 | 1 | U |
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| **91** | 0.715277777777778 | 0.285824621811341 | 0.240265598524416 | 2.355361315713747 | 3.399538106975414 | -0.809100642504859 | 1.617669735606919 | -0.031237940806856 | -0.044725325630698 | 0.528787920347544 | 0.171152924937948 | -0.060986943699848 | 0.356885566451330 | 0.204540920750052 | -0.030134224285373 | -0.148044120284617 | 0.781856915995101 | 2 | 2 | 1 | 0 | 2 | 3 | 2 | 3 | Z |
| **92** | 2.986666666666677 | 0.155744938352741 | 0.377937906197521 | -0.830954574638428 | 2.003452205517366 | -3.364870940604014 | 3.491675119980315 | 0.670091408319143 | -0.172927442203677 | 0.061053820538104 | 0.719627192233752 | -0.418502380604375 | -0.425585461253978 | 0.410148185021880 | 0.263127689937286 | -0.357645346242030 | 0.109279707025955 | 2 | 1 | 2 | 3 | 2 | 2 | 5 | 5 | F |
| **93** | 2.126984126984127 | 0.210254039153976 | 0.338873329297678 | -0.637019224724891 | 1.903840405829572 | -0.713278955571319 | 3.131886337596193 | 0.341732260291364 | -0.450842682439805 | 0.247723141915085 | 0.069408748244248 | -0.667422475513110 | 0.072366208275277 | 0.210303730932628 | -0.261715632113330 | 0.098371880908705 | 0.090442227154160 | 1 | 1 | 2 | 2 | 2 | 1 | 2 | 3 | G |
| **94** | 5.851851851851872 | 0.150080773031545 | 0.907961374153335 | -0.504947852096908 | 0.414823855250001 | -3.064056265315970 | 2.506096783998555 | 0.997168925149364 | -0.594168750111163 | -0.078695624018151 | -0.209369500487807 | -0.627232513456598 | -0.025700030568063 | -0.158690617927975 | -0.558411298081391 | -0.466344436232085 | 0.961576165449287 | 0 | 0 | 1 | 0 | 1 | 0 | 2 | 1 | L |
| **95** | 1.175757575757576 | 0.249162850010259 | 0.308389163569387 | 0.665708579686737 | 1.477840359964930 | -1.468320486920732 | 4.233062064808800 | -0.039198348959432 | 0.173694422944983 | 0.167963897245276 | 0.001917127626576 | -0.567436755684252 | 0.635638323853835 | 0.248547260146237 | -0.443819072841683 | -0.157990826961895 | 0.869065423635967 | 2 | 2 | 2 | 2 | 3 | 2 | 3 | 2 | M |
| **96** | 1.609756097560975 | 0.282816799577964 | 0.357652400344969 | 0.860095103600279 | 0.923728554227436 | -0.329364239351743 | 2.783384410586935 | 0.343659997760558 | 0.224532859629405 | 0.362394924742542 | 0.228136439484587 | -0.630868180726116 | 0.355670321516083 | 0.176572594580703 | 0.390133537976408 | 0.190054317185793 | 0.462227813323224 | 0 | 0 | 1 | 1 | 1 | 1 | 2 | 1 | R |
| **97** | 1.274853801169591 | 0.312044014115279 | 0.328205049932437 | 1.027708998847520 | 1.102509452768020 | -1.054834706088035 | 3.228894956107113 | 0.030635323952007 | 0.469297558447451 | -0.132506973245821 | 0.445381652140773 | -0.325801668596929 | -0.742145518833758 | 0.164879966908232 | 0.479866167406539 | 0.280810822343280 | 0.270977612460998 | 0 | 0 | 1 | 1 | 1 | 2 | 2 | 1 | U |
| **98** | 1.521739130434784 | 0.258965347570357 | 0.418068816753598 | -0.419514939102463 | 2.788385297183907 | -3.849200175156579 | 2.571334376434119 | 0.043465747272446 | -0.030651161753495 | 0.047966373538978 | -0.059163228076987 | -0.580394595017737 | -0.337371257177611 | -0.269182631213894 | 0.376024941322159 | -0.519359421846192 | 0.273289676454930 | 0 | 1 | 1 | 1 | 1 | 1 | 2 | 1 | X |
| **99** | 18.222222222222435 | 0.076493271129114 | 1.290469814789305 | 0 | 0 | -2.441622954880871 | 5.078413599734651 | 0.827375616721705 | -0.004471223280200 | NaN | 0.686878297286617 | -0.171682150800891 | NaN | 0.627655527158422 | NaN | -0.439260685168221 | NaN | 0 | 0 | 1 | 0 | 0 | 0 | 1 | 1 | I |
| **100** | 1.377777777777775 | 0.243750287197699 | 0.306758553184482 | 0.793171684281060 | 1.437774518090699 | -0.252004705716399 | 2.411973548048855 | 0.424618087534837 | 0.269815099700418 | 0.347037125232257 | 0.148337104323247 | 0.415688895800852 | -0.411639494083106 | 0.211598457127453 | 0.103635069425582 | 0.013324086273383 | 0.468358729973358 | 1 | 1 | 1 | 1 | 2 | 2 | 2 | 1 | L |
| **⋮** |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |

predLetter

predLetter = 968×1 categorical

E   
F   
G   
J   
M   
P   
T   
Z   
D   
M

confusionchart(testdata.Character,predLetter);

## **Task 1**

confusionchart(testdata.Character,predLetter,"RowSummary","row-normalized");

## **Task 2**

falseneg = (testdata.Character == "U") & (predLetter ~= "U");

## **Task 3**

fnfiles = testfiles(falseneg)

fnfiles = 17×1 string

"user004\_U\_1.txt"   
"user007\_U\_1.txt"   
"user007\_U\_2.txt"   
"user024\_U\_1.txt"   
"user028\_U\_1.txt"   
"user034\_U\_1.txt"   
"user035\_U\_2.txt"   
"user036\_U\_2.txt"   
"user041\_U\_1.txt"   
"user041\_U\_2.txt"

fnpred = predLetter(falseneg)

fnpred = 17×1 categorical

W   
M   
K   
N   
N   
V   
N   
V   
C   
V

## **Task 4**

badU = readtable(fnfiles(4));

plot(badU.X,badU.Y)

## **Further Practice**

title("prediction :"+string((fnpred(4))))

# Investigate Features of Misclassified Samples

Instructions are in the task pane to the left. Complete and submit each task one at a time.

Do not edit. This code loads the data and a trained kNN model.

load letterdata.mat

load predmodel.mat

traindata

traindata = 2906×26 table

|  | **AspectRatio** | **MADX** | **MADY** | **AvgU** | **MADU** | **AvgV** | **MADV** | **CorrXY** | **CorrXP** | **CorrXU** | **CorrXV** | **CorrYP** | **CorrYU** | **CorrYV** | **CorrPU** | **CorrPV** | **CorrUV** | **NumXMin** | **NumXMax** | **NumYMin** | **NumYMax** | **NumUMin** | **NumUMax** | **NumVMin** | **NumVMax** | **Character** |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **1** | 1.566666666666666 | 0.155515233386831 | 0.336313784929654 | 0.375629749176785 | 1.356955291449102 | -0.834791159714693 | 3.536352129032878 | -0.143943215070704 | -0.241943944979169 | 0.489190049231356 | 0.398785998787002 | 0.059255554751418 | -0.753907309152895 | 0.452733005396064 | -0.158674905928219 | -0.023781488845678 | 0.164114779118796 | 1 | 1 | 1 | 2 | 2 | 2 | 2 | 2 | A |
| **2** | 3.679012345679014 | 0.151472155234306 | 0.598794174384228 | 0.115518061859597 | 0.896651387683114 | -1.737334042446258 | 3.166493339486913 | -0.415115748092513 | 0.467391545338845 | 0.102332293719049 | 0.026030131140846 | -0.566821376806246 | 0.195254602621443 | 0.054540847248741 | 0.249538274222553 | -0.185783649543451 | 0.367232549930493 | 0 | 1 | 1 | 2 | 1 | 1 | 2 | 1 | B |
| **3** | 1.866666666666670 | 0.223734127835238 | 0.515178853324436 | 0.077192081229682 | 1.725724776447386 | -1.318271674335405 | 1.681208153383196 | 0.189991672839288 | -0.800096589750624 | 0.596185815624314 | 0.945232977382946 | -0.106096297757145 | -0.513204233059225 | 0.326348068135355 | -0.583473758818426 | -0.672122834565983 | 0.390232381271942 | 1 | 0 | 0 | 1 | 1 | 1 | 1 | 1 | C |
| **4** | 2.047619047619046 | 0.183839713491210 | 0.312862534367305 | 0.350000172229654 | 1.251323300301837 | -0.370601952342210 | 3.586774085887461 | 0.512998808888989 | 0.001919103533622 | 0.274517345044628 | 0.212845252724828 | 0.408700796387389 | -0.402359476356668 | 0.237025785671930 | 0.077936075919498 | 0.093178372192167 | 0.336559764707214 | 1 | 0 | 1 | 2 | 2 | 1 | 2 | 1 | D |
| **5** | 4.454545454545453 | 0.149509757641866 | 0.654045860414259 | 0.515190677306067 | 0.480955827298621 | -2.297276994562864 | 3.198968990793958 | -0.537026854445254 | 0.025278012411143 | 0.689939462431174 | 0.121118489068579 | -0.477627961053532 | -0.316415475399855 | 0.131438569863249 | 0.325871251533507 | 0.287507907601788 | 0.636593233766675 | 0 | 0 | 1 | 1 | 0 | 1 | 2 | 1 | H |
| **6** | 5.897435897435892 | 0.097382877431199 | 0.734385570305529 | 0.282262770170575 | 0.939392113971417 | -1.452040286051057 | 3.175526013521721 | -0.207870128764534 | -0.420809150524201 | 0.710549877804024 | 0.499743067556179 | -0.385200381719274 | -0.836928862817579 | 0.409957706916606 | -0.035783613711059 | -0.799449563295921 | -0.092705428037437 | 0 | 1 | 1 | 0 | 2 | 1 | 1 | 1 | I |
| **7** | 3.353535353535354 | 0.117965893475964 | 0.513097703751441 | 0.276176657953536 | 1.223728309800000 | -1.775041598928962 | 3.311261227550622 | 0.144840842744430 | -0.325226391478132 | 0.352959857927636 | 0.263926326274419 | -0.467683154473443 | -0.250832021542724 | -0.080744161571284 | -0.143587893074235 | 0.023581281892303 | 0.830754725704409 | 2 | 1 | 1 | 1 | 2 | 1 | 2 | 1 | K |
| **8** | 4.999999999999996 | 0.145620476312486 | 0.633322545479107 | 0.383926190674598 | 0.744284114509516 | -0.573976372160595 | 4.199993234702343 | 0.679916426882011 | 0.611709079377653 | 0.211256784606219 | 0.242617824211643 | 0.837228293326089 | -0.205596089116913 | 0.570860817050901 | -0.518428042106225 | 0.223465779062681 | 0.510864194273193 | 1 | 1 | 0 | 1 | 1 | 1 | 1 | 1 | L |
| **9** | 1.655172413793104 | 0.270575508533960 | 0.369923126689901 | 0.734773970513414 | 0.714004250265529 | -1.555710778423304 | 3.879731061609099 | 0.129059945481231 | 0.137534658429930 | 0.479298903667136 | 0.099990549380945 | -0.017442449718173 | 0.486644857760503 | 0.531641032924525 | 0.392332460377901 | 0.352825093910211 | 0.827131651915599 | 0 | 0 | 1 | 1 | 1 | 2 | 2 | 1 | N |
| **10** | 1.000000000000001 | 0.233884297520661 | 0.302066115702479 | 0.035126463779956 | 2.118325522724521 | 0.066134864439603 | 2.185548293391432 | 0.221240807429258 | -0.048013814789690 | 0.390036648728024 | 0.954408507890786 | -0.564776447061302 | -0.763074286024442 | 0.382602849207107 | 0.467100171309780 | 0.080088795847518 | 0.226298139674199 | 1 | 1 | 1 | 1 | 2 | 1 | 1 | 1 | O |
| **11** | 2.687499999999998 | 0.131917609889382 | 0.433378814619411 | 0.100075888964780 | 1.507028472351723 | -1.243992102039567 | 2.746863813970454 | -0.087345663566209 | -0.354577474099320 | 0.266320430663468 | 0.472389748722477 | -0.148879104660983 | -0.398213670780594 | 0.270392010392602 | -0.107741261666347 | -0.582357427285116 | 0.543406848898267 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 1 | Q |
| **12** | 1.806451612903222 | 0.213606835528107 | 0.356571410467705 | 0.754464339323587 | 0.888278670470307 | 0.550424068100372 | 2.219962124483462 | 0.771891942613180 | -0.251227719500477 | 0.846667180768007 | 0.588192404110842 | -0.640240602093021 | 0.729602835800214 | 0.571007343940115 | -0.170360535205183 | -0.026522605703568 | 0.831958300789829 | 0 | 0 | 1 | 0 | 0 | 1 | 1 | 1 | R |
| **13** | 2.261904761904771 | 0.167708859960811 | 0.544425335547299 | -0.626529495872754 | 1.356858683967437 | -1.534977387250805 | 1.206736947065177 | 0.409206412958063 | 0.092458583799063 | 0.634515139439643 | -0.369232695162064 | -0.172251283442256 | 0.213453982944892 | 0.279099654357155 | 0.291761763817667 | -0.721219881996520 | -0.545823484366422 | 1 | 1 | 0 | 0 | 2 | 1 | 1 | 0 | S |
| **14** | 1.508771929824561 | 0.253283448449179 | 0.384150613424467 | 0.660727431741267 | 0.804946665819343 | -1.350828749612806 | 3.372427054750992 | -0.202464888458361 | 0.243039653761135 | 0.499510059153848 | 0.340395824143318 | -0.303517552303499 | -0.705688479718058 | 0.360323601785492 | -0.016357774424200 | 0.162855688309420 | 0.294648524572968 | 0 | 0 | 1 | 1 | 2 | 1 | 2 | 1 | U |
| **15** | 1.604166666666665 | 0.249055676222306 | 0.420196020146744 | 0.835422703506810 | 0.416811208484924 | -0.006064308315132 | 2.718619680053494 | -0.239840622353237 | 0.347540325126317 | 0.578160272053438 | 0.717385307578529 | -0.708972233031744 | -0.569691897287185 | 0.389072771395368 | 0.731393274029195 | -0.147049406758707 | 0.290201846018619 | 0 | 0 | 1 | 0 | 0 | 1 | 1 | 1 | V |
| **16** | 1.021276595744681 | 0.336167639273466 | 0.311600061512129 | 1.040774036477780 | 0.608506599973280 | 0.136079664004742 | 2.678522785871374 | 0.042819689729790 | 0.134634621313915 | 0.424876696617163 | 0.659723453932673 | -0.797549900670450 | -0.632532205044125 | 0.290430155646504 | 0.719191199133372 | -0.075245788475246 | 0.378806437618107 | 0 | 0 | 2 | 1 | 1 | 2 | 2 | 2 | W |
| **17** | 2.074074074074075 | 0.240585400680540 | 0.472649117339505 | 0.806012489124643 | 2.397669437629807 | -4.927240346158849 | 3.792643215906760 | -0.122198675009153 | 0.071884665201135 | -0.149551517266688 | 0.377355269492827 | -0.110387593933125 | -0.134527536945973 | 0.353453529750942 | 0.377487442667081 | -0.620049526425803 | -0.417818790085665 | 0 | 1 | 1 | 1 | 1 | 1 | 2 | 1 | X |
| **18** | 3.133333333333324 | 0.207612201170585 | 0.477054265531315 | 0.118780397701911 | 1.125815328462553 | -2.073557563047639 | 2.910065470840567 | -0.069248897780999 | 0.684452458239446 | 0.064002586906120 | 0.090697284069524 | -0.201561831504081 | 0.546495293366640 | 0.383413093660461 | 0.011219698630232 | -0.169726454870872 | 0.492140742436315 | 0 | 2 | 1 | 1 | 2 | 2 | 2 | 1 | Y |
| **19** | 1.125925925925925 | 0.161232485740442 | 0.295272077175268 | 0.457872931260248 | 1.640355383907492 | -0.745064192770700 | 3.552076884481862 | -0.116075999904264 | 0.282649111966249 | 0.365859232356374 | 0.489052223197011 | -0.253607306363421 | -0.862474369817157 | 0.115086428472004 | 0.512829011617653 | 0.041318413299865 | 0.097110006322277 | 1 | 0 | 2 | 2 | 6 | 6 | 2 | 2 | A |
| **20** | 2.208333333333331 | 0.174571257896117 | 0.337716965063991 | 0.150291134841290 | 1.393626712091991 | -1.610042154723151 | 2.369922329350542 | -0.320518569813002 | 0.601023762359692 | -0.030602136524037 | -0.020101088338274 | -0.784639487123356 | 0.487531254398284 | -0.382419003274952 | -0.307572260874843 | 0.377090404610597 | 0.169046181304079 | 0 | 1 | 1 | 1 | 3 | 3 | 5 | 4 | B |
| **21** | 1.466666666666666 | 0.223574284589589 | 0.432862253655513 | 0.378872979180279 | 1.749404674147533 | -1.469525602554054 | 1.646694731877185 | -0.221784610064806 | -0.128550662647699 | 0.385826430132123 | 0.904420458418923 | -0.423944586356305 | -0.963449437235073 | -0.186438020345839 | 0.722453941802193 | 0.418189750661114 | 0.307024994888540 | 1 | 0 | 1 | 1 | 2 | 2 | 4 | 3 | C |
| **22** | 1.154471544715446 | 0.245475992212409 | 0.298131482614961 | 0.764572467288789 | 2.535865945628735 | -0.559053343786189 | 2.196865286725719 | 0.019139503561415 | 0.170863033353222 | 0.176385593357857 | 0.864089794885347 | -0.026641313522654 | -0.850933856089565 | 0.230656584309032 | 0.441393839921319 | 0.128389690584364 | 0.236456338079954 | 1 | 1 | 0 | 1 | 2 | 3 | 1 | 1 | E |
| **23** | 2.399999999999991 | 0.131492538883842 | 0.371942352611190 | 1.455164788506885 | 1.363881953058398 | 3.355824211549995 | 3.882785962083962 | 0.459332011376560 | 0.038132190304100 | 0.297723040640663 | -0.644988044793049 | 0.386402560928577 | 0.614357970182158 | -0.416992789696703 | -0.092530872850015 | 0.298561990538483 | -0.725256771535046 | 2 | 1 | 1 | 1 | 6 | 6 | 7 | 8 | F |
| **24** | 1.446540880503146 | 0.151932162511580 | 0.262733339217207 | 0.827255437693426 | 1.677040040017937 | -0.759241779135059 | 3.323807186515991 | -0.191036813599387 | 0.343920306758516 | 0.266828093318826 | 0.441454622649993 | -0.540862322314208 | -0.150774699978233 | -0.190999013095105 | 0.475545063780265 | 0.519043125380779 | 0.507243663306071 | 2 | 1 | 2 | 2 | 1 | 2 | 3 | 3 | G |
| **25** | 2.438095238095238 | 0.191879706171264 | 0.412745056245122 | 0.790509914842472 | 0.494313491666157 | -1.777533113019639 | 3.220299574521236 | -0.571945770116079 | 0.320712438186435 | 0.222656568836222 | -0.002750921178008 | -0.573637530062704 | 0.515402865659446 | -0.094707702166980 | -0.115902468006066 | -0.001344194860107 | -0.002728181246144 | 0 | 0 | 1 | 1 | 1 | 2 | 3 | 2 | H |
| **26** | 21.066666666666645 | 0.058873946569112 | 1.396391315554901 | 0.585511574273856 | 0.434817898290946 | -9.051541117437473 | 5.701776559002814 | -0.882260678867026 | 0.440997465576383 | 0.320364665107963 | 0.177548997704464 | -0.596811126349163 | -0.228865882090275 | 0.200744472113783 | 0.592361777399915 | -0.400484950726824 | -0.196072727657039 | 0 | 1 | 1 | 2 | 3 | 3 | 3 | 2 | I |
| **27** | 2.504504504504505 | 0.182051630131244 | 0.503869727522725 | -0.502640303747428 | 0.875153752571012 | -1.414548057687065 | 2.103044275948978 | 0.354215139428512 | -0.089315847833107 | 0.438479906435711 | -0.914616991794815 | -0.796064062189508 | 0.834030201034813 | -0.533191912588112 | -0.712704450029126 | 0.423021205333541 | -0.693876724626283 | 0 | 1 | 1 | 0 | 2 | 2 | 1 | 0 | J |
| **28** | 2.407407407407405 | 0.238155308438772 | 0.439984152526167 | 1.327316885963814 | 1.126412499125898 | -4.504368488924927 | 6.908125641779832 | 0.077460402744392 | 0.232007500541300 | 0.796341907159764 | 0.644390919614153 | -0.243797692852259 | 0.167818347663444 | 0.430857565681301 | 0.027902278931888 | 0.031644258332827 | 0.751866456811742 | 1 | 1 | 1 | 1 | 2 | 3 | 2 | 1 | K |
| **29** | 45.666666666668320 | 0.042703841493391 | 2.385934416700374 | -0.077619457908827 | 0.331403105832211 | -7.526306711234086 | 5.637518362219889 | 0.587503328817250 | -0.368407918694848 | 0.077515517334518 | -0.380255381080283 | -0.522921492890653 | -0.256554846028255 | -0.463701424767184 | -0.378638494657956 | -0.385723606227222 | 0.623092201198444 | 0 | 1 | 1 | 1 | 2 | 2 | 2 | 1 | L |
| **30** | 2.283333333333334 | 0.262330305985658 | 0.457230816151090 | 0.714066918862640 | 0.913213394319879 | -1.696704437524700 | 3.937475865801729 | -0.458183212211660 | 0.552671276083271 | 0.166297924749814 | -0.413887452497380 | -0.486923519225192 | 0.767454057087176 | 0.141438570470262 | -0.163804109959848 | -0.019176038474483 | 0.003178006075378 | 0 | 0 | 1 | 1 | 2 | 2 | 2 | 1 | N |
| **31** | 1.293333333333334 | 0.186497316464864 | 0.310695933250565 | -0.101777095458027 | 1.857977305831617 | 0.202029076118327 | 2.561856682559953 | 0.077709344414865 | 0.305145588858066 | 0.168538941497299 | 0.942492847812878 | -0.242689482696548 | -0.880377572403036 | 0.203601419477639 | 0.001165935164582 | 0.303664264783761 | 0.115022336989538 | 1 | 1 | 1 | 1 | 2 | 1 | 1 | 2 | O |
| **32** | 3.733333333333347 | 0.125000290588748 | 0.481520930156774 | 0.023440273719689 | 1.139587520857439 | -0.837870411508803 | 4.881852936011995 | 0.438090219381232 | 0.297011530816920 | 0.046677018163963 | -0.331463302061951 | -0.335014339889531 | 0.486260495854340 | 0.037724162952959 | -0.101370410440186 | 0.233691997437165 | 0.260097978158243 | 1 | 1 | 1 | 1 | 4 | 4 | 2 | 1 | P |
| **33** | 1.676190476190476 | 0.256353400486788 | 0.384728265691907 | 0.740567776144548 | 0.803383256062800 | 0.425322922668722 | 2.480252098624902 | 0.088369904612187 | 0.595833213687203 | -0.393919800533430 | 0.974301731178556 | -0.433790790257149 | -0.963348402269736 | 0.373025442467401 | 0.045742630294363 | 0.471526871328429 | -0.394723837386685 | 0 | 1 | 1 | 0 | 1 | 1 | 1 | 1 | U |
| **34** | 2.451612903225804 | 0.185514085674257 | 0.505829294350135 | 0.766949687306688 | 0.411520425353534 | 0.459445193126649 | 3.535167298519970 | 0.110033794169690 | 0.571144124115831 | -0.307893405998757 | 0.687930570326662 | -0.403182815657163 | -0.178336767699268 | 0.307751321941257 | -0.032405772974852 | 0.466006493562064 | -0.295737331355610 | 0 | 0 | 1 | 0 | 2 | 3 | 1 | 1 | V |
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| **36** | 1.401360544217686 | 0.197707543313231 | 0.232853499892464 | 1.808893701884356 | 5.485840659237375 | -2.815520952169692 | 4.845582714598156 | -0.140076794179745 | 0.289183289841701 | 0.460709670183155 | 0.082105586965972 | -0.138957083541232 | 0.084968946621162 | 0.078418949994457 | 0.336985275638128 | -0.268030608214134 | 0.632686428645303 | 2 | 3 | 1 | 2 | 3 | 3 | 2 | 1 | Z |
| **37** | 1.060606060606061 | 0.247358850505284 | 0.324037243664035 | 0.722264468152127 | 1.235738684032295 | -1.204714114809140 | 3.686179931658546 | -0.338950079751561 | 0.421463643269954 | 0.466153514580117 | 0.401454921483006 | -0.374376593352820 | -0.704404080068226 | 0.244714713848493 | 0.440968006720109 | -0.200681858129271 | 0.328855287437124 | 1 | 0 | 2 | 2 | 2 | 2 | 2 | 1 | A |
| **38** | 1.225225225225226 | 0.183126660016785 | 0.367660054321764 | 0.515599612768149 | 1.362666831179407 | -1.000173521392588 | 3.214162969232842 | -0.210139355662289 | -0.072485743887030 | 0.558289588673060 | 0.395011679550111 | -0.300698287835146 | -0.738725709367945 | 0.342713037452632 | 0.146288282304330 | -0.281701829236096 | 0.329549660876768 | 1 | 0 | 2 | 2 | 2 | 2 | 2 | 1 | A |
| **39** | 2.071428571428572 | 0.189493181939905 | 0.382146102684003 | 0.255727244858175 | 1.348565468472086 | -1.429674780261135 | 3.082943034439084 | -0.404896925369703 | 0.609072321357561 | 0.041217816730853 | -0.156415900316311 | -0.625763550731173 | 0.586579963084135 | -0.168591830527634 | -0.160014450162801 | 0.346255797097406 | 0.068906784109277 | 0 | 1 | 2 | 1 | 2 | 2 | 2 | 1 | B |
| **40** | 2.608695652173917 | 0.175815339890870 | 0.482370555737271 | 0.192151214945507 | 1.068155871736462 | -2.222145148169977 | 3.430961646815677 | -0.489371978417919 | 0.628224700385917 | 0.043352044709088 | 0.164649956514862 | -0.634268327615193 | 0.444729302995182 | -0.288629490596684 | -0.139645094263086 | 0.065143556703233 | 0.081575271774061 | 0 | 1 | 2 | 1 | 3 | 3 | 2 | 1 | B |
| **41** | 1.296296296296294 | 0.235168819354018 | 0.418510992822159 | -0.231175502321835 | 2.011824067411547 | -0.854262647449830 | 1.641996723692459 | -0.029210755516780 | -0.370368168027053 | 0.197171293879065 | 0.892922924169890 | -0.304877158211517 | -0.811802380360337 | 0.022660036055855 | 0.441200380217051 | -0.166598361210505 | 0.290279434759755 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | C |
| **42** | 2.948717948717937 | 0.140410830380867 | 0.394205521664824 | 0.203515335077971 | 1.186492182985977 | -0.279428305288947 | 4.091157269815028 | 0.569415308424643 | -0.092441860130383 | 0.209210666093093 | 0.407012258307381 | 0.277431273004683 | -0.490142086547318 | 0.215502205888492 | 0.020194257741912 | -0.342622968502346 | 0.273501551731641 | 2 | 1 | 1 | 2 | 2 | 1 | 2 | 1 | D |
| **43** | 1.604166666666665 | 0.204434990933928 | 0.303211667587965 | 0.656022252215278 | 1.676084613644518 | -0.184135493061476 | 2.601062422634013 | -0.071809791640742 | 0.056171781404160 | 0.334484236658017 | 0.763005231315724 | -0.074177934690259 | -0.730375481712495 | 0.185777920761212 | 0.217889508228134 | -0.409737603362855 | 0.392488232605128 | 1 | 1 | 1 | 1 | 1 | 2 | 1 | 2 | E |
| **44** | 1.634408602150537 | 0.198091600557406 | 0.340461724797028 | 0.483113517526588 | 1.518052335926831 | -0.231521082383112 | 2.359178163724720 | -0.209832597847373 | -0.152037829323099 | 0.343079474118256 | 0.710572612158372 | 0.119815405886411 | -0.764032003827529 | 0.228981939799462 | 0.155921653805356 | -0.459168512560533 | 0.167605366285554 | 1 | 1 | 1 | 1 | 1 | 2 | 1 | 2 | E |
| **45** | 2.410256410256411 | 0.134413609710384 | 0.392496884137295 | 0.597349917680204 | 1.630985007336797 | -1.972590156218774 | 2.707739686999521 | 0.383395057708805 | 0.042224242690537 | 0.701568582201983 | 0.072634395531843 | -0.417266436188653 | 0.346790918490090 | 0.019930808287663 | -0.410074624385931 | -0.771778479828574 | 0.424851267674702 | 2 | 0 | 1 | 0 | 1 | 2 | 2 | 2 | F |
| **46** | 1.284848484848481 | 0.187386973538921 | 0.285160144009295 | 0.563056469321677 | 1.899489546605774 | -0.812778549730170 | 2.676714661180001 | 0.086405076908962 | 0.036283386170905 | 0.332412628184379 | 0.059050888794096 | -0.649931889459895 | 0.142872166179857 | -0.059606098132466 | 0.235338583497859 | 0.230659801426907 | 0.474637312818205 | 2 | 1 | 2 | 2 | 3 | 3 | 2 | 2 | G |
| **47** | 1.370370370370371 | 0.145334211069854 | 0.291166824783979 | 0.600527235347362 | 1.719259712200212 | -0.429165562218592 | 2.505924608867001 | 0.069733144435617 | -0.188836190321328 | 0.433639290811229 | -0.026568169461010 | -0.612511266340575 | 0.052294033906303 | 0.041510240648881 | -0.059817218133159 | -0.176817443733536 | 0.451308333084018 | 2 | 2 | 2 | 2 | 3 | 3 | 2 | 3 | G |
| **48** | 2.416666666666666 | 0.167056102621936 | 0.462047029763772 | 0.657728419454361 | 0.450032685550446 | -1.565534051788810 | 3.287789997692432 | -0.609810785853736 | 0.412107798699852 | 0.628963351114729 | -0.009358347041340 | -0.607837673346578 | 0.102500868956690 | -0.035795843477533 | 0.171034512012567 | 0.137517232444911 | 0.194247094414659 | 0 | 0 | 2 | 1 | 2 | 2 | 2 | 1 | H |
| **49** | 2.114285714285714 | 0.173036542953362 | 0.428035304740156 | 0.739651502781318 | 0.576596836569957 | -1.392202471970425 | 3.314889736982746 | -0.520002122274671 | -0.056402057870995 | 0.773692336962922 | 0.097870776859602 | -0.495186328219851 | 0.044623187487951 | -0.089177305906428 | -0.373692912740810 | 0.080637865260618 | 0.314426521575542 | 0 | 0 | 2 | 1 | 2 | 2 | 2 | 1 | H |
| **50** | 8.814814814814770 | 0.102526329475326 | 0.958991522849057 | 0.389562247380618 | 0.420366533058406 | -1.902959281736265 | 1.850458909179647 | -0.913238073961640 | 0.508890309294955 | 0.082125219019460 | -0.742970401039188 | -0.432099051842664 | -0.087931879206852 | 0.742812797355051 | 0.231493412943254 | -0.584013181236028 | -0.654644232978860 | 0 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | I |
| **51** | 4.179487179487189 | 0.124138730794615 | 0.619261111821821 | -0.611370751378259 | 1.302341325537005 | -2.103783836397531 | 3.944969279625507 | 0.715084292812531 | -0.291275487622231 | 0.436457731119627 | -0.719941508179852 | -0.650541038358863 | 0.530594171578886 | 0.023320616896376 | -0.453557449061778 | -0.263376574700550 | -0.178114311042764 | 1 | 0 | 1 | 0 | 3 | 3 | 1 | 1 | J |
| **52** | 4.694444444444440 | 0.103540058557359 | 0.718702865761689 | -0.583444250394714 | 1.050128601588706 | -3.071026180588633 | 5.027472593921170 | 0.625120837574518 | -0.133898434721880 | 0.600764287538705 | -0.626687093668245 | -0.625965082621709 | 0.621130892734598 | -0.003789153821317 | -0.440889116018752 | -0.452571985651657 | -0.314575809884390 | 1 | 0 | 1 | 0 | 2 | 2 | 1 | 1 | J |
| **53** | 2.482758620689649 | 0.222169077658196 | 0.431102006496347 | 0.164790878400615 | 1.568567185542397 | -3.566517905829680 | 2.224783624400851 | -0.268848162483864 | -0.126436592964107 | 0.345430920798138 | 0.556400192229607 | -0.266322907236675 | -0.322870810042173 | 0.045715936576301 | 0.228686050112153 | -0.370380397770888 | 0.204998593002993 | 1 | 1 | 1 | 1 | 2 | 3 | 3 | 2 | K |
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| **56** | 1.148148148148147 | 0.245593822436154 | 0.299260620672202 | 0.919599337067703 | 0.819914907872302 | -1.055519504830522 | 3.635625261601847 | -0.351194975480769 | 0.609841829563019 | 0.344574920853586 | -0.077716283998322 | -0.294371898862808 | 0.799089057228409 | 0.405948068932135 | 0.224095564515916 | 0.126404505667291 | 0.629762313418689 | 0 | 0 | 2 | 3 | 3 | 2 | 3 | 2 | M |
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| **58** | 2.309523809523809 | 0.205787555993749 | 0.467453108875061 | 0.754217308322385 | 0.424270987471308 | -1.825328039833760 | 3.719785775129048 | -0.526690812761141 | 0.411794636442664 | 0.329225958853461 | -0.078201673129230 | -0.472680686368021 | 0.381958660557717 | 0.111840494301447 | 0.212354166759991 | 0.142478275656105 | 0.444766332257356 | 0 | 0 | 1 | 1 | 3 | 4 | 2 | 1 | N |
| **59** | 1.898989898989899 | 0.178265396171463 | 0.420643785702837 | 0.718561574681995 | 0.300121109031017 | -1.861030295482293 | 3.419888624443868 | -0.696106052884443 | 0.361590511997832 | 0.434230454161195 | -0.009743066018041 | -0.368882891518546 | 0.234660607317665 | 0.032370382852439 | -0.149565092227018 | 0.124852061744272 | -0.088416349103610 | 0 | 0 | 1 | 2 | 3 | 3 | 2 | 1 | N |
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| **61** | 3.204301075268818 | 0.115354725547767 | 0.480774468483556 | 0.653246779435089 | 1.159474978040109 | -2.487249007512665 | 3.397036249184721 | -0.304752964892043 | 0.299670399831689 | 0.242204156950801 | -0.636168867912888 | -0.309115504946159 | 0.331474483038739 | 0.424968556879967 | 0.038992771682409 | -0.787149549757492 | 0.031913371755810 | 1 | 2 | 1 | 1 | 1 | 2 | 3 | 2 | P |
| **62** | 3.714285714285718 | 0.110535098100503 | 0.401658296388096 | 0.448939783356290 | 1.298364662398437 | -2.806290387116296 | 3.133457907703372 | 0.260297243557904 | 0.472370564166182 | 0.010198191483335 | -0.231249908870940 | 0.065541371159570 | 0.470885046378334 | 0.666654420014935 | 0.014952323573827 | -0.598387689251347 | 0.552723388463918 | 1 | 1 | 1 | 1 | 2 | 2 | 3 | 2 | P |
| **63** | 1.772727272727271 | 0.156906748161329 | 0.373414120624244 | 0.387707472728779 | 1.027044656366145 | 0.015142156540729 | 3.003193660323014 | -0.026550615283069 | 0.238339886783516 | 0.638141480677806 | 0.516321130472575 | -0.646055359034367 | -0.239031311603988 | 0.258834175731989 | 0.653200626262779 | 0.069719606903701 | 0.448619731382745 | 1 | 0 | 2 | 2 | 2 | 2 | 2 | 2 | Q |
| **64** | 2.294117647058819 | 0.151635579070357 | 0.408628928344973 | 0.593709979564673 | 0.807797673219693 | -0.135229282761005 | 3.186047325077921 | 0.114778446694811 | 0.061832350896146 | 0.570339508226907 | 0.537816711034956 | -0.654526161540861 | 0.106094246910314 | 0.232650196734049 | 0.287965033532966 | 0.116885252772281 | 0.807835930711091 | 1 | 0 | 1 | 1 | 1 | 2 | 2 | 2 | Q |
| **65** | 1.401709401709403 | 0.253174756742518 | 0.339428067046334 | 0.908920022786919 | 1.515215865407990 | 0.206855929604620 | 2.490454610641204 | 0.458109276214139 | 0.261621459095467 | 0.228956152575451 | -0.007621266547108 | -0.416987349101880 | 0.607430508045051 | 0.205621842044005 | 0.192706919029223 | 0.459502160998690 | 0.601214751239215 | 1 | 1 | 1 | 1 | 1 | 2 | 1 | 1 | R |
| **66** | 1.548387096774186 | 0.234234502641029 | 0.433290367906588 | -0.752634438349254 | 1.877204189541886 | -0.791482528680137 | 1.612377913601032 | 0.366243776131016 | -0.156078711892754 | 0.348632144184136 | -0.067056835835190 | -0.359541027786277 | 0.081618104337730 | 0.216484816714337 | -0.327473293952588 | -0.515025255304812 | -0.377220592208131 | 1 | 1 | 1 | 1 | 2 | 1 | 1 | 1 | S |
| **67** | 1.809523809523804 | 0.191427905208888 | 0.340280072067771 | 1.340787747185537 | 2.043115820898420 | -1.527525276353615 | 2.973317536722873 | 0.019885388365103 | 0.019613596119722 | 0.188499555563544 | 0.438381437232127 | -0.705716893784905 | -0.086701024520938 | 0.103629115876389 | -0.173168536211013 | -0.540552910735036 | 0.613769237016760 | 2 | 1 | 1 | 0 | 2 | 2 | 1 | 1 | T |
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| **69** | 1.084967320261438 | 0.263541814024249 | 0.337019781696248 | 0.971174079995205 | 0.937349473640383 | -0.693207770642621 | 3.285906590485510 | -0.476065843420935 | 0.465690882875302 | 0.283297086479630 | 0.412825398381499 | -0.499183010054322 | -0.880751951171054 | 0.221468595441411 | 0.454091671539879 | -0.154196457555939 | -0.042927123805295 | 0 | 0 | 2 | 1 | 1 | 2 | 2 | 2 | U |
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| **71** | 1.485714285714285 | 0.286637500715682 | 0.341034279761141 | 0.842799892455910 | 0.881568045964400 | 0.235956859820498 | 2.776259350950672 | 0.057952785734032 | 0.439165144090926 | -0.028931733107894 | 0.609628901481634 | -0.484755439313464 | -0.849103548985514 | 0.456502202407661 | 0.384590829594097 | -0.049334559093430 | -0.290366084989461 | 0 | 0 | 2 | 2 | 3 | 3 | 3 | 3 | W |
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| **74** | 1.229629629629629 | 0.201730395673328 | 0.331854850932791 | 0.208158509219144 | 2.126403588173324 | -2.764716022612010 | 1.647471967816079 | 0.090808557753975 | -0.105865575257040 | 0.499248798412564 | 0.155245266339583 | -0.349718401500838 | 0.104817573812728 | 0.209103112315137 | -0.449418710398865 | -0.868223499677496 | 0.729409196010111 | 2 | 2 | 1 | 2 | 2 | 2 | 2 | 1 | X |
| **75** | 2.299999999999998 | 0.162063524139922 | 0.399004235983468 | 0.238813833199692 | 1.674750008027677 | -0.749524055993633 | 2.942571183525878 | 0.327266181502557 | -0.010731379616690 | 0.323424431824611 | -0.369651759851089 | -0.740791487634302 | 0.514512756212105 | 0.056733751940502 | -0.384469927841225 | -0.163366850128865 | 0.487580460099538 | 1 | 2 | 2 | 1 | 2 | 3 | 3 | 2 | Y |
| **76** | 2.533333333333337 | 0.183811095291645 | 0.502778538952162 | 0.398110877516691 | 1.477919604855578 | -1.290037044670441 | 3.175702131662768 | -0.152190358492909 | 0.410866184891107 | 0.162166043690710 | -0.307635798297757 | -0.550575620643146 | 0.404713467114065 | -0.109253874307174 | -0.468116964909410 | -0.225758212665428 | 0.184480654949336 | 1 | 1 | 2 | 1 | 2 | 2 | 2 | 2 | Y |
| **77** | 1.163120567375887 | 0.266332118029216 | 0.423639392420742 | 0.886761815773809 | 2.546435396549547 | -1.099670459034723 | 1.725420860396057 | 0.148271510182509 | 0.030667327118397 | 0.292279226444997 | 0.178689016990449 | -0.759154591102179 | 0.211804708048422 | 0.221209343646126 | -0.420945352060624 | -0.378227330973156 | 0.873652395330527 | 1 | 1 | 1 | 1 | 2 | 3 | 2 | 1 | Z |
| **78** | 1.648148148148150 | 0.211864918838388 | 0.350294776904523 | 0.643303743816077 | 1.458688326325155 | -1.411187494620173 | 3.347191566117082 | -0.270965462971616 | 0.722495707958774 | 0.009622185916136 | 0.478186266859499 | -0.269231211871541 | -0.585829662162727 | 0.163063855218911 | 0.209526494791575 | 0.325982730876632 | 0.175949635310939 | 3 | 1 | 1 | 2 | 4 | 4 | 4 | 3 | A |
| **79** | 1.891891891891891 | 0.173460216487357 | 0.395270021882374 | 0.252534217154834 | 1.404106654972124 | -1.681314135706923 | 3.132063329034976 | -0.248379568102450 | 0.529616362898263 | 0.005436565832674 | -0.255751046437935 | -0.705107302149706 | 0.457402794500832 | -0.127224894304164 | 0.075971528940003 | 0.338719790341221 | 0.323659828332062 | 0 | 1 | 2 | 1 | 4 | 4 | 4 | 3 | B |
| **80** | 1.677419354838705 | 0.226076872321664 | 0.484724141503229 | 0.316599304608897 | 1.573514556894933 | -1.522922068901992 | 1.287416036278973 | -0.262712844095825 | -0.002737433543938 | 0.295241230959336 | 0.936656701829368 | -0.809680346622578 | -0.872543312999112 | 0.013921186468364 | 0.787050526739963 | -0.072737618819543 | 0.114258540436664 | 1 | 0 | 0 | 0 | 1 | 1 | 2 | 2 | C |
| **81** | 2.888888888888886 | 0.112621379102990 | 0.426247204748278 | 0.045079181660014 | 1.422251998660605 | -0.893659491313014 | 4.215467307593162 | 0.201555611845796 | 0.091085280303011 | 0.068020303754631 | 0.444406249905199 | 0.115469775805697 | -0.423236693122513 | 0.173360939482663 | 0.706555153668399 | 0.143848521875275 | 0.103539153406679 | 3 | 1 | 1 | 2 | 7 | 7 | 5 | 4 | D |
| **82** | 2.044444444444441 | 0.144310589935222 | 0.299256356607072 | 0.821351437298958 | 1.815905961160305 | -1.502938275583500 | 3.144760237119100 | 0.342531121029543 | 0.090778242736825 | -0.641618546623758 | 0.098662171857152 | -0.216812856559599 | -0.439384656114088 | 0.232147631498113 | 0.312643892048306 | -0.605500243206739 | 0.135744889671588 | 1 | 0 | 1 | 1 | 2 | 2 | 4 | 4 | F |
| **83** | 1.333333333333333 | 0.302690088469281 | 0.319572131177155 | 1.141344290848191 | 0.934084030037120 | -1.855527566249815 | 3.286986600802241 | -0.456496227559648 | 0.284756917359748 | 0.209903680482045 | -0.015108123723933 | -0.482155027770089 | 0.562142960716495 | -0.162251484069428 | 0.265487309886717 | 0.483723023101207 | 0.291916618302677 | 0 | 0 | 1 | 1 | 5 | 4 | 2 | 1 | H |
| **84** | 5.128205128205138 | 0.153656620285502 | 0.635706045828951 | -1.152024300121530 | 1.175140972398088 | -2.832028970134404 | 5.277414919303292 | 0.582827003368676 | -0.448775753700991 | 0.259939809191705 | -0.875668601036793 | -0.822350415411885 | 0.752530917462053 | -0.309868194011524 | -0.613942616030829 | 0.423242075728070 | -0.170319026042040 | 1 | 0 | 1 | 0 | 4 | 4 | 2 | 2 | J |
| **85** | 7.666666666666659 | 0.123334078059299 | 0.968082428113522 | 0.054976834673228 | 0.723800828925134 | -3.331937503064790 | 2.132538797023756 | -0.709748675349447 | 0.648793641493506 | 0.150633578301751 | 0.086944322115557 | -0.719973266316451 | 0.293823107952315 | -0.365935991632367 | 0.091319151683342 | -0.198995099914649 | -0.818001389972982 | 0 | 1 | 0 | 0 | 2 | 2 | 4 | 3 | L |
| **86** | 1.170068027210882 | 0.269786955064882 | 0.290551288815723 | 0.883407103527179 | 1.301311276528744 | -1.002802239703253 | 4.457966871949441 | -0.064405993596360 | 0.381563178830147 | 0.157272789184735 | -0.299087307276957 | -0.036791534812193 | 0.814198253905091 | 0.268250892540407 | 0.420047983103912 | 0.281505385480750 | 0.664727340888572 | 1 | 1 | 2 | 2 | 3 | 2 | 3 | 2 | M |
| **87** | 2.072072072072072 | 0.133808232213783 | 0.499947363666046 | 0.448005286454019 | 1.195224970679874 | -1.515939859130160 | 2.781078772031986 | -0.620227159647497 | 0.232163223837564 | 0.247499609985668 | 0.377782348498416 | -0.409673286022854 | -0.412246390657218 | -0.035230311723585 | 0.702741685687016 | 0.134202273996633 | 0.470555864847095 | 1 | 0 | 2 | 1 | 4 | 4 | 3 | 2 | Q |
| **88** | 2.181818181818189 | 0.224294694402889 | 0.446792752589989 | 0.748000771733072 | 0.805845982614522 | -0.194624023577598 | 3.722272366740442 | 0.558648468379817 | 0.249312319348869 | 0.392409449102012 | 0.088424407997900 | -0.336721314105133 | 0.655421735963079 | 0.066250483516099 | 0.293550307861059 | 0.495127547770638 | 0.383018768405273 | 0 | 0 | 1 | 1 | 2 | 2 | 2 | 1 | R |
| **89** | 2.266666666666663 | 0.194508829379442 | 0.544553114875736 | -0.638025559019206 | 1.976660705228237 | -1.175602308588382 | 2.012575299281477 | -0.120730752932270 | -0.327524923666456 | 0.246604660202139 | -0.183741821949377 | -0.379060619892676 | -0.088136481266160 | 0.136150279620188 | -0.028370604647654 | -0.434268071506768 | -0.650796054036418 | 1 | 1 | 1 | 1 | 3 | 2 | 2 | 2 | S |
| **90** | 2.312500000000011 | 0.105793792756689 | 0.350616358728402 | 0.998452152074676 | 1.600374637520896 | -2.681942826287655 | 2.540266061386298 | 0.206732157336182 | 0.135166509774136 | 0.225466613646434 | 0.226677863027440 | -0.449187875164901 | 0.082541971904493 | -0.208914003804148 | -0.452106466226594 | -0.533546173939208 | 0.717325641205500 | 1 | 0 | 1 | 0 | 3 | 3 | 1 | 0 | T |
| **91** | 1.711111111111112 | 0.258686810581022 | 0.438326301673760 | 1.434001684418373 | 1.110687332800095 | -0.281943157629147 | 3.420556968798150 | -0.158637009694837 | 0.609897585844818 | -0.459244425938080 | 0.765852400362432 | -0.571885461982265 | -0.070889550699537 | 0.071480708863052 | -0.029673814368085 | 0.293292114764512 | -0.608374551521068 | 0 | 0 | 1 | 0 | 5 | 5 | 1 | 1 | V |
| **92** | 0.986111111111110 | 0.310323010299459 | 0.279628042530424 | 1.237246870443527 | 0.778441870564867 | -0.016239382754842 | 3.851240974954482 | 0.159126130561317 | 0.544532853421571 | -0.362385565069143 | 0.388826896747844 | -0.350924076809356 | -0.692200663413759 | 0.200863488041432 | 0.010639051293527 | 0.254151482617619 | 0.175256367726079 | 0 | 0 | 2 | 1 | 4 | 4 | 3 | 2 | W |
| **93** | 1.636363636363636 | 0.217007072350197 | 0.412857771250744 | 1.985316533879896 | 1.233129388327120 | -0.206848576131964 | 3.643288860091749 | -0.240264886543400 | 0.412032951696839 | -0.216241048598910 | -0.091375679489134 | -0.042003133232871 | -0.156853928248258 | 0.123897503390968 | -0.041667171708331 | 0.060709097845413 | -0.783324473632338 | 1 | 1 | 1 | 0 | 5 | 6 | 2 | 2 | X |
| **94** | 1.157894736842106 | 0.256315100498667 | 0.421050315341272 | 0.903017548088148 | 2.695631522951135 | -1.016834863289848 | 1.811221200550380 | 0.111057196449558 | 0.001518430238615 | 0.266703861001443 | 0.652408020372037 | -0.245584919183505 | -0.189056008568014 | 0.055159034640461 | 0.051366659335660 | -0.119724678586007 | 0.818364238738866 | 1 | 1 | 1 | 1 | 1 | 2 | 2 | 2 | Z |
| **95** | 1.290322580645160 | 0.159053887384062 | 0.329800805500233 | 0.450485982884245 | 1.188121584056812 | -0.553322363746253 | 3.161320950987526 | 0.085352579959789 | 0.142365606694361 | 0.558920903404638 | 0.405239082603951 | -0.484732644160786 | -0.689820911284849 | 0.248384354526340 | 0.617868228641498 | -0.160331159348564 | 0.263247059097998 | 1 | 0 | 2 | 2 | 2 | 2 | 2 | 2 | A |
| **96** | 2.393939393939394 | 0.191013726634200 | 0.423072357379442 | 0.145594378178725 | 1.212456306618452 | -1.500430946177751 | 2.461389336652533 | -0.561304804513985 | 0.661474623565695 | 0.066138151865421 | 0.070222553571667 | -0.758605500524837 | 0.292867638197624 | -0.135119921746350 | -0.303088132047207 | 0.044610337991338 | -0.098053680494890 | 0 | 1 | 2 | 1 | 2 | 2 | 2 | 1 | B |
| **97** | 2.799999999999997 | 0.171822995087430 | 0.458099906946634 | 0.159611933522381 | 1.089785604118822 | -1.773037493932014 | 2.573910402577184 | -0.544186716914672 | 0.617490868343102 | 0.049397390471123 | 0.111656186112778 | -0.739984369481573 | 0.384130632839432 | -0.325839398541256 | -0.477661179824474 | 0.380231217997869 | -0.034996340131326 | 0 | 1 | 2 | 1 | 3 | 3 | 2 | 1 | B |
| **98** | 1.809523809523809 | 0.240813716124078 | 0.472637053512857 | -0.339122937754638 | 1.588693791774469 | -1.698586804717878 | 2.197741121267028 | 0.605296500690596 | -0.906484658319956 | 0.352705669480069 | 0.693385837447305 | -0.589596663888047 | -0.579828514136283 | 0.060380091520849 | -0.221128359002001 | -0.558655507860416 | 0.720525654696764 | 1 | 0 | 1 | 1 | 1 | 1 | 2 | 2 | C |
| **99** | 2.701754385964899 | 0.160100788487651 | 0.351593888443470 | 0.155286833581708 | 1.128105636203374 | -0.524013356297423 | 3.780075755147323 | 0.536379124702135 | -0.211531693792665 | 0.336314163079022 | 0.088308044052074 | 0.103470605489600 | -0.007296028600219 | 0.381153296537353 | 0.273174224534070 | -0.323486246755797 | 0.488269490150018 | 1 | 0 | 1 | 2 | 2 | 1 | 1 | 1 | D |
| **100** | 1.644444444444446 | 0.147033968158767 | 0.294835988387576 | 0.285317188912363 | 1.266480945994115 | -0.405104248465344 | 3.162390398895038 | 0.415540096959707 | -0.109399211332866 | 0.426735057614243 | 0.250171806837544 | 0.013365393383067 | -0.263026111534078 | 0.333529314858250 | 0.403511672693751 | -0.190041949508488 | 0.438516729612360 | 1 | 0 | 2 | 1 | 2 | 1 | 2 | 1 | D |
| **⋮** |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |

testdata

testdata = 968×26 table

|  | **AspectRatio** | **MADX** | **MADY** | **AvgU** | **MADU** | **AvgV** | **MADV** | **CorrXY** | **CorrXP** | **CorrXU** | **CorrXV** | **CorrYP** | **CorrYU** | **CorrYV** | **CorrPU** | **CorrPV** | **CorrUV** | **NumXMin** | **NumXMax** | **NumYMin** | **NumYMax** | **NumUMin** | **NumUMax** | **NumVMin** | **NumVMax** | **Character** |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **1** | 1.405405405405405 | 0.197169422944323 | 0.315278077450562 | 0.676772395532966 | 1.939177839168160 | -0.556798271601414 | 2.351323750216454 | -0.111210697254093 | -0.334064498713704 | 0.639906042605021 | 0.734469797288685 | 0.245445447374846 | -0.741999619690661 | 0.480497299598525 | -0.375839045921709 | -0.526880073122734 | 0.132302384532342 | 1 | 1 | 1 | 1 | 1 | 2 | 1 | 1 | E |
| **2** | 2.774193548387111 | 0.131421220782920 | 0.475718469114718 | 0.425123964981858 | 1.286213689388807 | -1.982892289161660 | 3.308047025855674 | 0.402772445399980 | -0.486445927469113 | 0.065055747023347 | 0.531482309715430 | -0.088610707643932 | -0.466985452030224 | 0.385788756212317 | 0.368760637289319 | -0.405411960760232 | 0.143773492074333 | 1 | 0 | 1 | 1 | 2 | 1 | 1 | 1 | F |
| **3** | 2.577777777777794 | 0.168337767695198 | 0.434642124701036 | -0.834969749715341 | 1.925548450364925 | -1.412360507434341 | 2.471744173197755 | 0.299515056980770 | 0.037656399066453 | 0.261095181472653 | 0.094769480161049 | -0.201187682004459 | 0.065663890639434 | 0.413313117322987 | 0.011105353980283 | -0.580407439927837 | 0.020240407861625 | 1 | 1 | 1 | 2 | 2 | 1 | 3 | 2 | G |
| **4** | 3.820512820512805 | 0.106944456417853 | 0.589232711789452 | -0.797682590081084 | 0.854744816982911 | -3.179170298421427 | 3.410587290929737 | 0.641704622757201 | 0.274413497077880 | 0.857635666100609 | -0.607463274798009 | -0.318646981812194 | 0.708679673806995 | 0.119037453167992 | 0.027768963462513 | -0.596439861348609 | -0.411295220474599 | 1 | 0 | 1 | 1 | 1 | 1 | 1 | 1 | J |
| **5** | 1.106382978723405 | 0.280636929614215 | 0.256200743204593 | 0.991474487506619 | 0.864995661252086 | -0.597752415292249 | 3.489796161022245 | 0.066304714879732 | 0.054995279632835 | 0.409753327229605 | -0.089025540979459 | 0.081526950452760 | 0.552022612470876 | 0.450231070068287 | 0.508956528028029 | 0.499966685137185 | 0.829772865202056 | 0 | 0 | 2 | 2 | 1 | 2 | 2 | 2 | M |
| **6** | 2.942528735632177 | 0.184606359548993 | 0.445814842519088 | 0.285927332769424 | 1.021863307709911 | -0.541487876039929 | 4.088613787004586 | 0.623979905661609 | 0.462148945350348 | 0.108602098737966 | -0.031232398958195 | -0.122190496156409 | 0.413274723133449 | 0.157769958090115 | 0.246677143039360 | 0.162179784145227 | 0.732219031087325 | 1 | 1 | 1 | 1 | 0 | 1 | 2 | 1 | P |
| **7** | 3.936507936507926 | 0.117234520795460 | 0.562763570852589 | 0.843335489735165 | 1.489690802287656 | -4.184760840259847 | 4.611072623795068 | -0.105725620896804 | -0.359235152940566 | 0.553282928297359 | 0.755144823491169 | -0.287372462577395 | -0.549553311462664 | -0.190771620601711 | -0.269958931687147 | -0.700402901901084 | 0.691254174211264 | 2 | 1 | 1 | 1 | 3 | 2 | 1 | 1 | T |
| **8** | 2.399999999999994 | 0.175025179441097 | 0.467081554455378 | 1.310033980019589 | 2.153936242762605 | -2.206513829938098 | 3.045207216939416 | -0.267732724185295 | 0.119895391494924 | 0.573697556815449 | 0.333106634723385 | -0.231161990840867 | 0.002123994990610 | 0.371086882396243 | -0.400687461886423 | -0.613185619954512 | 0.792870446041227 | 2 | 2 | 1 | 0 | 2 | 2 | 1 | 2 | Z |
| **9** | 2.245614035087713 | 0.188798497018330 | 0.300663159513878 | 0.062029827349357 | 1.669329733350576 | -1.418702354108693 | 2.473415098317632 | 0.311061226745379 | -0.329414228140767 | 0.075906338604132 | 0.225378623272962 | -0.648893014580156 | -0.622353073770264 | -0.503811910380704 | 0.152331173155305 | 0.695881852375806 | 0.036971047385645 | 1 | 0 | 2 | 1 | 3 | 3 | 4 | 3 | D |
| **10** | 1.546666666666667 | 0.243260658978860 | 0.329674604462622 | 0.752046497508043 | 0.920779923849822 | -1.155733778192158 | 4.179482298014933 | -0.131051127850549 | -0.014165465259955 | 0.247499379432622 | -0.183789659103964 | -0.280151944166934 | 0.484253969441976 | 0.273143589731612 | -0.291630662601810 | -0.151490297946076 | 0.752456928251392 | 0 | 0 | 2 | 2 | 3 | 2 | 3 | 2 | M |
| **11** | 2.228070175438595 | 0.176519163499198 | 0.390593026145059 | -0.029486610799849 | 1.679392507296984 | -1.765886743621915 | 3.827543501652472 | 0.077258928723840 | 0.167691163015979 | 0.046377106479208 | 0.200553609748844 | -0.555875016015455 | -0.351552650522661 | 0.265548135344432 | 0.432842868186460 | -0.169481435878911 | 0.355740778785408 | 1 | 1 | 2 | 2 | 2 | 1 | 4 | 3 | Q |
| **12** | 1.977777777777780 | 0.168791039907977 | 0.465490204781535 | 0.628029855214664 | 1.200660620545164 | -0.405165595818630 | 3.582931762585353 | 0.647574262891504 | 0.055534946661565 | 0.604052261136696 | 0.054317701815258 | -0.440416306976801 | 0.526333702451661 | -0.002166916942614 | 0.535549590910967 | 0.667698288358081 | 0.487514450511470 | 1 | 0 | 1 | 0 | 3 | 3 | 1 | 1 | R |
| **13** | 1.847619047619048 | 0.219670065763593 | 0.421760140798409 | -0.606039248443243 | 1.976575065905092 | -1.037534840290673 | 1.767802772215623 | 0.013978194660858 | -0.123664412202802 | 0.103008848427174 | 0.013741836294354 | -0.367289178245252 | 0.084592411690196 | 0.296271727998228 | -0.373083926718659 | -0.082786395002930 | -0.260921815169552 | 1 | 1 | 1 | 1 | 2 | 1 | 2 | 2 | S |
| **14** | 1.940740740740738 | 0.139687734033652 | 0.288314518110520 | 1.103727251744505 | 1.424034943306354 | -2.384329916396768 | 3.250890478822172 | 0.322798080984557 | 0.411809737723555 | 0.097193360436263 | 0.278172372650021 | -0.346076115311086 | -0.050753607694665 | -0.150169764147146 | 0.049886971672731 | 0.306423577051653 | 0.868619568405267 | 2 | 1 | 1 | 0 | 3 | 2 | 2 | 1 | T |
| **15** | 2.529411764705879 | 0.169965969503310 | 0.457733928852043 | 0.298981494277297 | 1.798823241011260 | -4.951420892264957 | 2.349819616297219 | 0.191523556735688 | -0.236516644211985 | 0.235846011227413 | -0.144345619277894 | -0.650050572769433 | -0.114122841513616 | -0.542375204595484 | 0.519789265220200 | 0.446228277551194 | 0.116411333458072 | 0 | 1 | 1 | 1 | 2 | 2 | 3 | 2 | X |
| **16** | 4.399999999999990 | 0.172876953897817 | 0.623060858780833 | 0.103326837201738 | 0.934765554658543 | -2.409797256419337 | 3.410759549671683 | -0.235968414526571 | 0.671733608258213 | -0.016537688070335 | 0.044651746732397 | -0.486051340997222 | 0.534277445616260 | 0.179127095756730 | -0.417190923174725 | -0.334370820492682 | 0.209429332566134 | 0 | 1 | 1 | 1 | 2 | 2 | 2 | 1 | Y |
| **17** | 1.428571428571430 | 0.206774549414850 | 0.428788263598714 | 0.347838770897428 | 1.462577531595711 | -0.807089933968806 | 1.705475186061308 | 0.006004782768646 | -0.536710823225558 | 0.558260929574404 | 0.923176524933453 | -0.582868245127523 | -0.686669826564253 | 0.173306742827903 | 0.141089328307886 | -0.634159801793411 | 0.498972399204271 | 1 | 0 | 1 | 1 | 1 | 1 | 1 | 1 | C |
| **18** | 2.016260162601622 | 0.124269407090457 | 0.328524163807050 | 0.111103625651157 | 1.451972410800256 | -0.847666437694230 | 3.620005781729839 | -0.025665953917106 | -0.215798285041405 | 0.618076108164513 | 0.321621076386692 | 0.166930259258131 | -0.427072038120278 | 0.392362855663332 | -0.017455764120211 | -0.138708569440033 | 0.308108006738530 | 2 | 1 | 1 | 2 | 2 | 1 | 2 | 1 | D |
| **19** | 2.851851851851849 | 0.142015477616892 | 0.343250933563824 | 0.600937627461172 | 1.259366762087823 | -3.014772192519995 | 3.623470643673657 | 0.222391638860839 | 0.170831220876844 | 0.412273377345662 | 0.276018038600370 | -0.480152520428181 | 0.473639094950670 | -0.183101400077582 | -0.488999965861567 | -0.446900926300619 | 0.370522348120718 | 1 | 0 | 1 | 0 | 1 | 1 | 3 | 3 | F |
| **20** | 14.266666666666758 | 0.063246237319965 | 1.331480379858093 | 0.573573781166584 | 0.424713602276791 | -3.163398149037732 | 4.195436096878431 | -0.266237733409507 | 0.399902738366837 | -0.380699360336655 | 0.233911024127058 | -0.298370083661790 | 0.357468938302696 | 0.477181999836130 | 0.542455723089964 | -0.451603982991640 | -0.560397342934015 | 1 | 1 | 1 | 1 | 2 | 3 | 1 | 1 | I |
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| **22** | 1.975308641975303 | 0.218825789711576 | 0.409287486527713 | -0.010338243847543 | 1.316147444657464 | -0.044533598371717 | 3.069509999229578 | 0.025251059092553 | 0.371027649957347 | 0.295544655203591 | 0.921615857235165 | -0.521578199184862 | -0.810453935441518 | 0.427096435379412 | 0.532905273966797 | 0.170018857810562 | 0.101519818448334 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | O |
| **23** | 1.276595744680850 | 0.290974149322429 | 0.357446589763838 | 0.666345316403260 | 1.448579390136190 | 0.899081518774028 | 2.324935400019553 | 0.651307733385752 | 0.247496842821382 | 0.273292205125020 | -0.129844111540388 | -0.259378383373893 | 0.506275818367594 | 0.280145343687424 | 0.295378794858224 | 0.275544876354080 | 0.633519830113116 | 1 | 1 | 1 | 0 | 2 | 1 | 1 | 1 | R |
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| **25** | 1.960784313725488 | 0.231916210366533 | 0.379649902071973 | 0.918739395132969 | 0.544792604411368 | 0.312768183880878 | 2.756925716404028 | 0.340584023170764 | 0.701033009708324 | -0.579050908390786 | 0.496917784346033 | -0.035126538118373 | -0.356358273960406 | 0.305813045818202 | -0.278866210427961 | 0.687475173431102 | -0.594095246843505 | 0 | 0 | 1 | 0 | 1 | 2 | 1 | 1 | V |
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| **28** | 1.045751633986926 | 0.238647675710483 | 0.295243230779200 | 0.416872907407966 | 2.834184603942520 | -0.477034009420981 | 2.393476551030632 | 0.335054658986521 | -0.154366125543537 | 0.135087054774342 | 0.878621377639807 | -0.133195110386803 | -0.659531203551983 | 0.039897466304340 | -0.323553616240730 | -0.340069490641269 | 0.434700033012955 | 1 | 1 | 1 | 1 | 3 | 4 | 3 | 3 | E |
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| **34** | 1.944444444444446 | 0.156952649708015 | 0.292318282169003 | -0.317840626330141 | 1.376476097199234 | -0.393574403195871 | 3.878568713317809 | 0.523366317668014 | 0.205665813285946 | -0.007769797801268 | -0.210934089209919 | -0.321909614738306 | 0.427641063144735 | 0.067580050879716 | 0.051163891349940 | 0.297786983957277 | 0.357867141698770 | 1 | 1 | 1 | 1 | 6 | 5 | 2 | 2 | P |
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| **36** | 2.036036036036036 | 0.185825591220139 | 0.437888790645517 | -0.521885363926982 | 1.295746860961823 | -2.850803591426832 | 1.376934952162725 | 0.636265765497348 | -0.132528231220992 | 0.171261470376020 | -0.135631229636664 | -0.384459127422927 | 0.281561100565348 | -0.101378862824263 | -0.284847011210998 | -0.482805255980236 | 0.302613534822401 | 0 | 1 | 1 | 1 | 1 | 2 | 2 | 1 | Y |
| **37** | 1.565217391304346 | 0.144683470978378 | 0.380262204900821 | 0.162878202059075 | 1.318373853152075 | -1.153100060783205 | 3.003418965142715 | -0.134221440376954 | -0.029001763082629 | 0.627262424498459 | 0.448748861149406 | -0.537519848350707 | -0.662243590747405 | 0.293910296636873 | 0.381354288063066 | -0.347468719714447 | 0.366437844982451 | 1 | 0 | 2 | 2 | 2 | 1 | 2 | 1 | A |
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| **39** | 1.205128205128206 | 0.212180111928900 | 0.251803749792623 | 0.771266466668139 | 1.709209683383181 | -0.174834298963680 | 2.114951765222354 | 0.190201590574829 | -0.108958134790103 | 0.423322094242498 | 0.843391046192821 | 0.016257703353537 | -0.710351432555248 | 0.190442253728951 | -0.020257785242980 | -0.282402739190082 | 0.526841726836731 | 1 | 1 | 1 | 1 | 1 | 2 | 2 | 1 | E |
| **40** | 4.311111111111098 | 0.099891757632790 | 0.750509501791331 | 0.524748583476291 | 0.529746189033208 | -2.048676007402999 | 2.295536973992145 | -0.654804816885888 | -0.250714970928831 | 0.940215132895801 | 0.598194243853235 | -0.335678825648299 | -0.562959065431553 | 0.180890837798150 | -0.656086324558677 | -0.877957524990175 | 0.662449092647739 | 0 | 0 | 1 | 1 | 2 | 1 | 1 | 0 | L |
| **41** | 1.884057971014492 | 0.188114356881169 | 0.423311173073375 | -0.314919109741056 | 1.613570768731780 | -0.492418445857723 | 2.978113516433997 | -0.188121378564642 | 0.521728440225467 | 0.273386253687767 | 0.941026657861021 | -0.634683229737672 | -0.825887430069706 | 0.059433229280263 | 0.290639527920465 | 0.318448455833729 | 0.167024039679079 | 1 | 1 | 1 | 1 | 3 | 3 | 1 | 1 | O |
| **42** | 2.186666666666660 | 0.127307759775621 | 0.403828106739696 | 0.133701564565752 | 1.201069011986150 | -1.425895506367511 | 3.041415344086214 | -0.269600555978545 | -0.207056551052780 | 0.543836858795157 | 0.285033383269348 | -0.354320242981503 | -0.502490432493060 | 0.390245446050336 | 0.184071517581064 | -0.451121628944864 | 0.487574571472246 | 1 | 0 | 2 | 2 | 2 | 1 | 2 | 1 | Q |
| **43** | 1.884057971014487 | 0.188735974632293 | 0.439910918315869 | 0.998056683164717 | 1.091374429608211 | -0.201128897512106 | 3.014575508683182 | -0.374957456776806 | 0.328780317117577 | 0.043820512254632 | -0.045046960529944 | -0.636266381149408 | 0.787826116640897 | 0.095124423974477 | -0.243309248496991 | 0.285840643349703 | 0.082107876791763 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | R |
| **44** | 2.090909090909088 | 0.187485715085969 | 0.367273128782608 | 0.845811893533103 | 1.492403975015998 | 0.407370704322066 | 2.455693236988095 | 0.031984308857096 | 0.226472371872804 | 0.233131725283866 | -0.198314193268218 | -0.562335954423502 | 0.782971916556272 | 0.304469909104686 | -0.054564983949660 | 0.411090357417073 | 0.300104469426178 | 1 | 1 | 1 | 1 | 1 | 2 | 1 | 2 | R |
| **45** | 2.456140350877191 | 0.216480367242418 | 0.335957215087061 | 0.612310294751556 | 0.373495061373621 | 0.503331566302159 | 2.852697538836446 | 0.213880333140168 | 0.410500916691417 | 0.106237387000220 | 0.501113949039530 | -0.555741631416904 | -0.509144469490513 | 0.647930791353289 | 0.545490415200857 | -0.098591513910395 | -0.452246696253987 | 0 | 0 | 1 | 1 | 3 | 4 | 1 | 1 | V |
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| **47** | 1.861111111111111 | 0.185938553739552 | 0.378200330673328 | -0.253558448814169 | 1.774218143376062 | -0.849923682963858 | 3.570853137431704 | 0.247460747571674 | 0.225622763291962 | 0.213584062797174 | -0.311315328044495 | -0.407812273183597 | 0.542112313475125 | -0.016065956848196 | 0.075671840081835 | -0.186306549217960 | 0.261295250975878 | 1 | 1 | 2 | 1 | 2 | 1 | 3 | 2 | B |
| **48** | 1.777777777777781 | 0.223765432098765 | 0.495149911816579 | 0.139926655758459 | 1.443617834754092 | -1.142697681369557 | 1.431625143881004 | 0.332658717127702 | -0.684891926980515 | 0.486527301374709 | 0.962562032145783 | 0.099721779228782 | -0.667253759088866 | 0.477692525426958 | -0.661871850010147 | -0.564471753666390 | 0.258710456505063 | 1 | 0 | 0 | 0 | 1 | 1 | 1 | 1 | C |
| **49** | 2.385964912280707 | 0.160517251644038 | 0.302090095755738 | -0.372420226084974 | 1.378685223690358 | -2.105493464502369 | 2.630872683043842 | 0.510104571504073 | -0.597652291277835 | -0.057845634622139 | 0.079860139275284 | -0.341126569311387 | -0.784822611826827 | 0.013246217764388 | -0.274617481982277 | 0.232840062277989 | -0.085371346786445 | 1 | 0 | 1 | 1 | 3 | 3 | 3 | 2 | D |
| **50** | 1.508771929824563 | 0.188634372712629 | 0.306164630024023 | -0.718960625830100 | 1.767754833119614 | -0.636940099454690 | 2.300403765858256 | 0.541871802377283 | 0.261870137966030 | 0.518956598279372 | -0.109552238641147 | 0.056826761259428 | 0.403974795229267 | 0.313075545375382 | 0.003366732576280 | -0.339803597177012 | 0.303359877516617 | 1 | 1 | 2 | 2 | 2 | 1 | 2 | 3 | G |
| **51** | 2.888888888888892 | 0.172282577048474 | 0.502263863457195 | -0.596888404111615 | 0.372896335189346 | -2.081566296845637 | 1.475650115350005 | 0.997786113932899 | -0.299286429672928 | 0.235762269741416 | 0.019466183314449 | -0.336173448318176 | 0.278371451446138 | 0.075535179461426 | -0.721019873451032 | -0.745102910023326 | 0.841947704581663 | 1 | 0 | 1 | 1 | 3 | 2 | 2 | 1 | I |
| **52** | 1.944444444444447 | 0.182562022918104 | 0.443738784723977 | 0.378150605089128 | 1.203779289797235 | -1.777809762682490 | 4.027072755522325 | 0.098367957441687 | -0.148107553333023 | 0.403658889959762 | -0.295075648313185 | -0.328104764770538 | 0.350215433888396 | 0.249376564717688 | 0.221004533583884 | 0.037409378433188 | 0.708382353275822 | 1 | 0 | 1 | 1 | 1 | 1 | 2 | 1 | N |
| **53** | 1.353535353535355 | 0.210456633472532 | 0.342565054880042 | -0.024099356310436 | 1.817355219497297 | -0.306821681083118 | 2.251811400246922 | 0.043572506982429 | -0.313342896603891 | 0.174336250498350 | 0.985914952181940 | -0.548801589091854 | -0.876754831147672 | 0.057718043357155 | 0.468648580547919 | -0.248376722822182 | 0.050364314315492 | 1 | 1 | 1 | 1 | 2 | 1 | 1 | 1 | O |
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| **58** | 1.346153846153846 | 0.268017333483147 | 0.262440166618522 | 1.093118267411630 | 0.879180178254665 | 0.360092037524474 | 2.596680198681509 | 0.476511643427417 | -0.350159734592933 | 0.455534493079037 | 0.848925236843567 | -0.644624339702652 | -0.120067112970690 | 0.551060585481949 | 0.314327185251498 | -0.293821184305205 | 0.643903025937688 | 0 | 0 | 1 | 0 | 1 | 2 | 1 | 1 | V |
| **59** | 0.905982905982906 | 0.291587466841659 | 0.241746809656072 | 1.024104659147175 | 1.147993539553217 | -0.098041779552848 | 2.877862703882962 | 0.024577473903357 | 0.014380929415006 | 0.608544885815766 | 0.637873913637860 | -0.693367914127624 | -0.519933717363598 | 0.267742149136640 | 0.461713490763154 | -0.124894076860204 | 0.623571579612629 | 0 | 0 | 2 | 1 | 2 | 2 | 2 | 2 | W |
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| **61** | 1.485714285714285 | 0.179774012525175 | 0.348957889255046 | 0.004099878991500 | 1.556178107653084 | -1.207431858610594 | 2.838907909942086 | 0.109449163869877 | -0.574485089773087 | 0.248963337495013 | 0.347197299038947 | -0.363718820250009 | -0.669906148668454 | 0.207959958341205 | 0.215884280058156 | -0.278241823297922 | 0.478208769234667 | 1 | 0 | 1 | 2 | 2 | 2 | 3 | 3 | A |
| **62** | 1.843137254901959 | 0.165107648515751 | 0.297482322475948 | 0.057229981686896 | 1.488955969786300 | -0.387924796517810 | 3.322746470155838 | 0.544252343804592 | -0.365690408303480 | 0.268847383345322 | 0.287545601333056 | 0.100752756338149 | -0.274646903605271 | 0.238560892188142 | 0.456877276265628 | 0.083218863703800 | 0.433771762934954 | 1 | 0 | 1 | 2 | 2 | 1 | 2 | 1 | D |
| **63** | 2.777777777777775 | 0.099687500000000 | 0.435885416666666 | -0.743544163777345 | 2.396811963118120 | -2.969535779127825 | 2.263613955974434 | 0.030607949715107 | 0.540497775421929 | 0.508392542423776 | -0.595498326285640 | -0.288004940450542 | 0.586309176534864 | 0.642972920178709 | -0.116623174608051 | -0.915227272394637 | 0.207709409503634 | 1 | 1 | 1 | 0 | 2 | 1 | 3 | 2 | J |
| **64** | 1.777777777777777 | 0.234310699588477 | 0.517661179698217 | 0.769149890357323 | 2.146546623467537 | -1.118906806987301 | 1.810262183636796 | 0.124025221930235 | -0.074451309023092 | 0.295772610449723 | 0.160674319639797 | -0.412173878975604 | 0.091069572275502 | 0.207533566678194 | -0.315797644443468 | -0.548241638874585 | 0.935159259511376 | 1 | 1 | 1 | 1 | 1 | 2 | 1 | 1 | Z |
| **65** | 0.876190476190476 | 0.215255533697343 | 0.281406683163736 | 0.481028040428816 | 1.459828420237049 | -0.619918201379667 | 2.483060727335832 | -0.178958144141592 | -0.252071043924499 | 0.524222823789860 | 0.301595771530052 | -0.411784534150623 | -0.870597187841228 | 0.312044838451643 | 0.394108228718807 | -0.197591035874941 | 0.039529750477770 | 1 | 0 | 1 | 2 | 2 | 1 | 2 | 2 | A |
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| **67** | 5.392156862745104 | 0.086711766926647 | 0.771969200225406 | -0.920057364700089 | 1.329092433304542 | -4.915405650555043 | 4.200559882120633 | 0.633076890248449 | 0.109243591104535 | 0.887035150655894 | -0.461378588653954 | -0.319654808467229 | 0.824685456094584 | 0.248919436763033 | 0.075835565362458 | -0.684231193550490 | -0.296269850354847 | 1 | 0 | 1 | 1 | 2 | 2 | 2 | 1 | J |
| **68** | 1.829059829059827 | 0.156066760278411 | 0.328133484018253 | 0.455090273035349 | 1.694364064257950 | -1.411612065307632 | 3.377398236928070 | -0.140345643929061 | -0.234064553336515 | 0.394600882527970 | -0.256903900853855 | -0.294547499025288 | -0.024013401607238 | -0.029406807079096 | 0.177647719592494 | 0.295650457551242 | 0.075200555883474 | 2 | 1 | 1 | 1 | 2 | 3 | 3 | 2 | K |
| **69** | 1.113924050632911 | 0.278865162819002 | 0.330767075255021 | 0.923720568996194 | 0.868894216036955 | -1.078372740808831 | 4.594078253750987 | -0.087067401899106 | 0.258948998533317 | 0.495993663434233 | -0.090651714601271 | -0.404685731252739 | 0.523322317292521 | 0.127997725926167 | 0.351829626531742 | 0.076661914575170 | 0.351420939971735 | 0 | 0 | 2 | 2 | 2 | 2 | 4 | 3 | M |
| **70** | 1.525114155251141 | 0.213861689523671 | 0.377234420360521 | 0.278112708294884 | 1.908417846940322 | 0.082932837852980 | 2.723631535098198 | -0.169954784762780 | 0.292741509839794 | 0.140732476439735 | -0.970546431665360 | -0.622299119470637 | 0.935771714173257 | 0.234500524574775 | -0.512969790845009 | -0.157096112189781 | 0.026244620673524 | 1 | 1 | 1 | 1 | 2 | 3 | 1 | 2 | O |
| **71** | 2.931034482758622 | 0.137161430868857 | 0.469799027141254 | 0.363373031005721 | 1.240261067735186 | -1.035122534664499 | 4.515324909200825 | -0.087406079334006 | 0.538905247000217 | -0.021462187730721 | -0.154162230429574 | -0.503685658510987 | 0.350947972781932 | -0.008038665218256 | -0.012415843339501 | 0.195851285389510 | -0.192313095754881 | 1 | 2 | 1 | 1 | 2 | 2 | 2 | 1 | P |
| **72** | 2.795698924731184 | 0.125992101088093 | 0.425382730874579 | -0.190997758942354 | 1.465258789321946 | -1.363687043896590 | 3.034264120067137 | -0.371892595254569 | -0.261903636566618 | 0.114747786694628 | 0.348305411668640 | -0.352089523317149 | -0.706428682246474 | 0.422914646193855 | 0.759453732321986 | -0.455407647476569 | -0.203030754584158 | 1 | 0 | 1 | 2 | 3 | 2 | 2 | 2 | Q |
| **73** | 1.497716894977168 | 0.213374311184566 | 0.326882448855700 | 0.772208458785066 | 0.584767093966982 | -0.910470307433820 | 2.997293875314903 | -0.480932010171858 | 0.133652636779661 | 0.762912890634804 | 0.490786782146145 | -0.705042158116020 | -0.766163296704369 | -0.158163332202997 | 0.564965376895829 | 0.003868112956862 | 0.615936611788887 | 0 | 0 | 2 | 1 | 3 | 3 | 3 | 2 | W |
| **74** | 3.318181818181815 | 0.157860538460538 | 0.430360495814963 | 0.196773699910224 | 1.377089749706668 | -0.600012467418893 | 4.440141418707611 | -0.441232547823153 | 0.139081213188242 | 0.252697467918920 | -0.213875770203317 | -0.631761755286901 | 0.357359618198526 | 0.185404993784405 | 0.042182649352537 | -0.084938717588132 | 0.072030888715822 | 2 | 1 | 2 | 1 | 2 | 2 | 2 | 3 | Y |
| **75** | 1.624999999999998 | 0.126408642106949 | 0.278977939632965 | 0.289736291941740 | 1.359655826623205 | -0.127145716615262 | 3.118652593538561 | 0.462463180010571 | -0.166528789070636 | 0.208526698636573 | 0.290991321206425 | 0.224002184199138 | -0.320433667345378 | 0.167035172895711 | -0.030325999621985 | -0.002071127098011 | 0.266292875840359 | 1 | 0 | 1 | 2 | 2 | 1 | 2 | 2 | D |
| **76** | 6.512820512820524 | 0.097437024587602 | 0.733138598694347 | 0.610701352425213 | 1.083271314544786 | -1.899476894109753 | 4.113216794180488 | 0.251517919506218 | -0.041280173875111 | 0.456461858200362 | 0.560359878049530 | -0.112155063823613 | -0.600505495171468 | 0.505454157527580 | 0.033160987275713 | -0.508295753678067 | -0.021614139464647 | 2 | 2 | 3 | 3 | 3 | 4 | 3 | 4 | I |
| **77** | 1.757575757575755 | 0.152352273483878 | 0.329321874692707 | 0.735020502984831 | 0.800531174786279 | -0.070682239428996 | 2.970997554061481 | 0.029653881780928 | 0.187446993255764 | 0.468883051707692 | 0.212364485262124 | 0.210385578268554 | -0.365331360876678 | 0.301328316338933 | -0.266703901015968 | -0.073253901597642 | 0.648678075108928 | 1 | 1 | 2 | 2 | 2 | 3 | 2 | 2 | L |
| **78** | 0.592592592592593 | 0.246865043425124 | 0.246294257197552 | 0.765245461577175 | 2.509433717655169 | -0.552026688200883 | 1.273293818520952 | 0.267542686471953 | -0.242998279168848 | 0.496555208376011 | 0.361947602851326 | -0.431980961003987 | -0.001919859587570 | 0.165988558133054 | 0.031849182076066 | -0.280337956224772 | 0.863961214039495 | 1 | 1 | 2 | 1 | 2 | 2 | 2 | 2 | Z |
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| **80** | 1.161904761904762 | 0.189960758509789 | 0.301057532866505 | 0.910868848499520 | 2.028916332566543 | -0.302103839034871 | 1.790688012840226 | -0.058387593586913 | 0.262563383702746 | 0.442568315538370 | 0.172785873938278 | -0.609420782034439 | 0.342139455426040 | 0.055067642444528 | -0.083290725875893 | -0.045302909131108 | 0.697431417259431 | 2 | 2 | 1 | 0 | 2 | 3 | 2 | 2 | Z |
| **81** | 1.901234567901232 | 0.201675658218590 | 0.361960582174686 | -0.434967041820694 | 1.234140741131116 | -1.589222906898375 | 2.759847007978477 | 0.555149747078759 | -0.391732580696072 | 0.014164410526291 | -0.044653637642192 | -0.657681190517106 | -0.302894950267740 | -0.146588128395081 | -0.110308621289864 | -0.173933572304183 | 0.078615245684876 | 1 | 0 | 2 | 1 | 4 | 4 | 2 | 1 | D |
| **82** | 3.263157894736843 | 0.226204378526915 | 0.518169016673839 | 0.692767280505653 | 0.770864020827600 | -1.873122728607331 | 4.240235647826617 | -0.521903208725128 | 0.303676073319588 | 0.195873607422430 | 0.159543477939401 | -0.580842550664723 | -0.059869904164813 | -0.029648279963854 | 0.301734303851252 | -0.153294766523697 | 0.561425909092327 | 0 | 0 | 2 | 2 | 1 | 1 | 3 | 3 | H |
| **83** | 1.028571428571429 | 0.325566076407343 | 0.291596966714912 | 1.019794163537818 | 1.220828737560632 | -0.764240763607110 | 3.883100674545016 | 0.061892500521769 | 0.216064405872004 | 0.061787099441297 | -0.130592074210948 | -0.122509880650361 | 0.684831429326236 | 0.330719400682569 | 0.249460438717514 | 0.253522466939938 | 0.852906621021717 | 0 | 0 | 3 | 2 | 4 | 4 | 3 | 2 | M |
| **84** | 3.699999999999997 | 0.160317407730582 | 0.424790188843070 | 0.124702742392933 | 1.054298833099819 | -1.169648104235597 | 5.331755495964363 | 0.619112318503686 | 0.201437471999076 | 0.069865755383417 | -0.029875713566648 | -0.198442987126526 | 0.468482931648132 | 0.172419475310450 | 0.103072332804278 | 0.125339893532703 | 0.411822732594136 | 1 | 1 | 1 | 1 | 2 | 1 | 2 | 1 | P |
| **85** | 1.419354838709676 | 0.248869971493522 | 0.393717581447428 | 1.486675165265364 | 0.860119997469663 | 0.013251437520962 | 3.061209060883094 | 0.271389289170443 | 0.210834742858389 | -0.545808925682325 | 0.581592097311285 | -0.396371019750090 | 0.069624965334661 | 0.203065175871820 | 0.203367879368286 | -0.049460297818632 | -0.038504950173139 | 0 | 0 | 1 | 0 | 4 | 4 | 2 | 1 | V |
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| **87** | 1.706214689265532 | 0.155657840560286 | 0.346154112384579 | 0.541671792386262 | 1.502391306173156 | -0.951306105401096 | 2.471819870792550 | 0.385553789946729 | -0.129738868085542 | 0.320813019742785 | 0.286017760638327 | -0.402934830823794 | -0.135773033032242 | 0.169403235641348 | 0.150947929176526 | -0.542690868261245 | 0.218116558811610 | 1 | 0 | 1 | 1 | 2 | 2 | 1 | 2 | F |
| **88** | 1.860215053763444 | 0.110984654133347 | 0.324327646307425 | 0.262942476208043 | 1.605683170831915 | -0.194507938641747 | 3.046499068378532 | 0.262524305925994 | -0.429583576487693 | 0.610610059612006 | 0.633490105091480 | -0.504019558166316 | -0.076397204437891 | 0.268471905475205 | -0.090049027579827 | -0.225079780024314 | 0.523260376342238 | 3 | 2 | 2 | 2 | 3 | 2 | 3 | 3 | Q |
| **89** | 1.513513513513514 | 0.288973409819233 | 0.441801302521653 | 0.759880188619204 | 1.037417782262979 | -1.274827769968405 | 3.537343551744805 | -0.237876528233777 | 0.299572908564124 | 0.168145386483918 | 0.285800238659265 | -0.274551924470865 | -0.488795802827015 | 0.247219912046075 | 0.123377529645071 | 0.025895351769769 | 0.699545674136649 | 1 | 1 | 1 | 1 | 2 | 1 | 2 | 1 | U |
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| **91** | 0.715277777777778 | 0.285824621811341 | 0.240265598524416 | 2.355361315713747 | 3.399538106975414 | -0.809100642504859 | 1.617669735606919 | -0.031237940806856 | -0.044725325630698 | 0.528787920347544 | 0.171152924937948 | -0.060986943699848 | 0.356885566451330 | 0.204540920750052 | -0.030134224285373 | -0.148044120284617 | 0.781856915995101 | 2 | 2 | 1 | 0 | 2 | 3 | 2 | 3 | Z |
| **92** | 2.986666666666677 | 0.155744938352741 | 0.377937906197521 | -0.830954574638428 | 2.003452205517366 | -3.364870940604014 | 3.491675119980315 | 0.670091408319143 | -0.172927442203677 | 0.061053820538104 | 0.719627192233752 | -0.418502380604375 | -0.425585461253978 | 0.410148185021880 | 0.263127689937286 | -0.357645346242030 | 0.109279707025955 | 2 | 1 | 2 | 3 | 2 | 2 | 5 | 5 | F |
| **93** | 2.126984126984127 | 0.210254039153976 | 0.338873329297678 | -0.637019224724891 | 1.903840405829572 | -0.713278955571319 | 3.131886337596193 | 0.341732260291364 | -0.450842682439805 | 0.247723141915085 | 0.069408748244248 | -0.667422475513110 | 0.072366208275277 | 0.210303730932628 | -0.261715632113330 | 0.098371880908705 | 0.090442227154160 | 1 | 1 | 2 | 2 | 2 | 1 | 2 | 3 | G |
| **94** | 5.851851851851872 | 0.150080773031545 | 0.907961374153335 | -0.504947852096908 | 0.414823855250001 | -3.064056265315970 | 2.506096783998555 | 0.997168925149364 | -0.594168750111163 | -0.078695624018151 | -0.209369500487807 | -0.627232513456598 | -0.025700030568063 | -0.158690617927975 | -0.558411298081391 | -0.466344436232085 | 0.961576165449287 | 0 | 0 | 1 | 0 | 1 | 0 | 2 | 1 | L |
| **95** | 1.175757575757576 | 0.249162850010259 | 0.308389163569387 | 0.665708579686737 | 1.477840359964930 | -1.468320486920732 | 4.233062064808800 | -0.039198348959432 | 0.173694422944983 | 0.167963897245276 | 0.001917127626576 | -0.567436755684252 | 0.635638323853835 | 0.248547260146237 | -0.443819072841683 | -0.157990826961895 | 0.869065423635967 | 2 | 2 | 2 | 2 | 3 | 2 | 3 | 2 | M |
| **96** | 1.609756097560975 | 0.282816799577964 | 0.357652400344969 | 0.860095103600279 | 0.923728554227436 | -0.329364239351743 | 2.783384410586935 | 0.343659997760558 | 0.224532859629405 | 0.362394924742542 | 0.228136439484587 | -0.630868180726116 | 0.355670321516083 | 0.176572594580703 | 0.390133537976408 | 0.190054317185793 | 0.462227813323224 | 0 | 0 | 1 | 1 | 1 | 1 | 2 | 1 | R |
| **97** | 1.274853801169591 | 0.312044014115279 | 0.328205049932437 | 1.027708998847520 | 1.102509452768020 | -1.054834706088035 | 3.228894956107113 | 0.030635323952007 | 0.469297558447451 | -0.132506973245821 | 0.445381652140773 | -0.325801668596929 | -0.742145518833758 | 0.164879966908232 | 0.479866167406539 | 0.280810822343280 | 0.270977612460998 | 0 | 0 | 1 | 1 | 1 | 2 | 2 | 1 | U |
| **98** | 1.521739130434784 | 0.258965347570357 | 0.418068816753598 | -0.419514939102463 | 2.788385297183907 | -3.849200175156579 | 2.571334376434119 | 0.043465747272446 | -0.030651161753495 | 0.047966373538978 | -0.059163228076987 | -0.580394595017737 | -0.337371257177611 | -0.269182631213894 | 0.376024941322159 | -0.519359421846192 | 0.273289676454930 | 0 | 1 | 1 | 1 | 1 | 1 | 2 | 1 | X |
| **99** | 18.222222222222435 | 0.076493271129114 | 1.290469814789305 | 0 | 0 | -2.441622954880871 | 5.078413599734651 | 0.827375616721705 | -0.004471223280200 | NaN | 0.686878297286617 | -0.171682150800891 | NaN | 0.627655527158422 | NaN | -0.439260685168221 | NaN | 0 | 0 | 1 | 0 | 0 | 0 | 1 | 1 | I |
| **100** | 1.377777777777775 | 0.243750287197699 | 0.306758553184482 | 0.793171684281060 | 1.437774518090699 | -0.252004705716399 | 2.411973548048855 | 0.424618087534837 | 0.269815099700418 | 0.347037125232257 | 0.148337104323247 | 0.415688895800852 | -0.411639494083106 | 0.211598457127453 | 0.103635069425582 | 0.013324086273383 | 0.468358729973358 | 1 | 1 | 1 | 1 | 2 | 2 | 2 | 1 | L |
| **⋮** |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |

predLetter

predLetter = 968×1 categorical

E   
F   
G   
J   
M   
P   
T   
Z   
D   
M

## **Task 1**

idx=(traindata.Character=='U')|(traindata.Character=='N')

idx = 2906×1 logical array

0  
 0  
 0  
 0  
 0  
 0  
 0  
 0  
 1  
 0

UorN=traindata(idx,:)

UorN = 219×26 table

|  | **AspectRatio** | **MADX** | **MADY** | **AvgU** | **MADU** | **AvgV** | **MADV** | **CorrXY** | **CorrXP** | **CorrXU** | **CorrXV** | **CorrYP** | **CorrYU** | **CorrYV** | **CorrPU** | **CorrPV** | **CorrUV** | **NumXMin** | **NumXMax** | **NumYMin** | **NumYMax** | **NumUMin** | **NumUMax** | **NumVMin** | **NumVMax** | **Character** |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **1** | 1.655172413793104 | 0.270575508533960 | 0.369923126689901 | 0.734773970513414 | 0.714004250265529 | -1.555710778423304 | 3.879731061609099 | 0.129059945481231 | 0.137534658429930 | 0.479298903667136 | 0.099990549380945 | -0.017442449718173 | 0.486644857760503 | 0.531641032924525 | 0.392332460377901 | 0.352825093910211 | 0.827131651915599 | 0 | 0 | 1 | 1 | 1 | 2 | 2 | 1 | N |
| **2** | 1.508771929824561 | 0.253283448449179 | 0.384150613424467 | 0.660727431741267 | 0.804946665819343 | -1.350828749612806 | 3.372427054750992 | -0.202464888458361 | 0.243039653761135 | 0.499510059153848 | 0.340395824143318 | -0.303517552303499 | -0.705688479718058 | 0.360323601785492 | -0.016357774424200 | 0.162855688309420 | 0.294648524572968 | 0 | 0 | 1 | 1 | 2 | 1 | 2 | 1 | U |
| **3** | 2.283333333333334 | 0.262330305985658 | 0.457230816151090 | 0.714066918862640 | 0.913213394319879 | -1.696704437524700 | 3.937475865801729 | -0.458183212211660 | 0.552671276083271 | 0.166297924749814 | -0.413887452497380 | -0.486923519225192 | 0.767454057087176 | 0.141438570470262 | -0.163804109959848 | -0.019176038474483 | 0.003178006075378 | 0 | 0 | 1 | 1 | 2 | 2 | 2 | 1 | N |
| **4** | 1.676190476190476 | 0.256353400486788 | 0.384728265691907 | 0.740567776144548 | 0.803383256062800 | 0.425322922668722 | 2.480252098624902 | 0.088369904612187 | 0.595833213687203 | -0.393919800533430 | 0.974301731178556 | -0.433790790257149 | -0.963348402269736 | 0.373025442467401 | 0.045742630294363 | 0.471526871328429 | -0.394723837386685 | 0 | 1 | 1 | 0 | 1 | 1 | 1 | 1 | U |
| **5** | 2.309523809523809 | 0.205787555993749 | 0.467453108875061 | 0.754217308322385 | 0.424270987471308 | -1.825328039833760 | 3.719785775129048 | -0.526690812761141 | 0.411794636442664 | 0.329225958853461 | -0.078201673129230 | -0.472680686368021 | 0.381958660557717 | 0.111840494301447 | 0.212354166759991 | 0.142478275656105 | 0.444766332257356 | 0 | 0 | 1 | 1 | 3 | 4 | 2 | 1 | N |
| **6** | 1.898989898989899 | 0.178265396171463 | 0.420643785702837 | 0.718561574681995 | 0.300121109031017 | -1.861030295482293 | 3.419888624443868 | -0.696106052884443 | 0.361590511997832 | 0.434230454161195 | -0.009743066018041 | -0.368882891518546 | 0.234660607317665 | 0.032370382852439 | -0.149565092227018 | 0.124852061744272 | -0.088416349103610 | 0 | 0 | 1 | 2 | 3 | 3 | 2 | 1 | N |
| **7** | 1.084967320261438 | 0.263541814024249 | 0.337019781696248 | 0.971174079995205 | 0.937349473640383 | -0.693207770642621 | 3.285906590485510 | -0.476065843420935 | 0.465690882875302 | 0.283297086479630 | 0.412825398381499 | -0.499183010054322 | -0.880751951171054 | 0.221468595441411 | 0.454091671539879 | -0.154196457555939 | -0.042927123805295 | 0 | 0 | 2 | 1 | 1 | 2 | 2 | 2 | U |
| **8** | 1.303030303030303 | 0.252427443148749 | 0.366017030173005 | 0.957799806738165 | 0.861022489416071 | -1.009946584601167 | 3.303801645636140 | -0.472225564986911 | 0.236144228122739 | 0.156672339588571 | 0.334774335545820 | -0.201771875096691 | -0.945806997948935 | 0.161165869429885 | 0.113272042804989 | -0.382013936902495 | -0.328770698161541 | 0 | 0 | 1 | 1 | 1 | 2 | 2 | 1 | U |
| **9** | 1.540229885057473 | 0.181036152119215 | 0.326328155898345 | 0.933142149253847 | 0.531119453289651 | -1.114235924318018 | 3.167970046647421 | -0.786662373946204 | 0.381304489601790 | 0.483562011231601 | -0.402051387883679 | -0.208390571095220 | 0.033162618865662 | 0.329520230439509 | 0.197829371421824 | -0.428451302004802 | -0.419377188564076 | 0 | 0 | 2 | 2 | 2 | 3 | 2 | 2 | N |
| **10** | 1.353535353535352 | 0.198808913697656 | 0.325447003726152 | 1.063964819582273 | 0.687601999278376 | -1.629452436152387 | 3.741460835117708 | -0.767616804761531 | 0.276532382168522 | 0.384187724196894 | -0.016344346203462 | -0.235460006975855 | -0.195977818702477 | 0.095595168072313 | 0.214456142496617 | -0.399219406623142 | -0.709966548512443 | 0 | 0 | 2 | 2 | 1 | 2 | 2 | 1 | N |
| **11** | 0.858974358974359 | 0.264237873729069 | 0.238491619365724 | 1.215233220466027 | 0.675793275056895 | -0.642393141494370 | 2.999065845961093 | -0.295116134257300 | 0.552699579591417 | 0.183797271770560 | 0.283766632752083 | -0.388282572032446 | -0.803894409754227 | 0.322943700634640 | 0.253394152642536 | -0.269336222097945 | -0.458393767451907 | 0 | 0 | 2 | 2 | 2 | 2 | 2 | 1 | U |
| **12** | 0.820512820512821 | 0.292994258104984 | 0.217798601649435 | 1.337746125925165 | 0.782196576920307 | 0.360709715079421 | 3.235504034545858 | -0.205353026210392 | 0.437773303453371 | -0.015772400489275 | -0.044895170957475 | -0.226349005229768 | -0.367454443512916 | 0.453395024269942 | -0.115310022568353 | -0.507180380461866 | -0.156173408322733 | 0 | 0 | 2 | 2 | 2 | 3 | 2 | 2 | U |
| **13** | 1.786666666666666 | 0.264132159623500 | 0.344764164292201 | 0.769405557573834 | 0.985072515834357 | -1.039888194615149 | 3.228872851801385 | -0.252216120413624 | 0.123514086240117 | 0.342530884887874 | -0.537066037042670 | 0.095507568433346 | 0.656990992132815 | 0.363098620005073 | 0.504754866673610 | -0.035328126267553 | 0.391496737123127 | 1 | 0 | 1 | 1 | 2 | 2 | 2 | 1 | N |
| **14** | 2.509803921568632 | 0.222429993527786 | 0.453336874462745 | 0.537785281547900 | 0.994476069241516 | -1.834733960319799 | 4.903204569163909 | 0.165979784149649 | 0.375446181269921 | 0.276211946024209 | -0.280500091007149 | -0.120047037835293 | 0.812661616181296 | 0.288875712964705 | 0.263088378652390 | -0.282259048302619 | 0.682482587223835 | 1 | 0 | 1 | 1 | 2 | 2 | 2 | 1 | N |
| **15** | 2.421052631578946 | 0.174046027364647 | 0.486442970548821 | 0.495723787842013 | 0.673187358815200 | -1.761035689635037 | 3.460990391575302 | -0.303938285158306 | -0.109782055888529 | 0.403803792830745 | 0.244021495727838 | -0.340052920697303 | -0.612938317366962 | 0.081107158132454 | 0.123158955191090 | 0.044881598162068 | 0.639918986064435 | 1 | 0 | 1 | 1 | 3 | 3 | 2 | 1 | U |
| **16** | 1.487804878048781 | 0.201387525332046 | 0.394152293341316 | 0.822851358628070 | 0.751145510781838 | -1.616258773271048 | 3.456445894338841 | -0.581772729649643 | 0.190401435307133 | 0.677400187528914 | -0.235362673922221 | -0.342170417149278 | 0.083822307581887 | 0.135827837705880 | 0.147797403840704 | 0.260338364247094 | -0.517787860712660 | 0 | 0 | 1 | 1 | 1 | 2 | 2 | 1 | N |
| **17** | 2.144444444444445 | 0.217164181295600 | 0.443344794014819 | 0.664927313576792 | 0.522860915312948 | -1.104308525382351 | 3.339472072570310 | -0.447121641892702 | -0.162076558921556 | -0.008651012006999 | 0.480787786285326 | 0.765638682174928 | -0.429661971974680 | 0.168711309361322 | -0.439169985396578 | 0.076919525127616 | 0.125940381263114 | 0 | 0 | 1 | 2 | 2 | 2 | 2 | 1 | U |
| **18** | 0.924731182795700 | 0.241600079066847 | 0.303546905880963 | 1.206016302061393 | 1.083616137478025 | -0.750867563562797 | 2.976727712504923 | -0.257647815542374 | 0.238403724942196 | 0.939745745794958 | -0.060199086962316 | -0.489424863925608 | -0.204319854604057 | 0.159775549174419 | 0.376695845408167 | -0.054366790874780 | -0.060812388730698 | 0 | 0 | 1 | 2 | 2 | 3 | 2 | 1 | N |
| **19** | 1.247311827956989 | 0.358389960594052 | 0.307140453764313 | 2.131542679973589 | 2.707325668192147 | -4.683851257702520 | 7.384020045799237 | -0.426605619717324 | -0.384833291205611 | 0.268009392418254 | 0.002819128376383 | -0.206018632073354 | -0.882062040681781 | 0.408206260129445 | 0.343196100501357 | -0.054212641145218 | -0.192567368679486 | 0 | 0 | 1 | 2 | 3 | 3 | 3 | 2 | U |
| **20** | 1.481481481481482 | 0.214418100519187 | 0.353970790348293 | 1.588750998419178 | 0.818280158703243 | -1.610293306109081 | 5.296508896538206 | -0.339980117843115 | 0.334046654330946 | 0.596531944253837 | -0.228730117892804 | -0.475387677393702 | 0.510430355563000 | 0.138603754802230 | 0.144290890056063 | 0.145011295463635 | -0.482439709145736 | 0 | 0 | 1 | 1 | 2 | 3 | 2 | 1 | N |
| **21** | 0.806201550387597 | 0.282057472353059 | 0.207780323476083 | 1.217637856125735 | 0.437240708318494 | 0.376008853468610 | 2.951543683060888 | 0.234455775933531 | 0.395456037761950 | 0.219335804000802 | 0.043384436360054 | 0.011375750871112 | -0.424510485390720 | 0.255278114691028 | 0.217384293054617 | -0.324805614592926 | -0.388900367707226 | 0 | 0 | 2 | 2 | 1 | 2 | 2 | 3 | U |
| **22** | 1.786666666666668 | 0.276932498952030 | 0.393047532002245 | 0.906764959172452 | 0.710774987032642 | -1.661408828067282 | 4.221156002445312 | -0.210381337223719 | 0.526969855726751 | -0.061059960209609 | 0.187027200745429 | -0.566450778365491 | 0.472491738055749 | 0.016426865876019 | 0.337601993811291 | 0.583797908197248 | 0.793070219723792 | 0 | 0 | 1 | 1 | 2 | 2 | 2 | 1 | N |
| **23** | 1.471264367816092 | 0.297506100976996 | 0.343513175996690 | 0.864095123947875 | 0.780362600110627 | -0.982263517595730 | 3.783184573884613 | -0.071403224364777 | 0.131977196147822 | -0.013555293606591 | 0.384665941964466 | -0.174850105586242 | -0.552772016900834 | 0.236767163349822 | 0.170973469159447 | -0.123620914757543 | 0.280225467219730 | 0 | 0 | 2 | 1 | 2 | 2 | 2 | 1 | U |
| **24** | 1.129943502824859 | 0.291951149367980 | 0.272571805058944 | 0.968202950782725 | 1.076793431717076 | -0.064111655931237 | 3.579674236767218 | -0.033231040341121 | 0.327215383985840 | -0.006148586304321 | -0.298528024685345 | 0.117263246690571 | 0.562176291135134 | 0.349808574064661 | -0.141862677620878 | -0.162388130409808 | 0.840543670018050 | 1 | 1 | 1 | 2 | 3 | 3 | 2 | 2 | N |
| **25** | 1.255555555555555 | 0.356152734941201 | 0.342810588555972 | 0.911451544841222 | 0.874171919129281 | -1.053759649598518 | 3.009846858864816 | -0.270471461038919 | 0.577298691838648 | 0.305447992547776 | -0.308838485827069 | -0.472329494711263 | 0.708344944834420 | 0.294485492116614 | 0.073893757737665 | -0.402483087956633 | 0.315820945944363 | 0 | 0 | 1 | 1 | 1 | 2 | 3 | 2 | N |
| **26** | 1.033333333333335 | 0.273215268840901 | 0.337194115984237 | 0.981740567452366 | 0.921236651567847 | -0.915039376945780 | 2.872757792600432 | -0.437361866622022 | -0.007127591950911 | 0.602365948049762 | -0.000247539534790 | -0.283381403135578 | 0.052489511226281 | 0.131948194377246 | -0.201208502688116 | -0.240440531769277 | 0.704538693367335 | 0 | 0 | 2 | 2 | 2 | 3 | 2 | 1 | N |
| **27** | 0.893939393939394 | 0.313291627009382 | 0.276344759942348 | 0.959041043069464 | 1.101236956091422 | -0.763184793004574 | 2.699760070740814 | -0.057552121137465 | -0.035507648142151 | 0.480013953203574 | 0.385078138452681 | -0.313712915176369 | -0.573262253220600 | 0.119869645574922 | -0.208492212259025 | -0.183735924784470 | 0.660134735120171 | 1 | 0 | 2 | 1 | 2 | 1 | 2 | 1 | U |
| **28** | 0.994350282485876 | 0.225814462303405 | 0.257441158908470 | 1.028118304452652 | 1.103988098922088 | -0.415656936468075 | 2.841747309808528 | -0.025836571929110 | 0.703790136128267 | 0.277866441635598 | 0.517648665073971 | -0.132961850237355 | -0.881125774971720 | 0.056064254064507 | 0.317988835897312 | 0.378590906705334 | 0.124216711665471 | 1 | 1 | 2 | 1 | 1 | 2 | 2 | 2 | U |
| **29** | 2.769230769230768 | 0.167150813552087 | 0.520580586514069 | 0.585482013298311 | 0.520641492623416 | -1.523938158499955 | 4.149535891845673 | -0.457629395899616 | 0.317648883601166 | 0.474911681299713 | -0.183111489451204 | -0.503077942811640 | 0.211241551242558 | 0.124396658491899 | 0.429180666175889 | 0.138189007328761 | -0.161252110647616 | 0 | 0 | 1 | 2 | 2 | 2 | 2 | 1 | N |
| **30** | 2.222222222222221 | 0.187084273547166 | 0.443491246904833 | 0.642298266455674 | 0.312600803514985 | -1.521231388609982 | 3.648201555964893 | -0.531114635404430 | 0.014805616759571 | 0.711472196579991 | -0.045188561729413 | -0.353354938710837 | -0.162640232869194 | 0.163455157441360 | 0.025076864833540 | -0.255091377292993 | 0.065087233493448 | 0 | 0 | 1 | 2 | 2 | 2 | 2 | 1 | N |
| **31** | 3.119047619047619 | 0.176119894156211 | 0.555150816533794 | 0.548503548941627 | 0.590632712716646 | -2.230720218064228 | 3.985836541022292 | -0.385990046983833 | 0.032939361299619 | 0.445428558533887 | -0.069619804639523 | -0.398048960110857 | 0.290605199484459 | -0.018416733936026 | -0.038285622706867 | -0.025301732391109 | 0.582900720649082 | 0 | 0 | 1 | 1 | 2 | 1 | 2 | 1 | N |
| **32** | 3.071428571428572 | 0.165354028890881 | 0.542166072453670 | 0.601618768024771 | 0.384666670373603 | -1.947811759912704 | 3.804740300253609 | -0.598057883319436 | 0.080254596132256 | 0.495865548791892 | -0.224460991617604 | -0.305671574929868 | 0.320688912632060 | 0.152412572696062 | 0.087220031578366 | -0.073636634617823 | 0.038409849117423 | 0 | 0 | 1 | 1 | 2 | 2 | 2 | 1 | N |
| **33** | 2.641975308641974 | 0.187274907950633 | 0.533899665239662 | 0.631457846045412 | 0.520563233833578 | -1.658388350401360 | 4.048107667190914 | -0.667577923933050 | 0.395605672890260 | 0.226483308651317 | 0.262047621677820 | -0.523564730059895 | -0.826052659819275 | 0.119315978494848 | 0.350305594079633 | 0.084767591837925 | -0.497931702234192 | 0 | 0 | 1 | 1 | 1 | 1 | 2 | 1 | U |
| **34** | 1.603603603603603 | 0.258571881886765 | 0.395469766816850 | 0.814263733834419 | 0.564880766615594 | -1.329424435420152 | 2.636519796782022 | -0.645579964861697 | 0.290916661318153 | 0.168851152208464 | 0.258333204441609 | -0.360167784589314 | -0.896030986539352 | 0.159712382405767 | 0.385440112420090 | 0.181435378869715 | -0.130052642543474 | 0 | 0 | 1 | 1 | 1 | 2 | 2 | 1 | U |
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| **37** | 1.724637681159422 | 0.279564810439971 | 0.404902691770084 | 0.837214729596831 | 0.746597613899359 | -1.323631636195954 | 3.333259167788844 | -0.256214177496512 | 0.473784862261389 | 0.292626701735800 | -0.352691832222809 | -0.236771114578130 | 0.755054981779557 | 0.191988428086664 | 0.349764112366362 | -0.064484015775884 | 0.427232531075404 | 0 | 0 | 1 | 1 | 1 | 2 | 2 | 1 | N |
| **38** | 1.175141242937854 | 0.303131972615272 | 0.349734344744725 | 0.996300812842114 | 0.680775407055055 | -1.427274137796203 | 3.237217188849659 | -0.209472296788803 | 0.246654686997638 | 0.382550505116012 | -0.160385153911981 | -0.251200688529206 | 0.752874885421483 | 0.269822253580933 | 0.330600702672726 | 0.016694892508583 | 0.246892349347979 | 0 | 0 | 1 | 1 | 2 | 3 | 2 | 1 | N |
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| **43** | 1.747126436781608 | 0.273384392862529 | 0.382910632274331 | 0.775973735018394 | 0.663731008201881 | -1.238836266610314 | 3.072572357708106 | -0.327307206021602 | 0.031980375688912 | 0.520805170362303 | -0.253300381857429 | -0.055828320636455 | 0.494468371781507 | 0.600276381588632 | 0.240479888496724 | 0.253927551732007 | 0.534206188366921 | 0 | 0 | 1 | 1 | 1 | 2 | 2 | 1 | N |
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| **47** | 1.428571428571427 | 0.250229808097891 | 0.415807003915261 | 0.777684930678760 | 0.991857647205959 | -1.326489270319024 | 3.898903614774691 | -0.234260447525505 | -0.031131492291183 | 0.538289277616613 | -0.094857746898354 | -0.112987742605213 | 0.437454262439721 | 0.495532221892394 | -0.317099188483050 | -0.058855897377612 | 0.677025801172446 | 0 | 0 | 1 | 2 | 2 | 1 | 2 | 1 | N |
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| **62** | 1.355555555555556 | 0.336815064650847 | 0.360015900863416 | 0.850137976625426 | 1.144656554957095 | -1.006701631699028 | 3.476189542347102 | -0.043124904172315 | 0.247896727182282 | 0.038475126393750 | 0.174969982031172 | -0.087466239166773 | -0.186056899461520 | 0.224320446433130 | 0.167411293669510 | -0.033044304065527 | 0.856303994665357 | 0 | 0 | 1 | 2 | 2 | 1 | 2 | 1 | U |
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| **74** | 1.054054054054054 | 0.301059212635032 | 0.294872981185707 | 0.876376957632700 | 1.054487394529774 | -0.531231454814390 | 2.855144420606037 | -0.038222790696917 | -0.113676694904599 | 0.639007048410008 | -0.126964363517390 | -0.138207772358538 | 0.295631577120910 | 0.293258763292488 | 0.045348352120017 | -0.131160219581553 | 0.461952331704337 | 0 | 0 | 2 | 2 | 2 | 2 | 2 | 1 | N |
| **75** | 1.265700483091788 | 0.243655030034420 | 0.343577779080042 | 0.820464068808247 | 0.582710879518795 | -1.307527235052598 | 3.394309300437940 | -0.274827569153989 | 0.341322563284296 | 0.626929008841565 | 0.351912504057242 | -0.434554704981654 | -0.670647936098639 | 0.183881617131926 | 0.301137930864667 | 0.262393872488779 | 0.424069852245362 | 0 | 0 | 2 | 1 | 1 | 1 | 2 | 1 | U |
| **76** | 1.253731343283582 | 0.246762348500415 | 0.362779088798491 | 0.817203658423714 | 0.730344038484801 | -0.994267756571464 | 3.001722964261455 | -0.190668564457036 | 0.164911952366063 | 0.534435392643519 | 0.271302311299874 | -0.394292401392029 | -0.370950888334739 | 0.249578942892928 | -0.015857122897472 | 0.071874939988710 | 0.697473285636758 | 0 | 0 | 2 | 1 | 2 | 1 | 2 | 1 | U |
| **77** | 0.709956709956710 | 0.241572708714032 | 0.250772433983394 | 1.240919846372341 | 1.353277465665516 | 0.654258689578659 | 3.189023621312210 | 0.595495698273664 | 0.277973761755713 | 0.237182222972732 | -0.004374551447875 | 0.213474921012139 | -0.093760380470693 | 0.064775438570914 | -0.326567413937467 | -0.386317954326161 | 0.825675619026937 | 1 | 1 | 2 | 2 | 2 | 3 | 2 | 2 | N |
| **78** | 1.365079365079364 | 0.230349589008718 | 0.372149836271062 | 0.813931856674275 | 0.942079132851980 | -1.055308033118430 | 3.378817498446637 | -0.189810186545134 | 0.103964874649856 | 0.677313813239001 | -0.033798654083208 | -0.273066781248955 | 0.122128680366993 | 0.147326287512362 | -0.106571458981938 | 0.022370070459962 | 0.605240246130989 | 0 | 0 | 2 | 1 | 1 | 1 | 2 | 1 | N |
| **79** | 0.656565656565656 | 0.274943670395080 | 0.251473807682933 | 1.140271092897728 | 1.395265531948297 | 0.189738107665629 | 3.105182301494703 | 0.418881629957444 | 0.422905835675073 | 0.298830492577301 | -0.011357794429763 | 0.391177352118472 | -0.111255471346223 | 0.352073579367856 | -0.356065214579269 | -0.343957175056563 | 0.759943113311108 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | U |
| **80** | 1.160493827160495 | 0.280580881729811 | 0.294224019907837 | 0.976711410273455 | 0.661666995417080 | -1.064770427646704 | 2.352044871667362 | -0.353494636032674 | 0.292375295810799 | 0.210702299723067 | 0.062159155539322 | 0.129433464038354 | -0.357918522037527 | 0.584415978965964 | -0.435409330448016 | 0.170391574968263 | 0.492244837585847 | 0 | 0 | 1 | 1 | 1 | 1 | 2 | 1 | U |
| **81** | 1.200000000000000 | 0.243507520583964 | 0.317952323631117 | 0.875828202402058 | 0.523719683716132 | -1.157041009964934 | 2.007021117928154 | -0.666706444200244 | -0.075466605875620 | 0.650416730919775 | 0.183438834018391 | -0.228607651208397 | -0.964184328082514 | 0.284534309205835 | -0.482444803536607 | 0.203075951529280 | -0.149546872771276 | 0 | 0 | 1 | 1 | 1 | 1 | 2 | 1 | U |
| **82** | 2.211382113821137 | 0.185219148651698 | 0.333313990753957 | 0.345865085730649 | 0.972204211936336 | -1.388392454490779 | 2.435352036789556 | -0.284298325554081 | -0.142997987501330 | 0.500126114495570 | -0.480792673887963 | -0.128860742079294 | 0.030148612774049 | 0.470100541753720 | 0.541975396171511 | 0.053033723903133 | 0.327362400842434 | 1 | 0 | 1 | 1 | 1 | 2 | 1 | 1 | N |
| **83** | 0.829268292682928 | 0.233596538919005 | 0.234675170135778 | 1.058302414932675 | 0.678030098219082 | 0.065582267085699 | 3.586388397510201 | -0.214359010383192 | 0.190895948362193 | 0.659945474577654 | -0.388539416935316 | 0.152683562158216 | 0.350106032315758 | 0.514381539298004 | -0.188568279070038 | -0.164540723423257 | 0.135687810375966 | 0 | 0 | 2 | 2 | 2 | 2 | 2 | 2 | N |
| **84** | 1.274074074074075 | 0.228941950939221 | 0.380588270991228 | 0.914018407997320 | 0.650546808136472 | -0.839960401898841 | 2.549340762887579 | -0.435336142297330 | 0.360298463005075 | 0.730365890830899 | -0.259847847073240 | -0.240028050651437 | -0.048226901352000 | 0.468193221735110 | -0.313289386424935 | -0.012431354214964 | -0.476476644398048 | 0 | 0 | 1 | 1 | 2 | 3 | 2 | 1 | N |
| **85** | 1.839080459770116 | 0.297632976674373 | 0.341184334361582 | 1.012223402256447 | 1.074272236785581 | -0.379371551497647 | 3.488120072634766 | 0.096150866739562 | 0.537592740798125 | -0.087771719430640 | 0.478099816377968 | -0.292399436335289 | -0.754374859535117 | 0.458535521570639 | 0.104855913220188 | 0.334066053542122 | -0.784842488053543 | 0 | 0 | 1 | 1 | 2 | 2 | 1 | 1 | U |
| **86** | 1.055555555555555 | 0.230954952319342 | 0.298252516376760 | 0.967460415674147 | 1.069611750012000 | -0.645273991270344 | 2.584819287026245 | -0.400467370132784 | 0.049782844500141 | 0.593700862075573 | 0.312111596983209 | -0.184903518300870 | -0.823537768264308 | 0.165069788933080 | -0.141375957332698 | -0.078539076579171 | -0.193462981936024 | 1 | 1 | 1 | 2 | 1 | 1 | 2 | 1 | U |
| **87** | 0.859649122807017 | 0.281667731097075 | 0.324225617013648 | 1.130263524581575 | 1.112445249254656 | -1.888459345402115 | 2.064983005231889 | -0.430407573578307 | -0.001033305379916 | 0.867520376249810 | 0.369750430610408 | -0.355287622678754 | -0.591566341021064 | 0.373617633072309 | -0.240812017565650 | 0.041064269589567 | 0.312332068148900 | 1 | 0 | 1 | 1 | 2 | 2 | 2 | 1 | U |
| **88** | 1.069444444444444 | 0.206256053585012 | 0.313095797480694 | 0.668719474414266 | 1.324502389396828 | -0.783356080978808 | 2.690701170010067 | 0.156880779737805 | 0.140520079549207 | 0.591241799747521 | 0.058895012251891 | -0.488333653647043 | -0.055631746286076 | 0.049317460323570 | 0.544213976567545 | 0.201216257941649 | 0.757763826245820 | 1 | 0 | 2 | 1 | 2 | 1 | 2 | 1 | N |
| **89** | 1.192982456140351 | 0.258635014813446 | 0.357683166408669 | 0.783343257864323 | 1.488344801728424 | -1.157268342526512 | 3.113687839494818 | 0.022429181504028 | 0.163374493259321 | 0.324602803286587 | 0.406518487242761 | -0.352108774316983 | -0.465961600143710 | 0.145711367917511 | 0.114454894891805 | 0.013551488634025 | 0.741878491202001 | 2 | 1 | 1 | 1 | 1 | 1 | 2 | 1 | U |
| **90** | 1.626666666666667 | 0.269160228617183 | 0.308763539788170 | 0.734150364469074 | 0.572003414875140 | 0.725501138630261 | 2.573590116391783 | -0.086839434431412 | 0.534473065289702 | 0.036616245431507 | 0.425520338870216 | -0.379739455891216 | -0.936878296155026 | 0.557489275969723 | 0.730022648668240 | -0.353757292499649 | -0.544459448044133 | 0 | 0 | 1 | 1 | 1 | 2 | 1 | 1 | U |
| **91** | 1.888888888888888 | 0.258704666705422 | 0.408942012214039 | 1.102950523503886 | 1.326402025870895 | -0.736540041966817 | 3.244436762725181 | -0.204152380485898 | 0.354679506768773 | -0.317519805397294 | 0.756060477186352 | -0.692987031615793 | -0.503932347301934 | 0.313563477858823 | 0.352084511986910 | -0.176498091987463 | -0.781830118035602 | 0 | 1 | 1 | 0 | 3 | 3 | 1 | 1 | U |
| **92** | 1.305555555555554 | 0.295862824421563 | 0.349211594460144 | 0.945999085496046 | 0.808305126677437 | -0.477508130205727 | 2.679007662819200 | -0.292824146951920 | 0.527529816262180 | 0.207821630376094 | -0.291070070795815 | -0.398119732844984 | 0.530540727331876 | 0.024924418654621 | 0.433908703855947 | 0.153212014444957 | 0.349202782881647 | 0 | 0 | 1 | 1 | 1 | 2 | 2 | 1 | N |
| **93** | 1.101449275362320 | 0.295516974516367 | 0.311412903155981 | 1.148653096423985 | 1.003110397666291 | -1.072051018255210 | 2.983709379455361 | -0.246566057449033 | 0.355931825157921 | 0.393023128183530 | -0.225932079937799 | -0.294632028740965 | 0.301679357832400 | 0.273590975897785 | 0.483172409831412 | -0.056892638165245 | -0.228080990326935 | 0 | 0 | 1 | 2 | 2 | 3 | 2 | 1 | N |
| **94** | 1.283950617283951 | 0.273745438630382 | 0.377856473333369 | 1.096879499056308 | 0.657387737459476 | -0.348506006272357 | 2.662732414154709 | -0.269610208686333 | 0.469267049330374 | -0.397902586902168 | 0.364474473103326 | -0.286953825515181 | -0.612266654330538 | 0.093633386057157 | -0.160611685673732 | 0.344642344260869 | 0.038937650507942 | 0 | 0 | 1 | 1 | 2 | 2 | 1 | 1 | U |
| **95** | 1.283950617283951 | 0.266045856581837 | 0.342029804881994 | 0.820406437169457 | 0.783372314419071 | -1.351209711557459 | 2.820577462114800 | -0.387071354583373 | 0.377431753961241 | 0.431239609098464 | 0.310451058033593 | -0.470783769322086 | -0.832224241119164 | 0.113932798388773 | 0.459426673854310 | 0.174080811684091 | 0.347860760957989 | 0 | 0 | 1 | 1 | 2 | 1 | 2 | 1 | U |
| **96** | 1.422222222222221 | 0.256196951743032 | 0.398801241254592 | 0.827404932864972 | 0.678469476010323 | -1.540148231435388 | 3.487535305088892 | -0.478188584945645 | -0.050698545417569 | 0.751455310664274 | -0.044583530012520 | -0.203182943039607 | -0.072287274118015 | 0.228205525526140 | 0.144074546946885 | -0.078989701525916 | 0.339295476014993 | 0 | 0 | 1 | 2 | 2 | 2 | 2 | 1 | N |
| **97** | 1.373737373737373 | 0.257090492022672 | 0.367876784578311 | 0.892978532735789 | 0.847312530320386 | -1.082162325026026 | 2.825655450086887 | -0.523578835577007 | -0.056304273947995 | 0.764982795457915 | -0.165397844838391 | -0.160005225381273 | -0.269380599160868 | 0.293920671320872 | 0.119718936503810 | -0.154186501417684 | 0.363625242376293 | 0 | 0 | 1 | 2 | 1 | 1 | 2 | 1 | N |
| **98** | 2.121212121212121 | 0.221847811820129 | 0.449346706457753 | 0.678918491830317 | 0.576687603813415 | -2.519516713106402 | 4.829942726665137 | -0.204728154701579 | 0.376085297836790 | 0.504072539740569 | -0.082340047447006 | -0.141309766480948 | 0.644911806100851 | 0.311756829065204 | 0.601378220074099 | 0.052251438205573 | 0.261939332652391 | 0 | 0 | 1 | 2 | 1 | 2 | 2 | 1 | N |
| **99** | 1.466666666666665 | 0.192668658897113 | 0.398640629956170 | 0.812980982511669 | 0.338310792934156 | -1.277763948463255 | 3.559289026623603 | -0.445853129526722 | 0.279908292931661 | 0.516404925603996 | -0.027025974924183 | -0.253722976096603 | 0.349614069305316 | 0.249494494945168 | 0.040431506892737 | 0.331586537494247 | -0.353027891798164 | 0 | 0 | 1 | 1 | 1 | 1 | 2 | 1 | N |
| **100** | 1.644444444444445 | 0.278853416146156 | 0.404896891101158 | 0.924732816975126 | 0.562270248769921 | -1.691568699178608 | 3.416837136605400 | -0.466814672249450 | 0.681193753179558 | -0.233862958492479 | 0.201427020672970 | -0.405759319653780 | -0.483926843758838 | 0.206899196715312 | 0.021436415964304 | -0.235846895808394 | -0.101467814815583 | 0 | 0 | 1 | 1 | 2 | 3 | 2 | 1 | U |
| **⋮** |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |

idx = (testdata.Character == "U") & (predLetter ~= "U");

fnU = testdata(idx,:)

fnU = 17×26 table

|  | **AspectRatio** | **MADX** | **MADY** | **AvgU** | **MADU** | **AvgV** | **MADV** | **CorrXY** | **CorrXP** | **CorrXU** | **CorrXV** | **CorrYP** | **CorrYU** | **CorrYV** | **CorrPU** | **CorrPV** | **CorrUV** | **NumXMin** | **NumXMax** | **NumYMin** | **NumYMax** | **NumUMin** | **NumUMax** | **NumVMin** | **NumVMax** | **Character** |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **1** | 1.521367521367522 | 0.275593048546924 | 0.387425449404327 | 0.928894194697063 | 1.125477176728743 | -1.488451310818312 | 3.441848159601074 | -0.268675052441410 | 0.742992207240029 | -0.262434620923350 | 0.454068142098910 | -0.210424586186752 | -0.444038698146078 | 0.038615769100744 | 0.016168135900642 | 0.523150942371933 | 0.328927721083996 | 0 | 0 | 1 | 1 | 2 | 3 | 4 | 3 | U |
| **2** | 0.845528455284553 | 0.366332985373529 | 0.266551621988185 | 1.196111480519504 | 1.394466950107878 | -1.747031784047515 | 2.377578989742262 | -0.437189819469041 | -0.361157974533569 | 0.519085117873670 | 0.590535473941730 | -0.071758835787166 | -0.511068546784169 | -0.266101121276968 | 0.016274480239042 | -0.240245213508542 | 0.745925643893309 | 1 | 0 | 1 | 1 | 2 | 3 | 3 | 2 | U |
| **3** | 0.972222222222221 | 0.335828825218420 | 0.283777061530079 | 0.693669117688583 | 2.813710971300089 | -3.383413252221132 | 2.730173891430742 | -0.199093402236883 | -0.062393920613110 | 0.204758648124442 | -0.079693395459563 | -0.534159870149109 | -0.739587030515011 | -0.140619387387980 | 0.506012898206114 | -0.055157411471699 | 0.655286090193614 | 2 | 1 | 1 | 1 | 2 | 1 | 3 | 2 | U |
| **4** | 1.154471544715447 | 0.252968772398617 | 0.335298835695262 | 0.852146394905999 | 0.789078295223506 | -1.560495323553089 | 3.343397467229446 | -0.576495552835106 | 0.369942906000092 | 0.700307305605825 | 0.109226302007985 | -0.240585117756072 | -0.878955921766146 | 0.317554530322153 | 0.494824890404513 | -0.006224350285285 | 0.010727390302866 | 0 | 0 | 1 | 2 | 2 | 3 | 2 | 2 | U |
| **5** | 1.006060606060606 | 0.262841078676164 | 0.246440485918046 | 1.011697171696822 | 0.517399553095739 | -0.373678229173609 | 2.612996788640704 | -0.140880129485105 | -0.071238407543195 | 0.769533181622207 | 0.231004076302561 | -0.253262768008169 | -0.460386268115302 | 0.183674159236910 | -0.329961407907505 | -0.188471087938837 | 0.381827069604345 | 0 | 0 | 2 | 1 | 1 | 2 | 2 | 1 | U |
| **6** | 1.418803418803419 | 0.260729482099664 | 0.297077766570274 | 1.203539178034772 | 0.877479035316407 | -1.698236285295110 | 2.660988998044113 | -0.522218102337621 | 0.323923618246625 | -0.819238165695664 | 0.563389667832839 | 0.007746312301522 | -0.340408421715615 | 0.189170991706550 | -0.458926984034457 | 0.178697864267927 | -0.571215390321398 | 0 | 0 | 1 | 1 | 2 | 2 | 1 | 1 | U |
| **7** | 0.980392156862745 | 0.236180499639008 | 0.254092066620528 | 0.965533029664132 | 0.845493477950290 | 1.124854984843229 | 3.480607200310603 | 0.502514371506668 | 0.427867687722887 | 0.407311715297401 | -0.108770538118936 | 0.450087631259382 | -0.343192470729168 | 0.276447103431718 | -0.162325181505844 | -0.498722760109225 | 0.461868984109423 | 0 | 0 | 2 | 2 | 2 | 3 | 2 | 2 | U |
| **8** | 2.236559139784946 | 0.261768034397138 | 0.457583661348677 | 0.780807041534270 | 0.682800500382650 | 0.780980964489959 | 2.869036421724782 | 0.172428013166231 | 0.442569838617238 | 0.141183621974825 | 0.626838694731324 | -0.500915182366176 | -0.775211550876618 | 0.572931772291997 | 0.551047640033668 | 0.175343270762484 | -0.074485771079354 | 0 | 0 | 1 | 1 | 1 | 1 | 1 | 1 | U |
| **9** | 1.565217391304347 | 0.297024438774010 | 0.375036341949877 | 0.224502609854177 | 1.881310227760582 | -1.261646768219356 | 3.739538483241180 | -0.290210989946094 | -0.204902780544050 | 0.572296321352445 | 0.894504561213120 | -0.528972735049649 | -0.538827313278999 | 0.227135580351884 | 0.127703861450852 | -0.441285494013272 | 0.615845662305048 | 0 | 0 | 1 | 0 | 1 | 1 | 1 | 1 | U |
| **10** | 1.126436781609196 | 0.349767986243812 | 0.341879488083114 | 1.017986628379803 | 1.296760791601310 | -0.503412870258002 | 2.717169903559594 | -0.242191975082420 | 0.002004614878981 | 0.318462992823848 | 0.730421256556192 | -0.635055805670629 | -0.912845068660888 | 0.495042540616349 | 0.481928853046486 | -0.424273113206599 | -0.198706979733555 | 0 | 0 | 1 | 0 | 0 | 1 | 1 | 1 | U |
| **11** | 0.530864197530864 | 0.315954733516489 | 0.178217575249810 | 1.327493980966481 | 1.359966539730979 | -0.442562936367739 | 2.112638543798608 | -0.085330203932044 | 0.071287674068946 | 0.666934171986294 | 0.132795477388538 | 0.120534183929894 | -0.614568357097620 | 0.354438459750452 | -0.152813559096538 | -0.007562715601277 | -0.314173150651898 | 1 | 1 | 1 | 1 | 2 | 3 | 2 | 2 | U |
| **12** | 1.072463768115943 | 0.273184682337882 | 0.277179672374730 | 1.038280487677821 | 1.079704067660564 | -0.846501821794712 | 3.029055545546817 | -0.457949278779521 | 0.405355990391085 | 0.370309152284152 | 0.126041867185040 | -0.334297476161175 | -0.176762515876454 | 0.422387271032046 | 0.255472507928765 | -0.193411620481759 | 0.704331697298287 | 2 | 1 | 1 | 2 | 2 | 2 | 2 | 2 | U |
| **13** | 1.432098765432099 | 0.249971227980448 | 0.411920431615426 | 0.863369515228496 | 0.768563741530502 | -1.050586010499140 | 3.097806272561140 | -0.427899227932762 | 0.093518369050912 | 0.539798805967617 | 0.031392407107473 | -0.183711314107499 | -0.544843239367052 | 0.195748464672166 | 0.501648397822677 | 0.088977106770041 | 0.147999373668215 | 0 | 0 | 2 | 1 | 2 | 3 | 2 | 1 | U |
| **14** | 0.842767295597484 | 0.282425774288459 | 0.180516363984153 | 1.489237015306650 | 1.459729104249641 | -0.350451951848678 | 2.025212393583161 | -0.122732975853582 | -0.201826933457520 | 0.309248121091726 | -0.031807742517416 | -0.111607601969611 | -0.605847105521784 | 0.566348668969294 | -0.090527689454944 | -0.001854094574597 | -0.889419785901242 | 1 | 1 | 1 | 1 | 1 | 2 | 2 | 1 | U |
| **15** | 1.954022988505748 | 0.248509106338221 | 0.439662148509328 | 0.600160269574313 | 0.552866180402938 | -0.103118104923794 | 2.747662102576450 | 0.030817111244184 | -0.021278794618873 | 0.527867791891081 | 0.762557882554192 | -0.704599132756283 | -0.751053962996212 | 0.425038727893687 | 0.382438437616967 | -0.155239903112402 | 0.132327671299176 | 0 | 0 | 1 | 0 | 1 | 1 | 1 | 1 | U |
| **16** | 1.007751937984496 | 0.407494026547965 | 0.292625631662790 | 1.064087788562633 | 1.152631138287053 | 0.287737022441239 | 1.962077494335553 | 0.108365011633565 | 0.508221448818231 | 0.158150196201023 | 0.869183506731559 | -0.586027784593936 | -0.832987598637900 | 0.514979003363226 | 0.669611198482836 | 0.293221712899336 | -0.024119275543765 | 0 | 0 | 1 | 0 | 0 | 1 | 1 | 1 | U |
| **17** | 1.571428571428571 | 0.228350510633480 | 0.336134362081756 | 1.058863477258659 | 1.457818372579769 | 0.955119398264927 | 4.349554807194707 | 0.676680180835311 | 0.610132062920217 | 0.010164447698012 | -0.079821473175870 | 0.482836159434469 | 0.183342559564081 | 0.243057498100673 | -0.187344471009638 | -0.311313556471389 | 0.950698499849637 | 2 | 2 | 3 | 2 | 2 | 2 | 3 | 2 | U |

## **Task 2**

UorN.Character=removecats(UorN.Character)

UorN = 219×26 table

|  | **AspectRatio** | **MADX** | **MADY** | **AvgU** | **MADU** | **AvgV** | **MADV** | **CorrXY** | **CorrXP** | **CorrXU** | **CorrXV** | **CorrYP** | **CorrYU** | **CorrYV** | **CorrPU** | **CorrPV** | **CorrUV** | **NumXMin** | **NumXMax** | **NumYMin** | **NumYMax** | **NumUMin** | **NumUMax** | **NumVMin** | **NumVMax** | **Character** |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **1** | 1.655172413793104 | 0.270575508533960 | 0.369923126689901 | 0.734773970513414 | 0.714004250265529 | -1.555710778423304 | 3.879731061609099 | 0.129059945481231 | 0.137534658429930 | 0.479298903667136 | 0.099990549380945 | -0.017442449718173 | 0.486644857760503 | 0.531641032924525 | 0.392332460377901 | 0.352825093910211 | 0.827131651915599 | 0 | 0 | 1 | 1 | 1 | 2 | 2 | 1 | N |
| **2** | 1.508771929824561 | 0.253283448449179 | 0.384150613424467 | 0.660727431741267 | 0.804946665819343 | -1.350828749612806 | 3.372427054750992 | -0.202464888458361 | 0.243039653761135 | 0.499510059153848 | 0.340395824143318 | -0.303517552303499 | -0.705688479718058 | 0.360323601785492 | -0.016357774424200 | 0.162855688309420 | 0.294648524572968 | 0 | 0 | 1 | 1 | 2 | 1 | 2 | 1 | U |
| **3** | 2.283333333333334 | 0.262330305985658 | 0.457230816151090 | 0.714066918862640 | 0.913213394319879 | -1.696704437524700 | 3.937475865801729 | -0.458183212211660 | 0.552671276083271 | 0.166297924749814 | -0.413887452497380 | -0.486923519225192 | 0.767454057087176 | 0.141438570470262 | -0.163804109959848 | -0.019176038474483 | 0.003178006075378 | 0 | 0 | 1 | 1 | 2 | 2 | 2 | 1 | N |
| **4** | 1.676190476190476 | 0.256353400486788 | 0.384728265691907 | 0.740567776144548 | 0.803383256062800 | 0.425322922668722 | 2.480252098624902 | 0.088369904612187 | 0.595833213687203 | -0.393919800533430 | 0.974301731178556 | -0.433790790257149 | -0.963348402269736 | 0.373025442467401 | 0.045742630294363 | 0.471526871328429 | -0.394723837386685 | 0 | 1 | 1 | 0 | 1 | 1 | 1 | 1 | U |
| **5** | 2.309523809523809 | 0.205787555993749 | 0.467453108875061 | 0.754217308322385 | 0.424270987471308 | -1.825328039833760 | 3.719785775129048 | -0.526690812761141 | 0.411794636442664 | 0.329225958853461 | -0.078201673129230 | -0.472680686368021 | 0.381958660557717 | 0.111840494301447 | 0.212354166759991 | 0.142478275656105 | 0.444766332257356 | 0 | 0 | 1 | 1 | 3 | 4 | 2 | 1 | N |
| **6** | 1.898989898989899 | 0.178265396171463 | 0.420643785702837 | 0.718561574681995 | 0.300121109031017 | -1.861030295482293 | 3.419888624443868 | -0.696106052884443 | 0.361590511997832 | 0.434230454161195 | -0.009743066018041 | -0.368882891518546 | 0.234660607317665 | 0.032370382852439 | -0.149565092227018 | 0.124852061744272 | -0.088416349103610 | 0 | 0 | 1 | 2 | 3 | 3 | 2 | 1 | N |
| **7** | 1.084967320261438 | 0.263541814024249 | 0.337019781696248 | 0.971174079995205 | 0.937349473640383 | -0.693207770642621 | 3.285906590485510 | -0.476065843420935 | 0.465690882875302 | 0.283297086479630 | 0.412825398381499 | -0.499183010054322 | -0.880751951171054 | 0.221468595441411 | 0.454091671539879 | -0.154196457555939 | -0.042927123805295 | 0 | 0 | 2 | 1 | 1 | 2 | 2 | 2 | U |
| **8** | 1.303030303030303 | 0.252427443148749 | 0.366017030173005 | 0.957799806738165 | 0.861022489416071 | -1.009946584601167 | 3.303801645636140 | -0.472225564986911 | 0.236144228122739 | 0.156672339588571 | 0.334774335545820 | -0.201771875096691 | -0.945806997948935 | 0.161165869429885 | 0.113272042804989 | -0.382013936902495 | -0.328770698161541 | 0 | 0 | 1 | 1 | 1 | 2 | 2 | 1 | U |
| **9** | 1.540229885057473 | 0.181036152119215 | 0.326328155898345 | 0.933142149253847 | 0.531119453289651 | -1.114235924318018 | 3.167970046647421 | -0.786662373946204 | 0.381304489601790 | 0.483562011231601 | -0.402051387883679 | -0.208390571095220 | 0.033162618865662 | 0.329520230439509 | 0.197829371421824 | -0.428451302004802 | -0.419377188564076 | 0 | 0 | 2 | 2 | 2 | 3 | 2 | 2 | N |
| **10** | 1.353535353535352 | 0.198808913697656 | 0.325447003726152 | 1.063964819582273 | 0.687601999278376 | -1.629452436152387 | 3.741460835117708 | -0.767616804761531 | 0.276532382168522 | 0.384187724196894 | -0.016344346203462 | -0.235460006975855 | -0.195977818702477 | 0.095595168072313 | 0.214456142496617 | -0.399219406623142 | -0.709966548512443 | 0 | 0 | 2 | 2 | 1 | 2 | 2 | 1 | N |
| **11** | 0.858974358974359 | 0.264237873729069 | 0.238491619365724 | 1.215233220466027 | 0.675793275056895 | -0.642393141494370 | 2.999065845961093 | -0.295116134257300 | 0.552699579591417 | 0.183797271770560 | 0.283766632752083 | -0.388282572032446 | -0.803894409754227 | 0.322943700634640 | 0.253394152642536 | -0.269336222097945 | -0.458393767451907 | 0 | 0 | 2 | 2 | 2 | 2 | 2 | 1 | U |
| **12** | 0.820512820512821 | 0.292994258104984 | 0.217798601649435 | 1.337746125925165 | 0.782196576920307 | 0.360709715079421 | 3.235504034545858 | -0.205353026210392 | 0.437773303453371 | -0.015772400489275 | -0.044895170957475 | -0.226349005229768 | -0.367454443512916 | 0.453395024269942 | -0.115310022568353 | -0.507180380461866 | -0.156173408322733 | 0 | 0 | 2 | 2 | 2 | 3 | 2 | 2 | U |
| **13** | 1.786666666666666 | 0.264132159623500 | 0.344764164292201 | 0.769405557573834 | 0.985072515834357 | -1.039888194615149 | 3.228872851801385 | -0.252216120413624 | 0.123514086240117 | 0.342530884887874 | -0.537066037042670 | 0.095507568433346 | 0.656990992132815 | 0.363098620005073 | 0.504754866673610 | -0.035328126267553 | 0.391496737123127 | 1 | 0 | 1 | 1 | 2 | 2 | 2 | 1 | N |
| **14** | 2.509803921568632 | 0.222429993527786 | 0.453336874462745 | 0.537785281547900 | 0.994476069241516 | -1.834733960319799 | 4.903204569163909 | 0.165979784149649 | 0.375446181269921 | 0.276211946024209 | -0.280500091007149 | -0.120047037835293 | 0.812661616181296 | 0.288875712964705 | 0.263088378652390 | -0.282259048302619 | 0.682482587223835 | 1 | 0 | 1 | 1 | 2 | 2 | 2 | 1 | N |
| **15** | 2.421052631578946 | 0.174046027364647 | 0.486442970548821 | 0.495723787842013 | 0.673187358815200 | -1.761035689635037 | 3.460990391575302 | -0.303938285158306 | -0.109782055888529 | 0.403803792830745 | 0.244021495727838 | -0.340052920697303 | -0.612938317366962 | 0.081107158132454 | 0.123158955191090 | 0.044881598162068 | 0.639918986064435 | 1 | 0 | 1 | 1 | 3 | 3 | 2 | 1 | U |
| **16** | 1.487804878048781 | 0.201387525332046 | 0.394152293341316 | 0.822851358628070 | 0.751145510781838 | -1.616258773271048 | 3.456445894338841 | -0.581772729649643 | 0.190401435307133 | 0.677400187528914 | -0.235362673922221 | -0.342170417149278 | 0.083822307581887 | 0.135827837705880 | 0.147797403840704 | 0.260338364247094 | -0.517787860712660 | 0 | 0 | 1 | 1 | 1 | 2 | 2 | 1 | N |
| **17** | 2.144444444444445 | 0.217164181295600 | 0.443344794014819 | 0.664927313576792 | 0.522860915312948 | -1.104308525382351 | 3.339472072570310 | -0.447121641892702 | -0.162076558921556 | -0.008651012006999 | 0.480787786285326 | 0.765638682174928 | -0.429661971974680 | 0.168711309361322 | -0.439169985396578 | 0.076919525127616 | 0.125940381263114 | 0 | 0 | 1 | 2 | 2 | 2 | 2 | 1 | U |
| **18** | 0.924731182795700 | 0.241600079066847 | 0.303546905880963 | 1.206016302061393 | 1.083616137478025 | -0.750867563562797 | 2.976727712504923 | -0.257647815542374 | 0.238403724942196 | 0.939745745794958 | -0.060199086962316 | -0.489424863925608 | -0.204319854604057 | 0.159775549174419 | 0.376695845408167 | -0.054366790874780 | -0.060812388730698 | 0 | 0 | 1 | 2 | 2 | 3 | 2 | 1 | N |
| **19** | 1.247311827956989 | 0.358389960594052 | 0.307140453764313 | 2.131542679973589 | 2.707325668192147 | -4.683851257702520 | 7.384020045799237 | -0.426605619717324 | -0.384833291205611 | 0.268009392418254 | 0.002819128376383 | -0.206018632073354 | -0.882062040681781 | 0.408206260129445 | 0.343196100501357 | -0.054212641145218 | -0.192567368679486 | 0 | 0 | 1 | 2 | 3 | 3 | 3 | 2 | U |
| **20** | 1.481481481481482 | 0.214418100519187 | 0.353970790348293 | 1.588750998419178 | 0.818280158703243 | -1.610293306109081 | 5.296508896538206 | -0.339980117843115 | 0.334046654330946 | 0.596531944253837 | -0.228730117892804 | -0.475387677393702 | 0.510430355563000 | 0.138603754802230 | 0.144290890056063 | 0.145011295463635 | -0.482439709145736 | 0 | 0 | 1 | 1 | 2 | 3 | 2 | 1 | N |
| **21** | 0.806201550387597 | 0.282057472353059 | 0.207780323476083 | 1.217637856125735 | 0.437240708318494 | 0.376008853468610 | 2.951543683060888 | 0.234455775933531 | 0.395456037761950 | 0.219335804000802 | 0.043384436360054 | 0.011375750871112 | -0.424510485390720 | 0.255278114691028 | 0.217384293054617 | -0.324805614592926 | -0.388900367707226 | 0 | 0 | 2 | 2 | 1 | 2 | 2 | 3 | U |
| **22** | 1.786666666666668 | 0.276932498952030 | 0.393047532002245 | 0.906764959172452 | 0.710774987032642 | -1.661408828067282 | 4.221156002445312 | -0.210381337223719 | 0.526969855726751 | -0.061059960209609 | 0.187027200745429 | -0.566450778365491 | 0.472491738055749 | 0.016426865876019 | 0.337601993811291 | 0.583797908197248 | 0.793070219723792 | 0 | 0 | 1 | 1 | 2 | 2 | 2 | 1 | N |
| **23** | 1.471264367816092 | 0.297506100976996 | 0.343513175996690 | 0.864095123947875 | 0.780362600110627 | -0.982263517595730 | 3.783184573884613 | -0.071403224364777 | 0.131977196147822 | -0.013555293606591 | 0.384665941964466 | -0.174850105586242 | -0.552772016900834 | 0.236767163349822 | 0.170973469159447 | -0.123620914757543 | 0.280225467219730 | 0 | 0 | 2 | 1 | 2 | 2 | 2 | 1 | U |
| **24** | 1.129943502824859 | 0.291951149367980 | 0.272571805058944 | 0.968202950782725 | 1.076793431717076 | -0.064111655931237 | 3.579674236767218 | -0.033231040341121 | 0.327215383985840 | -0.006148586304321 | -0.298528024685345 | 0.117263246690571 | 0.562176291135134 | 0.349808574064661 | -0.141862677620878 | -0.162388130409808 | 0.840543670018050 | 1 | 1 | 1 | 2 | 3 | 3 | 2 | 2 | N |
| **25** | 1.255555555555555 | 0.356152734941201 | 0.342810588555972 | 0.911451544841222 | 0.874171919129281 | -1.053759649598518 | 3.009846858864816 | -0.270471461038919 | 0.577298691838648 | 0.305447992547776 | -0.308838485827069 | -0.472329494711263 | 0.708344944834420 | 0.294485492116614 | 0.073893757737665 | -0.402483087956633 | 0.315820945944363 | 0 | 0 | 1 | 1 | 1 | 2 | 3 | 2 | N |
| **26** | 1.033333333333335 | 0.273215268840901 | 0.337194115984237 | 0.981740567452366 | 0.921236651567847 | -0.915039376945780 | 2.872757792600432 | -0.437361866622022 | -0.007127591950911 | 0.602365948049762 | -0.000247539534790 | -0.283381403135578 | 0.052489511226281 | 0.131948194377246 | -0.201208502688116 | -0.240440531769277 | 0.704538693367335 | 0 | 0 | 2 | 2 | 2 | 3 | 2 | 1 | N |
| **27** | 0.893939393939394 | 0.313291627009382 | 0.276344759942348 | 0.959041043069464 | 1.101236956091422 | -0.763184793004574 | 2.699760070740814 | -0.057552121137465 | -0.035507648142151 | 0.480013953203574 | 0.385078138452681 | -0.313712915176369 | -0.573262253220600 | 0.119869645574922 | -0.208492212259025 | -0.183735924784470 | 0.660134735120171 | 1 | 0 | 2 | 1 | 2 | 1 | 2 | 1 | U |
| **28** | 0.994350282485876 | 0.225814462303405 | 0.257441158908470 | 1.028118304452652 | 1.103988098922088 | -0.415656936468075 | 2.841747309808528 | -0.025836571929110 | 0.703790136128267 | 0.277866441635598 | 0.517648665073971 | -0.132961850237355 | -0.881125774971720 | 0.056064254064507 | 0.317988835897312 | 0.378590906705334 | 0.124216711665471 | 1 | 1 | 2 | 1 | 1 | 2 | 2 | 2 | U |
| **29** | 2.769230769230768 | 0.167150813552087 | 0.520580586514069 | 0.585482013298311 | 0.520641492623416 | -1.523938158499955 | 4.149535891845673 | -0.457629395899616 | 0.317648883601166 | 0.474911681299713 | -0.183111489451204 | -0.503077942811640 | 0.211241551242558 | 0.124396658491899 | 0.429180666175889 | 0.138189007328761 | -0.161252110647616 | 0 | 0 | 1 | 2 | 2 | 2 | 2 | 1 | N |
| **30** | 2.222222222222221 | 0.187084273547166 | 0.443491246904833 | 0.642298266455674 | 0.312600803514985 | -1.521231388609982 | 3.648201555964893 | -0.531114635404430 | 0.014805616759571 | 0.711472196579991 | -0.045188561729413 | -0.353354938710837 | -0.162640232869194 | 0.163455157441360 | 0.025076864833540 | -0.255091377292993 | 0.065087233493448 | 0 | 0 | 1 | 2 | 2 | 2 | 2 | 1 | N |
| **31** | 3.119047619047619 | 0.176119894156211 | 0.555150816533794 | 0.548503548941627 | 0.590632712716646 | -2.230720218064228 | 3.985836541022292 | -0.385990046983833 | 0.032939361299619 | 0.445428558533887 | -0.069619804639523 | -0.398048960110857 | 0.290605199484459 | -0.018416733936026 | -0.038285622706867 | -0.025301732391109 | 0.582900720649082 | 0 | 0 | 1 | 1 | 2 | 1 | 2 | 1 | N |
| **32** | 3.071428571428572 | 0.165354028890881 | 0.542166072453670 | 0.601618768024771 | 0.384666670373603 | -1.947811759912704 | 3.804740300253609 | -0.598057883319436 | 0.080254596132256 | 0.495865548791892 | -0.224460991617604 | -0.305671574929868 | 0.320688912632060 | 0.152412572696062 | 0.087220031578366 | -0.073636634617823 | 0.038409849117423 | 0 | 0 | 1 | 1 | 2 | 2 | 2 | 1 | N |
| **33** | 2.641975308641974 | 0.187274907950633 | 0.533899665239662 | 0.631457846045412 | 0.520563233833578 | -1.658388350401360 | 4.048107667190914 | -0.667577923933050 | 0.395605672890260 | 0.226483308651317 | 0.262047621677820 | -0.523564730059895 | -0.826052659819275 | 0.119315978494848 | 0.350305594079633 | 0.084767591837925 | -0.497931702234192 | 0 | 0 | 1 | 1 | 1 | 1 | 2 | 1 | U |
| **34** | 1.603603603603603 | 0.258571881886765 | 0.395469766816850 | 0.814263733834419 | 0.564880766615594 | -1.329424435420152 | 2.636519796782022 | -0.645579964861697 | 0.290916661318153 | 0.168851152208464 | 0.258333204441609 | -0.360167784589314 | -0.896030986539352 | 0.159712382405767 | 0.385440112420090 | 0.181435378869715 | -0.130052642543474 | 0 | 0 | 1 | 1 | 1 | 2 | 2 | 1 | U |
| **35** | 1.714285714285714 | 0.221087876093971 | 0.441054148519307 | 0.744588052995517 | 0.458231658357629 | -1.644396142938193 | 2.511871772366205 | -0.771021493173753 | 0.126631045645915 | 0.431487315158758 | 0.104093069302877 | -0.475097961843572 | -0.829694876671499 | 0.300642935542568 | 0.329107635863885 | -0.185013273213369 | -0.411169971728403 | 0 | 0 | 1 | 1 | 2 | 2 | 2 | 1 | U |
| **36** | 1.814814814814814 | 0.225222506063186 | 0.438741745246247 | 0.755443252041675 | 0.670698487881748 | -1.333098155258140 | 3.318059079980456 | -0.671461585256531 | 0.167960589917700 | 0.304487704386483 | 0.188667911064046 | -0.400118907505570 | -0.888056471273133 | 0.212195730794978 | 0.421397984729216 | -0.229959054153493 | -0.325524093433221 | 0 | 0 | 1 | 2 | 1 | 2 | 2 | 1 | U |
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| **40** | 2.126126126126127 | 0.247826190774940 | 0.422425806251651 | 0.753478845729333 | 0.667240897367023 | -1.500673179683291 | 3.457132393123566 | -0.449396448578408 | 0.249845528294681 | 0.147025079224973 | 0.214157064626517 | -0.150078653993405 | -0.752017872268245 | 0.346699253128612 | 0.203348541033200 | 0.121142346393064 | 0.187922221637664 | 0 | 0 | 1 | 1 | 1 | 2 | 2 | 1 | U |
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| **43** | 1.747126436781608 | 0.273384392862529 | 0.382910632274331 | 0.775973735018394 | 0.663731008201881 | -1.238836266610314 | 3.072572357708106 | -0.327307206021602 | 0.031980375688912 | 0.520805170362303 | -0.253300381857429 | -0.055828320636455 | 0.494468371781507 | 0.600276381588632 | 0.240479888496724 | 0.253927551732007 | 0.534206188366921 | 0 | 0 | 1 | 1 | 1 | 2 | 2 | 1 | N |
| **44** | 1.301587301587301 | 0.248542227390765 | 0.353789354907341 | 0.791328125441861 | 0.794855710245263 | -1.160069248705776 | 2.866011229366310 | -0.353866470816806 | 0.064183544167622 | 0.543193871569585 | 0.118646325169533 | -0.129528162766436 | -0.603951122692567 | 0.544996760672475 | -0.319397633921220 | 0.295691610357406 | 0.277621070301075 | 0 | 0 | 1 | 1 | 1 | 1 | 2 | 1 | U |
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| **62** | 1.355555555555556 | 0.336815064650847 | 0.360015900863416 | 0.850137976625426 | 1.144656554957095 | -1.006701631699028 | 3.476189542347102 | -0.043124904172315 | 0.247896727182282 | 0.038475126393750 | 0.174969982031172 | -0.087466239166773 | -0.186056899461520 | 0.224320446433130 | 0.167411293669510 | -0.033044304065527 | 0.856303994665357 | 0 | 0 | 1 | 2 | 2 | 1 | 2 | 1 | U |
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| **69** | 1.753623188405798 | 0.275610775681319 | 0.408171916252952 | 0.764585899951100 | 0.917274928176274 | -1.523128358675250 | 3.361578348617397 | -0.306277054591552 | 0.429821865536191 | 0.361200412560849 | -0.351884715212620 | -0.293689220865147 | 0.739410968367747 | 0.330803285640499 | 0.257341406944590 | -0.020746249988738 | 0.332566661025856 | 0 | 0 | 1 | 1 | 2 | 2 | 2 | 1 | N |
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| **76** | 1.253731343283582 | 0.246762348500415 | 0.362779088798491 | 0.817203658423714 | 0.730344038484801 | -0.994267756571464 | 3.001722964261455 | -0.190668564457036 | 0.164911952366063 | 0.534435392643519 | 0.271302311299874 | -0.394292401392029 | -0.370950888334739 | 0.249578942892928 | -0.015857122897472 | 0.071874939988710 | 0.697473285636758 | 0 | 0 | 2 | 1 | 2 | 1 | 2 | 1 | U |
| **77** | 0.709956709956710 | 0.241572708714032 | 0.250772433983394 | 1.240919846372341 | 1.353277465665516 | 0.654258689578659 | 3.189023621312210 | 0.595495698273664 | 0.277973761755713 | 0.237182222972732 | -0.004374551447875 | 0.213474921012139 | -0.093760380470693 | 0.064775438570914 | -0.326567413937467 | -0.386317954326161 | 0.825675619026937 | 1 | 1 | 2 | 2 | 2 | 3 | 2 | 2 | N |
| **78** | 1.365079365079364 | 0.230349589008718 | 0.372149836271062 | 0.813931856674275 | 0.942079132851980 | -1.055308033118430 | 3.378817498446637 | -0.189810186545134 | 0.103964874649856 | 0.677313813239001 | -0.033798654083208 | -0.273066781248955 | 0.122128680366993 | 0.147326287512362 | -0.106571458981938 | 0.022370070459962 | 0.605240246130989 | 0 | 0 | 2 | 1 | 1 | 1 | 2 | 1 | N |
| **79** | 0.656565656565656 | 0.274943670395080 | 0.251473807682933 | 1.140271092897728 | 1.395265531948297 | 0.189738107665629 | 3.105182301494703 | 0.418881629957444 | 0.422905835675073 | 0.298830492577301 | -0.011357794429763 | 0.391177352118472 | -0.111255471346223 | 0.352073579367856 | -0.356065214579269 | -0.343957175056563 | 0.759943113311108 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | U |
| **80** | 1.160493827160495 | 0.280580881729811 | 0.294224019907837 | 0.976711410273455 | 0.661666995417080 | -1.064770427646704 | 2.352044871667362 | -0.353494636032674 | 0.292375295810799 | 0.210702299723067 | 0.062159155539322 | 0.129433464038354 | -0.357918522037527 | 0.584415978965964 | -0.435409330448016 | 0.170391574968263 | 0.492244837585847 | 0 | 0 | 1 | 1 | 1 | 1 | 2 | 1 | U |
| **81** | 1.200000000000000 | 0.243507520583964 | 0.317952323631117 | 0.875828202402058 | 0.523719683716132 | -1.157041009964934 | 2.007021117928154 | -0.666706444200244 | -0.075466605875620 | 0.650416730919775 | 0.183438834018391 | -0.228607651208397 | -0.964184328082514 | 0.284534309205835 | -0.482444803536607 | 0.203075951529280 | -0.149546872771276 | 0 | 0 | 1 | 1 | 1 | 1 | 2 | 1 | U |
| **82** | 2.211382113821137 | 0.185219148651698 | 0.333313990753957 | 0.345865085730649 | 0.972204211936336 | -1.388392454490779 | 2.435352036789556 | -0.284298325554081 | -0.142997987501330 | 0.500126114495570 | -0.480792673887963 | -0.128860742079294 | 0.030148612774049 | 0.470100541753720 | 0.541975396171511 | 0.053033723903133 | 0.327362400842434 | 1 | 0 | 1 | 1 | 1 | 2 | 1 | 1 | N |
| **83** | 0.829268292682928 | 0.233596538919005 | 0.234675170135778 | 1.058302414932675 | 0.678030098219082 | 0.065582267085699 | 3.586388397510201 | -0.214359010383192 | 0.190895948362193 | 0.659945474577654 | -0.388539416935316 | 0.152683562158216 | 0.350106032315758 | 0.514381539298004 | -0.188568279070038 | -0.164540723423257 | 0.135687810375966 | 0 | 0 | 2 | 2 | 2 | 2 | 2 | 2 | N |
| **84** | 1.274074074074075 | 0.228941950939221 | 0.380588270991228 | 0.914018407997320 | 0.650546808136472 | -0.839960401898841 | 2.549340762887579 | -0.435336142297330 | 0.360298463005075 | 0.730365890830899 | -0.259847847073240 | -0.240028050651437 | -0.048226901352000 | 0.468193221735110 | -0.313289386424935 | -0.012431354214964 | -0.476476644398048 | 0 | 0 | 1 | 1 | 2 | 3 | 2 | 1 | N |
| **85** | 1.839080459770116 | 0.297632976674373 | 0.341184334361582 | 1.012223402256447 | 1.074272236785581 | -0.379371551497647 | 3.488120072634766 | 0.096150866739562 | 0.537592740798125 | -0.087771719430640 | 0.478099816377968 | -0.292399436335289 | -0.754374859535117 | 0.458535521570639 | 0.104855913220188 | 0.334066053542122 | -0.784842488053543 | 0 | 0 | 1 | 1 | 2 | 2 | 1 | 1 | U |
| **86** | 1.055555555555555 | 0.230954952319342 | 0.298252516376760 | 0.967460415674147 | 1.069611750012000 | -0.645273991270344 | 2.584819287026245 | -0.400467370132784 | 0.049782844500141 | 0.593700862075573 | 0.312111596983209 | -0.184903518300870 | -0.823537768264308 | 0.165069788933080 | -0.141375957332698 | -0.078539076579171 | -0.193462981936024 | 1 | 1 | 1 | 2 | 1 | 1 | 2 | 1 | U |
| **87** | 0.859649122807017 | 0.281667731097075 | 0.324225617013648 | 1.130263524581575 | 1.112445249254656 | -1.888459345402115 | 2.064983005231889 | -0.430407573578307 | -0.001033305379916 | 0.867520376249810 | 0.369750430610408 | -0.355287622678754 | -0.591566341021064 | 0.373617633072309 | -0.240812017565650 | 0.041064269589567 | 0.312332068148900 | 1 | 0 | 1 | 1 | 2 | 2 | 2 | 1 | U |
| **88** | 1.069444444444444 | 0.206256053585012 | 0.313095797480694 | 0.668719474414266 | 1.324502389396828 | -0.783356080978808 | 2.690701170010067 | 0.156880779737805 | 0.140520079549207 | 0.591241799747521 | 0.058895012251891 | -0.488333653647043 | -0.055631746286076 | 0.049317460323570 | 0.544213976567545 | 0.201216257941649 | 0.757763826245820 | 1 | 0 | 2 | 1 | 2 | 1 | 2 | 1 | N |
| **89** | 1.192982456140351 | 0.258635014813446 | 0.357683166408669 | 0.783343257864323 | 1.488344801728424 | -1.157268342526512 | 3.113687839494818 | 0.022429181504028 | 0.163374493259321 | 0.324602803286587 | 0.406518487242761 | -0.352108774316983 | -0.465961600143710 | 0.145711367917511 | 0.114454894891805 | 0.013551488634025 | 0.741878491202001 | 2 | 1 | 1 | 1 | 1 | 1 | 2 | 1 | U |
| **90** | 1.626666666666667 | 0.269160228617183 | 0.308763539788170 | 0.734150364469074 | 0.572003414875140 | 0.725501138630261 | 2.573590116391783 | -0.086839434431412 | 0.534473065289702 | 0.036616245431507 | 0.425520338870216 | -0.379739455891216 | -0.936878296155026 | 0.557489275969723 | 0.730022648668240 | -0.353757292499649 | -0.544459448044133 | 0 | 0 | 1 | 1 | 1 | 2 | 1 | 1 | U |
| **91** | 1.888888888888888 | 0.258704666705422 | 0.408942012214039 | 1.102950523503886 | 1.326402025870895 | -0.736540041966817 | 3.244436762725181 | -0.204152380485898 | 0.354679506768773 | -0.317519805397294 | 0.756060477186352 | -0.692987031615793 | -0.503932347301934 | 0.313563477858823 | 0.352084511986910 | -0.176498091987463 | -0.781830118035602 | 0 | 1 | 1 | 0 | 3 | 3 | 1 | 1 | U |
| **92** | 1.305555555555554 | 0.295862824421563 | 0.349211594460144 | 0.945999085496046 | 0.808305126677437 | -0.477508130205727 | 2.679007662819200 | -0.292824146951920 | 0.527529816262180 | 0.207821630376094 | -0.291070070795815 | -0.398119732844984 | 0.530540727331876 | 0.024924418654621 | 0.433908703855947 | 0.153212014444957 | 0.349202782881647 | 0 | 0 | 1 | 1 | 1 | 2 | 2 | 1 | N |
| **93** | 1.101449275362320 | 0.295516974516367 | 0.311412903155981 | 1.148653096423985 | 1.003110397666291 | -1.072051018255210 | 2.983709379455361 | -0.246566057449033 | 0.355931825157921 | 0.393023128183530 | -0.225932079937799 | -0.294632028740965 | 0.301679357832400 | 0.273590975897785 | 0.483172409831412 | -0.056892638165245 | -0.228080990326935 | 0 | 0 | 1 | 2 | 2 | 3 | 2 | 1 | N |
| **94** | 1.283950617283951 | 0.273745438630382 | 0.377856473333369 | 1.096879499056308 | 0.657387737459476 | -0.348506006272357 | 2.662732414154709 | -0.269610208686333 | 0.469267049330374 | -0.397902586902168 | 0.364474473103326 | -0.286953825515181 | -0.612266654330538 | 0.093633386057157 | -0.160611685673732 | 0.344642344260869 | 0.038937650507942 | 0 | 0 | 1 | 1 | 2 | 2 | 1 | 1 | U |
| **95** | 1.283950617283951 | 0.266045856581837 | 0.342029804881994 | 0.820406437169457 | 0.783372314419071 | -1.351209711557459 | 2.820577462114800 | -0.387071354583373 | 0.377431753961241 | 0.431239609098464 | 0.310451058033593 | -0.470783769322086 | -0.832224241119164 | 0.113932798388773 | 0.459426673854310 | 0.174080811684091 | 0.347860760957989 | 0 | 0 | 1 | 1 | 2 | 1 | 2 | 1 | U |
| **96** | 1.422222222222221 | 0.256196951743032 | 0.398801241254592 | 0.827404932864972 | 0.678469476010323 | -1.540148231435388 | 3.487535305088892 | -0.478188584945645 | -0.050698545417569 | 0.751455310664274 | -0.044583530012520 | -0.203182943039607 | -0.072287274118015 | 0.228205525526140 | 0.144074546946885 | -0.078989701525916 | 0.339295476014993 | 0 | 0 | 1 | 2 | 2 | 2 | 2 | 1 | N |
| **97** | 1.373737373737373 | 0.257090492022672 | 0.367876784578311 | 0.892978532735789 | 0.847312530320386 | -1.082162325026026 | 2.825655450086887 | -0.523578835577007 | -0.056304273947995 | 0.764982795457915 | -0.165397844838391 | -0.160005225381273 | -0.269380599160868 | 0.293920671320872 | 0.119718936503810 | -0.154186501417684 | 0.363625242376293 | 0 | 0 | 1 | 2 | 1 | 1 | 2 | 1 | N |
| **98** | 2.121212121212121 | 0.221847811820129 | 0.449346706457753 | 0.678918491830317 | 0.576687603813415 | -2.519516713106402 | 4.829942726665137 | -0.204728154701579 | 0.376085297836790 | 0.504072539740569 | -0.082340047447006 | -0.141309766480948 | 0.644911806100851 | 0.311756829065204 | 0.601378220074099 | 0.052251438205573 | 0.261939332652391 | 0 | 0 | 1 | 2 | 1 | 2 | 2 | 1 | N |
| **99** | 1.466666666666665 | 0.192668658897113 | 0.398640629956170 | 0.812980982511669 | 0.338310792934156 | -1.277763948463255 | 3.559289026623603 | -0.445853129526722 | 0.279908292931661 | 0.516404925603996 | -0.027025974924183 | -0.253722976096603 | 0.349614069305316 | 0.249494494945168 | 0.040431506892737 | 0.331586537494247 | -0.353027891798164 | 0 | 0 | 1 | 1 | 1 | 1 | 2 | 1 | N |
| **100** | 1.644444444444445 | 0.278853416146156 | 0.404896891101158 | 0.924732816975126 | 0.562270248769921 | -1.691568699178608 | 3.416837136605400 | -0.466814672249450 | 0.681193753179558 | -0.233862958492479 | 0.201427020672970 | -0.405759319653780 | -0.483926843758838 | 0.206899196715312 | 0.021436415964304 | -0.235846895808394 | -0.101467814815583 | 0 | 0 | 1 | 1 | 2 | 3 | 2 | 1 | U |
| **⋮** |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |

## **Task 3**

UorNfeat=UorN{:,1:end-1}

UorNfeat = 219×25

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 1.508771929824561 0.253283448449179 0.384150613424467 0.660727431741267 0.804946665819343 -1.350828749612806 3.372427054750992 -0.202464888458361 0.243039653761135 0.499510059153848 0.340395824143318 -0.303517552303499 -0.705688479718058 0.360323601785492 -0.016357774424200 0.162855688309420 0.294648524572968 0 0 1.000000000000000 1.000000000000000 2.000000000000000 1.000000000000000 2.000000000000000 1.000000000000000  
 2.283333333333334 0.262330305985658 0.457230816151090 0.714066918862640 0.913213394319879 -1.696704437524700 3.937475865801729 -0.458183212211660 0.552671276083271 0.166297924749814 -0.413887452497380 -0.486923519225192 0.767454057087176 0.141438570470262 -0.163804109959848 -0.019176038474483 0.003178006075378 0 0 1.000000000000000 1.000000000000000 2.000000000000000 2.000000000000000 2.000000000000000 1.000000000000000  
 1.676190476190476 0.256353400486788 0.384728265691907 0.740567776144548 0.803383256062800 0.425322922668722 2.480252098624902 0.088369904612187 0.595833213687203 -0.393919800533430 0.974301731178556 -0.433790790257149 -0.963348402269736 0.373025442467401 0.045742630294363 0.471526871328429 -0.394723837386685 0 1.000000000000000 1.000000000000000 0 1.000000000000000 1.000000000000000 1.000000000000000 1.000000000000000  
 2.309523809523809 0.205787555993749 0.467453108875061 0.754217308322385 0.424270987471308 -1.825328039833760 3.719785775129048 -0.526690812761141 0.411794636442664 0.329225958853461 -0.078201673129230 -0.472680686368021 0.381958660557717 0.111840494301447 0.212354166759991 0.142478275656105 0.444766332257356 0 0 1.000000000000000 1.000000000000000 3.000000000000000 4.000000000000000 2.000000000000000 1.000000000000000  
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fnUfeat=fnU{:,1:end-1}

fnUfeat = 17×25

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 0.980392156862745 0.236180499639008 0.254092066620528 0.965533029664132 0.845493477950290 1.124854984843229 3.480607200310603 0.502514371506668 0.427867687722887 0.407311715297401 -0.108770538118936 0.450087631259382 -0.343192470729168 0.276447103431718 -0.162325181505844 -0.498722760109225 0.461868984109423 0 0 2.000000000000000 2.000000000000000 2.000000000000000 3.000000000000000 2.000000000000000 2.000000000000000  
 2.236559139784946 0.261768034397138 0.457583661348677 0.780807041534270 0.682800500382650 0.780980964489959 2.869036421724782 0.172428013166231 0.442569838617238 0.141183621974825 0.626838694731324 -0.500915182366176 -0.775211550876618 0.572931772291997 0.551047640033668 0.175343270762484 -0.074485771079354 0 0 1.000000000000000 1.000000000000000 1.000000000000000 1.000000000000000 1.000000000000000 1.000000000000000  
 1.565217391304347 0.297024438774010 0.375036341949877 0.224502609854177 1.881310227760582 -1.261646768219356 3.739538483241180 -0.290210989946094 -0.204902780544050 0.572296321352445 0.894504561213120 -0.528972735049649 -0.538827313278999 0.227135580351884 0.127703861450852 -0.441285494013272 0.615845662305048 0 0 1.000000000000000 0 1.000000000000000 1.000000000000000 1.000000000000000 1.000000000000000  
 1.126436781609196 0.349767986243812 0.341879488083114 1.017986628379803 1.296760791601310 -0.503412870258002 2.717169903559594 -0.242191975082420 0.002004614878981 0.318462992823848 0.730421256556192 -0.635055805670629 -0.912845068660888 0.495042540616349 0.481928853046486 -0.424273113206599 -0.198706979733555 0 0 1.000000000000000 0 0 1.000000000000000 1.000000000000000 1.000000000000000

## **Task 4**

parallelcoords(UorNfeat,"Group",UorN.Character)

## **Task 5**

hold on

plot(fnUfeat(4,:),"k")

hold off

## **Further Practice**

parallelcoords(UorNfeat,"Group",UorN.Character,"Quantile",0.2)