

```
###DEEP LEARNING MODEL TO PREDICT DIFFERENT CIFAR10 IMAGES.
```

```
import numpy as np
import pandas as pd
import matplotlib.pyplot as plt
import tensorflow as tf
import sys
import os
```

```
from tensorflow.keras.datasets import cifar10
(X_train,y_train),(X_test,y_test)=cifar10.load_data()
```

```
Downloading data from https://www.cs.toronto.edu/~kriz/cifar-10-
python.tar.gz
```

```
170500096/170498071 [=====] - 4s 0us/step
```

```
170508288/170498071 [=====] - 4s 0us/step
```

```
print(X_train.shape)
print(X_test.shape)
print(y_train.shape)
print(y_test.shape)
```

```
(50000, 32, 32, 3)
```

```
(10000, 32, 32, 3)
```

```
(50000, 1)
```

```
(10000, 1)
```

```
X_train[0]
```

```
array([[ 59,  62,  63],
       [ 43,  46,  45],
       [ 50,  48,  43],
       ...,
       [158, 132, 108],
       [152, 125, 102],
       [148, 124, 103]],
```

```
      [[ 16,  20,  20],
       [  0,   0,   0],
       [ 18,   8,   0],
       ...,
       [123,  88,  55],
       [119,  83,  50],
       [122,  87,  57]],
```

```
      [[ 25,  24,  21],
       [ 16,   7,   0],
       [ 49,  27,   8],
       ...,
       [118,  84,  50],
       [120,  84,  50],
```

```

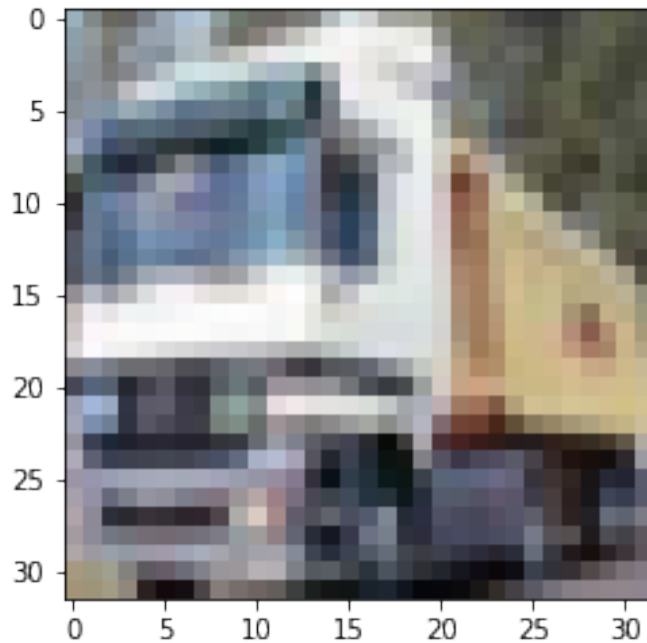
    [109, 73, 42]],
    ...,
    [[208, 170, 96],
     [201, 153, 34],
     [198, 161, 26],
     ...,
     [160, 133, 70],
     [ 56, 31, 7],
     [ 53, 34, 20]],

    [[180, 139, 96],
     [173, 123, 42],
     [186, 144, 30],
     ...,
     [184, 148, 94],
     [ 97, 62, 34],
     [ 83, 53, 34]],

    [[177, 144, 116],
     [168, 129, 94],
     [179, 142, 87],
     ...,
     [216, 184, 140],
     [151, 118, 84],
     [123, 92, 72]]], dtype=uint8)

plt.imshow(X_train[1])
<matplotlib.image.AxesImage at 0x7f611b7bc210>

```



```

###REshaping
y_train=y_train.reshape(-1, )
y_train

array([6, 9, 9, ..., 9, 1, 1], dtype=uint8)

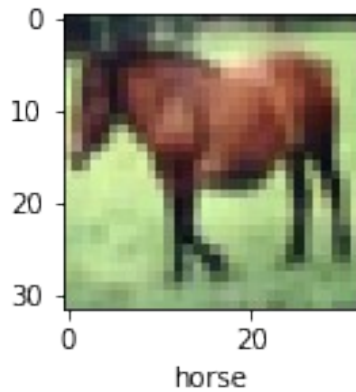
y_classes=["airplane","automobile","bird","cat","deer","dog","frog","horse","ship","truck"]
len(y_classes)

10

def showImage(x, y , index):
    plt.figure(figsize=(15,2))
    plt.imshow(x[index])
    plt.xlabel(y_classes[y[index]])

showImage(X_train, y_train, 7)

```



###Normalizing the pixels

```
X_train = X_train/ 255.0
```

```
X_test=X_test/255.0
```

```
X_train
```

```
array([[[[0.23137255, 0.24313725, 0.24705882],
          [0.16862745, 0.18039216, 0.17647059],
          [0.19607843, 0.18823529, 0.16862745],
          ...,
          [0.61960784, 0.51764706, 0.42352941],
          [0.59607843, 0.49019608, 0.4          ],
          [0.58039216, 0.48627451, 0.40392157]],

        [[0.0627451 , 0.07843137, 0.07843137],
          [0.          , 0.          , 0.          ],
          [0.07058824, 0.03137255, 0.          ],
          ...,
          [0.48235294, 0.34509804, 0.21568627],
          [0.46666667, 0.3254902 , 0.19607843],
          [0.47843137, 0.34117647, 0.22352941]],

        [[0.09803922, 0.09411765, 0.08235294],
          [0.0627451 , 0.02745098, 0.          ],
          [0.19215686, 0.10588235, 0.03137255],
          ...,
          [0.4627451 , 0.32941176, 0.19607843],
          [0.47058824, 0.32941176, 0.19607843],
          [0.42745098, 0.28627451, 0.16470588]],

        ...,

        [[0.81568627, 0.66666667, 0.37647059],
          [0.78823529, 0.6          , 0.13333333],
          [0.77647059, 0.63137255, 0.10196078],
          ...,
```

```

[0.62745098, 0.52156863, 0.2745098 ],
[0.21960784, 0.12156863, 0.02745098],
[0.20784314, 0.13333333, 0.07843137]],

[[0.70588235, 0.54509804, 0.37647059],
 [0.67843137, 0.48235294, 0.16470588],
 [0.72941176, 0.56470588, 0.11764706],
 ...,
 [0.72156863, 0.58039216, 0.36862745],
 [0.38039216, 0.24313725, 0.13333333],
 [0.3254902 , 0.20784314, 0.13333333]],

[[0.69411765, 0.56470588, 0.45490196],
 [0.65882353, 0.50588235, 0.36862745],
 [0.70196078, 0.55686275, 0.34117647],
 ...,
 [0.84705882, 0.72156863, 0.54901961],
 [0.59215686, 0.4627451 , 0.32941176],
 [0.48235294, 0.36078431, 0.28235294]]],

[[[0.60392157, 0.69411765, 0.73333333],
  [0.49411765, 0.5372549 , 0.53333333],
  [0.41176471, 0.40784314, 0.37254902],
  ...,
  [0.35686275, 0.37254902, 0.27843137],
  [0.34117647, 0.35294118, 0.27843137],
  [0.30980392, 0.31764706, 0.2745098 ]],

[[0.54901961, 0.62745098, 0.6627451 ],
 [0.56862745, 0.6 , 0.60392157],
 [0.49019608, 0.49019608, 0.4627451 ],
 ...,
 [0.37647059, 0.38823529, 0.30588235],
 [0.30196078, 0.31372549, 0.24313725],
 [0.27843137, 0.28627451, 0.23921569]],

[[0.54901961, 0.60784314, 0.64313725],
 [0.54509804, 0.57254902, 0.58431373],
 [0.45098039, 0.45098039, 0.43921569],
 ...,
 [0.30980392, 0.32156863, 0.25098039],
 [0.26666667, 0.2745098 , 0.21568627],
 [0.2627451 , 0.27058824, 0.21568627]],

...,

[[0.68627451, 0.65490196, 0.65098039],
 [0.61176471, 0.60392157, 0.62745098],

```

```

[0.60392157, 0.62745098, 0.66666667],
...,
[0.16470588, 0.13333333, 0.14117647],
[0.23921569, 0.20784314, 0.22352941],
[0.36470588, 0.3254902 , 0.35686275]],

[[0.64705882, 0.60392157, 0.50196078],
 [0.61176471, 0.59607843, 0.50980392],
 [0.62352941, 0.63137255, 0.55686275],
 ...,
 [0.40392157, 0.36470588, 0.37647059],
 [0.48235294, 0.44705882, 0.47058824],
 [0.51372549, 0.4745098 , 0.51372549]],

[[0.63921569, 0.58039216, 0.47058824],
 [0.61960784, 0.58039216, 0.47843137],
 [0.63921569, 0.61176471, 0.52156863],
 ...,
 [0.56078431, 0.52156863, 0.54509804],
 [0.56078431, 0.5254902 , 0.55686275],
 [0.56078431, 0.52156863, 0.56470588]]],

[[[1.          , 1.          , 1.          ],
  [0.99215686, 0.99215686, 0.99215686],
  [0.99215686, 0.99215686, 0.99215686],
  ...,
  [0.99215686, 0.99215686, 0.99215686],
  [0.99215686, 0.99215686, 0.99215686],
  [0.99215686, 0.99215686, 0.99215686]]],

[[[1.          , 1.          , 1.          ],
  [1.          , 1.          , 1.          ],
  [1.          , 1.          , 1.          ],
  ...,
  [1.          , 1.          , 1.          ],
  [1.          , 1.          , 1.          ],
  [1.          , 1.          , 1.          ]]],

[[[1.          , 1.          , 1.          ],
  [0.99607843, 0.99607843, 0.99607843],
  [0.99607843, 0.99607843, 0.99607843],
  ...,
  [0.99607843, 0.99607843, 0.99607843],
  [0.99607843, 0.99607843, 0.99607843],
  [0.99607843, 0.99607843, 0.99607843]]],

...,

```

```

[[0.44313725, 0.47058824, 0.43921569],
 [0.43529412, 0.4627451 , 0.43529412],
 [0.41176471, 0.43921569, 0.41568627],
 ...,
 [0.28235294, 0.31764706, 0.31372549],
 [0.28235294, 0.31372549, 0.30980392],
 [0.28235294, 0.31372549, 0.30980392]],

[[0.43529412, 0.4627451 , 0.43137255],
 [0.40784314, 0.43529412, 0.40784314],
 [0.38823529, 0.41568627, 0.38431373],
 ...,
 [0.26666667, 0.29411765, 0.28627451],
 [0.2745098 , 0.29803922, 0.29411765],
 [0.30588235, 0.32941176, 0.32156863]],

[[0.41568627, 0.44313725, 0.41176471],
 [0.38823529, 0.41568627, 0.38431373],
 [0.37254902, 0.4 , 0.36862745],
 ...,
 [0.30588235, 0.33333333, 0.3254902 ],
 [0.30980392, 0.33333333, 0.3254902 ],
 [0.31372549, 0.3372549 , 0.32941176]]],

...,

[[[0.1372549 , 0.69803922, 0.92156863],
 [0.15686275, 0.69019608, 0.9372549 ],
 [0.16470588, 0.69019608, 0.94509804],
 ...,
 [0.38823529, 0.69411765, 0.85882353],
 [0.30980392, 0.57647059, 0.77254902],
 [0.34901961, 0.58039216, 0.74117647]],

[[0.22352941, 0.71372549, 0.91764706],
 [0.17254902, 0.72156863, 0.98039216],
 [0.19607843, 0.71764706, 0.94117647],
 ...,
 [0.61176471, 0.71372549, 0.78431373],
 [0.55294118, 0.69411765, 0.80784314],
 [0.45490196, 0.58431373, 0.68627451]],

[[0.38431373, 0.77254902, 0.92941176],
 [0.25098039, 0.74117647, 0.98823529],
 [0.27058824, 0.75294118, 0.96078431],
 ...,
 [0.7372549 , 0.76470588, 0.80784314],

```

```

[0.46666667, 0.52941176, 0.57647059],
[0.23921569, 0.30980392, 0.35294118]],

...,

[[0.28627451, 0.30980392, 0.30196078],
 [0.20784314, 0.24705882, 0.26666667],
 [0.21176471, 0.26666667, 0.31372549],
 ...,
 [0.06666667, 0.15686275, 0.25098039],
 [0.08235294, 0.14117647, 0.2          ],
 [0.12941176, 0.18823529, 0.19215686]],

[[0.23921569, 0.26666667, 0.29411765],
 [0.21568627, 0.2745098 , 0.3372549 ],
 [0.22352941, 0.30980392, 0.40392157],
 ...,
 [0.09411765, 0.18823529, 0.28235294],
 [0.06666667, 0.1372549 , 0.20784314],
 [0.02745098, 0.09019608, 0.1254902  ]],

[[0.17254902, 0.21960784, 0.28627451],
 [0.18039216, 0.25882353, 0.34509804],
 [0.19215686, 0.30196078, 0.41176471],
 ...,
 [0.10588235, 0.20392157, 0.30196078],
 [0.08235294, 0.16862745, 0.25882353],
 [0.04705882, 0.12156863, 0.19607843]]],

[[[0.74117647, 0.82745098, 0.94117647],
  [0.72941176, 0.81568627, 0.9254902 ],
  [0.7254902 , 0.81176471, 0.92156863],
  ...,
  [0.68627451, 0.76470588, 0.87843137],
  [0.6745098 , 0.76078431, 0.87058824],
  [0.6627451 , 0.76078431, 0.8627451  ]],

[[0.76078431, 0.82352941, 0.9372549 ],
 [0.74901961, 0.81176471, 0.9254902 ],
 [0.74509804, 0.80784314, 0.92156863],
 ...,
 [0.67843137, 0.75294118, 0.8627451 ],
 [0.67058824, 0.74901961, 0.85490196],
 [0.65490196, 0.74509804, 0.84705882]]],

[[0.81568627, 0.85882353, 0.95686275],
 [0.80392157, 0.84705882, 0.94117647],
 [0.8          , 0.84313725, 0.9372549 ],

```



```

    ...,
    [0.68627451, 0.74901961, 0.85098039],
    [0.6745098 , 0.74509804, 0.84705882],
    [0.6627451 , 0.74901961, 0.84313725]],

    ...,

[[[0.81176471, 0.78039216, 0.70980392],
  [0.79607843, 0.76470588, 0.68627451],
  [0.79607843, 0.76862745, 0.67843137],
  ...,
  [0.52941176, 0.51764706, 0.49803922],
  [0.63529412, 0.61960784, 0.58823529],
  [0.65882353, 0.63921569, 0.59215686]],

[[[0.77647059, 0.74509804, 0.66666667],
  [0.74117647, 0.70980392, 0.62352941],
  [0.70588235, 0.6745098 , 0.57647059],
  ...,
  [0.69803922, 0.67058824, 0.62745098],
  [0.68627451, 0.6627451 , 0.61176471],
  [0.68627451, 0.6627451 , 0.60392157]]],

[[[0.77647059, 0.74117647, 0.67843137],
  [0.74117647, 0.70980392, 0.63529412],
  [0.69803922, 0.66666667, 0.58431373],
  ...,
  [0.76470588, 0.72156863, 0.6627451 ],
  [0.76862745, 0.74117647, 0.67058824],
  [0.76470588, 0.74509804, 0.67058824]]],

[[[0.89803922, 0.89803922, 0.9372549 ],
  [0.9254902 , 0.92941176, 0.96862745],
  [0.91764706, 0.9254902 , 0.96862745],
  ...,
  [0.85098039, 0.85882353, 0.91372549],
  [0.86666667, 0.8745098 , 0.91764706],
  [0.87058824, 0.8745098 , 0.91372549]]],

[[[0.87058824, 0.86666667, 0.89803922],
  [0.9372549 , 0.9372549 , 0.97647059],
  [0.91372549, 0.91764706, 0.96470588],
  ...,
  [0.8745098 , 0.8745098 , 0.9254902 ],
  [0.89019608, 0.89411765, 0.93333333],
  [0.82352941, 0.82745098, 0.8627451 ]]],

[[0.83529412, 0.80784314, 0.82745098],

```

```

[0.91764706, 0.90980392, 0.9372549 ],
[0.90588235, 0.91372549, 0.95686275],
...,
[0.8627451 , 0.8627451 , 0.90980392],
[0.8627451 , 0.85882353, 0.90980392],
[0.79215686, 0.79607843, 0.84313725]],

...,

[[0.58823529, 0.56078431, 0.52941176],
 [0.54901961, 0.52941176, 0.49803922],
 [0.51764706, 0.49803922, 0.47058824],
 ...,
 [0.87843137, 0.87058824, 0.85490196],
 [0.90196078, 0.89411765, 0.88235294],
 [0.94509804, 0.94509804, 0.93333333]],

[[0.5372549 , 0.51764706, 0.49411765],
 [0.50980392, 0.49803922, 0.47058824],
 [0.49019608, 0.4745098 , 0.45098039],
 ...,
 [0.70980392, 0.70588235, 0.69803922],
 [0.79215686, 0.78823529, 0.77647059],
 [0.83137255, 0.82745098, 0.81176471]],

[[0.47843137, 0.46666667, 0.44705882],
 [0.4627451 , 0.45490196, 0.43137255],
 [0.47058824, 0.45490196, 0.43529412],
 ...,
 [0.70196078, 0.69411765, 0.67843137],
 [0.64313725, 0.64313725, 0.63529412],
 [0.63921569, 0.63921569, 0.63137255]]]])

```

####BUILDING CNN MODEL

```

from tensorflow.keras.layers import Dense,Flatten,Conv2D,MaxPooling2D
from tensorflow.keras.models import Sequential
from sklearn.model_selection import train_test_split

m1=Sequential()
m1.add(Conv2D(32,(3,3),activation='relu',input_shape=(32,32,3)))
m1.add(MaxPooling2D(pool_size=(2,2)))
m1.add(Conv2D(64,(4,4),activation='relu'))
m1.add(MaxPooling2D(pool_size=(2,2)))

m1.add(Flatten())
m1.add(Dense(34,activation='relu'))
m1.add(Dense(10,activation='softmax'))

m1.compile(optimizer='adam',loss='sparse_categorical_crossentropy',

```

```
metrics = ['accuracy'])
```

```
h1=m1.fit(X_train, y_train, validation_data=(X_test, y_test),  
epochs=10)
```

```
Epoch 1/10
```

```
1563/1563 [=====] - 72s 46ms/step - loss:  
1.5519 - accuracy: 0.4359 - val_loss: 1.2591 - val_accuracy: 0.5604
```

```
Epoch 2/10
```

```
1563/1563 [=====] - 73s 46ms/step - loss:  
1.1480 - accuracy: 0.5946 - val_loss: 1.0804 - val_accuracy: 0.6226
```

```
Epoch 3/10
```

```
1563/1563 [=====] - 72s 46ms/step - loss:  
1.0098 - accuracy: 0.6489 - val_loss: 0.9944 - val_accuracy: 0.6573
```

```
Epoch 4/10
```

```
1563/1563 [=====] - 78s 50ms/step - loss:  
0.9246 - accuracy: 0.6785 - val_loss: 0.9538 - val_accuracy: 0.6716
```

```
Epoch 5/10
```

```
1563/1563 [=====] - 103s 66ms/step - loss:  
0.8626 - accuracy: 0.6992 - val_loss: 0.9236 - val_accuracy: 0.6813
```

```
Epoch 6/10
```

```
1563/1563 [=====] - 92s 59ms/step - loss:  
0.8176 - accuracy: 0.7152 - val_loss: 0.9051 - val_accuracy: 0.6914
```

```
Epoch 7/10
```

```
1563/1563 [=====] - 85s 54ms/step - loss:  
0.7794 - accuracy: 0.7296 - val_loss: 0.8842 - val_accuracy: 0.6993
```

```
Epoch 8/10
```

```
1563/1563 [=====] - 73s 47ms/step - loss:  
0.7472 - accuracy: 0.7410 - val_loss: 0.8894 - val_accuracy: 0.7016
```

```
Epoch 9/10
```

```
1563/1563 [=====] - 72s 46ms/step - loss:  
0.7127 - accuracy: 0.7522 - val_loss: 0.8920 - val_accuracy: 0.7006
```

```
Epoch 10/10
```

```
1563/1563 [=====] - 72s 46ms/step - loss:  
0.6841 - accuracy: 0.7632 - val_loss: 0.8751 - val_accuracy: 0.7107
```

```
r1=pd.DataFrame(h1.history)
```

```
r1['Epoch']=h1.epoch
```

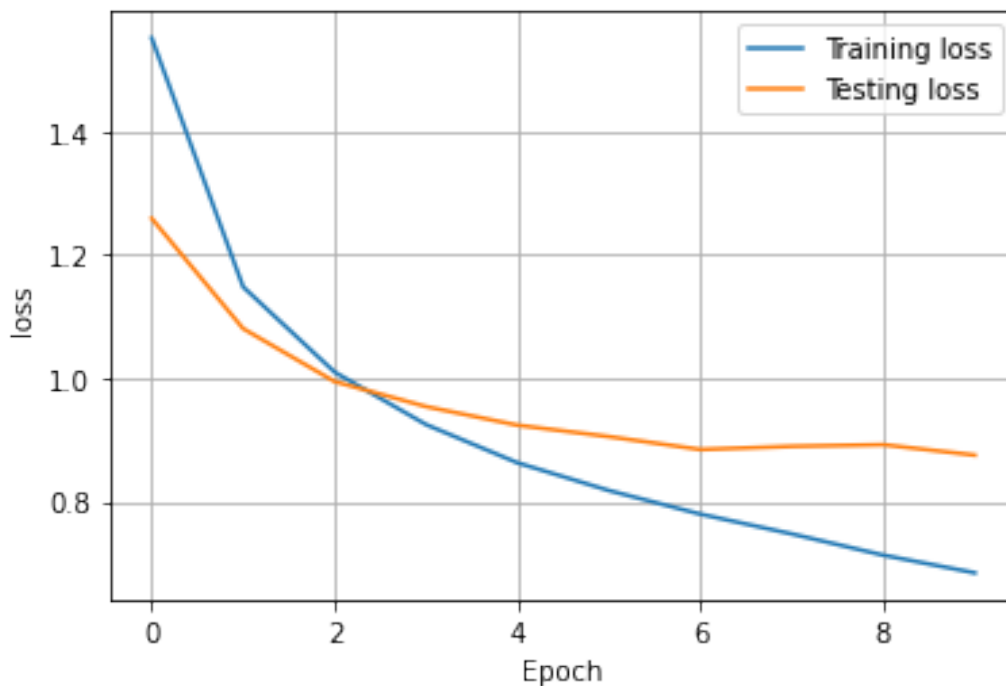
```
r1.tail
```

```
<bound method NDFrame.tail of  
val_accuracy Epoch loss accuracy val_loss  
0 1.551910 0.43592 1.259127 0.5604 0  
1 1.147975 0.59458 1.080362 0.6226 1  
2 1.009773 0.64888 0.994444 0.6573 2  
3 0.924642 0.67848 0.953834 0.6716 3  
4 0.862599 0.69922 0.923627 0.6813 4  
5 0.817631 0.71516 0.905096 0.6914 5
```

6	0.779351	0.72958	0.884190	0.6993	6
7	0.747223	0.74102	0.889384	0.7016	7
8	0.712745	0.75222	0.891966	0.7006	8
9	0.684075	0.76320	0.875077	0.7107	9>

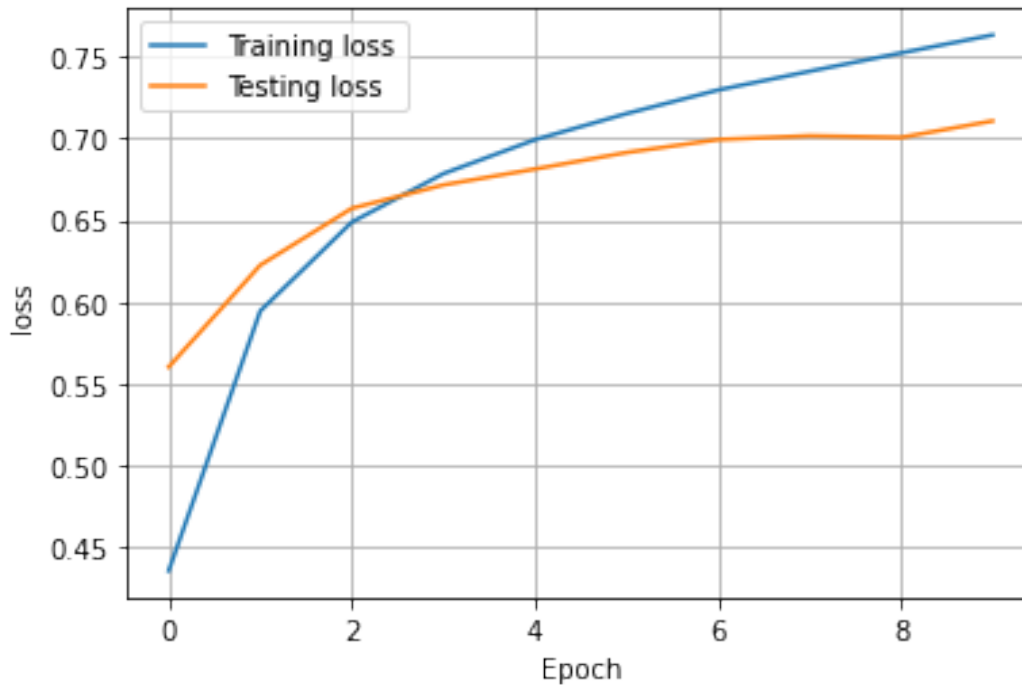
Loss vs Val_Loss

```
plt.plot(r1['Epoch'],r1['loss'],label='Training loss')
plt.plot(r1['Epoch'],r1['val_loss'],label='Testing loss')
plt.xlabel('Epoch')
plt.ylabel('loss')
plt.legend()
plt.grid()
plt.show()
```



Accuracy vs Val_Loss

```
plt.plot(r1['Epoch'],r1['accuracy'],label='Training loss')
plt.plot(r1['Epoch'],r1['val_accuracy'],label='Testing loss')
plt.xlabel('Epoch')
plt.ylabel('loss')
plt.legend()
plt.grid()
plt.show()
```



PREDICTION ON DATA

```
ypred=m1.predict(X_test)
print(ypred[0])
print(sum(ypred[0]))
print(sum(ypred[465]))
```

```
[9.84059297e-04 1.12239206e-04 7.75187917e-04 7.88244784e-01
 9.13043623e-04 7.91113675e-02 9.10990965e-03 1.41402488e-04
 1.19767442e-01 8.40569090e-04]
1.00000000049549271
0.999999993859592
```

```
y_test[:10]
```

```
array([[3],
       [8],
       [8],
       [0],
       [6],
       [6],
       [1],
       [6],
       [3],
       [1]], dtype=uint8)
```

```
ypred_m1=[np.argmax(i) for i in ypred]
print(ypred_m1)
```

[3, 8, 8, 0, 4, 6, 1, 6, 3, 1, 0, 9, 5, 7, 9, 6, 5, 7, 8, 6, 7, 0, 4,
9, 4, 2, 4, 0, 9, 6, 6, 5, 4, 5, 9, 3, 7, 9, 9, 5, 4, 6, 3, 6, 0, 9,
3, 9, 7, 6, 9, 8, 6, 3, 8, 8, 7, 3, 5, 3, 7, 5, 6, 3, 6, 2, 1, 0, 5,
9, 0, 3, 8, 8, 0, 2, 7, 3, 3, 8, 8, 1, 1, 7, 2, 7, 0, 0, 9, 9, 0, 4,
8, 6, 4, 6, 6, 0, 0, 7, 4, 5, 6, 3, 1, 1, 8, 6, 8, 7, 4, 0, 2, 2, 9,
7, 0, 4, 3, 5, 8, 7, 1, 2, 8, 0, 0, 3, 3, 0, 4, 1, 8, 9, 1, 2, 9, 7,
2, 8, 3, 5, 6, 5, 8, 7, 6, 5, 5, 3, 0, 9, 6, 0, 0, 6, 2, 9, 2, 4, 2,
1, 6, 6, 0, 7, 8, 6, 6, 0, 9, 9, 9, 8, 9, 9, 3, 7, 3, 0, 9, 5, 2, 6,
0, 8, 6, 3, 3, 8, 5, 8, 0, 1, 7, 4, 8, 8, 7, 8, 3, 0, 8, 7, 1, 3, 8,
5, 7, 9, 6, 0, 5, 9, 8, 0, 7, 9, 0, 7, 7, 7, 9, 3, 4, 9, 4, 2, 3, 6,
3, 1, 5, 8, 8, 0, 4, 0, 5, 3, 1, 9, 8, 9, 0, 6, 1, 8, 2, 0, 5, 3, 9,
9, 6, 0, 6, 0, 8, 1, 8, 9, 8, 3, 0, 8, 8, 4, 7, 0, 2, 3, 6, 3, 8, 2,
0, 7, 4, 3, 9, 0, 6, 1, 9, 9, 1, 8, 7, 9, 1, 2, 6, 1, 3, 2, 6, 0, 0,
6, 6, 6, 2, 2, 6, 1, 9, 2, 9, 4, 8, 6, 8, 0, 3, 0, 7, 7, 5, 5, 3, 3,
2, 2, 4, 4, 7, 5, 4, 6, 1, 9, 4, 6, 6, 9, 3, 8, 0, 7, 4, 6, 2, 3, 0,
5, 7, 6, 8, 9, 9, 1, 8, 0, 6, 4, 4, 2, 8, 0, 9, 5, 8, 0, 9, 4, 1, 8,
0, 1, 2, 7, 9, 7, 2, 7, 2, 5, 8, 6, 6, 9, 0, 0, 5, 8, 7, 4, 3, 5, 1,
0, 6, 6, 9, 6, 2, 3, 0, 8, 9, 8, 7, 8, 8, 4, 0, 1, 8, 2, 7, 0, 3, 6,
1, 9, 3, 7, 3, 7, 4, 3, 8, 0, 2, 9, 6, 4, 6, 6, 4, 5, 3, 7, 9, 7, 9,
5, 3, 9, 1, 2, 9, 1, 5, 4, 5, 0, 2, 2, 1, 9, 7, 3, 9, 4, 6, 4, 4, 9,
2, 6, 1, 4, 3, 4, 7, 3, 7, 8, 3, 0, 8, 0, 3, 7, 6, 8, 5, 0, 9, 6, 8,
5, 5, 9, 9, 9, 5, 0, 1, 0, 8, 1, 8, 8, 0, 2, 2, 0, 4, 4, 3, 4, 9, 4,
7, 9, 6, 4, 5, 6, 6, 1, 5, 6, 8, 9, 3, 8, 5, 7, 0, 7, 0, 6, 7, 0, 8,
6, 9, 9, 1, 5, 6, 6, 6, 2, 8, 9, 1, 7, 6, 7, 5, 9, 1, 6, 6, 5, 5, 2,
8, 3, 9, 8, 6, 4, 3, 2, 0, 7, 6, 3, 2, 9, 9, 4, 9, 4, 6, 7, 8, 8, 3,
6, 8, 8, 7, 2, 4, 0, 8, 7, 0, 9, 3, 4, 8, 9, 6, 9, 2, 6, 1, 4, 7, 2,
5, 3, 8, 5, 8, 2, 1, 6, 3, 3, 3, 9, 6, 9, 8, 8, 5, 8, 6, 6, 4, 1, 7,
7, 1, 4, 7, 9, 9, 4, 7, 8, 8, 2, 6, 8, 4, 6, 8, 4, 0, 3, 3, 3, 7, 7,
9, 9, 3, 4, 4, 7, 3, 9, 5, 6, 9, 0, 1, 1, 4, 1, 9, 4, 7, 2, 3, 0, 9,
0, 1, 2, 6, 3, 4, 3, 0, 8, 4, 9, 3, 3, 1, 6, 0, 9, 9, 4, 9, 6, 6, 9,
2, 2, 2, 7, 8, 3, 8, 2, 7, 5, 7, 2, 6, 8, 7, 4, 2, 3, 8, 8, 6, 0, 8,
7, 4, 3, 3, 1, 4, 8, 7, 8, 8, 1, 8, 8, 1, 2, 6, 3, 4, 0, 7, 9, 1, 2,
1, 4, 1, 7, 5, 7, 0, 7, 2, 7, 6, 6, 2, 3, 9, 0, 9, 1, 2, 4, 6, 8, 2,
1, 3, 2, 4, 0, 1, 2, 2, 9, 5, 4, 1, 9, 6, 6, 0, 2, 2, 6, 0, 6, 9, 1,
7, 6, 7, 0, 3, 9, 4, 8, 0, 0, 7, 3, 7, 5, 4, 4, 7, 4, 7, 1, 2, 7, 4,
4, 8, 4, 7, 8, 3, 2, 7, 2, 0, 8, 9, 3, 8, 0, 6, 2, 0, 8, 7, 3, 7, 6,
5, 3, 1, 3, 2, 5, 4, 4, 1, 4, 9, 2, 7, 0, 7, 2, 1, 3, 4, 0, 2, 4, 5,
9, 8, 1, 0, 9, 7, 8, 7, 8, 4, 6, 6, 3, 0, 1, 6, 7, 0, 1, 4, 1, 4, 2,
3, 8, 4, 5, 3, 7, 8, 4, 0, 0, 9, 0, 0, 1, 8, 4, 4, 6, 7, 3, 1, 1, 3,
7, 3, 5, 5, 6, 6, 3, 8, 7, 1, 6, 8, 8, 7, 3, 7, 4, 0, 1, 4, 8, 8, 0,
6, 9, 9, 9, 5, 3, 2, 3, 0, 8, 4, 2, 3, 5, 7, 3, 2, 5, 9, 8, 9, 7, 7,
6, 0, 3, 0, 1, 4, 8, 4, 9, 6, 0, 4, 7, 0, 6, 7, 8, 9, 1, 1, 6, 6, 6,
6, 9, 1, 9, 9, 4, 6, 1, 7, 0, 6, 8, 1, 9, 6, 9, 5, 4, 7, 8, 3, 1, 2,
0, 1, 5, 8, 7, 6, 2, 8, 1, 3, 8, 5, 0, 4, 4, 8, 1, 1, 8, 9, 6, 0, 8,
6, 1, 3, 6, 1, 6, 0, 5, 1, 1, 0, 0, 3, 5, 0, 0, 6, 6, 3, 3, 8, 3, 3,
3, 0, 7, 2, 2, 3, 3, 0, 0, 8, 5, 2, 1, 1, 1, 0, 7, 0, 5, 1, 5, 3, 3,
3, 8, 9, 1, 4, 4, 1, 0, 9, 0, 9, 6, 3, 6, 8, 7, 3, 8, 0, 0, 0, 6, 6,
6, 8, 4, 5, 4, 4, 6, 5, 6, 8, 8, 3, 2, 5, 2, 7, 5, 1, 2, 8, 8, 8, 0,
9, 3, 9, 7, 2, 0, 2, 8, 2, 8, 9, 1, 5, 5, 7, 7, 5, 3, 8, 3, 2, 6, 0,
8, 5, 0, 4, 9, 2, 4, 1, 6, 9, 7, 9, 8, 6, 1, 8, 6, 1, 4, 4, 9, 2, 7,

7, 2, 0, 8, 6, 9, 1, 1, 1, 8, 8, 0, 7, 7, 8, 0, 3, 4, 3, 7, 7, 9, 2,
3, 1, 9, 1, 9, 2, 3, 3, 2, 1, 0, 6, 1, 4, 1, 0, 0, 1, 1, 2, 5, 4, 6,
2, 0, 7, 9, 8, 7, 2, 8, 6, 8, 1, 0, 0, 7, 0, 6, 1, 8, 5, 7, 1, 4, 8,
5, 9, 9, 1, 8, 4, 6, 6, 3, 4, 1, 3, 9, 1, 4, 1, 5, 7, 0, 1, 3, 6, 0,
9, 8, 3, 6, 7, 3, 4, 6, 7, 7, 5, 8, 2, 4, 8, 2, 1, 8, 9, 9, 8, 0, 8,
1, 0, 4, 0, 3, 1, 8, 4, 6, 3, 3, 1, 2, 2, 3, 5, 8, 9, 5, 8, 9, 0, 9,
1, 6, 5, 9, 6, 7, 8, 0, 7, 0, 9, 0, 4, 1, 6, 2, 8, 9, 1, 0, 4, 6, 0,
8, 6, 1, 9, 0, 3, 9, 3, 0, 7, 2, 0, 0, 4, 4, 6, 6, 3, 5, 5, 8, 1, 2,
2, 1, 4, 5, 6, 5, 1, 4, 7, 0, 9, 4, 9, 8, 6, 8, 4, 7, 2, 9, 1, 4, 2,
9, 8, 9, 7, 9, 5, 1, 4, 0, 8, 2, 9, 8, 9, 1, 9, 3, 2, 4, 9, 3, 0, 7,
4, 6, 0, 8, 9, 5, 3, 9, 3, 4, 6, 2, 2, 3, 5, 3, 1, 0, 0, 0, 3, 3, 7,
2, 1, 1, 9, 8, 1, 0, 1, 3, 1, 1, 1, 7, 3, 9, 6, 8, 7, 6, 8, 4, 9, 3,
7, 9, 7, 2, 8, 4, 9, 7, 0, 1, 6, 1, 8, 1, 8, 4, 3, 2, 1, 4, 0, 8, 2,
6, 2, 6, 6, 5, 8, 9, 4, 1, 1, 8, 6, 0, 4, 0, 1, 9, 7, 1, 3, 7, 2, 0,
9, 7, 7, 9, 7, 7, 7, 9, 8, 2, 0, 6, 4, 0, 7, 9, 8, 6, 8, 4, 9, 1, 7,
0, 2, 8, 3, 8, 1, 6, 2, 3, 1, 2, 7, 8, 8, 1, 8, 1, 8, 6, 0, 2, 4, 1,
3, 6, 7, 7, 4, 7, 3, 8, 4, 7, 2, 4, 9, 7, 8, 7, 4, 4, 3, 7, 8, 2, 8,
4, 5, 5, 4, 9, 4, 0, 3, 9, 6, 2, 5, 4, 4, 0, 8, 8, 2, 3, 7, 5, 6, 9,
1, 6, 7, 2, 0, 1, 4, 5, 3, 0, 7, 2, 3, 4, 6, 0, 5, 2, 9, 1, 7, 7, 5,
0, 5, 6, 0, 1, 4, 3, 3, 6, 2, 3, 5, 5, 9, 9, 7, 3, 1, 2, 3, 9, 4, 4,
3, 3, 3, 8, 1, 3, 7, 0, 2, 4, 3, 1, 4, 9, 4, 6, 0, 9, 7, 9, 9, 1, 0,
1, 6, 7, 5, 5, 4, 9, 5, 6, 6, 9, 6, 4, 0, 7, 8, 6, 5, 0, 0, 9, 9, 8,
4, 5, 4, 8, 4, 6, 9, 6, 0, 6, 6, 6, 1, 6, 4, 8, 6, 9, 4, 7, 8, 1, 2,
7, 6, 7, 7, 8, 1, 6, 0, 0, 6, 9, 2, 8, 9, 8, 0, 9, 4, 9, 5, 7, 3, 5,
9, 5, 0, 0, 1, 9, 1, 2, 6, 1, 0, 1, 0, 4, 1, 7, 8, 0, 4, 4, 6, 3, 2,
0, 0, 9, 0, 8, 8, 6, 9, 3, 9, 0, 9, 6, 5, 9, 1, 3, 8, 1, 0, 5, 0, 0,
0, 2, 8, 1, 5, 6, 7, 7, 3, 6, 2, 3, 0, 1, 4, 2, 7, 3, 6, 2, 0, 8, 7,
4, 8, 5, 6, 3, 0, 4, 8, 5, 7, 6, 2, 8, 1, 0, 1, 3, 6, 0, 7, 6, 9, 5,
5, 6, 8, 1, 4, 0, 4, 4, 2, 3, 3, 8, 9, 7, 9, 8, 1, 1, 5, 5, 9, 9, 7,
6, 5, 0, 8, 4, 1, 4, 9, 2, 8, 4, 9, 1, 2, 9, 9, 8, 9, 4, 4, 1, 0, 7,
6, 9, 4, 8, 9, 7, 2, 5, 3, 7, 3, 0, 9, 9, 5, 5, 8, 5, 3, 2, 8, 3, 4,
1, 7, 7, 8, 4, 7, 8, 2, 3, 5, 6, 8, 0, 2, 3, 1, 0, 1, 9, 1, 4, 2, 5,
8, 3, 2, 9, 6, 8, 6, 9, 3, 0, 9, 8, 6, 7, 8, 5, 0, 0, 1, 0, 3, 1, 3,
3, 6, 6, 0, 9, 9, 9, 6, 8, 2, 4, 2, 0, 5, 1, 9, 1, 0, 1, 4, 4, 1, 6,
0, 5, 0, 2, 7, 7, 8, 7, 3, 2, 2, 8, 3, 4, 8, 1, 5, 0, 5, 7, 4, 4, 0,
7, 7, 5, 6, 0, 5, 7, 6, 2, 3, 9, 7, 7, 8, 9, 1, 3, 6, 0, 6, 6, 5, 5,
6, 6, 9, 6, 6, 5, 7, 6, 2, 9, 5, 4, 7, 1, 6, 2, 1, 2, 5, 9, 8, 5, 6,
3, 2, 5, 7, 6, 7, 8, 9, 1, 7, 4, 5, 9, 8, 4, 6, 5, 8, 6, 9, 0, 3, 3,
6, 4, 5, 3, 7, 6, 4, 1, 4, 2, 2, 6, 3, 3, 2, 1, 0, 0, 1, 8, 3, 1, 5,
5, 8, 4, 8, 3, 8, 6, 5, 5, 5, 5, 8, 8, 3, 4, 7, 1, 8, 4, 4, 4, 3, 4,
2, 9, 6, 2, 2, 7, 3, 0, 6, 0, 9, 6, 2, 6, 7, 2, 1, 0, 7, 7, 2, 0, 1,
6, 5, 7, 9, 2, 8, 1, 2, 6, 0, 1, 6, 6, 3, 3, 4, 0, 7, 1, 1, 0, 2, 1,
9, 0, 8, 6, 8, 6, 0, 2, 0, 0, 9, 7, 6, 9, 0, 7, 2, 9, 1, 8, 9, 2, 6,
8, 9, 7, 9, 9, 3, 4, 2, 7, 9, 6, 9, 5, 7, 8, 5, 0, 8, 6, 9, 9, 0, 3,
8, 7, 1, 0, 2, 7, 5, 8, 2, 3, 0, 0, 9, 3, 8, 9, 6, 1, 4, 3, 4, 4, 9,
0, 1, 3, 9, 2, 9, 4, 6, 0, 8, 2, 8, 6, 8, 6, 0, 5, 9, 6, 9, 5, 1, 3,
4, 4, 8, 7, 2, 4, 6, 0, 3, 8, 4, 2, 1, 2, 6, 8, 1, 7, 6, 8, 7, 4, 3,
3, 3, 4, 7, 2, 5, 6, 1, 7, 9, 0, 6, 3, 9, 8, 8, 5, 0, 0, 7, 6, 3, 3,
8, 8, 4, 0, 1, 5, 4, 6, 4, 6, 8, 8, 8, 6, 3, 4, 4, 9, 7, 3, 1, 6, 0,
5, 9, 9, 0, 5, 9, 7, 0, 5, 7, 2, 6, 1, 9, 5, 4, 6, 9, 8, 9, 7, 0, 6,

4, 2, 0, 4, 6, 2, 3, 9, 1, 6, 6, 4, 2, 6, 3, 2, 2, 5, 2, 7, 2, 4, 0,
8, 0, 0, 7, 1, 7, 4, 0, 7, 2, 6, 1, 3, 9, 7, 6, 2, 7, 0, 6, 4, 0, 1,
9, 8, 3, 5, 1, 9, 2, 6, 8, 9, 8, 1, 3, 4, 7, 0, 3, 6, 6, 7, 9, 4, 0,
1, 0, 8, 5, 0, 8, 0, 0, 6, 1, 0, 8, 5, 9, 4, 3, 5, 7, 9, 0, 6, 1, 2,
5, 1, 6, 7, 3, 2, 8, 8, 0, 8, 9, 4, 7, 6, 4, 9, 2, 4, 3, 0, 6, 6, 6,
6, 9, 7, 8, 4, 8, 8, 4, 6, 8, 0, 0, 3, 6, 8, 7, 8, 9, 9, 0, 2, 6, 8,
0, 1, 7, 4, 6, 2, 3, 6, 9, 6, 2, 5, 1, 8, 6, 4, 1, 6, 8, 6, 0, 5, 9,
0, 1, 0, 4, 9, 0, 9, 0, 9, 7, 8, 6, 0, 6, 6, 8, 1, 6, 4, 8, 4, 9, 2,
1, 6, 4, 5, 6, 3, 1, 0, 8, 9, 5, 8, 9, 0, 3, 6, 4, 4, 8, 8, 1, 9, 1,
8, 6, 6, 4, 1, 2, 2, 3, 2, 5, 9, 7, 4, 1, 5, 1, 4, 3, 0, 2, 8, 9, 3,
6, 2, 1, 6, 9, 8, 5, 1, 4, 9, 3, 1, 8, 4, 6, 7, 8, 4, 0, 6, 4, 4, 9,
8, 7, 9, 6, 2, 6, 7, 7, 6, 4, 0, 2, 3, 2, 3, 9, 0, 2, 9, 6, 3, 8, 4,
6, 4, 8, 8, 6, 6, 5, 7, 6, 5, 2, 0, 4, 0, 2, 8, 5, 8, 0, 4, 1, 3, 3,
6, 8, 1, 6, 0, 8, 4, 5, 1, 2, 3, 2, 6, 3, 4, 0, 7, 1, 3, 3, 3, 1, 8,
0, 0, 6, 2, 7, 7, 0, 4, 6, 4, 6, 3, 9, 4, 1, 6, 4, 6, 7, 4, 5, 3, 8,
1, 3, 1, 4, 6, 9, 8, 7, 0, 5, 8, 9, 5, 7, 2, 2, 3, 2, 7, 4, 1, 6, 1,
8, 6, 9, 9, 0, 4, 0, 4, 4, 7, 0, 0, 0, 0, 4, 5, 3, 4, 7, 8, 3, 3, 0,
2, 8, 1, 1, 2, 7, 0, 3, 4, 1, 9, 4, 0, 9, 8, 3, 6, 6, 6, 7, 5, 1, 8,
8, 0, 3, 0, 3, 3, 3, 8, 3, 8, 0, 8, 5, 9, 2, 3, 6, 5, 7, 4, 7, 6, 9,
8, 4, 2, 1, 6, 2, 9, 9, 8, 2, 8, 1, 0, 5, 5, 3, 7, 6, 7, 9, 9, 1, 3,
2, 7, 4, 4, 1, 9, 4, 3, 2, 9, 8, 7, 6, 0, 5, 3, 7, 3, 4, 1, 7, 7, 7,
0, 1, 4, 7, 3, 3, 1, 8, 7, 0, 9, 8, 3, 7, 6, 5, 8, 6, 5, 6, 5, 8, 4,
2, 9, 6, 3, 7, 2, 0, 1, 9, 9, 7, 9, 5, 1, 6, 0, 5, 3, 7, 2, 4, 5, 2,
9, 6, 3, 3, 0, 2, 1, 8, 8, 1, 2, 3, 2, 4, 8, 4, 5, 6, 0, 6, 6, 5, 4,
7, 9, 9, 3, 2, 0, 4, 9, 7, 5, 6, 6, 5, 6, 9, 7, 9, 4, 8, 3, 1, 9, 8,
1, 0, 0, 3, 0, 4, 7, 7, 2, 6, 5, 6, 9, 3, 5, 5, 7, 0, 8, 6, 6, 8, 3,
6, 9, 2, 2, 9, 2, 7, 4, 9, 9, 7, 0, 2, 1, 6, 0, 6, 5, 1, 4, 2, 8, 3,
8, 3, 7, 1, 4, 9, 8, 1, 1, 5, 9, 9, 4, 6, 8, 5, 3, 3, 2, 5, 8, 5, 1,
9, 7, 9, 1, 3, 3, 1, 0, 3, 8, 9, 5, 0, 8, 8, 7, 0, 4, 8, 3, 0, 7, 0,
7, 0, 5, 3, 4, 3, 0, 9, 7, 0, 6, 7, 0, 8, 4, 4, 5, 2, 8, 8, 3, 5, 6,
4, 3, 8, 0, 8, 4, 8, 5, 6, 6, 5, 1, 7, 2, 4, 2, 3, 6, 8, 7, 6, 3, 8,
0, 6, 6, 4, 5, 5, 5, 1, 8, 7, 5, 0, 6, 7, 1, 1, 1, 6, 5, 1, 9, 2, 3,
9, 8, 3, 1, 7, 4, 8, 4, 7, 7, 8, 6, 0, 3, 0, 8, 2, 3, 0, 9, 6, 6, 1,
3, 7, 7, 9, 0, 1, 3, 1, 4, 0, 6, 0, 7, 8, 3, 1, 3, 6, 1, 8, 0, 1, 9,
7, 0, 4, 2, 9, 0, 6, 8, 4, 9, 7, 7, 0, 4, 7, 0, 4, 9, 0, 7, 0, 6, 7,
1, 8, 3, 2, 8, 5, 0, 0, 6, 8, 3, 7, 0, 6, 6, 4, 9, 1, 8, 6, 3, 9, 6,
9, 3, 3, 7, 8, 9, 7, 5, 4, 5, 8, 9, 8, 9, 5, 5, 1, 9, 0, 2, 8, 1, 9,
8, 1, 1, 0, 8, 9, 9, 0, 2, 2, 9, 1, 9, 2, 9, 9, 2, 4, 9, 9, 0, 9, 9,
2, 1, 7, 0, 5, 6, 6, 9, 8, 3, 0, 6, 0, 7, 4, 8, 3, 0, 2, 0, 3, 4, 7,
6, 6, 6, 5, 6, 3, 4, 3, 8, 8, 0, 9, 7, 9, 9, 6, 9, 3, 1, 9, 7, 3, 0,
9, 5, 7, 7, 6, 9, 0, 2, 3, 9, 3, 3, 7, 8, 3, 5, 5, 9, 6, 1, 8, 7, 4,
8, 7, 7, 9, 5, 0, 3, 6, 3, 4, 8, 0, 5, 4, 7, 0, 3, 7, 0, 3, 1, 0, 8,
7, 5, 5, 7, 8, 6, 7, 8, 9, 7, 4, 7, 0, 8, 3, 2, 9, 6, 4, 9, 6, 7, 9,
8, 5, 5, 4, 1, 0, 9, 4, 7, 5, 4, 4, 8, 0, 8, 2, 9, 9, 9, 7, 4, 6, 7,
2, 2, 9, 3, 7, 7, 8, 6, 7, 0, 2, 5, 9, 6, 4, 3, 2, 3, 5, 8, 4, 2, 2,
1, 9, 7, 0, 3, 6, 1, 8, 5, 1, 7, 0, 9, 1, 2, 8, 1, 2, 3, 8, 0, 3, 2,
9, 3, 4, 7, 1, 9, 4, 9, 8, 7, 9, 3, 1, 5, 1, 2, 6, 4, 5, 7, 4, 3, 8,
3, 4, 8, 7, 8, 2, 3, 6, 1, 5, 3, 9, 5, 1, 9, 2, 9, 2, 0, 8, 2, 6, 8,
5, 7, 6, 1, 6, 9, 4, 3, 0, 1, 7, 2, 2, 4, 1, 4, 3, 9, 5, 8, 5, 0, 0,
6, 9, 0, 0, 4, 5, 7, 3, 6, 4, 7, 9, 6, 6, 0, 6, 2, 0, 0, 3, 4, 6, 1,

1, 5, 5, 2, 0, 6, 3, 0, 3, 1, 1, 5, 2, 9, 9, 6, 5, 0, 2, 9, 7, 1, 9,
2, 9, 0, 8, 6, 4, 3, 2, 7, 7, 0, 4, 1, 6, 5, 9, 9, 0, 3, 9, 0, 9, 5,
0, 1, 8, 0, 1, 1, 3, 4, 9, 4, 2, 4, 3, 9, 4, 8, 4, 6, 5, 8, 9, 8, 5,
8, 1, 8, 2, 6, 7, 3, 4, 1, 1, 6, 6, 8, 5, 2, 3, 5, 0, 8, 2, 3, 6, 2,
9, 6, 9, 4, 5, 9, 0, 1, 7, 0, 8, 1, 9, 6, 6, 6, 5, 4, 9, 5, 0, 6, 0,
1, 7, 6, 0, 6, 3, 3, 3, 2, 7, 3, 2, 9, 7, 8, 2, 4, 6, 1, 3, 8, 8, 6,
6, 7, 7, 6, 7, 3, 5, 2, 4, 6, 2, 7, 2, 6, 9, 6, 2, 4, 3, 2, 0, 9, 5,
1, 1, 5, 3, 7, 4, 3, 2, 1, 7, 4, 3, 5, 4, 8, 9, 3, 3, 1, 8, 0, 1, 3,
3, 4, 4, 2, 9, 7, 6, 0, 1, 8, 9, 9, 3, 1, 7, 3, 0, 0, 2, 8, 5, 9, 3,
7, 4, 6, 0, 1, 6, 1, 6, 7, 5, 5, 2, 3, 9, 4, 0, 8, 8, 4, 1, 4, 1, 8,
0, 2, 3, 0, 9, 2, 8, 1, 7, 7, 9, 1, 4, 8, 2, 8, 4, 2, 8, 9, 3, 1, 1,
6, 5, 8, 4, 4, 6, 7, 2, 4, 4, 2, 3, 6, 6, 6, 8, 5, 2, 0, 7, 1, 6, 0,
6, 9, 3, 8, 1, 6, 9, 3, 7, 2, 3, 5, 9, 7, 0, 7, 9, 3, 4, 1, 6, 9, 5,
8, 9, 7, 1, 3, 0, 0, 0, 9, 2, 4, 7, 8, 8, 8, 1, 0, 0, 4, 1, 8, 0, 0,
1, 5, 3, 6, 9, 7, 7, 9, 4, 2, 0, 2, 5, 5, 7, 4, 7, 5, 4, 4, 0, 6, 1,
7, 5, 6, 5, 7, 9, 0, 7, 8, 3, 9, 4, 8, 5, 7, 3, 7, 9, 8, 1, 7, 4, 8,
9, 3, 0, 8, 4, 0, 2, 0, 1, 4, 7, 0, 5, 0, 4, 9, 8, 5, 7, 9, 1, 5, 3,
9, 8, 7, 2, 0, 9, 0, 8, 4, 9, 6, 2, 3, 8, 1, 9, 8, 8, 6, 7, 6, 4, 2,
9, 7, 0, 5, 2, 8, 8, 8, 7, 9, 6, 3, 7, 4, 7, 7, 6, 7, 9, 7, 3, 6, 8,
4, 6, 6, 5, 9, 6, 9, 7, 1, 5, 0, 1, 6, 6, 8, 9, 0, 1, 7, 6, 2, 2, 3,
0, 9, 8, 7, 4, 4, 9, 0, 6, 7, 3, 8, 9, 7, 6, 1, 9, 0, 6, 3, 1, 5, 6,
6, 2, 7, 6, 8, 8, 9, 3, 6, 9, 0, 7, 5, 8, 4, 1, 3, 8, 1, 4, 4, 5, 0,
3, 8, 9, 5, 5, 8, 4, 5, 8, 0, 4, 4, 8, 2, 9, 0, 7, 9, 8, 7, 1, 6, 2,
9, 9, 8, 9, 7, 6, 7, 7, 1, 6, 6, 4, 2, 0, 6, 8, 9, 6, 2, 2, 9, 0, 2,
7, 0, 2, 6, 8, 6, 8, 2, 7, 7, 9, 1, 8, 1, 2, 5, 9, 7, 8, 9, 6, 3, 8,
1, 9, 4, 0, 2, 1, 4, 3, 6, 2, 2, 0, 0, 9, 7, 0, 7, 3, 3, 2, 7, 7, 4,
7, 4, 2, 3, 5, 4, 0, 0, 0, 7, 7, 1, 6, 5, 0, 7, 7, 4, 2, 1, 8, 5, 9,
6, 5, 6, 2, 2, 7, 5, 5, 8, 1, 9, 6, 8, 7, 7, 8, 5, 7, 2, 4, 9, 7, 3,
5, 8, 8, 6, 9, 6, 7, 4, 0, 8, 0, 7, 8, 3, 4, 5, 2, 4, 5, 0, 4, 8, 2,
4, 0, 8, 4, 7, 6, 0, 8, 2, 2, 4, 1, 1, 6, 1, 4, 2, 1, 1, 2, 3, 4, 0,
3, 8, 8, 5, 1, 8, 2, 5, 3, 9, 6, 6, 1, 0, 7, 3, 3, 0, 7, 4, 5, 6, 0,
6, 1, 8, 8, 0, 9, 3, 8, 0, 5, 3, 2, 3, 3, 6, 7, 6, 0, 0, 5, 7, 2, 7,
7, 0, 6, 1, 7, 9, 0, 8, 0, 3, 8, 4, 0, 8, 4, 1, 0, 4, 6, 4, 1, 1, 2,
7, 5, 4, 1, 4, 7, 8, 0, 0, 9, 0, 0, 0, 8, 7, 5, 5, 0, 3, 0, 8, 2, 0,
5, 9, 2, 9, 1, 1, 3, 4, 7, 5, 8, 6, 4, 1, 5, 7, 3, 4, 1, 8, 9, 9, 8,
9, 8, 6, 8, 5, 8, 0, 4, 6, 4, 6, 3, 7, 7, 0, 0, 8, 7, 3, 1, 5, 9, 5,
1, 6, 0, 2, 6, 6, 9, 6, 2, 3, 1, 7, 2, 9, 1, 9, 2, 0, 8, 9, 9, 8, 8,
9, 2, 6, 3, 0, 3, 2, 0, 2, 4, 7, 2, 2, 1, 2, 8, 8, 1, 2, 8, 5, 4, 5,
9, 6, 7, 1, 0, 6, 9, 6, 2, 3, 4, 8, 9, 1, 9, 7, 0, 1, 3, 5, 4, 3, 3,
8, 8, 0, 4, 8, 3, 6, 2, 3, 0, 3, 5, 2, 6, 8, 4, 9, 9, 9, 2, 0, 4, 7,
8, 1, 1, 0, 0, 4, 2, 4, 1, 1, 9, 7, 7, 4, 3, 8, 2, 0, 0, 8, 5, 0, 2,
3, 5, 7, 9, 8, 9, 4, 3, 1, 4, 8, 4, 6, 5, 3, 9, 8, 9, 3, 7, 6, 2, 0,
2, 9, 9, 0, 5, 5, 3, 2, 1, 1, 0, 2, 8, 2, 8, 1, 7, 5, 2, 3, 4, 1, 7,
9, 3, 1, 0, 4, 8, 9, 0, 8, 4, 9, 0, 0, 2, 0, 6, 8, 7, 3, 3, 8, 9, 0,
5, 5, 3, 6, 1, 3, 9, 3, 0, 2, 4, 4, 0, 0, 3, 3, 1, 7, 9, 9, 6, 0, 4,
7, 8, 5, 4, 7, 0, 2, 8, 4, 8, 3, 0, 8, 8, 3, 5, 3, 7, 4, 0, 4, 1, 5,
9, 7, 0, 6, 8, 3, 9, 0, 9, 8, 9, 6, 3, 9, 2, 4, 4, 0, 3, 3, 4, 4, 3,
1, 1, 8, 2, 2, 0, 3, 5, 8, 9, 2, 3, 1, 7, 4, 8, 7, 0, 1, 1, 5, 3, 3,
7, 7, 8, 0, 0, 3, 1, 3, 5, 5, 4, 4, 8, 4, 8, 9, 3, 4, 3, 4, 3, 6, 4,
6, 4, 6, 6, 3, 8, 7, 0, 8, 0, 5, 0, 5, 2, 0, 7, 3, 1, 1, 7, 9, 1, 9,

4, 2, 1, 6, 4, 6, 6, 1, 4, 8, 6, 1, 7, 1, 4, 2, 4, 6, 6, 9, 7, 8, 4,
5, 5, 4, 5, 4, 7, 7, 3, 5, 3, 1, 7, 7, 8, 3, 6, 9, 2, 5, 4, 2, 4, 4,
5, 1, 6, 8, 6, 8, 3, 2, 7, 5, 9, 7, 1, 4, 7, 3, 6, 1, 7, 3, 0, 0, 6,
2, 8, 6, 6, 0, 3, 4, 4, 4, 8, 6, 9, 1, 3, 4, 1, 4, 0, 3, 7, 1, 2, 6,
8, 2, 7, 8, 3, 3, 6, 3, 6, 0, 6, 4, 9, 5, 2, 9, 3, 0, 3, 9, 4, 1, 6,
9, 9, 4, 3, 9, 0, 1, 3, 9, 5, 9, 0, 9, 7, 6, 4, 4, 4, 6, 4, 8, 1, 9,
3, 6, 3, 1, 8, 6, 0, 1, 6, 5, 9, 4, 4, 6, 1, 2, 0, 1, 6, 7, 2, 0, 5,
9, 1, 0, 5, 4, 1, 6, 9, 8, 9, 0, 6, 1, 6, 2, 0, 5, 6, 8, 8, 0, 2, 4,
0, 3, 8, 8, 6, 9, 1, 9, 0, 6, 2, 3, 9, 5, 4, 0, 9, 7, 0, 7, 3, 3, 1,
8, 3, 0, 5, 0, 8, 8, 8, 9, 6, 0, 9, 5, 5, 4, 1, 4, 0, 2, 3, 9, 2, 3,
6, 1, 6, 4, 4, 9, 9, 7, 1, 7, 0, 1, 2, 1, 3, 3, 8, 5, 1, 3, 1, 9, 0,
7, 0, 1, 7, 6, 2, 6, 5, 9, 0, 1, 3, 9, 9, 9, 8, 8, 8, 4, 9, 0, 9, 1,
6, 6, 7, 6, 8, 8, 6, 2, 6, 2, 3, 3, 5, 7, 1, 6, 7, 1, 6, 1, 7, 1, 6,
2, 3, 0, 4, 2, 9, 7, 3, 5, 6, 0, 9, 8, 1, 1, 3, 5, 6, 3, 3, 8, 7, 6,
0, 7, 4, 5, 9, 1, 9, 9, 1, 8, 9, 7, 5, 5, 3, 0, 9, 0, 6, 6, 0, 4, 8,
9, 6, 3, 1, 1, 2, 7, 9, 0, 1, 8, 5, 2, 4, 7, 4, 8, 3, 3, 2, 2, 5, 2,
0, 1, 6, 9, 8, 9, 5, 3, 5, 9, 1, 9, 1, 1, 5, 6, 3, 2, 9, 3, 4, 6, 7,
0, 1, 0, 7, 5, 5, 3, 6, 1, 7, 6, 8, 4, 4, 7, 0, 3, 4, 8, 7, 5, 6, 2,
7, 2, 6, 9, 4, 1, 8, 0, 2, 4, 1, 5, 4, 0, 1, 3, 0, 0, 2, 3, 0, 5, 0,
8, 4, 6, 3, 9, 2, 0, 5, 9, 5, 5, 8, 7, 5, 1, 2, 4, 9, 0, 9, 7, 1, 4,
6, 1, 5, 9, 5, 0, 4, 1, 5, 9, 3, 1, 2, 8, 0, 6, 5, 0, 8, 1, 7, 5, 6,
9, 3, 6, 4, 9, 7, 6, 1, 0, 9, 0, 9, 8, 7, 7, 2, 3, 3, 5, 7, 7, 9, 7,
5, 9, 1, 9, 8, 6, 9, 4, 7, 5, 6, 7, 2, 7, 9, 6, 6, 7, 0, 1, 0, 9, 3,
6, 2, 6, 0, 2, 6, 1, 9, 9, 8, 6, 8, 9, 8, 9, 7, 4, 2, 3, 3, 6, 4, 0,
9, 7, 2, 5, 5, 6, 4, 6, 0, 3, 2, 5, 0, 2, 0, 2, 7, 2, 9, 2, 6, 0, 6,
6, 3, 2, 5, 5, 9, 1, 9, 3, 6, 3, 5, 3, 8, 0, 0, 3, 9, 2, 9, 4, 2, 3,
8, 6, 3, 1, 9, 6, 3, 8, 4, 8, 4, 7, 3, 5, 5, 4, 1, 1, 6, 1, 2, 2, 0,
7, 5, 0, 1, 0, 1, 4, 3, 3, 8, 4, 5, 9, 7, 1, 8, 6, 0, 4, 9, 6, 0, 1,
2, 1, 7, 7, 9, 8, 7, 3, 4, 0, 9, 0, 0, 8, 6, 8, 0, 9, 4, 8, 6, 2, 4,
6, 0, 7, 1, 5, 3, 7, 2, 2, 9, 8, 0, 0, 0, 6, 4, 2, 6, 9, 6, 3, 4, 2,
3, 1, 4, 0, 8, 0, 4, 3, 5, 7, 9, 7, 0, 5, 7, 7, 3, 1, 9, 3, 2, 3, 5,
7, 9, 9, 4, 4, 1, 7, 6, 1, 4, 1, 9, 8, 7, 0, 0, 0, 6, 2, 9, 7, 6, 8,
3, 5, 8, 9, 4, 6, 8, 3, 6, 4, 7, 1, 1, 3, 9, 7, 3, 1, 8, 8, 7, 8, 8,
6, 9, 3, 6, 7, 7, 8, 9, 0, 3, 4, 6, 7, 8, 2, 8, 1, 5, 3, 9, 3, 1, 3,
0, 8, 6, 7, 9, 6, 6, 4, 1, 9, 0, 7, 1, 8, 1, 8, 8, 6, 9, 0, 4, 7, 2,
0, 7, 7, 0, 1, 2, 6, 6, 5, 4, 7, 1, 7, 8, 4, 6, 6, 1, 6, 3, 6, 5, 8,
7, 6, 7, 1, 9, 5, 6, 4, 6, 0, 4, 1, 9, 3, 2, 4, 7, 7, 0, 5, 9, 1, 3,
6, 0, 2, 0, 9, 1, 8, 4, 6, 0, 4, 2, 3, 7, 7, 8, 3, 3, 3, 1, 6, 9, 5,
1, 0, 6, 8, 3, 2, 1, 2, 7, 9, 9, 8, 2, 2, 9, 7, 5, 0, 0, 3, 9, 7, 4,
3, 1, 6, 8, 6, 6, 8, 5, 4, 4, 6, 7, 7, 4, 6, 9, 6, 2, 2, 2, 5, 3, 6,
6, 9, 3, 6, 0, 7, 8, 7, 5, 9, 6, 8, 3, 2, 6, 3, 6, 5, 7, 4, 5, 7, 9,
0, 1, 6, 7, 8, 0, 5, 5, 1, 5, 3, 9, 4, 9, 4, 4, 2, 5, 6, 7, 1, 6, 4,
1, 6, 7, 0, 5, 9, 1, 9, 7, 3, 5, 4, 3, 9, 3, 5, 3, 0, 0, 0, 8, 0, 3,
2, 4, 9, 3, 7, 9, 6, 9, 8, 1, 2, 6, 7, 4, 7, 1, 3, 7, 1, 9, 3, 9, 7,
8, 6, 8, 5, 6, 5, 0, 8, 2, 8, 1, 8, 1, 5, 2, 9, 1, 6, 3, 6, 9, 2, 2,
7, 4, 7, 4, 8, 3, 4, 7, 5, 7, 3, 8, 5, 8, 0, 3, 2, 0, 5, 4, 3, 6, 1,
4, 5, 9, 4, 2, 8, 6, 0, 6, 1, 7, 1, 6, 3, 8, 5, 8, 7, 6, 7, 1, 0, 2,
3, 3, 6, 7, 1, 6, 0, 8, 3, 7, 2, 5, 7, 5, 7, 7, 1, 7, 4, 7, 3, 4, 0,
4, 2, 7, 0, 7, 5, 6, 6, 2, 5, 2, 6, 0, 8, 1, 5, 9, 0, 0, 1, 2, 5, 1,
6, 7, 8, 9, 6, 9, 3, 6, 0, 1, 9, 2, 6, 6, 8, 3, 6, 0, 3, 7, 8, 8, 3,

6, 8, 0, 2, 3, 2, 4, 4, 8, 9, 2, 6, 8, 9, 7, 9, 8, 7, 7, 3, 8, 6, 9,
3, 5, 7, 5, 8, 7, 3, 7, 0, 7, 9, 6, 2, 4, 1, 0, 2, 9, 8, 2, 8, 7, 4,
7, 6, 0, 1, 7, 9, 2, 1, 9, 1, 0, 6, 5, 2, 5, 7, 4, 4, 0, 6, 5, 4, 7,
0, 5, 2, 3, 5, 7, 6, 4, 0, 5, 4, 4, 6, 9, 5, 5, 2, 8, 4, 1, 4, 2, 6,
7, 6, 0, 5, 5, 8, 5, 2, 2, 1, 6, 5, 4, 1, 5, 8, 7, 2, 0, 1, 7, 4, 9,
6, 4, 7, 7, 5, 7, 2, 5, 4, 2, 1, 6, 9, 4, 8, 0, 5, 9, 6, 4, 4, 5, 1,
4, 6, 4, 0, 8, 9, 7, 6, 9, 4, 8, 1, 5, 6, 9, 0, 7, 1, 4, 5, 7, 1, 3,
6, 4, 7, 1, 3, 9, 2, 1, 0, 8, 5, 7, 1, 2, 5, 2, 6, 7, 7, 2, 4, 4, 4,
7, 6, 6, 1, 9, 9, 2, 9, 4, 4, 2, 9, 8, 5, 0, 6, 9, 0, 9, 7, 8, 0, 2,
3, 9, 8, 3, 2, 6, 9, 9, 7, 9, 9, 0, 2, 1, 1, 0, 6, 9, 9, 5, 6, 3, 3,
9, 7, 8, 7, 3, 4, 9, 7, 9, 8, 0, 2, 7, 8, 2, 0, 4, 0, 7, 0, 8, 0, 2,
0, 7, 4, 0, 6, 0, 4, 6, 5, 2, 6, 7, 8, 6, 9, 5, 6, 6, 3, 0, 5, 2, 4,
3, 3, 9, 0, 8, 3, 4, 2, 9, 6, 0, 3, 4, 8, 2, 8, 6, 5, 4, 8, 6, 0, 1,
8, 4, 4, 8, 4, 5, 8, 4, 0, 1, 9, 4, 0, 4, 4, 5, 5, 2, 8, 0, 0, 9, 4,
5, 2, 4, 6, 7, 2, 2, 3, 1, 0, 0, 2, 1, 2, 9, 4, 6, 7, 1, 0, 3, 6, 5,
9, 2, 5, 6, 7, 1, 9, 7, 6, 1, 0, 2, 9, 4, 2, 9, 2, 8, 2, 9, 8, 2, 1,
0, 1, 5, 3, 3, 6, 8, 8, 3, 2, 0, 4, 8, 3, 7, 0, 8, 3, 2, 2, 2, 9, 9,
8, 3, 1, 7, 3, 9, 9, 4, 7, 1, 6, 6, 7, 4, 0, 9, 0, 8, 1, 2, 6, 7, 3,
2, 4, 1, 9, 7, 5, 2, 4, 1, 1, 3, 6, 9, 2, 6, 8, 0, 8, 1, 3, 1, 5, 9,
0, 1, 2, 2, 0, 6, 9, 1, 1, 8, 4, 9, 5, 3, 2, 2, 3, 7, 1, 3, 9, 8, 7,
3, 8, 7, 6, 5, 2, 5, 8, 6, 7, 5, 0, 0, 7, 5, 6, 5, 5, 7, 6, 2, 8, 2,
7, 7, 6, 1, 5, 8, 6, 0, 5, 0, 4, 8, 5, 4, 0, 2, 5, 4, 9, 2, 4, 4, 6,
9, 2, 0, 5, 2, 0, 8, 2, 6, 4, 7, 9, 5, 7, 2, 2, 3, 1, 9, 9, 7, 4, 3,
1, 7, 1, 6, 3, 0, 0, 8, 5, 6, 9, 9, 9, 2, 3, 0, 8, 8, 5, 5, 4, 1, 1,
0, 7, 0, 4, 0, 7, 4, 6, 5, 3, 2, 9, 6, 6, 7, 7, 7, 7, 0, 8, 7, 2, 7,
7, 4, 4, 0, 3, 6, 0, 5, 3, 5, 2, 4, 9, 7, 3, 3, 2, 8, 8, 3, 5, 8, 0,
8, 0, 0, 0, 2, 4, 7, 0, 7, 7, 7, 3, 2, 0, 4, 0, 0, 7, 8, 3, 7, 9, 5,
9, 1, 6, 9, 3, 8, 9, 3, 8, 6, 1, 3, 2, 6, 5, 8, 4, 7, 3, 7, 9, 6, 0,
9, 8, 6, 5, 4, 1, 8, 4, 8, 4, 7, 9, 9, 2, 0, 9, 1, 3, 9, 6, 8, 1, 7,
1, 0, 8, 7, 6, 3, 5, 8, 1, 1, 2, 6, 1, 1, 1, 8, 8, 8, 9, 8, 0, 4, 4,
1, 3, 6, 6, 3, 1, 2, 7, 7, 8, 0, 1, 4, 8, 4, 6, 2, 2, 2, 6, 3, 6, 0,
8, 1, 3, 5, 3, 8, 9, 1, 6, 1, 9, 0, 3, 0, 4, 7, 4, 0, 0, 7, 6, 8, 9,
8, 6, 2, 8, 0, 8, 1, 1, 0, 7, 7, 4, 6, 5, 0, 2, 6, 6, 7, 4, 5, 3, 0,
9, 7, 7, 2, 5, 8, 2, 2, 7, 6, 2, 6, 4, 9, 4, 8, 9, 8, 5, 5, 2, 3, 4,
5, 9, 7, 5, 1, 8, 3, 7, 8, 8, 0, 3, 0, 0, 2, 6, 0, 8, 1, 4, 1, 3, 5,
1, 8, 9, 6, 2, 6, 9, 8, 6, 3, 9, 9, 4, 2, 9, 9, 5, 4, 7, 0, 3, 7, 9,
6, 9, 0, 9, 4, 0, 5, 1, 6, 3, 8, 2, 7, 5, 5, 2, 0, 2, 3, 9, 6, 4, 7,
0, 8, 9, 6, 2, 3, 7, 2, 5, 8, 8, 5, 8, 5, 7, 0, 4, 0, 0, 7, 0, 4, 0,
4, 4, 2, 6, 4, 0, 7, 2, 7, 0, 4, 9, 2, 9, 1, 1, 3, 8, 9, 1, 0, 6, 5,
4, 0, 9, 0, 6, 2, 2, 4, 1, 3, 7, 3, 1, 0, 4, 6, 0, 4, 7, 2, 7, 6, 2,
3, 5, 9, 2, 2, 2, 0, 6, 3, 4, 3, 2, 4, 5, 8, 1, 9, 3, 2, 8, 5, 8, 6,
6, 3, 4, 0, 2, 3, 2, 6, 1, 8, 6, 9, 4, 3, 2, 2, 3, 9, 5, 0, 2, 1, 2,
8, 0, 8, 3, 2, 7, 3, 7, 9, 8, 7, 6, 1, 1, 8, 6, 3, 5, 8, 9, 4, 8, 0,
0, 4, 9, 1, 8, 3, 7, 5, 8, 2, 9, 3, 8, 9, 6, 0, 9, 5, 4, 8, 9, 5, 5,
2, 3, 5, 8, 8, 1, 2, 3, 1, 3, 9, 2, 2, 0, 8, 2, 2, 1, 7, 2, 5, 6, 9,
6, 5, 5, 1, 1, 4, 7, 1, 3, 8, 1, 6, 0, 8, 0, 2, 6, 4, 6, 3, 1, 1, 7,
0, 6, 8, 9, 0, 6, 1, 0, 1, 1, 7, 2, 1, 5, 4, 5, 0, 3, 6, 0, 3, 8, 1,
8, 9, 3, 1, 5, 7, 7, 1, 2, 9, 9, 3, 1, 7, 4, 9, 8, 0, 2, 6, 0, 0, 5,
0, 6, 5, 3, 1, 1, 0, 0, 5, 6, 0, 3, 4, 6, 1, 4, 5, 9, 3, 3, 6, 5, 9,
8, 5, 1, 2, 0, 9, 7, 0, 0, 1, 3, 4, 5, 5, 9, 6, 3, 6, 2, 6, 8, 3, 5,

9, 9, 4, 9, 2, 2, 9, 6, 4, 4, 7, 6, 9, 6, 0, 1, 4, 6, 4, 2, 2, 6, 6,
0, 3, 2, 4, 5, 2, 5, 0, 4, 9, 4, 6, 7, 9, 8, 3, 2, 1, 4, 2, 4, 3, 5,
6, 8, 6, 0, 0, 9, 8, 9, 0, 7, 6, 6, 0, 2, 9, 8, 5, 9, 5, 3, 0, 7, 8,
6, 3, 9, 1, 3, 9, 1, 0, 7, 4, 4, 0, 2, 1, 9, 1, 8, 5, 8, 2, 7, 3, 1,
4, 3, 4, 1, 0, 3, 8, 8, 8, 1, 6, 3, 0, 8, 6, 9, 1, 3, 0, 7, 7, 1, 3,
5, 3, 9, 0, 4, 7, 9, 2, 6, 9, 6, 3, 6, 9, 4, 4, 0, 6, 8, 0, 9, 3, 3,
0, 1, 0, 0, 8, 6, 4, 3, 9, 8, 2, 2, 0, 5, 1, 1, 0, 8, 2, 6, 9, 4, 8,
4, 4, 6, 5, 2, 6, 9, 0, 0, 7, 1, 8, 9, 5, 9, 9, 0, 7, 7, 4, 4, 8, 4,
4, 2, 7, 7, 8, 7, 4, 6, 2, 2, 4, 4, 0, 3, 1, 5, 0, 6, 0, 0, 2, 2, 8,
4, 7, 4, 3, 5, 0, 9, 1, 0, 0, 3, 5, 9, 2, 9, 9, 6, 4, 5, 0, 8, 3, 1,
6, 6, 4, 1, 4, 4, 1, 5, 0, 0, 4, 5, 8, 4, 8, 3, 0, 7, 0, 3, 6, 9, 5,
0, 0, 9, 1, 5, 7, 6, 5, 4, 5, 6, 0, 0, 1, 7, 3, 1, 9, 2, 4, 1, 6, 7,
8, 7, 0, 9, 6, 2, 0, 2, 5, 8, 1, 7, 7, 0, 2, 7, 7, 8, 8, 7, 0, 0, 8,
1, 4, 0, 5, 7, 7, 6, 2, 3, 1, 0, 3, 3, 2, 2, 5, 1, 2, 0, 0, 7, 9, 3,
8, 7, 3, 1, 7, 4, 3, 2, 6, 0, 9, 5, 9, 6, 9, 7, 4, 4, 0, 3, 7, 9, 5,
4, 0, 8, 4, 9, 8, 7, 8, 4, 2, 3, 4, 0, 5, 4, 1, 0, 2, 5, 6, 5, 4, 2,
3, 7, 9, 4, 1, 4, 9, 5, 6, 4, 2, 5, 8, 7, 1, 3, 8, 9, 2, 3, 7, 0, 6,
3, 3, 7, 7, 5, 8, 9, 4, 6, 3, 6, 6, 8, 3, 6, 7, 8, 4, 1, 5, 9, 2, 3,
9, 0, 1, 6, 7, 2, 0, 2, 4, 3, 1, 4, 4, 4, 4, 9, 5, 5, 7, 6, 5, 4, 5,
6, 5, 6, 2, 4, 3, 5, 4, 6, 3, 0, 2, 3, 9, 1, 3, 8, 0, 7, 0, 6, 8, 1,
7, 8, 9, 1, 5, 4, 2, 5, 5, 0, 0, 6, 5, 0, 3, 4, 1, 3, 5, 7, 7, 4, 0,
4, 3, 9, 3, 1, 7, 6, 9, 4, 8, 4, 1, 5, 8, 6, 3, 3, 3, 3, 0, 4, 8, 7,
8, 9, 3, 8, 4, 4, 9, 1, 0, 3, 9, 6, 8, 0, 4, 8, 3, 6, 9, 2, 7, 2, 0,
3, 2, 8, 7, 5, 0, 7, 0, 7, 5, 3, 3, 8, 7, 3, 9, 6, 9, 0, 1, 6, 1, 9,
4, 9, 0, 9, 4, 2, 5, 8, 5, 9, 1, 2, 8, 0, 6, 6, 8, 6, 9, 2, 1, 1, 5,
3, 3, 0, 7, 6, 1, 4, 4, 1, 1, 8, 9, 1, 2, 2, 4, 9, 9, 3, 2, 7, 4, 5,
6, 1, 6, 9, 8, 8, 6, 7, 4, 7, 2, 1, 8, 0, 9, 0, 7, 8, 1, 2, 2, 8, 4,
2, 9, 0, 4, 8, 9, 6, 5, 6, 8, 4, 1, 0, 6, 1, 8, 4, 5, 2, 5, 0, 8, 9,
0, 2, 7, 9, 6, 5, 4, 6, 4, 8, 5, 1, 2, 7, 7, 8, 0, 2, 5, 9, 8, 1, 9,
7, 5, 3, 1, 6, 9, 1, 0, 8, 8, 1, 9, 3, 8, 9, 3, 1, 1, 6, 1, 7, 5, 6,
4, 6, 9, 6, 0, 1, 3, 9, 5, 8, 1, 8, 6, 9, 1, 4, 6, 8, 5, 0, 3, 7, 7,
9, 4, 5, 0, 2, 3, 3, 9, 8, 9, 9, 2, 7, 1, 3, 3, 6, 9, 1, 7, 7, 1, 9,
5, 8, 1, 9, 9, 6, 9, 8, 2, 0, 2, 6, 0, 2, 2, 4, 0, 8, 4, 8, 1, 5, 7,
4, 4, 9, 6, 2, 2, 9, 4, 4, 3, 4, 2, 5, 6, 6, 9, 3, 2, 1, 8, 6, 5, 0,
8, 0, 3, 1, 7, 6, 8, 8, 6, 6, 0, 7, 9, 8, 0, 7, 0, 9, 6, 0, 4, 7, 1,
7, 8, 8, 2, 4, 9, 6, 5, 6, 3, 1, 5, 3, 0, 3, 2, 2, 7, 4, 8, 4, 7, 6,
1, 9, 4, 1, 7, 0, 1, 0, 3, 0, 2, 9, 4, 5, 0, 3, 3, 7, 0, 6, 0, 1, 4,
4, 9, 9, 0, 7, 5, 6, 7, 1, 2, 3, 7, 4, 6, 8, 6, 9, 8, 7, 9, 4, 3, 4,
0, 2, 5, 6, 6, 5, 9, 6, 8, 3, 4, 2, 9, 5, 6, 3, 8, 6, 1, 8, 6, 3, 8,
6, 5, 9, 0, 4, 3, 0, 5, 9, 9, 3, 8, 0, 6, 0, 2, 0, 7, 1, 4, 6, 9, 1,
8, 0, 4, 7, 9, 6, 1, 7, 5, 0, 7, 2, 8, 0, 5, 0, 0, 7, 0, 4, 1, 3, 4,
0, 9, 2, 6, 7, 2, 0, 0, 0, 7, 3, 3, 5, 2, 6, 2, 7, 8, 2, 0, 0, 1, 3,
6, 7, 8, 0, 6, 0, 9, 1, 6, 3, 1, 0, 1, 6, 0, 6, 7, 9, 1, 2, 7, 5, 7,
1, 6, 6, 9, 8, 1, 4, 4, 0, 1, 7, 9, 9, 2, 1, 1, 3, 4, 6, 9, 8, 5, 2,
0, 1, 7, 3, 0, 6, 5, 6, 9, 2, 8, 9, 5, 0, 3, 7, 2, 0, 0, 9, 1, 2, 8,
7, 1, 1, 2, 2, 6, 2, 9, 1, 2, 6, 1, 6, 1, 8, 9, 2, 8, 1, 9, 9, 3, 4,
3, 0, 0, 2, 7, 7, 1, 7, 7, 4, 8, 6, 3, 5, 5, 1, 6, 2, 4, 8, 4, 3, 3,
5, 9, 8, 8, 6, 1, 0, 6, 3, 0, 9, 6, 0, 0, 8, 7, 1, 2, 6, 9, 1, 6, 2,
2, 1, 0, 2, 0, 6, 5, 8, 3, 8, 2, 0, 4, 0, 8, 3, 6, 1, 7, 3, 0, 5, 0,
4, 1, 7, 0, 0, 1, 3, 9, 1, 6, 1, 6, 1, 2, 3, 7, 0, 9, 5, 7, 8, 0, 1,

7, 9, 7, 1, 9, 2, 9, 9, 0, 3, 6, 0, 2, 0, 0, 9, 9, 8, 9, 2, 2, 3, 2,
0, 7, 8, 7, 5, 3, 3, 4, 6, 3, 9, 5, 2, 6, 5, 7, 9, 6, 7, 0, 4, 1, 2,
3, 1, 1, 3, 6, 8, 9, 7, 7, 0, 8, 1, 5, 2, 9, 5, 6, 6, 3, 3, 9, 8, 8,
2, 8, 0, 3, 1, 7, 8, 3, 9, 3, 2, 6, 3, 8, 8, 6, 3, 2, 0, 9, 1, 3, 3,
7, 9, 9, 9, 8, 3, 9, 9, 6, 8, 8, 4, 1, 1, 0, 1, 8, 8, 6, 5, 9, 0, 6,
1, 2, 6, 6, 6, 5, 6, 3, 3, 3, 3, 4, 9, 9, 4, 4, 3, 0, 5, 6, 0, 8, 5,
7, 0, 4, 6, 5, 5, 9, 8, 9, 8, 4, 1, 3, 3, 4, 3, 3, 2, 7, 7, 8, 4, 0,
5, 3, 6, 1, 1, 3, 9, 6, 6, 9, 7, 1, 8, 3, 0, 3, 7, 8, 8, 0, 3, 5, 4,
1, 7, 8, 7, 1, 8, 7, 6, 5, 4, 4, 5, 8, 6, 1, 1, 6, 3, 2, 2, 1, 9, 8,
3, 3, 8, 1, 4, 0, 5, 2, 0, 3, 2, 4, 8, 6, 3, 1, 6, 0, 5, 0, 7, 8, 6,
3, 3, 1, 1, 2, 9, 2, 8, 5, 5, 8, 7, 1, 5, 8, 0, 3, 1, 3, 3, 5, 4, 3,
8, 9, 4, 2, 4, 5, 4, 3, 8, 9, 6, 3, 6, 5, 3, 3, 7, 7, 4, 2, 9, 7, 4,
5, 8, 7, 8, 5, 2, 9, 1, 6, 5, 3, 3, 3, 8, 5, 6, 0, 3, 7, 9, 6, 1, 6,
7, 9, 2, 6, 7, 4, 9, 1, 8, 0, 6, 7, 8, 4, 3, 0, 6, 9, 6, 6, 2, 6, 2,
1, 8, 4, 4, 7, 8, 5, 8, 9, 6, 3, 4, 3, 8, 3, 0, 1, 1, 1, 1, 6, 8, 7,
1, 3, 4, 4, 5, 9, 5, 0, 6, 2, 2, 9, 8, 2, 8, 3, 8, 2, 9, 6, 0, 3, 9,
8, 2, 6, 2, 9, 6, 3, 6, 9, 2, 5, 4, 9, 8, 5, 3, 9, 9, 3, 7, 1, 8, 3,
8, 6, 7, 5, 1, 3, 0, 4, 1, 9, 2, 4, 1, 7, 1, 4, 4, 5, 9, 8, 7, 2, 3,
6, 1, 5, 3, 6, 9, 8, 8, 2, 7, 4, 6, 4, 5, 3, 7, 2, 3, 1, 0, 1, 0, 4,
2, 9, 1, 3, 7, 9, 2, 1, 1, 0, 4, 1, 9, 4, 8, 1, 8, 8, 5, 9, 0, 1, 6,
7, 2, 9, 9, 7, 8, 8, 1, 3, 7, 8, 8, 1, 6, 6, 3, 3, 1, 3, 9, 8, 8, 3,
6, 6, 7, 0, 0, 7, 6, 4, 1, 6, 0, 6, 6, 8, 6, 6, 9, 1, 8, 6, 5, 0, 5,
4, 3, 2, 1, 7, 8, 6, 7, 8, 7, 0, 8, 7, 6, 6, 7, 0, 4, 4, 9, 8, 6, 5,
1, 5, 8, 6, 8, 9, 9, 4, 7, 6, 3, 0, 6, 0, 1, 3, 1, 8, 5, 6, 4, 3, 3,
0, 1, 6, 6, 1, 8, 8, 6, 2, 7, 4, 3, 8, 9, 6, 4, 3, 7, 2, 1, 4, 1, 9,
5, 3, 7, 7, 7, 5, 2, 8, 2, 6, 6, 6, 4, 0, 7, 1, 7, 6, 0, 7, 1, 7, 4,
1, 6, 2, 2, 9, 1, 4, 8, 7, 6, 3, 0, 7, 3, 3, 1, 3, 3, 0, 4, 3, 4, 9,
3, 7, 9, 1, 7, 0, 5, 1, 8, 3, 0, 5, 7, 3, 7, 9, 6, 8, 2, 8, 3, 5, 9,
0, 4, 8, 5, 4, 5, 6, 8, 0, 4, 8, 6, 7, 2, 4, 1, 7, 2, 1, 6, 4, 5, 0,
8, 7, 2, 0, 3, 4, 7, 6, 8, 9, 0, 3, 5, 4, 1, 1, 7, 2, 3, 3, 7, 4, 3,
2, 0, 9, 8, 1, 5, 3, 2, 6, 9, 9, 6, 5, 7, 3, 6, 2, 3, 9, 7, 8, 0, 8,
9, 1, 0, 5, 7, 2, 0, 3, 6, 1, 2, 3, 1, 5, 0, 0, 7, 4, 6, 5, 5, 4, 8,
3, 2, 5, 5, 0, 6, 6, 7, 3, 0, 9, 9, 6, 1, 0, 7, 6, 7, 2, 9, 2, 6, 6,
6, 2, 1, 0, 1, 9, 1, 7, 3, 3, 0, 0, 7, 6, 7, 3, 1, 8, 2, 1, 0, 9, 6,
6, 6, 8, 8, 4, 1, 8, 1, 7, 0, 4, 8, 3, 2, 6, 4, 3, 9, 1, 0, 7, 2, 8,
4, 0, 9, 6, 2, 2, 4, 0, 5, 9, 7, 1, 8, 9, 6, 5, 9, 2, 5, 7, 8, 9, 9,
8, 9, 1, 6, 3, 1, 0, 3, 4, 4, 8, 4, 8, 9, 8, 6, 0, 0, 8, 0, 0, 4, 2,
7, 6, 0, 5, 8, 7, 1, 9, 0, 1, 4, 5, 8, 4, 9, 6, 0, 7, 7, 6, 8, 7, 2,
2, 0, 4, 9, 2, 9, 2, 9, 2, 6, 5, 0, 9, 7, 8, 3, 3, 0, 6, 3, 7, 1, 9,
4, 6, 7, 9, 8, 3, 9, 4, 1, 0, 7, 6, 1, 0, 0, 5, 6, 0, 2, 3, 3, 8, 8,
0, 6, 2, 5, 2, 8, 2, 3, 6, 5, 9, 4, 2, 5, 6, 0, 6, 3, 2, 4, 1, 0, 5,
9, 8, 9, 7, 5, 9, 3, 8, 1, 6, 4, 7, 5, 6, 1, 0, 6, 5, 6, 1, 7, 7, 8,
1, 0, 8, 9, 7, 6, 6, 8, 8, 5, 9, 5, 8, 4, 2, 0, 9, 5, 4, 7, 4, 9, 4,
6, 5, 3, 1, 0, 2, 0, 0, 4, 9, 6, 3, 8, 0, 3, 8, 6, 4, 8, 5, 3, 9, 7,
9, 7, 9, 0, 1, 9, 6, 1, 4, 3, 9, 6, 4, 0, 6, 4, 4, 8, 3, 7, 3, 8, 5,
9, 0, 5, 3, 3, 4, 7, 6, 5, 6, 5, 9, 0, 6, 9, 9, 8, 7, 7, 4, 8, 6, 8,
2, 3, 1, 0, 4, 1, 8, 8, 4, 9, 4, 4, 4, 3, 9, 2, 0, 1, 8, 9, 4, 4, 8,
3, 9, 8, 5, 7, 6, 6, 5, 4, 7, 3, 0, 0, 0, 9, 5, 6, 5, 0, 6, 0, 4, 0,
2, 5, 6, 3, 8, 9, 3, 6, 1, 4, 5, 4, 3, 7, 2, 8, 9, 2, 0, 4, 9, 8, 8,
9, 1, 1, 5, 0, 0, 8, 7, 1, 7, 6, 2, 4, 3, 7, 2, 2, 6, 6, 8, 1, 3, 9,

```

8, 3, 7, 8, 8, 4, 8, 9, 8, 1, 7, 1, 6, 2, 9, 3, 3, 0, 3, 9, 0, 7, 7,
9, 6, 8, 4, 9, 3, 3, 2, 4, 1, 8, 2, 0, 9, 2, 9, 8, 8, 6, 7, 3, 7, 1,
3, 9, 0, 9, 2, 9, 4, 9, 5, 3, 0, 3, 9, 7, 5, 5, 0, 6, 3, 1, 8, 1, 7,
3, 9, 0, 0, 2, 8, 8, 4, 5, 7, 8, 9, 0, 2, 9, 7, 8, 7, 9, 8, 5, 4, 0,
7, 7, 2, 3, 8, 2, 9, 9, 6, 3, 3, 1, 5, 7, 8, 7, 3, 3, 4, 5, 9, 7, 6,
7, 4, 3, 4, 5, 9, 4, 2, 1, 9, 6, 0, 3, 6, 7, 4, 7, 9, 0, 7, 4, 5, 3,
3, 1, 1, 3, 6, 8, 2, 1, 2, 8, 5, 0, 6, 1, 8, 5, 0, 6, 0, 9, 0, 3, 0,
2, 9, 3, 5, 6, 2, 9, 1, 8, 8, 8, 7, 1, 7, 4, 2, 4, 9, 7, 3, 3, 9, 9,
4, 6, 2, 1, 3, 8, 7, 9, 0, 6, 5, 7, 2, 6, 8, 7, 6, 9, 2, 1, 3, 8, 3,
6, 6, 9, 5, 7, 8, 0, 3, 4, 7, 3, 1, 2, 6, 9, 3, 7, 2, 6, 4, 1, 3, 4,
4, 3, 1, 3, 3, 7, 5, 7, 7, 0, 8, 4, 4, 2, 7, 3, 3, 4, 5, 0, 6, 8, 8,
3, 6, 1, 6, 1, 7, 0, 3, 4, 0, 9, 4, 2, 8, 9, 7, 0, 9, 6, 8, 0, 8, 2,
8, 5, 7, 7, 2, 2, 0, 0, 7, 7, 2, 1, 6, 6, 8, 8, 9, 0, 9, 0, 1, 2, 6,
0, 9, 6, 6, 6, 6, 4, 7, 0, 8, 7, 1, 7, 0, 3, 4, 9, 9, 9, 9, 9, 1, 2,
4, 5, 4, 2, 9, 3, 0, 9, 6, 6, 8, 0, 6, 9, 4, 6, 9, 0, 5, 4, 9, 2, 0,
9, 6, 4, 3, 4, 6, 5, 9, 7, 7, 4, 6, 5, 0, 1, 0, 0, 3, 9, 9, 0, 9, 4,
8, 6, 7, 6, 8, 5, 4, 5, 3, 0, 3, 2, 1, 7, 5, 0, 3, 4, 3, 9, 1, 5, 3,
1, 1, 9, 3, 7, 5, 4, 9, 7, 8, 5, 8, 2, 0, 5, 9, 7, 0, 1, 4, 8, 7, 4,
6, 6, 4, 8, 1, 8, 7, 6, 7, 9, 2, 0, 1, 2, 9, 1, 6, 7, 2, 1, 1, 4, 6,
3, 2, 2, 5, 3, 0, 0, 9, 1, 7, 5, 3, 3, 8, 7, 5, 6, 7, 8, 0, 3, 9, 2,
6, 3, 1, 1, 0, 5, 3, 9, 4, 8, 9, 7, 7, 1, 9, 4, 3, 6, 2, 3, 0, 3, 7,
6, 7, 0, 2, 9, 2, 9, 2, 6, 9, 6, 9, 0, 1, 8, 7, 9, 0, 4, 7, 4, 4, 6,
9, 5, 9, 9, 7, 4, 2, 8, 1, 4, 4, 9, 9, 8, 0, 6, 9, 7, 0, 8, 9, 0, 2,
6, 6, 2, 9, 7, 4, 8, 8, 4, 6, 1, 3, 5, 9, 1, 9, 3, 0, 0, 3, 0, 4, 8,
7, 6, 9, 5, 7, 7, 9, 5, 9, 5, 6, 1, 6, 4, 0, 4, 7, 8, 4, 4, 0, 9, 3,
9, 2, 6, 3, 6, 6, 3, 2, 2, 8, 0, 1, 8, 1, 3, 0, 6, 7, 9, 0, 4, 9, 1,
5, 7, 1, 3, 0, 1, 2, 0, 8, 1, 8, 3, 5, 1, 8, 1, 8, 2, 1, 9, 0, 3, 8,
4, 0, 3, 9, 2, 0, 4, 9, 5, 1, 2, 2, 7, 8, 7, 8, 4, 3, 7, 3, 8, 4, 1,
3, 9, 8, 0, 2, 0, 4, 6, 0, 6, 9, 7, 5, 1, 4, 6, 0, 6, 0, 6, 0, 1, 9,
8, 9, 7, 5, 9, 0, 9, 2, 9, 0, 2, 2, 3, 7, 9, 1, 7, 1, 8, 4, 5, 0, 0,
0, 3, 5, 2, 0, 4, 6, 8, 0, 3, 8, 8, 6, 6, 0, 1, 1, 1, 8, 1, 4, 9, 0,
7, 8, 2, 1, 2, 9, 2, 6, 0, 6, 2, 0, 4, 4, 9, 5, 8, 9, 0, 8, 2, 7, 1,
8, 4, 9, 5, 3, 9, 7, 7, 7, 7, 0, 3, 8, 3, 6, 0, 5, 7, 0, 8, 0, 0, 9,
3, 0, 3, 4, 0, 4, 2, 6, 4, 5, 0, 2, 9, 3, 0, 1, 7, 5, 6, 4, 3, 0, 7,
6, 2, 7, 3, 0, 0, 8, 4, 7, 0, 3, 3, 3, 3, 6, 5, 1, 7]

```

###CONFUSION MATRIX

```

from sklearn.metrics import confusion_matrix,classification_report

```

```

cm=confusion_matrix(y_test,ypred_m1)
print(cm)
print(classification_report(y_test,ypred_m1))

```

```

[[792  15  31  10   9   5  10  16  71  41]
 [ 19 801   1   8   3   4   8   3  39 114]
 [ 87  10 537  63  96  50  76  36  23  22]
 [ 36  12  61 542  68 100  80  37  27  37]
 [ 34   6  70  60 654  14  64  77  16   5]

```

[	15	4	55	220	39	532	50	54	17	14]					
[	6	4	48	47	38	11	817	4	8	17]					
[	24	7	33	37	54	39	10	771	9	16]					
[	72	22	10	11	4	4	8	7	838	24]					
[	40	60	8	13	2	2	12	7	33	823]]					
											precision	recall	f1-score	support	
											0	0.70	0.79	0.75	1000
											1	0.85	0.80	0.83	1000
											2	0.63	0.54	0.58	1000
											3	0.54	0.54	0.54	1000
											4	0.68	0.65	0.66	1000
											5	0.70	0.53	0.60	1000
											6	0.72	0.82	0.77	1000
											7	0.76	0.77	0.77	1000
											8	0.78	0.84	0.81	1000
											9	0.74	0.82	0.78	1000
											accuracy			0.71	10000
											macro avg	0.71	0.71	0.71	10000
											weighted avg	0.71	0.71	0.71	10000