```python
#PROGRAM 3
#Using Numpy,pandas and Matplotlib demonstrate the following operations for t
he
#sample dataset given,
#i)Central tendency(mean,mode,median)
#ii)  Dispersion and Distribution(variance,SD)
#iii) ANOVA
#iv)  Hypothesis testing- z test


#i)   Central tendency : central location
#a. mean()
import statistics as st
nums=[1,2,3,5,5,9,9,9]
st.mean(nums)

5.375

#b.Mode: most common value
st.mode(nums)

9

#c median:  odd length-  middle item, even- average of two middle
st.median(nums)

5.0

#ii) Dispersion and Distribution: Dispersion/spread - how the data strays fro
m the typical value.
#1. variance()
st.variance(nums)

10.839285714285714

# 2. Standered Deviation
st.stdev(nums)

3.1847852585154217

import pandas as pd
df=pd.DataFrame(nums)
df.std()

0    3.292307
dtype: float64
```

iii)ANOVA(Hypothesis Testing): Analysis of variance in more than one group one-way ANOVA has the below given null and alternative hypotheses: H0 (null hypothesis): means of all the population are equal H1 (alternative hypothesis): there will be at least one population mean that differs from the rest

```python
# Importing library
from scipy.stats import f_oneway

# Performance when each of the engine
# oil is applied
performance1 = [89, 89, 88, 78, 79]
performance2 = [93, 92, 94, 89, 88]
performance3 = [89, 88, 89, 93, 90]
performance4 = [81, 78, 81, 92, 82]

# Conduct the one-way ANOVA
f_oneway(performance1, performance2, performance3, performance4)

F_onewayResult(statistic=4.625000000000002, pvalue=0.016336459839780215)

import math
import numpy as np
from numpy.random import randn
from statsmodels.stats.weightstats import ztest

# Generate a random array of 50 numbers having mean 110 and sd 15
# similar to the IQ scores data we assume above
mean_iq = 110
sd_iq = 15/math.sqrt(50)
alpha =0.05
null_mean =100
data = sd_iq*randn(50)+mean_iq
# print mean and sd
print('mean=%.2f stdv=%.2f' % (np.mean(data), np.std(data)))

# now we perform the test. In this function, we passed data, in the value par
ameter
# we passed mean value in the null hypothesis, in alternative hypothesis we c
heck whether the
# mean is larger

ztest_Score, p_value= ztest(data,value = null_mean, alternative='larger')
# the function outputs a p_value and z-score corresponding to that value, we
compare the
# p-value with alpha, if it is greater than alpha then we do not null hypothe
sis
# else we reject it.

if(p_value <  alpha):
  print("Reject Null Hypothesis")
else:
  print("Fail to Reject NUll Hypothesis")

mean=110.03 stdv=2.25
Reject Null Hypothesis
```