In [32]:

```
#Question 1
#Defining two (A, B) 3 × 3 and two (C, D) 1 × 3 matrices and store them in multiple fil
es. Find C·D, AB and CA, BD.



#Calling the Reserved matrices only from .txt files
list_A=[]
list_B=[]
list_C=[]
list_D=[]
with open("matrixA.txt") as matA, open("matrixB.txt") as matB, open("matrixC.txt") as m
atC, open("matrixD.txt") as matD:
    for k in matA:
        list_A.append(list(map(float, k.split())))
    for m in matB:
        list_B.append(list(map(float, m.split())))
    for n in matC:
        list_C.append(list(map(float, n.split())))
    for p in matD:
        list_D.append(list(map(float, p.split())))

#Here A and B both are 3*3 matrices

#Printing the matrices
print("\nMatrix A is ")
for k in list_A:
    print(k)

print("\nMatrix B is ")
for m in list_B:
    print(m)

print("\nMatrix C is ",list_C)
print("Matrix D is ",list_D)

#Storing variable
AB_ = [[0,0,0],[0,0,0],[0,0,0]] #Finding the product AB

for i in range(len(list_A)):
        for j in range(len(list_B[2])):#expanding along the coloumn 2 of B matrix
            for k in range(len(list_B)):
                AB_[i][j] += list_A[i][k]*list_B[k][j]
print("\nThe product of AB is ")
for l in AB_:# Calculating AB matrix
    print(l)




C_D=[0,0,0] # Finding the product of C.D
num=0
for i in range(len(list_C)):
     C_D[i] = list_C[i][0]*list_D[i][0]
     num+=C_D[i]
print("\nThe dot product of C.D is")
print(num)
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CA_ = [0,0,0] # Finding the product of CA

for i in range(len(list_C)):
    for k in range(len(list_A)):
        CA_[i] += list_C[i][0]*list_A[i][k]
print("\nThe product of CA is ")
for l in CA_:# Calculating AB matrix
    print(l)

BD_ = [0,0,0] #Finding the product BD

for i in range(len(list_B)):
    for k in range(len(list_D)):
        BD_[i] += list_B[i][k]*list_D[k][0]
print("\nThe product of BD is ")
print(BD_)
```

```
Matrix A is
[1.0, 0.0, 0.0]
[0.0, 1.0, 5.0]
[4.0, 0.0, 1.0]

Matrix B is
[1.0, 0.0, 1.0]
[2.0, 0.0, 2.0]
[0.0, 0.0, 3.0]

Matrix C is  [[1.0], [2.0], [3.0]]
Matrix D is  [[1.0], [5.0], [6.0]]

The product of AB is
[1.0, 0.0, 1.0]
[2.0, 0.0, 17.0]
[4.0, 0.0, 7.0]

The dot product of C.D is
29.0

The product of CA is
1.0
12.0
15.0

The product of BD is
[7.0, 14.0, 18.0]
```

In [12]:

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#Question 2
#Define your own class / structure myComplex and calculate the sum, product and divisio
n of two complex numbers. Also calculate the conjugate, modulus and phase angle of a co
mplex number.

#Importing math for phase angle calculation
import math
class Complex: #Creating a class
    def __init__(self,Real,Im): #Defining variables
        self.Real = Real
        self.Im = Im
    def conjugate(self):
        return Complex(self.Real, -self.Im)
    def modulus(self):

        return (((self.Real**2) + (self.Im**2))**0.5)
    def phase_angle(self):
        if self.Real==0 and self.Im==0:
            print("Undefined")
        else:
            return (math.atan2(self.Im,self.Real))


    def addition(first,second):#Defining addition
        return Complex(first.Real + second.Real, first.Im + second.Im)
    def subtraction(first,second):#Defining difference
        return Complex(first.Real - second.Real, first.Im - second.Im)
    def multiplication(first,second):#Defining multiplication
        return Complex((first.Real*second.Real)+(-first.Im*second.Im),(first.Real*secon
d.Im)+(first.Im*second.Real))
    def division(first,second):#Defining Division
        abs_2 = (second.Real**2 + second.Im**2)
        if second.Real==0 and second.Im==0:
            print("Z2 can't be 0")
        else:
            return Complex((first.Real*second.Real + first.Im*second.Im)/abs_2,
        (first.Im*second.Real - first.Real*second.Im)/abs_2)
    def print(self): #Printing the complex numbers
        if (self.Im < 0):
            return str(self.Real)+" - "+str(abs(self.Im))+"i"
        elif(self.Im == 0):
            return self.Real
        else:
            return str(self.Real)+" + "+str(self.Im)+"i"

#Inputs
Z1 = Complex(5,12)

Z2 = Complex(3,4)

#Outputs
print("\nThe input complex no. Z1 is :", Z1.print())
print("\nThe input complex no. Z2 is  :", Z2.print())
print("\nThe conjugate of Z1 is, Z1* :", Z1.conjugate().print())
print("\nThe conjugate of Z2 is, Z2* :", Z2.conjugate().print())



print("\nThe phase angle of the complex number Z1 is:", str(Z1.phase_angle())+" radians
```

```
or",str((180/math.pi)*(Z1.phase_angle()))+" degrees." )
print("\nThe phase angle of the complex number Z2 is:", str(Z2.phase_angle())+" radians
or",str((180/math.pi)*(Z2.phase_angle()))+" degrees." )
print("\nThe Modulus of the complex number Z1 is:", Z1.modulus())
print("\nThe Modulus of the complex number Z2 is:", Z2.modulus())


print("\n The Sum of two complex no. Z1,Z2 is (Z1 + Z2) = ", Z1.addition(Z2).print())
print("\nThe difference between  two complex no. Z1,Z2 is (Z1 - Z2) = ", Z1.subtraction
(Z2).print())
print("\nThe product of two complex no. Z1,Z2 is Z1 x Z2 = ", Z1.multiplication(Z2).pri
nt())
print("\nThe division of two complex no. Z1,Z2 is Z1 / Z2 :", Z1.division(Z2).print())
```

```
The input complex no. Z1 is : 5 + 12i

The input complex no. Z2 is  : 3 + 4i

The conjugate of Z1 is, Z1* : 5 - 12i

The conjugate of Z2 is, Z2* : 3 - 4i

The phase angle of the complex number Z1 is: 1.176005207095135 radians or
67.38013505195957 degrees.

The phase angle of the complex number Z2 is: 0.9272952180016122 radians or
53.13010235415598 degrees.

The Modulus of the complex number Z1 is: 13.0

The Modulus of the complex number Z2 is: 5.0

 The Sum of two complex no. Z1,Z2 is (Z1 + Z2) =  8 + 16i

The difference between  two complex no. Z1,Z2 is (Z1 - Z2) =  2 + 8i

The product of two complex no. Z1,Z2 is Z1 x Z2 =  -33 + 56i

The division of two complex no. Z1,Z2 is Z1 / Z2 : 2.52 + 0.64i
```

In [13]:

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#Question 3
#Find the average distance between two points on a straight line made of N discrete equ
idistant points.


def Average_distance(N): #Defining the input
    k=0
    Distant=0
    #introducing two nested for loops, 'i' will change the reference points and j will
 continuously jump from 1,2,3....,N-1
    for i in range (N):
        for j in range(N):
            k+=1
            Distant+=abs(j-i) #for each iteration the absolute value of the distance wi
ll add with it's previous one
    return (Distant/k)      #Diving by the total no. of iteration for calculating the a
verage.
```

In [14]:

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Average_distance(3)# for N=3 points
```

Out[14]:

```
0.8888888888888888
```

In [15]:

```
Average_distance(7)# for N=7 points
```

Out[15]:

```
2.2857142857142856
```

In [16]:

```
Average_distance(2)# for N=2 points
```

Out[16]:

```
0.5
```

In [17]:

```
Average_distance(10)# for N=10 points
```

Out[17]:

```
3.3
```

In [18]:

```
Average_distance(4)# for N=4 points
```

Out[18]:

```
1.25
```

In [8]:

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#Question 4
#Creating a hangman game of 24 countries that played in the last 2019 FIFA women's Worl
d Cup football final and their capital cities, guessing the capital cities offering 40%
of the word length as (integer) number of chances for wrong guess.

#importing random and math
import random
import math

with open("Wordlist_FIFA_Hangman.txt",'r') as f: #Calling the .txt file where all the 2
4 capitals had been stored
    wordlist = f.readlines()

Choice_Words = random.choice(wordlist)[:-1] # Creating a variable which will select ran
dom words from the file
Your_Guess =[]
l=len(Choice_Words) #length of word


Guessing_errors = math.ceil(l*0.4) # As no wrong Guesses is 40% of total word length
print("There are 24 countries that had been participated in 2019 FIFA Womens' World Cu
p,The game is about to guess their capitals, You've",Guessing_errors,  "chances to gues
s the capital correctly, BEST OF LUCK!")


done = False
while not done:
    for letter in Choice_Words:
        if letter.lower() in Your_Guess:
            print(letter,end=" ")
        else:
            print("_", end=" ")
    print("")


    guess = input(f"Allowed errors left for guessing the word {Guessing_errors}, Next G
uess:'")


    Your_Guess.append(guess.lower())
    if guess.lower() not in Choice_Words.lower():
        Guessing_errors-=1
        if Guessing_errors==0:
            break



    done = True
    for letter in Choice_Words:
        if letter.lower() not in Your_Guess:
            done = False

if done:
    print("Congratulations! you won! ,You guessed the word correctly ! The word was", C
hoice_Words  )
else:
    print ("Game over! You've reached maximum no. of attempts, the word was",Choice_Wor
ds)
```

```
There are 24 countries that had been participated in 2019 FIFA Womens' Wor
ld Cup,The game is about to guess their capitals, You've 4 chances to gues
s the capital correctly, BEST OF LUCK!
_ _ _ _ _ _ _ _
_ _ _ _ _ _ _ _
_ _ _ _ _ _ o _
_ _ _ _ _ t o _
_ _ _ _ _ t o _
_ _ n _ _ t o n
_ _ n _ _ t o n
Game over! You've reached maximum no. of attempts, the word was Kingston
```

In [11]:

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#Running the function again for showing another output

import random
import math

with open("Wordlist_FIFA_Hangman.txt",'r') as f: #Calling the .txt file where all the 2
4 capitals had been stored
    wordlist = f.readlines()

Choice_Words = random.choice(wordlist)[:-1] # Creating a variable which will select ran
dom words from the file
Your_Guess =[]
l=len(Choice_Words) #length of word


Guessing_errors = math.ceil(l*0.4) # As no wrong Guesses is 40% of total word length
print("There are 24 countries that had been participated in 2019 FIFA Womens' World Cu
p,The game is about to guess their capitals, You've",Guessing_errors,  "chances to gues
s the capital correctly, BEST OF LUCK!")


done = False
while not done:
    for letter in Choice_Words:
        if letter.lower() in Your_Guess:
            print(letter,end=" ")
        else:
            print("_", end=" ")
    print("")


    guess = input(f"Allowed errors left for guessing the word {Guessing_errors}, Next G
uess:'")


    Your_Guess.append(guess.lower())
    if guess.lower() not in Choice_Words.lower():
        Guessing_errors-=1
        if Guessing_errors==0:
            break



    done = True
    for letter in Choice_Words:
        if letter.lower() not in Your_Guess:
            done = False

if done:
    print("Congratulations! you won! ,You guessed the word correctly ! The word was", C
hoice_Words  )
else:
    print ("Game over! You've reached maximum no. of attempts, the word was",Choice_Wor
ds)
```

```
There are 24 countries that had been participated in 2019 FIFA Womens' Wor
ld Cup,The game is about to guess their capitals, You've 3 chances to gues
s the capital correctly, BEST OF LUCK!

_ _ _ _ _ _
L _ _ _ _ _
L _ n _ _ n
L o n _ o n
Congratulations! you won! ,You guessed the word correctly ! The word was L
ondon
```