```
#Q1
# Calculation of total Infiltration by Horton's Equation fo =
float(input("Enter the value of initial Infiltration Rate:")) fc=
float(input("Enter the value of Final infiltration Rate:")) t=
int(input("Enter the value of Time:")) kh= float(input("Enter the
value of Decay Coefficient:"))
# The total Infiltration is given by: Fp=
fc*t+(fo -fc)/kh print("The value of Total
Infiltration is:", Fp)
```

```
Enter the value of initial Infiltration Rate:6
Enter the value of Final infiltration Rate:1.2
Enter the value of Time:8
Enter the value of Decay Coefficient:0.888
The value of Total Infiltration is: 15.005405405405405
```

```
#Q2
#Calculation of Mean precipitation by theissen's polygon Method
#The value of precipitation at Each station is p1 =
int(input("Enter the value of rainfall at Station 1:")) p2 =
int(input("Enter the value of rainfall at Station 2:")) p3 =
int(input("Enter the value of rainfall at Station 3:")) p4 =
int(input("Enter the value of rainfall at Station 4:")) p5 =
int(input("Enter the value of rainfall at Station 5:"))
#Area for each station
A1= int(input("Enter the value of Catchment Area for raingauge station 1:"))
A2= int(input("Enter the value of Catchment Area for raingauge station 2:"))
A3 =int(input("Enter the value of Catchment Area for raingauge station 3:"))
A4=int(input("Enter the value of Catchment Area for raingauge station 4:"))
A5= int(input("Enter the value of Catchment Area for raingauge station 5:"))
#The total catchment area is
A=A1 + A2 + A3 + A4+ A5
print("The value of Total Catchment area is:",A)
# Runoff Volume
#The volume shall be multiplied by the coefficient 2500 to cater scale effects
#Runoff Volume
V= (p1*A1 + p2*A2+ p3*A3+ p4*A4 + p5*A5)*2500
print("The runoff volume from the given catchment is:", V)
# Mean Precipitation
p = (p1*A1 + p2*A2 + p3*A3 + p4*A4 + p5*A5)/A print("The
value of Mean Precipitalon is:", p)
```

```
Enter the value of rainfall at Station 1:125
Enter the value of rainfall at Station 2:175
Enter the value of rainfall at Station 3:225
Enter the value of rainfall at Station 4:275
Enter the value of rainfall at Station 5:325
Enter the value of Catchment Area for raingauge station 1:25
Enter the value of Catchment Area for raingauge station 2:30
Enter the value of Catchment Area for raingauge station 3:30
Enter the value of Catchment Area for raingauge station 4:10
Enter the value of Catchment Area for raingauge station 5:5
The value of Total Catchment area is: 100
The runoff volume from the given catchment is: 48750000
The value of Mean Precipitalon is: 195.0
```

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#Q3
```

```
#Calculation of Mean precipitation by Isohytel Method #The
value of precipitation at Each station i
p1= int(input("Enter the value of rainfall at Station 1:")) p2=
int(input("Enter the value of rainfall at Station 2:")) p3=
int(input("Enter the value of rainfall at Station 3:")) p4=
int(input("Enter the value of rainfall at Station 4:")) p5=
int(input("Enter the value of rainfall at Station 5:")) p6=
int(input("Enter the value of rainfall at Station 6:")) p7=
int(input("Enter the value of rainfall at Station 7:")) p8=
int(input("Enter the value of rainfall at Station 8:"))
# Area for each station
A1= int(input("Enter the value of Catchment Area for raingage station 1:"))
A2= int(input("Enter the value of Catchment Area for raingauge station 2:"))
A3= int(input("Enter the value of Catchment Area for raingauge station 3:"))
A4= int(input("Enter the value of Catchnent Area for reingauge station 4:"))
A5= int(input("Enter the value of Catchment Ares for raingauge station 5:"))
A6= int(input("Enter the value of Catchment Area for raingeuge station 6:"))
A7= int(input("Enter the value of Catchment Area for reingauge station 7:"))
# The total catchment area is
A= A1+ A2+ A3+ A4+ A5+ A6+ A7
print("The value of Total Catchment area is:", A)
# Mean Precipitation
p=((p1+p2)*A1/2 + (p2+p3)*A2/2+ (p3+p4)*A3/2+ (p4+p5)*A4/2 + (p5+p6)*A5/2 + (p6+p7)*A6/2 +
print("the value of Mean Precipitalon is:", p)
```

```
Enter the value of rainfall at Station 1:14
Enter the value of rainfall at Station 2:12
Enter the value of rainfall at Station 3:10
Enter the value of rainfall at Station 4:8
Enter the value of rainfall at Station 5:6
Enter the value of rainfall at Station 6:4
Enter the value of rainfall at Station 7:2
Enter the value of rainfall at Station 8:0
Enter the value of Catchment Area for raingage station 1:90
Enter the value of Catchment Area for raingauge station 2:140
Enter the value of Catchment Area for raingauge station 3:125
Enter the value of Catchnent Area for reingauge station 4:140
Enter the value of Catchment Ares for raingauge station 5:85
Enter the value of Catchment Area for raingeuge station 6:40
Enter the value of Catchment Area for reingauge station 7:20
The value of Total Catchment area is: 640
the value of Mean Precipitalon is: 8.40625
```

```
import  numpy as geek
N= int (input ("Number of data values of rainfall: "))
M = int (input ("Number of data values of Area: "))
R = [] A = [] for i in range (1,
N+1) :     print("Enter rainfall
in cm")
    Value_rainfall = float (input())
R.append(Value_rainfall) for j in
range (1, M+1):
    print("Enter Catchment area: ")
    Value_area = float (input () )
    A.append(Value_area)
product = geek.dot(R, A)
```

```
# print(" Dot Product : \n", product)
mean_precipitation = product/sum(A) print("Mean
Precipitation:", mean_precipitation, "cm")
```

```
Number of data values of rainfall: 5
    Number of data values of Area: 5
    Enter rainfall in cm
    125
    Enter rainfall in cm
    175
    Enter rainfall in cm
    225
    Enter rainfall in cm
    275
    Enter rainfall in cm
    325 Enter Catchment
    area:
    25 Enter Catchment
    area:
    30 Enter Catchment
    area:
    30 Enter Catchment
    area:
    10 Enter Catchment
    area:
    5
    Mean Precipitation: 195.0 cm
```

```
import numpy as np

# Input number of pulses, time interval, and runoff depth N
= int(input("Number of pulses: "))
dt = float(input("Enter time interval of each pulse in hours: ")) Rd
= float(input("Enter the value of runoff depth (Rd) in cm: ")) Ri =
[]  # Rainfall Intensities

# Input rainfall intensities for each pulse for
i in range(1, N + 1):
    Value = float(input(f"Enter rainfall intensity in cm/hr for pulse {i}: "))
    Ri.append(Value) print("\nW-Index

calculation")

# Calculate total rainfall Total_Rain
= sum(Ri) * dt
print("Total depth of rainfall = {:.2f} cm".format(Total_Rain))

# Calculate W-index
W_index = (Total_Rain - Rd) / (N * dt) print("W-index

= {:.2f} cm/hr".format(W_index)) print("\nPhi-Index

Calculation")

def excess_rain(M, Ri, tr):
    print("Trial No:", tr)
    print("Assume that out of {} pulses, {} pulses have rainfall excess".format(N, M))
te = dt * M  # Duration of excess rainfall
```

```
    print("Duration of excess rainfall = {:.2f} hrs".format(te))

    # Calculate total depth of excess rainfall
    R_depth = sum(Ri[-M:]) * dt  # Only consider the last M pulses
    print("Total depth of excess rainfall for trial", tr, " = {:.2f} cm".format(R_depth))

    # Calculate Phi index
    phi = (R_depth - Rd) / te
    print("Phi Index for trial", tr, "=", phi, "cm/hr")

    Ri.sort()  # Sort rainfall intensities
    print("Ri (sorted) = ", Ri)

    return phi

# Function to calculate Phi-index def
calculate_phi_index(N, Ri, Rd, dt):
    M = N  # Start with all pulses considered as excess
    tr = 0  # Trial number

    while 0 < M <= N:
        tr += 1
        phi = excess_rain(M, Ri, tr)  # Call the function to calculate phi

        print("While loop Ri =", Ri)
        print("While loop Phi =", phi)

        M -= 1  # Reduce the number of excess pulses to consider

        if Ri[0] > phi:
            print("\nFinal value of Phi-index = {:.2f} cm/hr".format(phi))
            break
        else:
            print("As rainfall intensity {:.2f} cm/hr < {:.2f}, so no contribution towards
            del Ri[0]  # Remove the least rainfall intensity
            print("Assumption of {} pulses having rainfall excess fails, so remove least r
print("Excess rainfall intensities (sorted):", Ri)
            print("In next trial assume no. of pulses that have rainfall excess:", len(Ri)

# Calculate Phi-index calculate_phi_index(N,
Ri, Rd, dt)
```

```
Number of pulses: 8
Enter time interval of each pulse in hours: 2
Enter the value of runoff depth (Rd) in cm: 5.8
Enter rainfall intensity in cm/hr for pulse 1: 0.2
Enter rainfall intensity in cm/hr for pulse 2: 0.45
Enter rainfall intensity in cm/hr for pulse 3: 0.75
Enter rainfall intensity in cm/hr for pulse 4: 1.15
Enter rainfall intensity in cm/hr for pulse 5: 0.9
Enter rainfall intensity in cm/hr for pulse 6: 0.8
Enter rainfall intensity in cm/hr for pulse 7: 0.5
Enter rainfall intensity in cm/hr for pulse 8: 0.25

W-Index calculation
Total depth of rainfall = 10.00 cm
W-index = 0.26 cm/hr

Phi-Index Calculation
```

```
Trial No: 1
Assume that out of 8 pulses, 8 pulses have rainfall excess
Duration of excess rainfall = 16.00 hrs
Total depth of excess rainfall for trial 1  = 10.00 cm
Phi Index for trial 1 = 0.2625 cm/hr
Ri (sorted) =  [0.2, 0.25, 0.45, 0.5, 0.75, 0.8, 0.9, 1.15]
While loop Ri = [0.2, 0.25, 0.45, 0.5, 0.75, 0.8, 0.9, 1.15]
While loop Phi = 0.2625
As rainfall intensity 0.20 cm/hr < 0.26, so no contribution towards runoff
Assumption of 8 pulses having rainfall excess fails, so remove least rainfall in
Excess rainfall intensities (sorted): [0.25, 0.45, 0.5, 0.75, 0.8, 0.9, 1.15]
In next trial assume no. of pulses that have rainfall excess: 7
Trial No: 2
Assume that out of 8 pulses, 7 pulses have rainfall excess
Duration of excess rainfall = 14.00 hrs
Total depth of excess rainfall for trial 2  = 9.60 cm
Phi Index for trial 2 = 0.2714285714285714 cm/hr
Ri (sorted) =  [0.25, 0.45, 0.5, 0.75, 0.8, 0.9, 1.15]
While loop Ri = [0.25, 0.45, 0.5, 0.75, 0.8, 0.9, 1.15]
While loop Phi = 0.2714285714285714
As rainfall intensity 0.25 cm/hr < 0.27, so no contribution towards runoff
Assumption of 7 pulses having rainfall excess fails, so remove least rainfall in
Excess rainfall intensities (sorted): [0.45, 0.5, 0.75, 0.8, 0.9, 1.15]
In next trial assume no. of pulses that have rainfall excess: 6
Trial No: 3
Assume that out of 8 pulses, 6 pulses have rainfall excess
Duration of excess rainfall = 12.00 hrs
Total depth of excess rainfall for trial 3  = 9.10 cm
Phi Index for trial 3 = 0.27499999999999997 cm/hr
Ri (sorted) =  [0.45, 0.5, 0.75, 0.8, 0.9, 1.15]
While loop Ri = [0.45, 0.5, 0.75, 0.8, 0.9, 1.15]
While loop Phi = 0.27499999999999997

Final value of Phi-index = 0.27 cm/hr
```