```python
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 runoff".format(Ri[0], phi))
            del Ri[0]  # Remove the least rainfall intensity
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        print( Assumption or {} pulses having rainfall excess fails, so remove least rainfall intensity < {} .forma
        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 intensity < 0.2625
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 intensity < 0.2714285714285714
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
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seconds_in_a_day = 24 * 60 * 60
seconds_in_a_day
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86400
```

To execute the code in the above cell, select it with a click and then either press the play button to the left of the code, or use the keyboard shortcut "Command/Ctrl+Enter". To edit the code, just click the cell and start editing.

Variables that you define in one cell can later be used in other cells: