```
#1
# To Calculate the length of transition curve
V = int(input("Enter the value of design speed (km/h): "))
R = int(input("Enter the value of Radius of curvature (m): "))
N = int(input("Enter the value of slope (ratio): "))
W = float(input("Enter the value of width of road including extra widening (m): "))
emax = float(input("Enter the value for plain terain "))

# Calculate the required superelevation
ecal = (V * V) / (225 * R)
print("The value of Super elevation:", ecal)

# Determine the actual superelevation
actual_superelevation = ecal if ecal < emax else emax
print("Actual Super elevation used:", actual_superelevation)

# Calculate the length of transition curve
Ls = (actual_superelevation * N * W) / 2
print("The length of transition curve:", Ls, "m")
```

```
Enter the value of design speed (km/h): 65
Enter the value of Radius of curvature (m): 220
Enter the value of slope (ratio): 150
Enter the value of width of road including extra widening (m): 7.5
Enter the value for plain terain 0.07
The value of Super elevation: 0.08535353535353535
Actual Super elevation used: 0.07
The length of transition curve: 39.37500000000001 m
```

```
#2
import numpy as np

R = int(input("Constant R: "))
C = int(input("Constant C: "))

A = int(input("Total Data Values for EWL Constant: "))
B = int(input("Total Data Values for AADT: "))

EWL_Constant = []
AADT = []

# Input for EWL Constant
for i in range(1, A + 1):
    print("Enter EWL Constant:")
    value = float(input())
    EWL_Constant.append(value)

# Input for AADT
for j in range(1, B + 1):
    print("Enter AADT:")
    value = float(input())
    AADT.append(value)
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# Calculate the dot product
product = np.dot(EWL_Constant, AADT)

# Total EWL and output
Total_EWL = product
print("Total EWL:", Total_EWL)
print("EWL after 60 years:", Total_EWL * 1.6)

# Traffic Index calculation
TI = 1.35 * (((1.6 * Total_EWL) + (product / 2)) ** 0.11)
print("Traffic Index:", TI)

# Calculate pavement thickness
Thickness = 0.166 * TI * (9032 - R) / (C ** 0.2)
print("Pavement Thickness:", Thickness, "cm")
```

```
Constant R: 48
Constant C: 16
Total Data Values for EWL Constant: 4
Total Data Values for AADT: 4
Enter EWL Constant:
330
Enter EWL Constant:
1070
Enter EWL Constant:
2460
Enter EWL Constant:
4620
Enter AADT:
3750
Enter AADT:
470
Enter AADT:
320
Enter AADT:
120
Total EWL: 3082000.0
EWL after 60 years: 4931200.0
Traffic Index: 7.577910657490486
Pavement Thickness: 30.34470100391634 cm
```

```
#3
# Initialize variables
P = float(input("Load in kg: "))
p = float(input("Tyre pressure in kg/cm^2: "))
M = int(input("Total Number of layers in a given Pavement: "))
CBR = []

# Input for CBR values
for i in range(1, M + 1):
    CBR_value = float(input(f"Enter CBR value for layer {i}: "))
    CBR.append(CBR_value)

# Calculate thickness for each layer
for i in range(M):
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        T = ((1.75 * P) / CBR[i] - (P / (p * 3.14159))) ** 0.5
        print(f"Thickness above layer {i + 1}: {T:.2f} cm")

print("Given that the bitumen layer is 4 cm.")
```

```
Load in kg: 4085
Tyre pressure in kg/cm^2: 7
Total Number of layers in a given Pavement: 3
Enter CBR value for layer 1: 4.38
Enter CBR value for layer 2: 6
Enter CBR value for layer 3: 12
Thickness above layer 1: 38.03 cm
Thickness above layer 2: 31.71 cm
Thickness above layer 3: 20.25 cm
Given that the bitumen layer is 4 cm.
```