If the average number of cars that cross a particular street in a day is 25, then you can find the probability of 28 cars passing the street using the poisson formula.

* *X* is the random variable representing the number of events,
* *k* is the specific number of events we're interested in (in this case, 28 cars passing the street),
* *λ* is the average rate of events per interval.

In your example:

* *λ*=25 (average number of cars passing the street in a day),
* *k*=28 (the number of cars you want to find the probability for).

Plugging in these values, the probability of observing exactly 28 cars passing the street in a day is:

*P*(*X*=28)= *e*−25⋅2528​/28!

import numpy as np

import matplotlib.pyplot as plt

import time

from scipy.stats import poisson

def print\_pause(message):

print(message)

time.sleep(2)

def poisson\_drv():

# Set the parameter

rate\_poisson = 2 # Average rate (lambda) for the Poisson distribution

print("A service center receives an average of 2 customers per hour.")

print\_pause("What is the probability of receiving at most 3 customers in the next hour?")

print\_pause("We can use the Poisson random variable for this scenario.")

print\_pause(f"The average rate (lambda) is {rate\_poisson} customers per hour.")

# Generate Poisson random variable

poisson\_rvs = poisson.rvs(mu=rate\_poisson, size=1000)

# Calculate PMF and CDF

k\_values = np.arange(0, 10) # Adjust the range based on your scenario

pmf\_values = poisson.pmf(k\_values, mu=rate\_poisson)

cdf\_values = poisson.cdf(k\_values, mu=rate\_poisson)

# Calculate mean and variance

mean\_poisson = poisson.mean(mu=rate\_poisson)

variance\_poisson = poisson.var(mu=rate\_poisson)

# Display mean and variance

print\_pause(f"The MEAN value = {mean\_poisson}")

print\_pause(f"The VARIANCE value = {variance\_poisson}")

cdf = poisson.cdf(3, mu=rate\_poisson)

print\_pause("To calculate the probability of receiving at most 3 customers in the next hour,")

print\_pause(f"We must calculate the CDF of 3, which is approximately {cdf:.4f}")

time.sleep(4)

print\_pause("Now let's visualize the PMF and CDF:")

time.sleep(3)

show\_x = int(input("Show? (1 for Yes, 0 for No): "))

if show\_x == 1:

plt.figure(figsize=(12, 6))

plt.subplot(121)

plt.plot(k\_values, pmf\_values, "bo", ms=8, label="Poisson PMF")

plt.vlines(k\_values, 0, pmf\_values, colors="b", lw=5, alpha=0.5)

plt.title('Poisson Distribution PMF')

plt.xlabel('k')

plt.ylabel('Probability')

plt.subplot(122)

plt.step(k\_values, cdf\_values, where='post')

plt.title('Poisson Distribution CDF')

plt.xlabel('k')

plt.ylabel('Probability')

plt.tight\_layout()

plt.show()

print("Choose the number of Example that you want : ")

print("1- Binomial random variable ")

print("2- Poisson random variable ")

choose = int(input("Choose: "))

if choose == 1:

binomial\_drv()

elif choose == 2:

poisson\_drv()

else:

print("Invalid choice. Please choose 1 or 2.")