Lab 3: **Two sample Z test for mean (both Standard Deviations known)**

A local college cafeteria has a self-service soft ice cream machine. The cafeteria provides bowls
that can hold up to 16 ounces of ice cream. The food service manager is interested in comparing the average amount of ice cream dispensed by male students to the average amount dispensed by female students. A measurement device was placed on the ice cream machine to determine the amounts dispensed.
Random samples of 85 male and 78 female students who got ice cream were selected. The sample averages were 7.23 and 6.49 ounces for the male and female students, respectively. Assume that the population standard deviations are 1.22 and 1.17 ounces, respectively.
Using the 1% significance level, can you conclude that the average amount of ice cream dispensed by male college students is larger than the average amount dispensed by female college students?
Question:

Solution:
Step 1: **Setting up null and alternative hypothesis**

- H_0: $\mu_1=\mu_2$ (There is no difference between the no. of tickets resolved in KTM and no. of tickets resolved in PKR)
- H_1: $\mu_1\neq\mu_2$ (There is a significant difference between the no. of tickets resolved in KTM and no. of tickets resolved in PKR)

We approach with a two tailed test.

Step 2: **Level of Significance**

Here the given level of significance is 5%
=Prob{Type I error}
=0.05

Step 3: **Test Statistics**

We use a Z-test for this test as we know the SD of both the independent population.

Data:
X_1=No. of tickets resolved in Kathmandu
X_2= No. of tickets resolved in Pokhara

Kathmandu

Sample Size (n_1) = 30
Sample Mean ($\overline{x_1}$) = 750
Population SD (σ_1) = 20

Pokhara
Sample Size (n_2) = 30
Sample Mean($\bar{x}_2$) = 780
Population SD(σ_2) = 25

Calculated Z

Z = -5.132393537
Formula Used: =(750-780)/SQRT((20^2/30)+(25^2/30))

Formula Used for Calculated Z: $$Z = \frac{\overline{x_1} - \bar{x}_2}{\sqrt{\frac{\sigma_1^2}{n_1} + \frac{\sigma_2^2}{n_2}}}$$

Step 4: **Critical or Decision value (p-value)**
P-value:
p-value = 2.86E-07 (Formatted: 0.0000003)
Formula Used: =2*NORM.DIST(C22,0,1,TRUE)

Step 5: **Statistical Decision**
Since, p-value =0.0000003<< α=0.05, we strongly reject H0, at 5% level of significance. Hence, there is significant difference in the mean no. of tickets resolved per day in two locations i.e KTM and PKR. Since sample mean of PKR (780) is higher than that of KTM (750). So, we strongly reject the H0 and go with the alternative hypothesis H1: $\mu 1 \neq \mu 2$(There is significant diff. in the mean no of tickets resolved in KTM and PKR).

Step 6 : **Conclusion**
Hence, there is significant difference in the mean no. of tickets resolved per day in two locations i.e KTM and PKR. Since sample mean of PKR (780) is higher than that of KTM (750). So, we strongly reject the H0 and go with the alternative hypothesis H1: $\mu 1 \neq \mu 2$(There is significant diff. in the mean no of tickets resolved in KTM and PKR).