```python
import math
import random
data = [1, 2, 3, 10, 11, 12]
mu1, mu2 = 2.0, 11.0
sigma1, sigma2 = 1.0, 1.0
pi1, pi2 = 0.5, 0.5
tol = 1e-4
max_iter = 100


def gaussian(x, mu, sigma):
    return (1 / (math.sqrt(2*math.pi)*sigma)) * math.exp(-((x-mu)**2)/(2*sigma**2))


for _ in range(max_iter):
    r1 = [pi1*gaussian(x, mu1, sigma1)/(pi1*gaussian(x, mu1, sigma1)+pi2*gaussian(x, mu2, sigma2)) for x in data]
    r2 = [1 - r for r in r1]
    mu1_new = sum(r1[i]*data[i] for i in range(len(data))) / sum(r1)
    mu2_new = sum(r2[i]*data[i] for i in range(len(data))) / sum(r2)
    sigma1_new = math.sqrt(sum(r1[i]*(data[i]-mu1_new)**2 for i in range(len(data))) / sum(r1))
    sigma2_new = math.sqrt(sum(r2[i]*(data[i]-mu2_new)**2 for i in range(len(data))) / sum(r2))
    pi1_new = sum(r1)/len(data)
    pi2_new = sum(r2)/len(data)
    if abs(mu1-mu1_new)<tol and abs(mu2-mu2_new)<tol:
        break

    mu1, mu2 = mu1_new, mu2_new
    sigma1, sigma2 = sigma1_new, sigma2_new
    pi1, pi2 = pi1_new, pi2_new

print("Cluster 1: mu =", mu1, ", sigma =", sigma1, ", pi =", pi1)
print("Cluster 2: mu =", mu2, ", sigma =", sigma2, ", pi =", pi2)
```
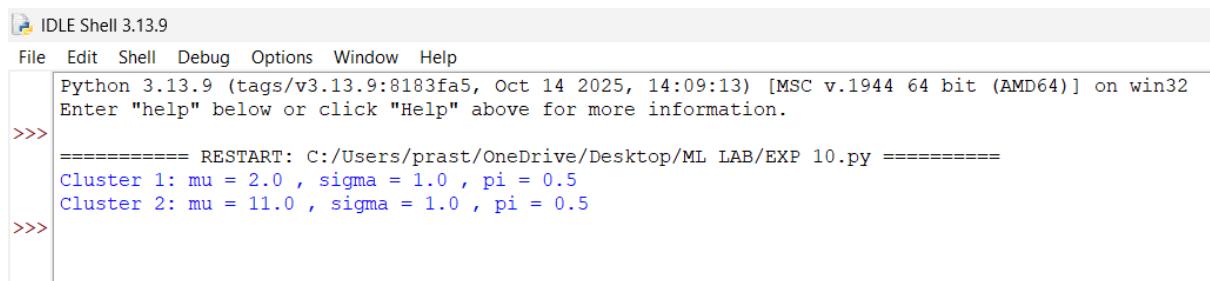
OUTPUT:

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```
Python 3.13.9 (tags/v3.13.9:8183fa5, Oct 14 2025, 14:09:13) [MSC v.1944 64 bit (AMD64)] on win32
Enter "help" below or click "Help" above for more information.
>>>
========== RESTART: C:/Users/prast/OneDrive/Desktop/ML LAB/EXP 10.py ==========
Cluster 1: mu = 2.0 , sigma = 1.0 , pi = 0.5
Cluster 2: mu = 11.0 , sigma = 1.0 , pi = 0.5
>>>
```

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