Random Sampling And Sample Distribution

Program:

```python
import numpy as np
import matplotlib.pyplot as plt
population = np.random.normal(loc=50, scale=10, size=10000)  # Population with mean=50, std=10, size=10,000
sample_size = 30
random_sample = np.random.choice(population, size=sample_size, replace=False)
sample_mean = np.mean(random_sample)
print(f"Sample Mean: {sample_mean:.2f}")
num_samples = 1000  # Number of samples
sample_means = []
for _ in range(num_samples):
    sample = np.random.choice(population, size=sample_size, replace=False)
    sample_means.append(np.mean(sample))
plt.figure(figsize=(12, 6))
plt.subplot(1, 2, 1)
plt.hist(population, bins=30, alpha=0.7, color='skyblue', label='Population')
plt.axvline(np.mean(population), color='red', linestyle='dashed', linewidth=2, label='Population Mean')
plt.title("Population Distribution")
plt.legend()
plt.subplot(1, 2, 2)
plt.hist(sample_means, bins=30, alpha=0.7, color='lightgreen', label='Sampling Distribution')
plt.axvline(np.mean(sample_means), color='red', linestyle='dashed', linewidth=2, label='Mean of Sample Means')
plt.title("Sampling Distribution of Sample Mean")
plt.legend()
plt.tight_layout()
plt.show()
```

Output:

Sample Mean: 49.44

Population Distribution — Population, Population Mean

Sampling Distribution of Sample Mean — Sampling Distribution, Mean of Sample Means