

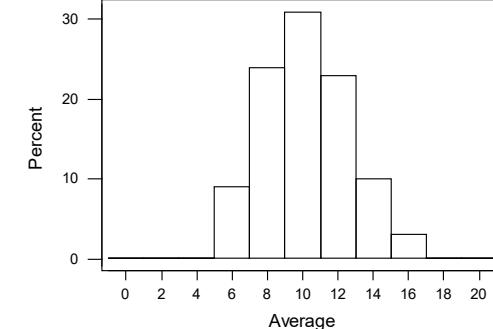
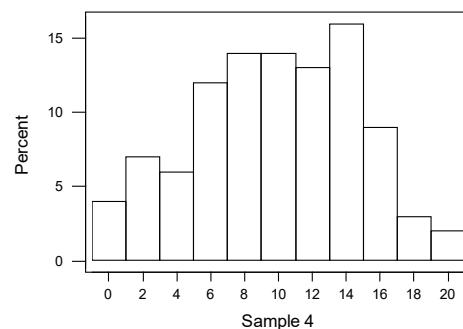
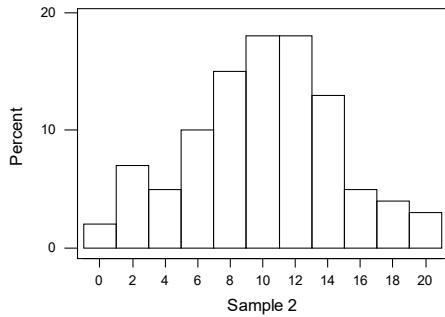
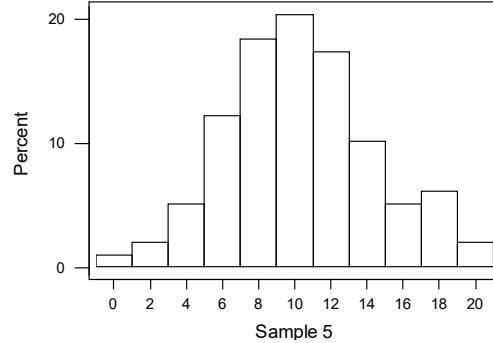
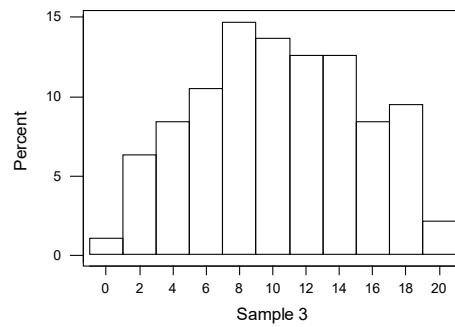
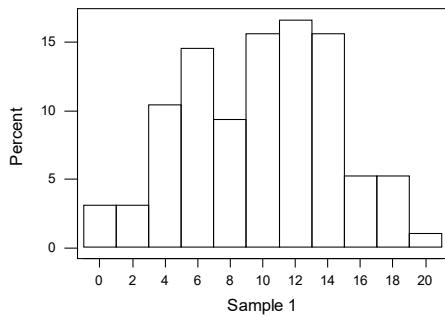
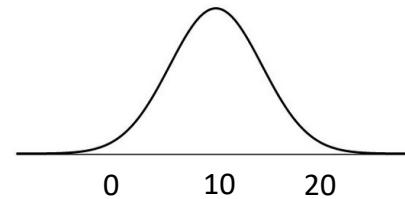
Parameters and Statistics

SAMPLING DISTRIBUTION

The **sampling distribution** of a statistic is the distribution of values taken by the statistic in all possible samples of the same size from the same population.

Sampling Distribution of a Sample Mean

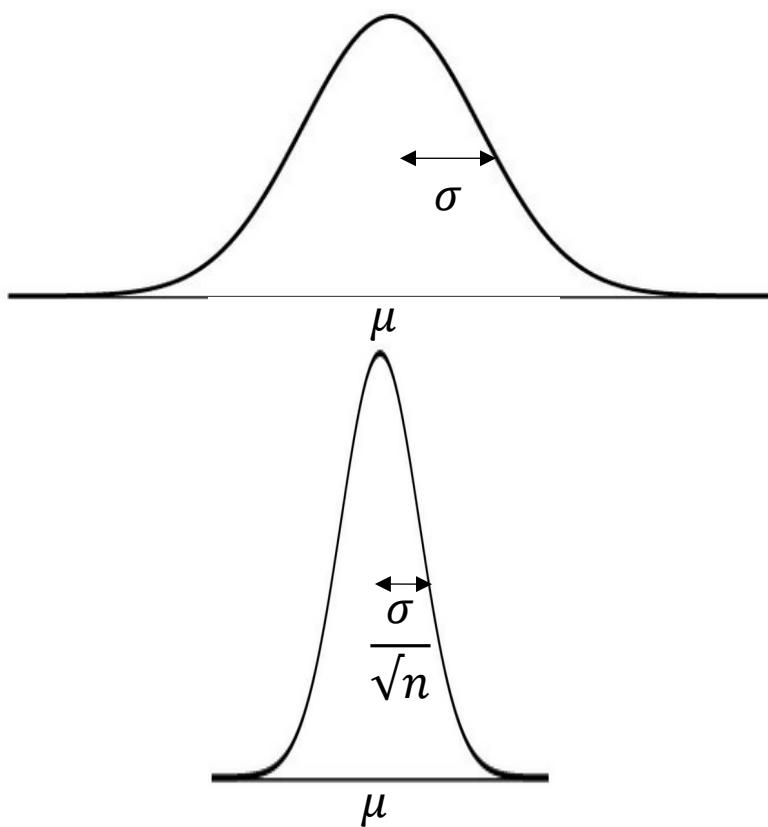
5 samples from an $N(10,5)$ distribution



Sampling Distribution of a Sample Mean

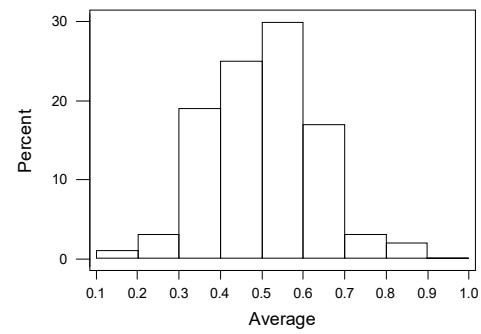
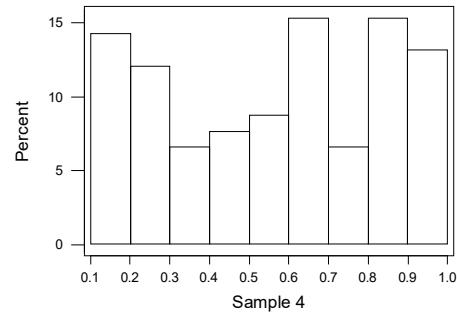
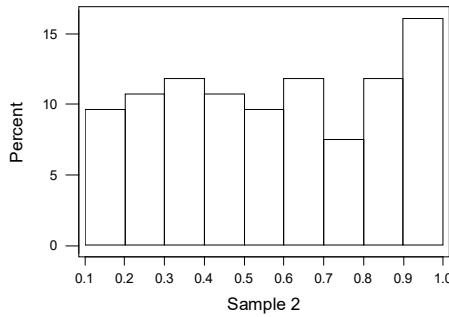
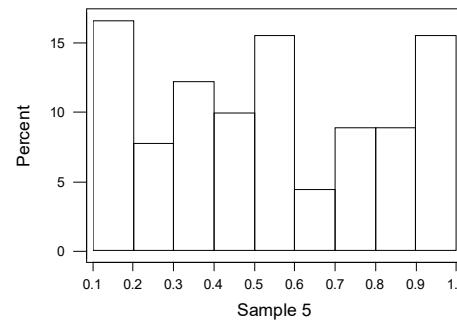
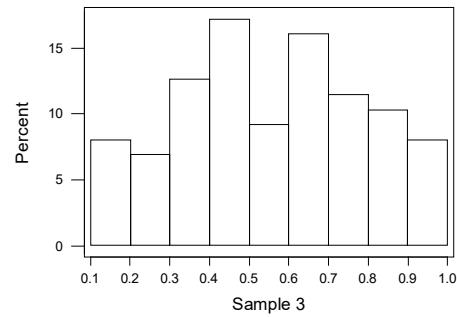
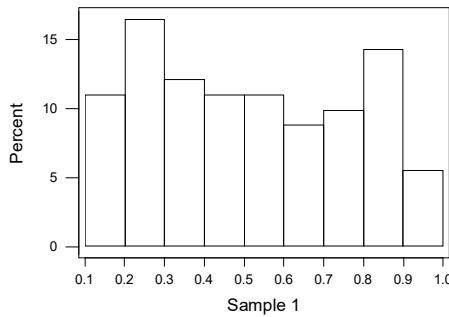
SAMPLING DISTRIBUTION OF A SAMPLE MEAN

If a population has the $N(\mu, \sigma)$ distribution, then the sample mean \bar{x} of n independent observations has the $N(\mu, \sigma/\sqrt{n})$ distribution.



Sampling Distribution of a Sample Mean

5 samples from a $U(0,1)$ distribution



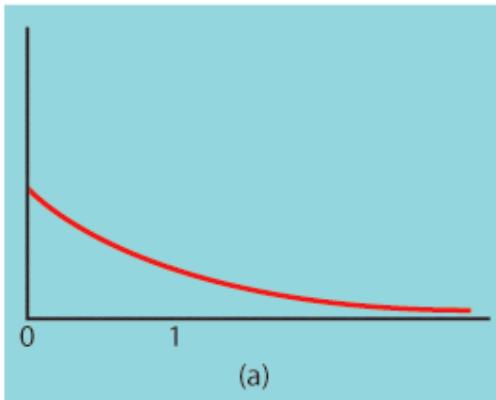
The Central Limit Theorem

CENTRAL LIMIT THEOREM

Draw an SRS of size n from any population with mean μ and finite standard deviation σ . When n is large, the sampling distribution of the sample mean \bar{x} is approximately Normal:

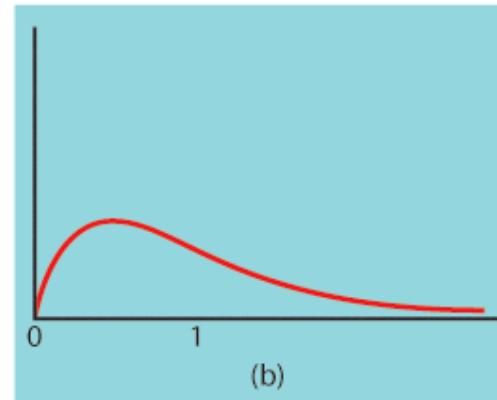
$$\bar{x} \text{ is approximately } N\left(\mu, \frac{\sigma}{\sqrt{n}}\right)$$

Population with
strongly skewed
distribution



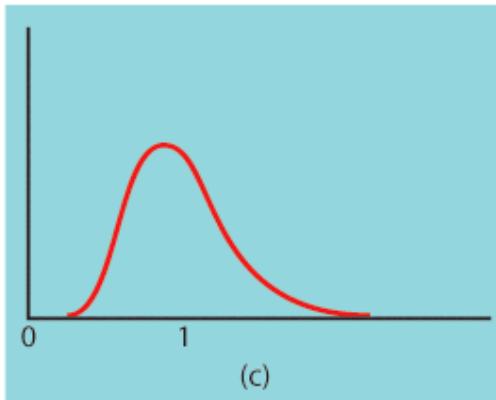
(a)

Sampling
distribution of
 \bar{x} for $n = 2$
observations



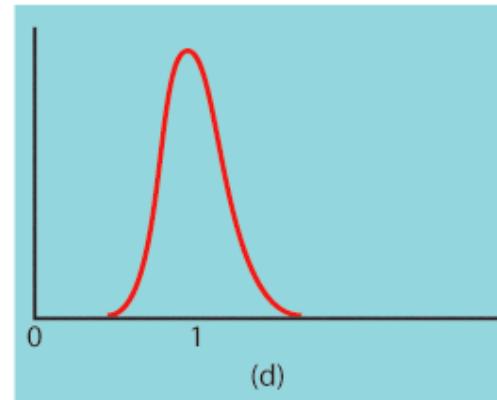
(b)

Sampling
distribution of
 \bar{x} for $n = 10$
observations



(c)

Sampling
distribution of
 \bar{x} for $n = 25$
observations



(d)

How Large Should n Be?

It depends on the population distribution. More observations are required if the population distribution is far from normal.

- A sample size of 25 is generally enough to obtain a normal sampling distribution from a strong skewness or even mild outliers.
- A sample size of 40 will typically be good enough to overcome extreme skewness and outliers.