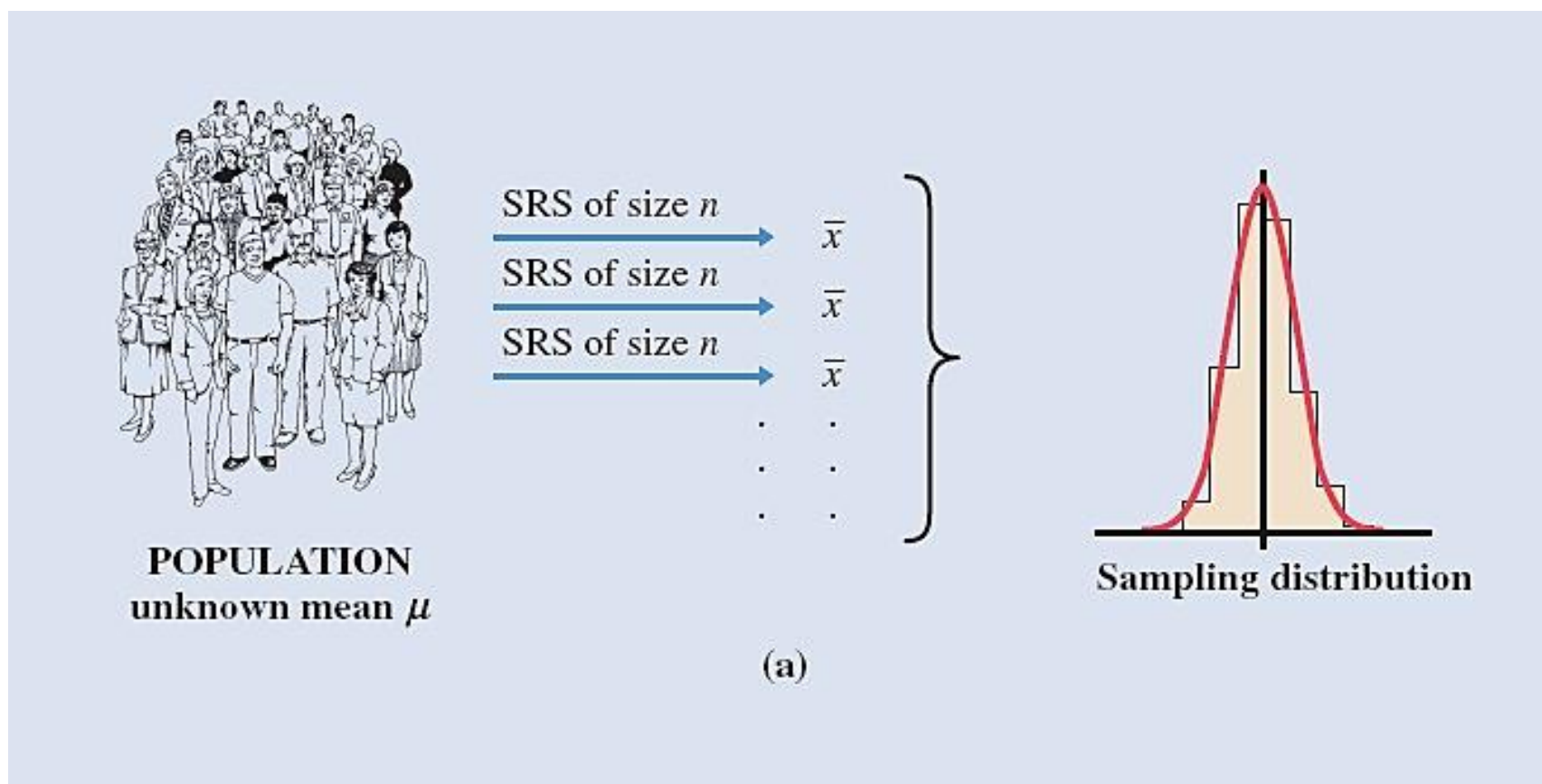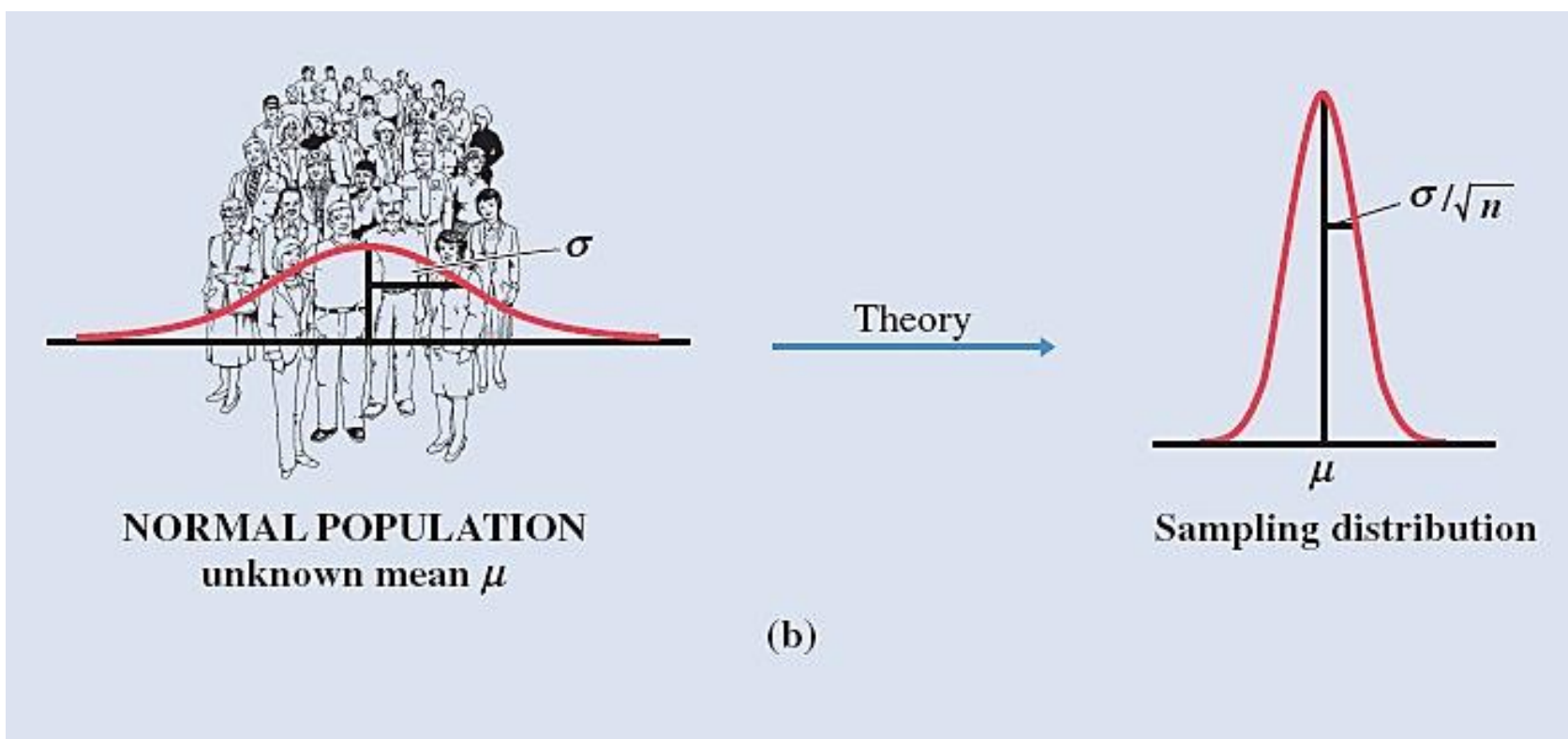# The Bootstrap Idea

The idea of the sampling distribution of the sample mean *x*-bar: Take many samples from the population, calculate *x*-bar for each sample, and look at the distribution of all the *x*-bar values.
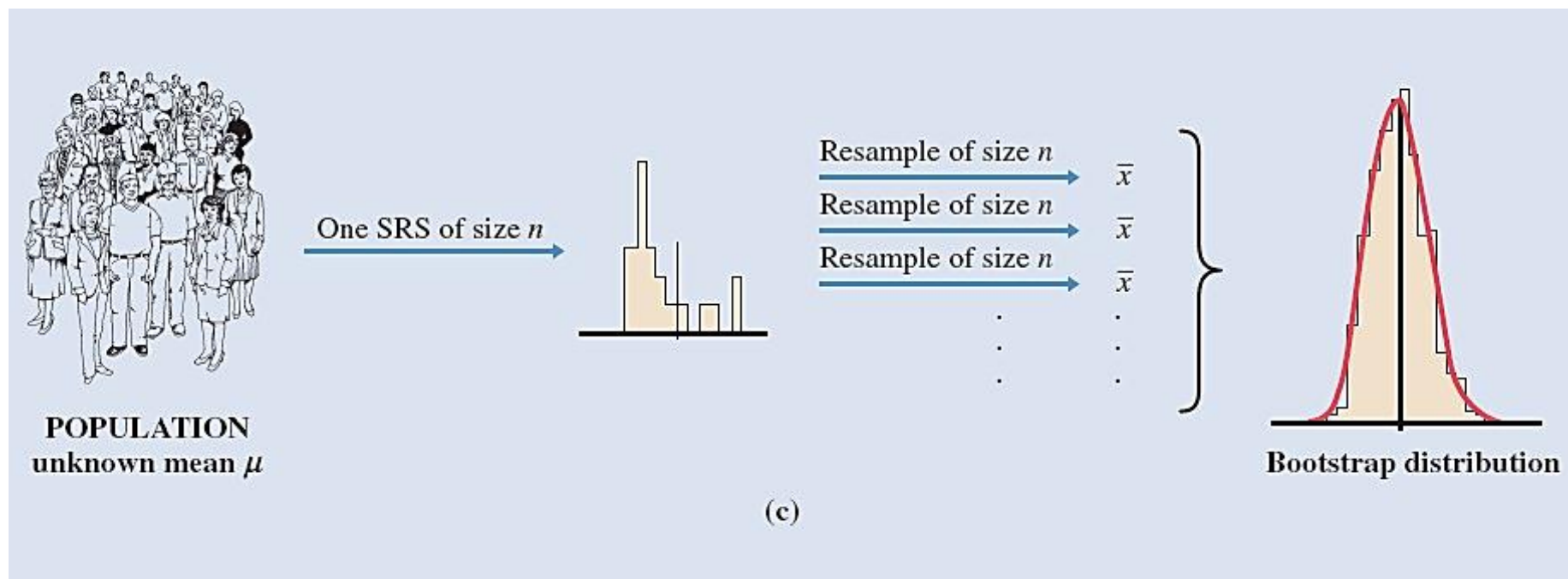
The Bootstrap Idea

The probability theory shortcut: If we know that the population values follow a Normal distribution, theory tells us that the sampling distribution of *x*-bar is also Normal.

The Bootstrap Idea

The bootstrap idea: When the theory fails and we can afford only one sample, that sample stands in for the population and the distribution of *x*-bar in many resamples stands in for the sampling distribution.

The Bootstrap Idea

The Bootstrap Idea

The original sample represents the population from which it was drawn. Thus, resamples from this original sample represent what we would get if we took many samples from the population.

The bootstrap distribution of a statistic, based on many resamples, represents the sampling distribution of the statistic.

Procedure for Bootstrapping

- **Step 1: Resampling.** Create hundreds of new samples, called bootstrap samples or **resamples**, by sampling *with replacement* from the original random sample. Each resample is the same size as the original random sample. **Sampling with replacement** means that, after we randomly draw an observation, we put it back in before drawing the next observation.

- **Step 2: Bootstrap Distribution.** Calculate the statistic for each resample. The distribution of these statistics is called a **bootstrap distribution**. The bootstrap distribution gives information about the shape, center, and spread of the sampling distribution of the statistic.