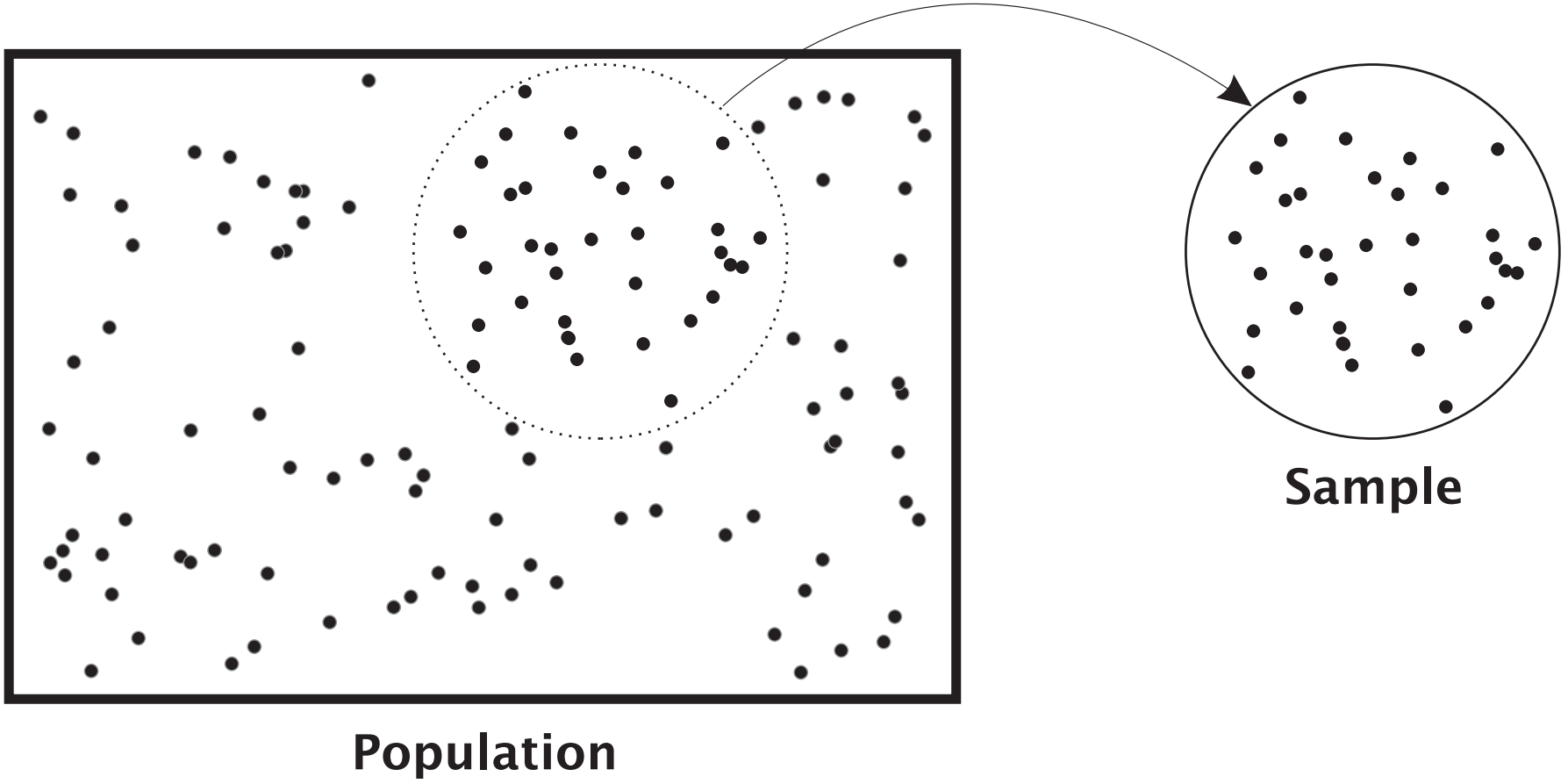
Populations and Samples

How might a statistician view the measurement process?



Probability Distribution of Sample Statistics

What is a *sampling distribution*?

- *Sample statistics are calculated from random variables.*
  For example, consider our little book length measurement class exercise. At the end of it we had 23 independent measurements of the book length, and we might choose to use the sample mean of those 23 values to represent our single, best, estimate of the true (and unknown) length of the book. That sample mean would be calculated from the usual formula for the arithmetic mean:

$$\bar{x}_n = \frac{1}{n} \sum_i x_i$$

  The subscript in $\bar{x}_n$ is sometimes used to emphasize that the statistic is the mean of n measurements.

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- Hence, ***sample statistics are themselves random variables***, with their own probability distributions. This distribution is called its ***sampling distribution***.
  Since the values x_i have uncertainty (i.e., random error), so too does any sample statistic calculated from those values. The uncertainty doesn't disappear when we use those values to calculate a statistic! If we repeated the book length exercise all over again, we'd get slightly different measurements and a slightly different sample mean of those measurements.

Probability Distribution of Sample Statistics

I'm a visual learner, can I get a pictorial representation of how a sampling distribution might be obtained?

