Sampling Distributions

Objectives

1. Obtain a sampling distribution of sample means
2. Determine the mean and standard error of a sampling distribution
3. Understand the Central Limit Theorem

Sampling Distributions

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For instance, let's say we have the following population prices of laptops: \$1000, \$1200, \$1600, and \$2000.

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Note: We will sample with replacement. Differences in sampling with and without replacement become negligent as sample sizes increase.

Example 1

Obtain a sampling distribution, taking 2 at a time, of the laptop prices \$1000, \$1200, \$1600, and \$2000. Then find the mean of each sample.

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Sample	Sample Mean	Sample	Sample Mean
1000, 1000	1000	1600, 1000	1300
1000, 1200	1100	1600, 1200	1400
1000, 1600	1300	1600, 1600	1600
1000, 2000	1500	1600, 2000	1800
1200, 1000	1100	2000, 1000	1500
1200, 1200	1200	2000, 1200	1600
1200, 1600	1400	2000, 1600	1800
1200, 2000	1600	2000, 2000	2000

Example 2

Create a histogram of the sample means from Example 1.

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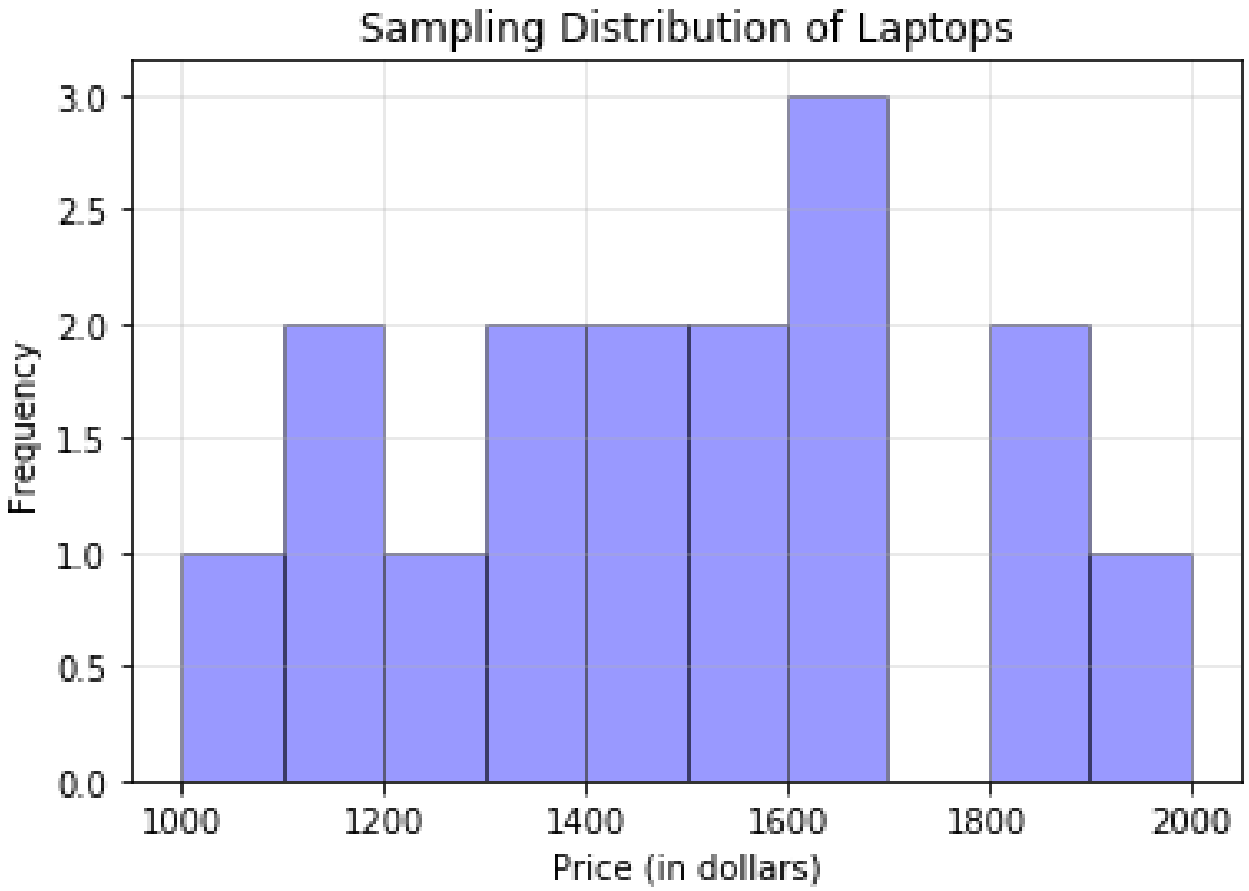

Example 3

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Mean $= \$1450$

Std. Dev $\approx \$271.57$

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$$\sigma \approx \frac{\sigma_{\overline{x}}}{\sqrt{n}}$$

where $\frac{\sigma}{\sqrt{n}}$ is called the **standard error of the mean**.

Example 4

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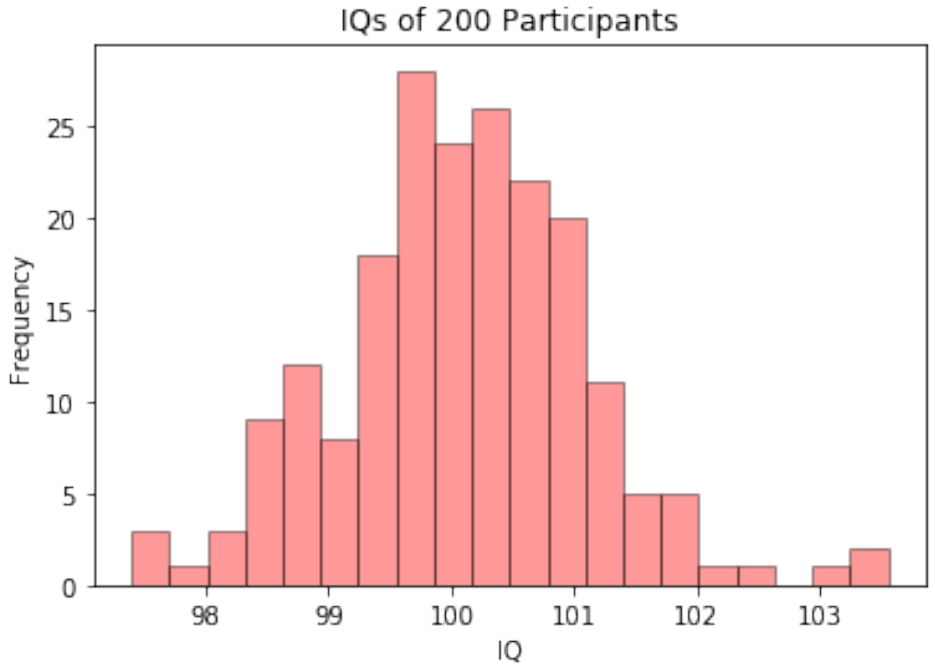

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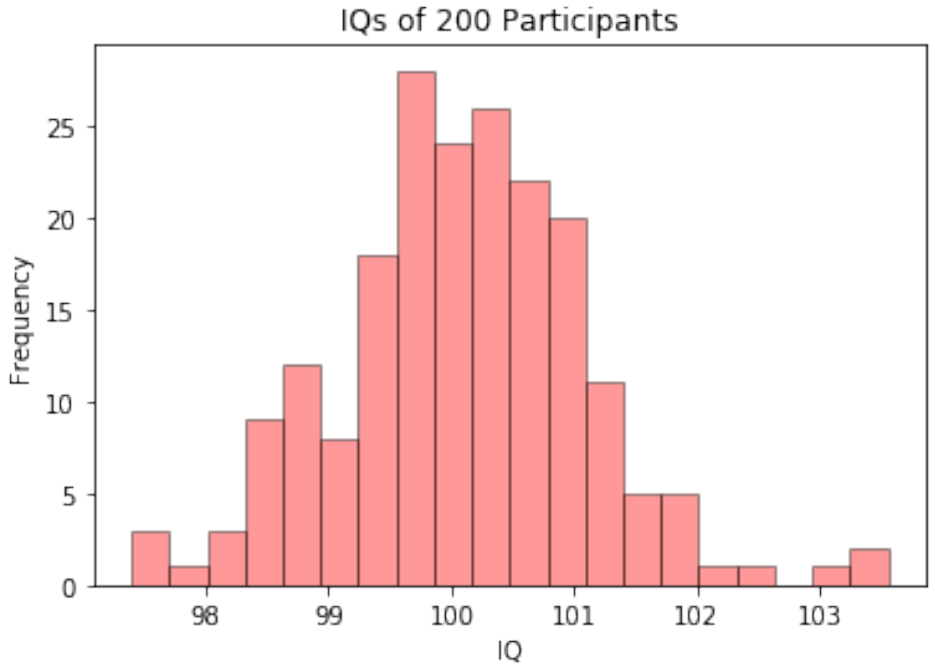

What are the approximate mean and standard error of the sample?

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$$\approx 1.13$$

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It turns out that the distributions of sample means for any population will be normal as our sample sizes increase.

Central Limit Theorem

As the sample size increases, the distribution of sample means becomes normal with a mean of $\bar{x}$ and standard deviation $\frac{\sigma}{\sqrt{n}}$ (the standard error).

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