



# 1 — Estimation

## 1.1 Confidence Intervals

**Definition 1.1 — Margin of error.** The margin of error of a distribution is the amount of error we predict when estimating the population parameters from sample statistics. The margin of error is computed as:

$$Z^* \cdot \frac{\sigma}{\sqrt{n}}$$

Where  $Z^*$  is the critical z-score for the level of confidence.

**Definition 1.2 — Confidence level.** The confidence level of an estimate is the percent of all possible sample means that fall within a margin of error of our estimate. That is to say that we are some % sure the true population parameter falls within a specific range

**Definition 1.3 — Confidence Interval.** A confidence interval is a range of values in which we suspect the population parameter lies between. To compute the confidence interval we use the formula:

$$\bar{x} \pm Z^* \cdot \frac{\sigma}{\sqrt{n}}$$

This gives us an upper and lower bound that capture our population mean.

### 1.1.1 Critical Values

The critical z-score is used to define a critical region for our confidence interval. Observations beyond this critical region are considered observations so extreme that they were very unlikely to have just happened by chance.

## 1.2 Practice Problems

**Problem 1.1** Find a confidence interval for the distribution of pizza delivery times.

Company A
20.4
24.2
15.4
21.4
20.2
18.5
21.5

Table 1.1: Pizza Companies Delivery Times