



# How to Construct a Confidence Interval

Instructions on the left  
pertain to **means**

Instructions on the right  
pertain to **proportions**

## 1. POPULATION

### a. Identify the parameter of interest:

$\mu$  : Mean  
Numerical (Measurement)

$\pi$  : proportion  
Categorical (success-failure)

### b. Describe the variable in context with the problem:

$\mu$  = mean of the amount of drying time of a particular paint.

$\pi$  = proportion of people in the community who prefer smoking

## 2. STATISTICAL METHOD

### a. Determine the confidence level (1 - $\alpha$ ) and the level of significance $\alpha$ .

**NOTE:** If not specified, set the confidence to 0.95 (95%) and the level of significance to 0.05.

### b. Identify the required formula for the confidence interval:

When  $\sigma$  known:

$$\bar{x} \pm (z_{critical\ value}) \left( \frac{\sigma}{\sqrt{n}} \right)$$

$$p \pm (z_{critical\ value}) \sqrt{\frac{p(1-p)}{n}}$$

When  $\sigma$  unknown:

$$\bar{x} \pm (t_{critical\ value}) \left( \frac{s}{\sqrt{n}} \right)$$

## 3. SAMPLE

### a. Calculate or identify the descriptive statistics:

Descriptive statistics  
needed:

- the sample mean
- standard deviation
- sample size

Descriptive statistics needed:

- the sample proportion
- sample size

### b. Check the conditions for normality:

population is normal  
OR  
 $n \geq 30$

$$np \geq 10 \text{ AND } n(1-p) \geq 10$$

**4. STATISTICAL RESULTS**

**a. Find the required z or t critical value:**

**z critical value:**

1. Find  $\frac{\alpha}{2}$
2. Take this value and locate it in the *standard normal probability* table and identify the z critical value.

**NOTE: Commonly used z critical value**

Confidence Level	$\alpha$	$\frac{\alpha}{2}$	z critical value
90%	.10	.05	1.645
95%	.05	.025	1.960
99%	.01	.005	2.576

**t critical value:**

1. Determine the degrees of freedom:  $df = (n - 1)$
2. Use the appropriate confidence level and the df and locate the t critical value in the t critical value table.

For example,

Confidence Level	df	t critical value
90%	15	1.75
98%	7	3.00
95%	23	2.07

Same as z critical value information on the left.



**b. Compute the confidence interval based on formula in step 2.**

NOTE: Calculator shortcuts for the confidence interval:

When $\sigma$ known: Z-Interval		1-PropZInt
When $\sigma$ unknown: T-Interval		

**5. CONCLUSION**

**Interpret the confidence interval in the context of the problem:**

Ex) There is 95% probability that the mean drying time is between...

Ex) There is 95% probability that the proportion of people who prefer smoking is between...