

[My Programs](#) ▶ ... ▶ [Descriptive Statistics - Part I](#) ▶ Video: Capital vs. Lower

Video: Capital vs. Lower

The video player shows a table with the following structure:

DATE	DOW	TIME	BUY
		5	
		10	
		...	
		...	
		...	

Arrows point from x_1 to the first row and x_2 to the second row. A red play button is centered over the table. The video player controls at the bottom show a progress bar at 1:56 / 1:57, a volume icon, a CC icon, a settings icon, and the YouTube logo.

Capital vs. Lower Case Letters

Random variables are represented by capital letters. Once we observe an outcome of these random variables, we notate it as a lower case of the same letter.

Example 1

For example, the **amount of time someone spends on our site** is a **random variable** (we are not sure what the outcome will be for any particular visitor), and we would notate this with **X**. Then when the first person visits the website, if they spend 5 minutes, we have now observed this outcome of our random variable. We would notate any outcome as a lowercase letter with a subscript associated with the order that we observed the outcome.

If 5 individuals visit our website, the first spends 10 minutes, the second spends 20 minutes, the third spends 45 mins, the fourth spends 12 minutes, and the fifth spends 8 minutes; we can notate this problem in the following way:

X is the amount of time an individual spends on the website.

$x_1 = 10$, $x_2 = 20$ $x_3 = 45$ $x_4 = 12$ $x_5 = 8$.

The capital **X** is associated with this idea of a **random variable**, while the observations of the random variable take on lowercase **x** values.

Example 2

Taking this one step further, we could ask:

What is the probability someone spends more than 20 minutes in our website?

In notation, we would write:

$P(X > 20)$?

Here **P** stands for **probability**, while the parentheses encompass the statement for which we would like to find the probability. Since **X** represents the amount of time spent on the website, this notation represents the probability the amount of time on the website is greater than 20.

We could find this in the above example by noticing that only one of the 5 observations exceeds 20. So, we would say there is a **1** (the 45) **in 5 or 20%** chance that an individual spends more than 20 minutes on our website (based on this dataset).

Example 3

If we asked: **What is the probability of an individual spending 20 or more minutes on our website?** We could notate this as:

$P(X \geq 20)$?

We could then find this by noticing there are two out of the five individuals that spent 20 or more minutes on the website. So this probability is **2 out of 5 or 40%**.

[< Previous](#)

[Next >](#)

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