**Name of the experiment**. Time to solve a puzzle of the map of Colombia

**Aims:**

* Desing an experiment that allows the application of the analysis of variance.
* Use the analysis of variance to determine if there are significant differences between the times required to solve a puzzle about the political map of Colombia, considering two versions of this map: one having the names of every department (represented by one piece of the puzzle) and without these names.

**Materials**. 4 puzzles about the map of Colombia and 4 timers.

|  |
| --- |
|  |

Figure 1: material for the experiment

**Procedure**: The steps for this activity are explained below:

1. Definition of the problem.

In this experiment we want to inquire about the mean time that a person needs to solve a puzzle about a political-administrative map of a country correctly. Additionally, we want to determine if the kind of map has effects on the time needed to solve the puzzle.

1. Election of the factor and its levels.

The factor considered in this experiment is the **kind of map**, which is a qualitative variable with two levels: a map-puzzle with the names of every department (piece) printed, and a puzzle-map without these names printed.

1. Election of the response variable.

The response variable is the **time** in seconds needed to correctly solve the puzzle.

1. Election of the experimental desing

A one factor design will be used.

1. Execution of the experiment.

The steps for this experiment are described bellow:

* A person who is preferably alone and willing to take part in the experiment will be approached; additionally, it will be necessary for them to have a table or a large place to comfortably assemble the puzzle. Each of the volunteers will be greeted and explained about the activity to achieve empathy and the participation of each one of them. To standardize the process, it is recommended to make contact as follows:

«*Good morning/afternoon! We are students of the university and we are taking a course for which we are performing an experiment to determine the mean time that a person requires to correctly solve a puzzle of the map of Colombia. We would like you to take part on this experiment. Thanks beforehand*».

* If the individual decides to take part in the experiment, then one of the two possible versions of the puzzle is assigned to him: one version has the names of every piece (one piece is one of the departments of Colombia) and the other version has no names printed at all. Then, the puzzle is placed on the table where the participant is ubicated. After that, the experimenter must start the cronometer when the participant takes the first piece, and must stop the time when the puzzle is solved correctly. Time is registered on table 1.
* After restringing the time needed by the participant to solve the puzzle in table 1, the experimenter must ask the participant their highest scholar levels (undergraduate student, professional, specialist, magister or PhD) and nationality.
* Finally, the experiment must thank the participant for their participation. One phrase the experimenter could say is:

*«Thank you very much for taking part in this experiment.»*

**Resultados del experimento.**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Obs. | Time (seg) | Type of map (with/without names) | Age (years) | Scholarship | Nationality |
| 1 |  |  |  |  |  |
| 2 |  |  |  |  |  |
| 3 |  |  |  |  |  |
| 4 |  |  |  |  |  |
| 5 |  |  |  |  |  |
| 6 |  |  |  |  |  |
| 7 |  |  |  |  |  |
| 8 |  |  |  |  |  |
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| 10 |  |  |  |  |  |
| 11 |  |  |  |  |  |
| 12 |  |  |  |  |  |
| 13 |  |  |  |  |  |
| 14 |  |  |  |  |  |
| 15 |  |  |  |  |  |
| 16 |  |  |  |  |  |
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| 18 |  |  |  |  |  |
| 19 |  |  |  |  |  |
| 20 |  |  |  |  |  |
| 21 |  |  |  |  |  |
| 22 |  |  |  |  |  |
| 23 |  |  |  |  |  |
| 24 |  |  |  |  |  |
| 25 |  |  |  |  |  |
| 26 |  |  |  |  |  |
| 27 |  |  |  |  |  |
| 28 |  |  |  |  |  |
| 29 |  |  |  |  |  |
| 30 |  |  |  |  |  |

Table 1. Data from this experiment.

**Statistical analysis of the results**

Complete the table below for the statistics related to the time variable:

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Type of map | Minimum | Mean | Maximum | Standard deviation |
| With names |  |  |  |  |
| Without names |  |  |  |  |

Table 1. Resume statistics for time variable.

* Define appropriate hypothesis for this experiment using simple word (do not use symbolic mathematical language):

**H0:**

**HA:**

* Build na ANOVA table for this experiment:

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Variation origin | Sum of squared | Degrees of freedom | Mean square |  |  |
|  |  |  |  |  |  |
|  |  |  |  |  |  |
|  |  |  |  |  |  |

Table 3. ANOVA table.

Use the results obtained in the ANOVA table to answer the following questions:

Are there differences between the mean times required to solve the puzzle for each kind of them?

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Without performing any formal statistical analysis, what do you think about the influence of the factors studied such as the *scholarity*, the nationality and the age over the mean time?

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What other factors do you think that can be included in next studies?

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