

Exam for: An introduction to statistical testing

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The content of the class, with the exercises and the answers can be downloaded from the following address.

<http://lab.thegrandlocus.com/static/misc/statscourse.pdf>

1 Straight from the class

Exercise 1 (1 pt)

What is the name of the statistic of Student's t test?

Exercise 2 (1 pt)

What is the power of a test?

Exercise 3 (1 pt)

What is the null hypothesis of the Wilcoxon test?

Exercise 4 (2 pt)

What is the distribution of p-values if the null hypothesis is true?

2 Statistics win battles

Here is a passage from an article published in The Guardian.

By 1941-42, the allies knew that US and even British tanks had been technically superior to German Panzer tanks in combat, but they were worried about the capabilities of the new marks IV and V. More troubling, they had really very little idea of how many tanks the enemy was capable of producing in a year. Without this information, they were unsure whether any invasion of the continent on the western front could succeed.

One solution was to ask intelligence to guess the number by secretly observing the output of German factories, or by trying to count tanks on the battlefield. Both the British and the Americans tried this, but they found that the estimates returned by intelligence were contradictory and unreliable. Therefore they asked statistical intelligence to see whether the accuracy of the estimates could be improved.

The statisticians had one key piece of information, which was the serial numbers on captured mark V tanks. The statisticians believed that the Germans, being Germans, had logically numbered their tanks in the order in which they were produced. And this deduction turned out to be right. It was enough to enable them to make an estimate of the total number of tanks that had been produced up to any given moment.

source: <http://www.guardian.co.uk/world/2006/jul/20/secondworldwar.tvandradio>

Suppose you are a statistician working for the Allies. In the first month of the battle, you have captured tanks with serial number (257, 303, 247, 12, 23). The generals know that they can attack if the number of tanks produced per month is less than 500.

Exercise 5 (2 pt)

Should the Allies attack?

Exercise 6 (4 pt)

With what confidence? Give a numerical estimate and explain your approach.