

STATISTICAL SERIES AND HISTOGRAM IN PROBABILITY THEORY

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The word statistics is derived from the Latin word, which means “state, situation”. Statistics studies mass events in nature and society. The science of statistics studies the methods of describing, collecting, systematizing, analyzing and interpreting the results of observing mass random events in order to identify patterns.

Mathematical statistics builds a mathematical apparatus for the analysis of mass economic and social events. The task of mathematical statistics is to collect statistical data, analyze them and draw some conclusions based on this.

Mathematical statistics is a special science that deals with the creation of methods for solving probabilistic problems based on the results of statistical experimental experience.

Graphically, the statistical series is formalized in the form of a histogram. For this, the distance along the abscissa axis is drawn, and the area of each is Q_i . a rectangle equal to is drawn. The height h_i is calculated by the formula:

$$h_i = \frac{Q_i}{x_{i+1} - x_i}, \quad (1)$$

$$\sum_{i=1}^k Q_i = 1.$$

Histogram (from Greek histos – column, gamma – line, letter, orthography) is a method of presenting table data in a graphic form, that is, in the form of a bar chart.

Quantitative ratios of a specific indicator are presented in the form of rectangles, their areas are proportional. Often, for ease of perception, rectangles have the same width, and their height determines the aspect ratio of the displayed parameter.

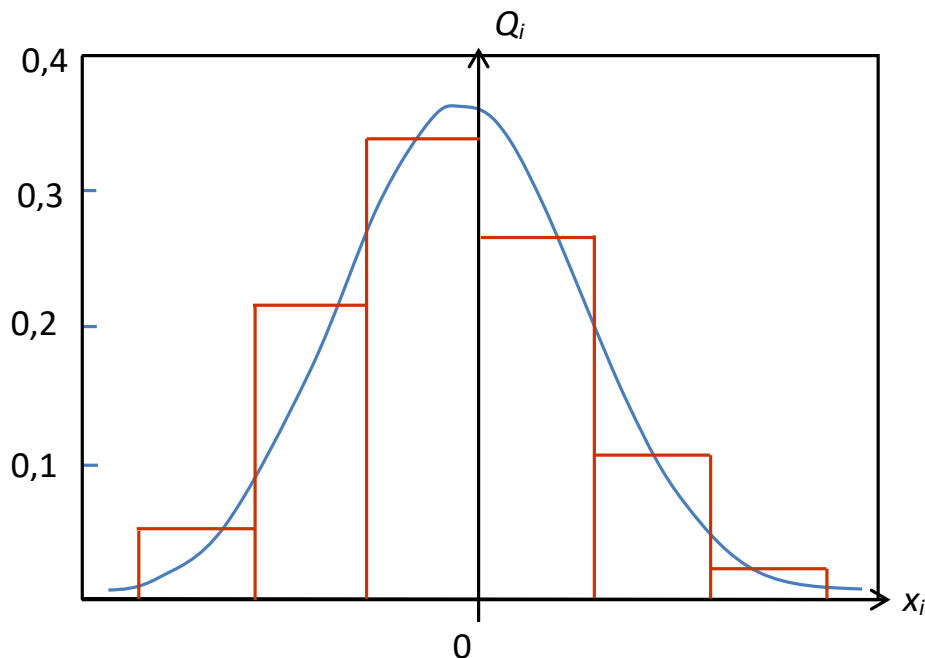


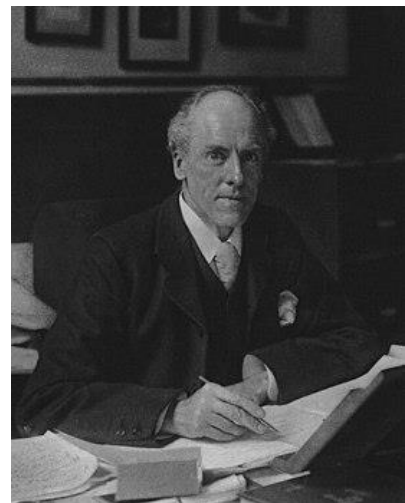
Fig.1. Histogram and distribution curvature

In descriptive statistics, a distribution histogram is a visual representation of the probability density function of some random variable constructed from a sample. It is sometimes called a frequency distribution because the histogram shows the frequency of occurrence of the measured values of the object's parameters. This concept and its name were introduced in 1895 by Carl Pearson

Karl Pearson (1857–1936, London, Great Britain) is an English mathematician, statistician, biologist and philosopher, the founder of mathematical statistics.

The histogram is constructed as follows. First, the set of values that a sample element can take is divided into several intervals. Often, these intervals are assumed to be the same, but this is not a strict requirement. These intervals are drawn on the horizontal axis, and then a rectangle is drawn above each one. If all intervals are the same, then the height of each rectangle is proportional to the number of sample elements that fall into the corresponding interval. If the intervals are different, then the height of the rectangle is chosen so that its area is proportional to the number of sample elements that fall into this interval.

In mathematical statistics, a histogram is one of the graphical methods of studying the distribution series of random variable values.



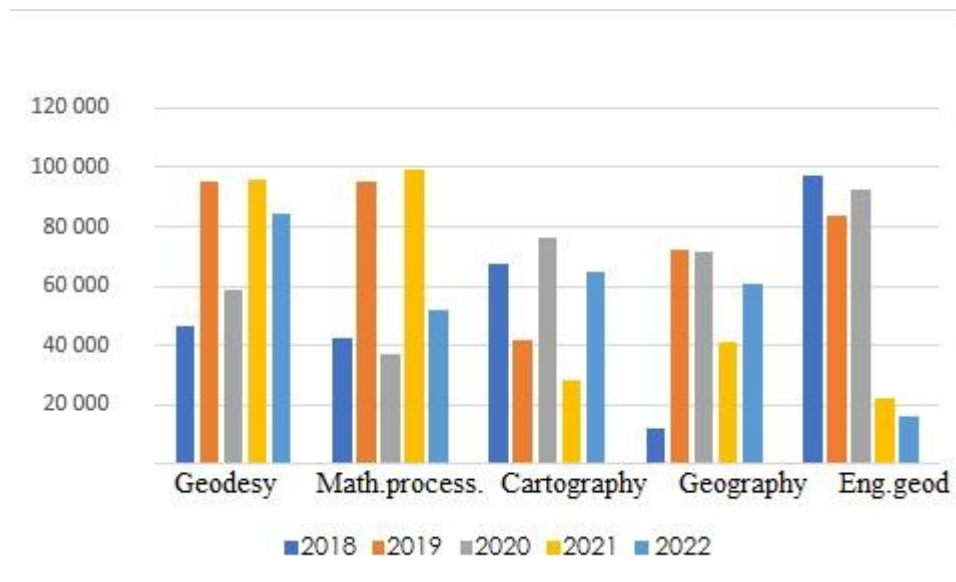


Fig.2. Normal distribution of sales of geodetic textbooks

Among graphical methods, the research distribution series is shown as follows:

- point method, (resulting in a point diagram);
- rectangle method (giving step polygon, bar chart or histogram);
- method of straight lines (giving the frequency polygon);
- sum of curves (image of accumulated frequency series);
- the image of the observed values of the random variable (their order number is drawn along the abscissa).

Column polygons and frequency polygons are collectively called distribution polygons. The scatter plot, column polygon and frequency polygon are cited as the most convenient.

For the two-dimensional case, instead of a distribution line, a distribution table is drawn, and the corresponding graph is called a prismogram.

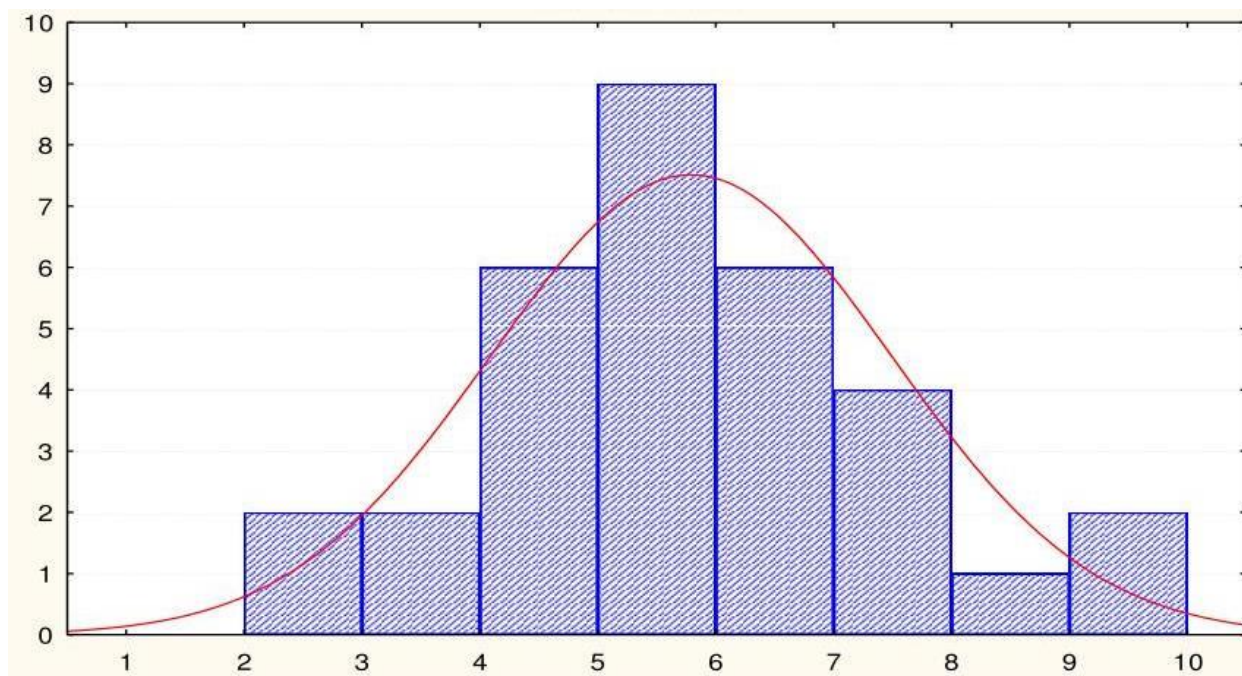


Fig.3. Normal distribution of the results of annual observations of the deformation of the structure

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2. www.geodesy.com/.