

# A/B тестирование

Занятие 1

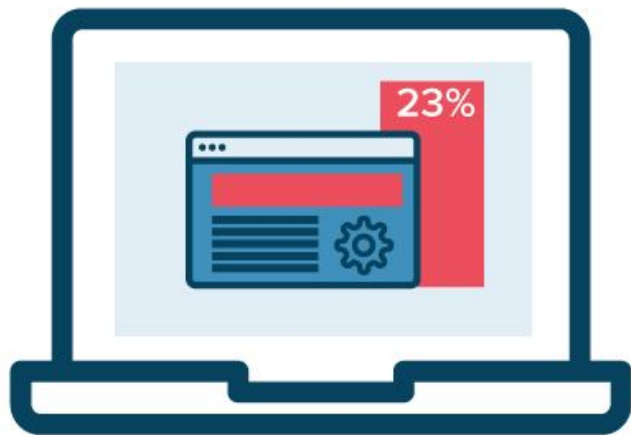
По материалам Вячеслава Мурашкина

# Содержание

- Методология проведения A/B тестов
- Выбор метрики
- Дизайн эксперимента
- Проверка гипотез

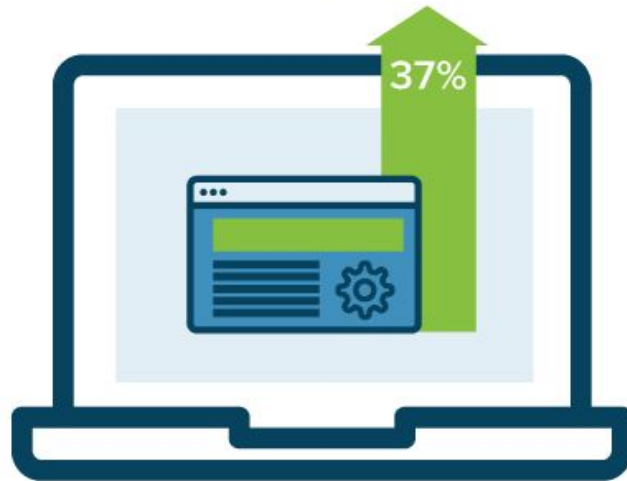
# A/B тестирование

A



CONTROL

B



VARIATION

# A/B тестирование

- Метод маркетингового исследования
- Набор пользователей разбивается на контрольную и тестовую группы
- В тестовой группе вносится некоторое изменение
- Эффект от изменений оценивается сравнением целевых метрик в группах

# Примеры A/B тестов: интерфейсы



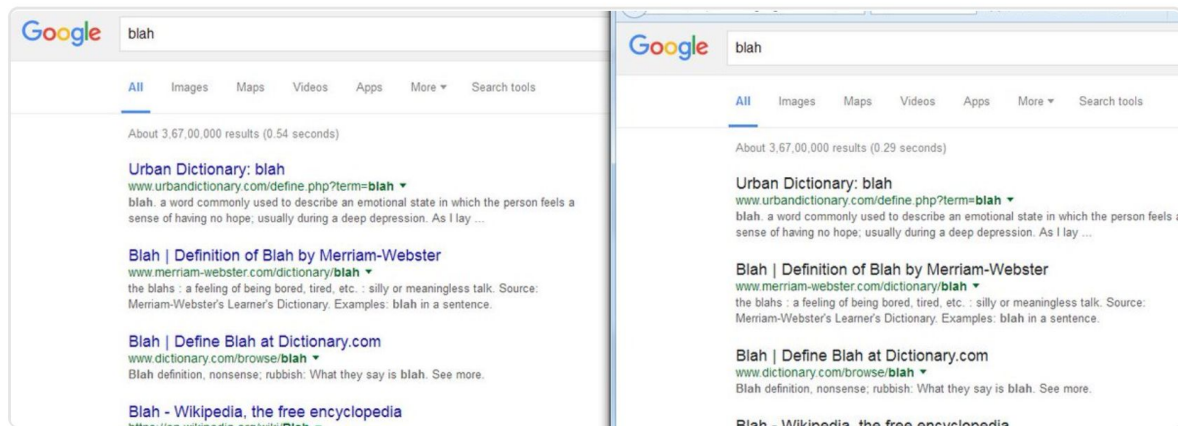
**Tripad**

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Google doing some A/B Testing with black links ? #UX #Webdesign



6:37 AM - 7 May 2016

# Примеры А/В тестов: интерфейсы

About 389,000 results (0.61 seconds)

**Hannibal - Wikipedia, the free encyclopedia**  
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Hannibal (247 – between 183 and 181 BC), in full Hannibal Barca, was a Punic military commander from Carthage, generally considered one of the greatest military commanders in history. His father Hamilcar Barca was the leading Carthaginian commander during the First Punic War.  
Hannibal (disambiguation) · Hannibal (TV series) · Scipio Africanus · Punic

**Hannibal - Warrior, General - Biography.com**  
[www.biography.com/people/hannibal-9327767](http://www.biography.com/people/hannibal-9327767) ▼  
Hannibal Barca was born in Carthage (present-day Tunisia) in approximately 247 B.C. He was the son of Carthaginian general Hamilcar Barca (Barca meaning "thunderbolt"). After Carthage's defeat by the Romans in the First Punic War in 241 B.C., Hamilcar devoted himself to improving both his and Carthage's fortunes.

**Hannibal Barca - Livius**  
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18 Aug 2015 - The Carthaginian general Hannibal (247-182 BCE) was one of the greatest military leaders in history. His most famous campaign took place ...

**Hannibal - Ancient History Encyclopedia**  
[www.ancienthistoryencyclopedia.com](http://www.ancienthistoryencyclopedia.com)

**darker**

Hannibal, fully Hannibal Barca, was a Punic military commander from Carthage, generally considered one of the greatest military commanders in history. His father Hamilcar Barca was the leading Carthaginian commander during the First Punic War. Wikipedia

**Born:** 247 BC, Carthage  
**Died:** Gebze, Turkey  
**Parents:** Hamilcar Barca  
**Allegiance:** Ancient Carthage  
**Battles and wars:** Siege of Saguntum, Battle of Ticinus, more

Hannibal Barca

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Hannibal (247 – between 183 and 181 BC), in full Hannibal Barca, was a Punic military commander from Carthage, generally considered one of the greatest military commanders in history. His father Hamilcar Barca was the leading Carthaginian commander during the First Punic War.  
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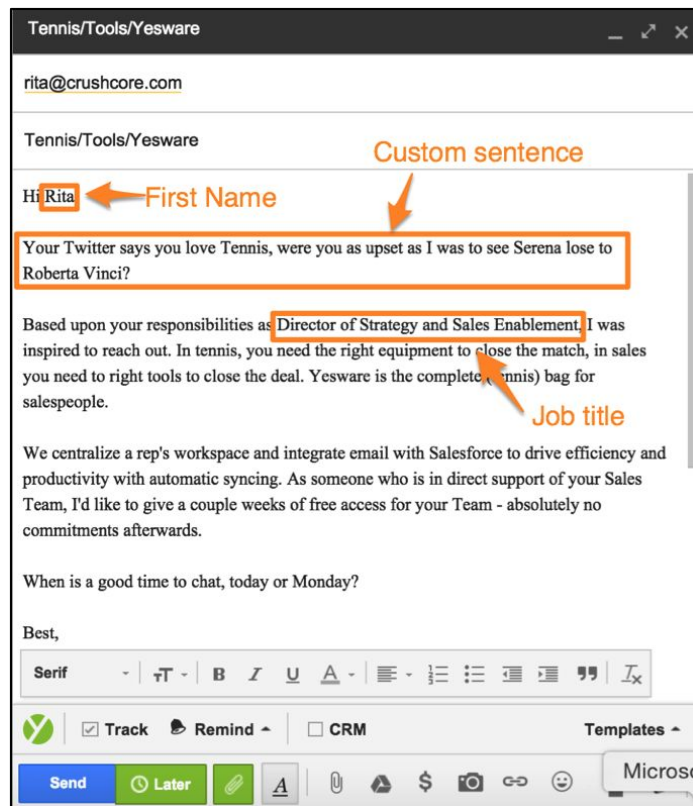
**Hannibal - Ancient History Encyclopedia**  
[www.ancienthistoryencyclopedia.com](http://www.ancienthistoryencyclopedia.com)

**lighter**

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# Примеры A/B тестов: email



# Примеры А/В тестов: реклама

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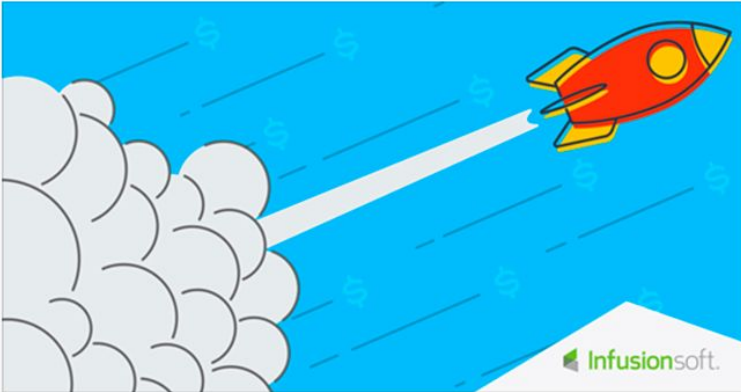
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# Примеры А/В тестов - алгоритмы

## Frequently Bought Together



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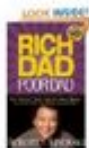
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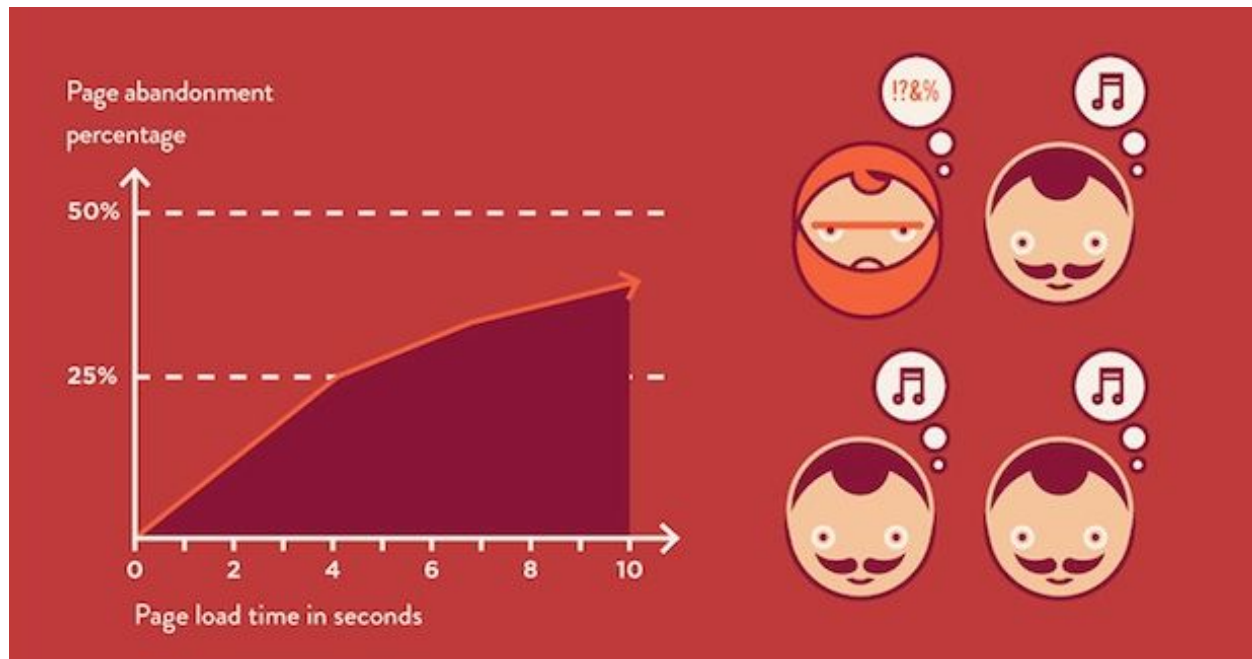


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# Примеры A/B тестов - время загрузки страницы



[How One Second Could Cost Amazon \\$1.6 Billion In Sales](#)

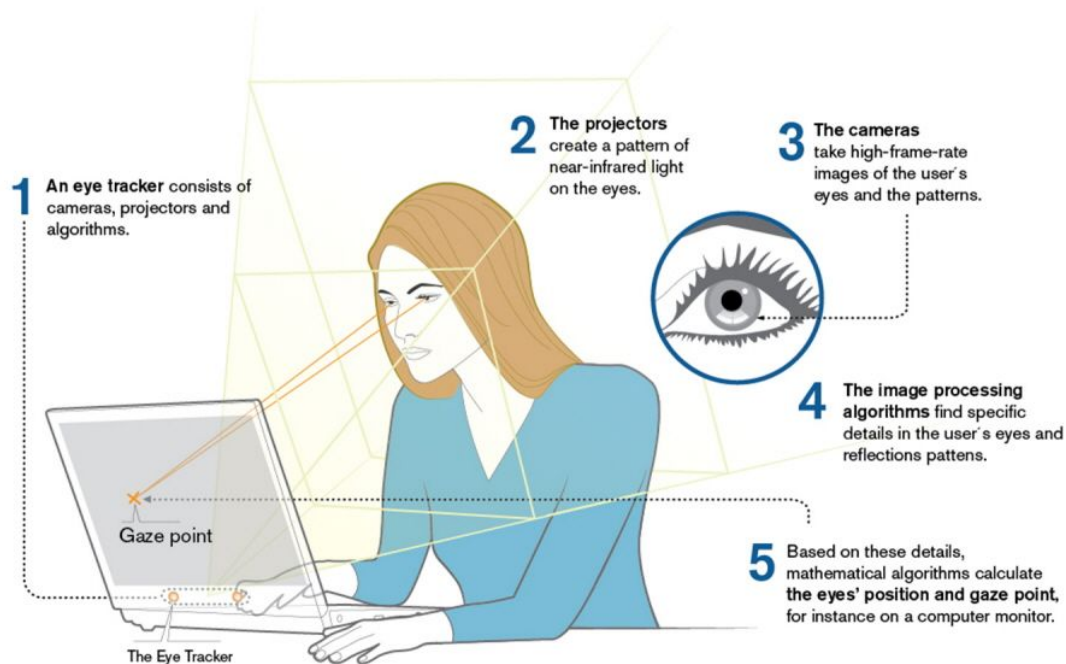
# A/B тесты проводить дорого

- Для проведения теста нужна инфраструктура
  - разбиение пользователей на группы
  - сбор и хранение необходимых данных
- Результат нельзя получить мгновенно
  - необходимо время для накопления достаточного объема данных
- В некоторых случаях можно отказаться от проведения A/B теста
  - если изменение будет в любом случае внесено

# Альтернативы A/B тестам

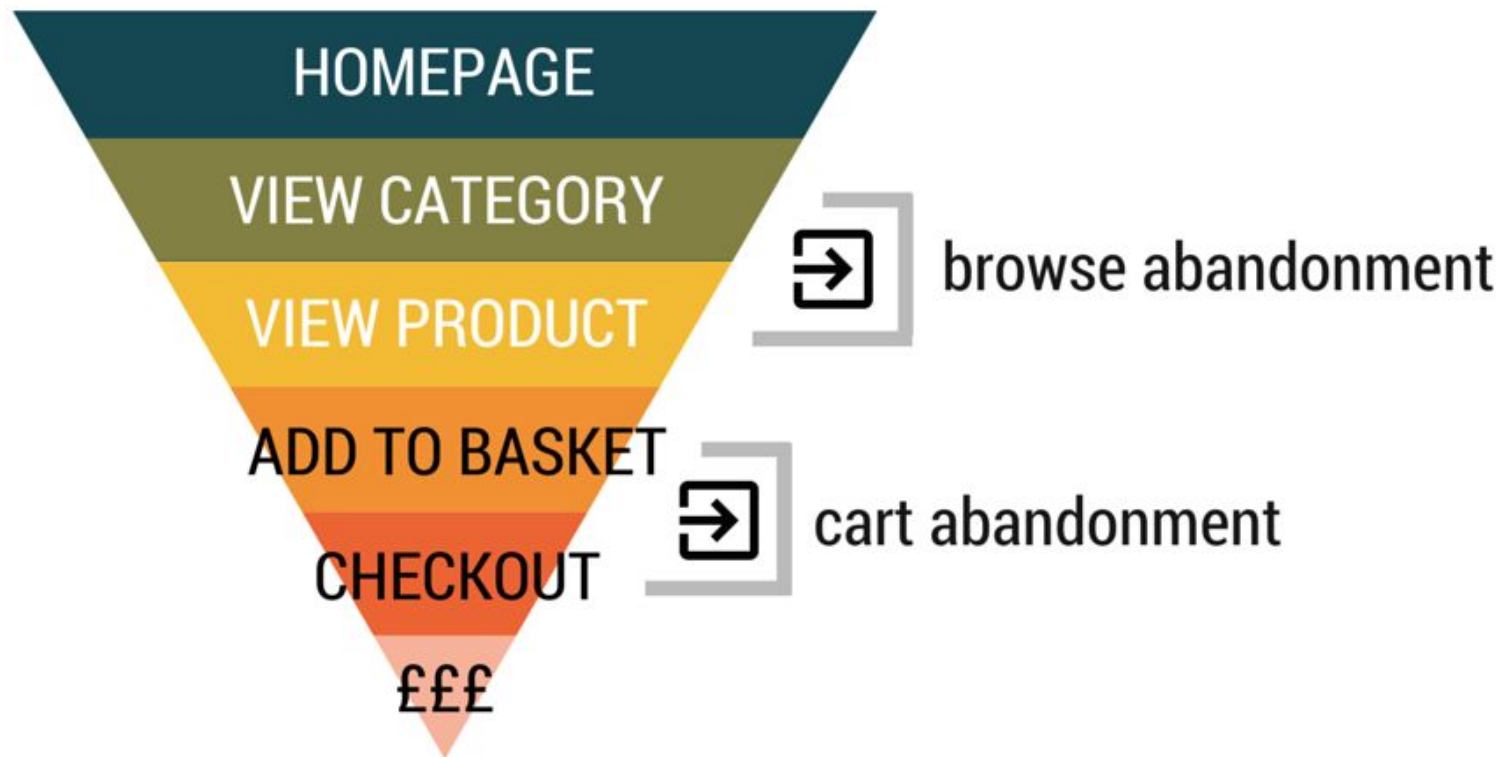
- Qualitative analysis (качественный анализ)
- UX исследования, фокус группы
- Eye tracking
- Опросы

# Альтернативы A/B тестам: Eye Tracking



Методология

# Методология: воронка интернет-магазина



# Методология: воронка интернет-магазина

	<b>CLICKS</b>	<b>USERS</b>
<b>VIEW PRODUCT</b>	10000	100
<b>ADD TO BASKET</b>	100	10
<b>CHECKOUT</b>	50	8



# Методология: воронка интернет-магазина

	<b>CLICKS</b>	<b>USERS</b>
<b>VIEW PRODUCT</b>	10000	100
<b>ADD TO BASKET</b>	100 (1%)	10 (10%)
<b>CHECKOUT</b>	50 (20%)	8 (80%)

# Методология: метрики

- Метрика выбирается исходя из бизнес-задачи
- При выборе метрики важно учитывать:
  - *чувствительность*
  - *стабильность*
  - *сложность вычисления*

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  - *чувствительность*
  - *стабильность*
  - *сложность вычисления*
- Для оценки качества метрики проводят A/A тесты

# Дизайн эксперимента

# Дизайн эксперимента

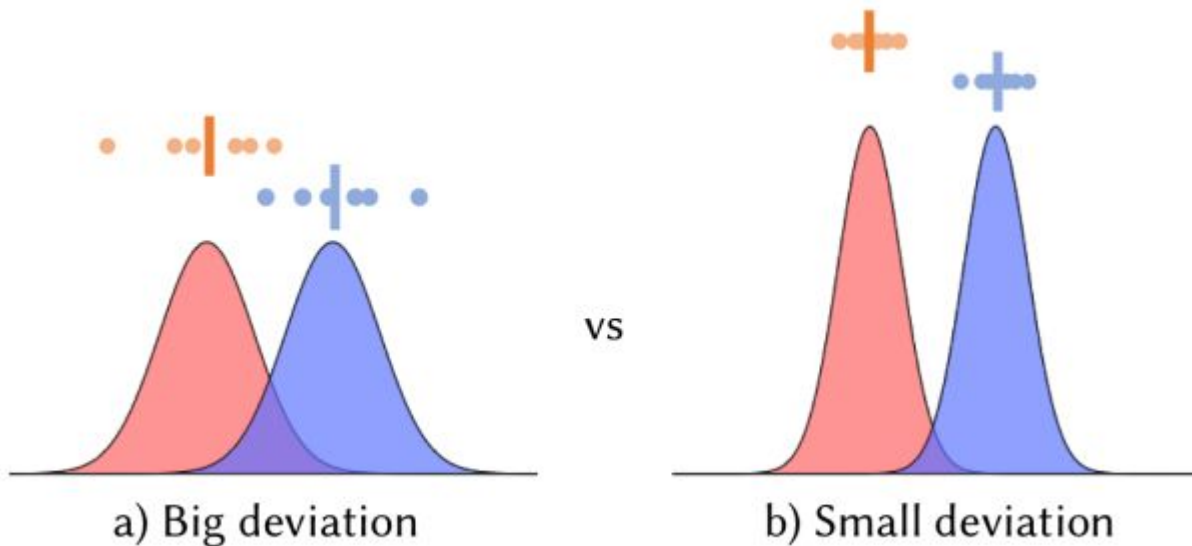
- Зафиксировать цели и метрики эксперимента
- Исключить внешние факторы
- Оценить необходимый объем выборки и время проведения эксперимента

Оценка эффекта и проверка гипотез

# Оценка эффекта

	<b>A</b>	<b>B</b>
<b>Conversion Rate</b>	5%	8%

# Оценка эффекта: разница случайна?





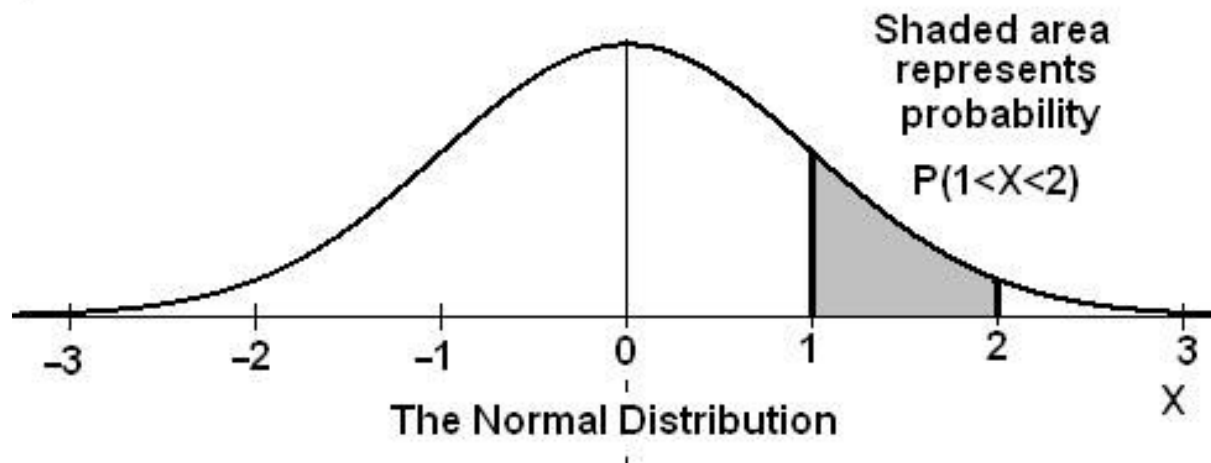
# Случайные величины

# Случайные величины

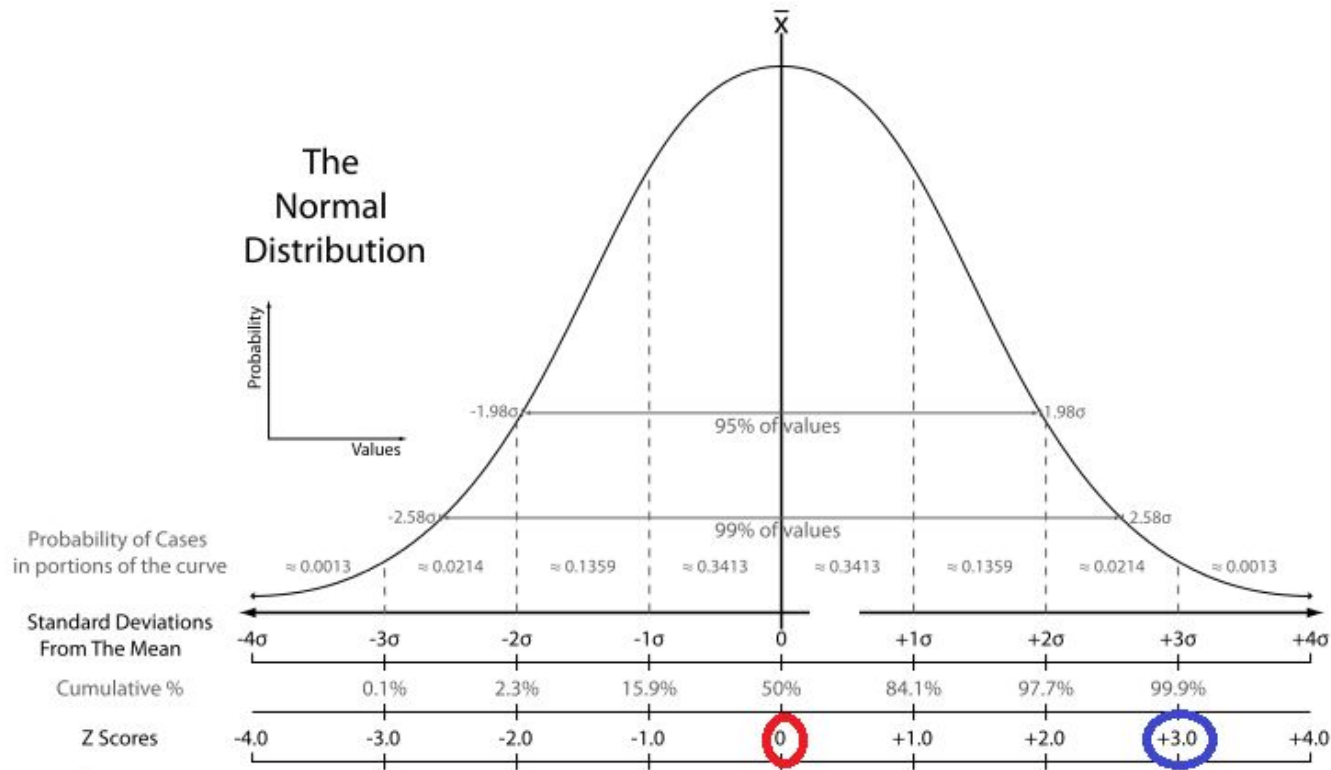
- **Дискретные**
  - *Пример:* число покупок на 100 посетителей сайта
- **Непрерывные**
  - *Пример:* выручка магазина за день

# Нормальное распределение

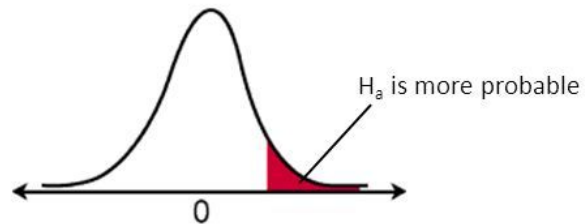
$$f(x \mid \mu, \sigma^2) = \frac{1}{\sqrt{2\pi\sigma^2}} e^{-\frac{(x-\mu)^2}{2\sigma^2}}$$



# Доверительный интервал, z-score

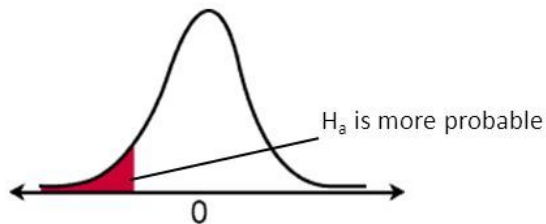


# Проверка гипотез



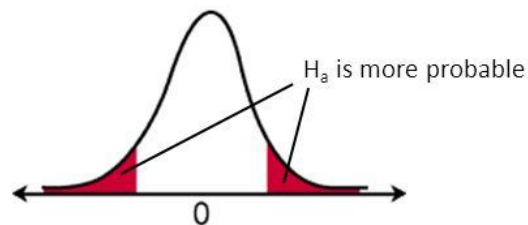
Right-tail test

$$H_a: \mu > \text{value}$$



Left-tail test

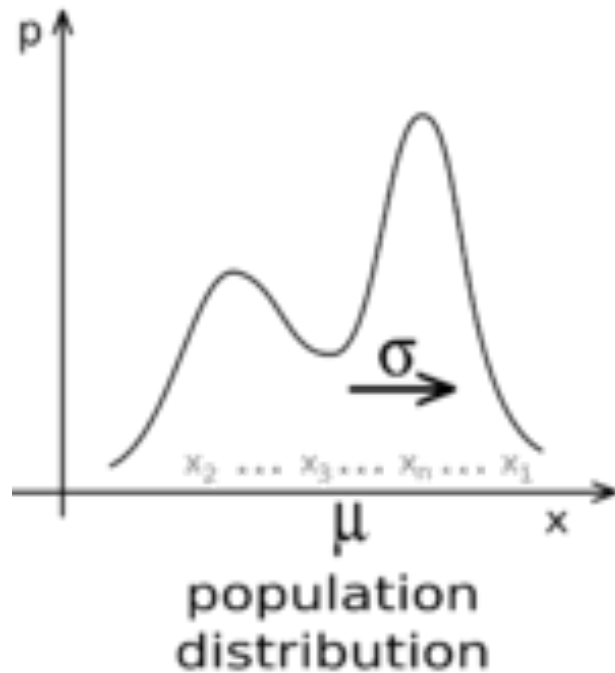
$$H_a: \mu < \text{value}$$



Two-tail test

$$H_a: \mu \neq \text{value}$$

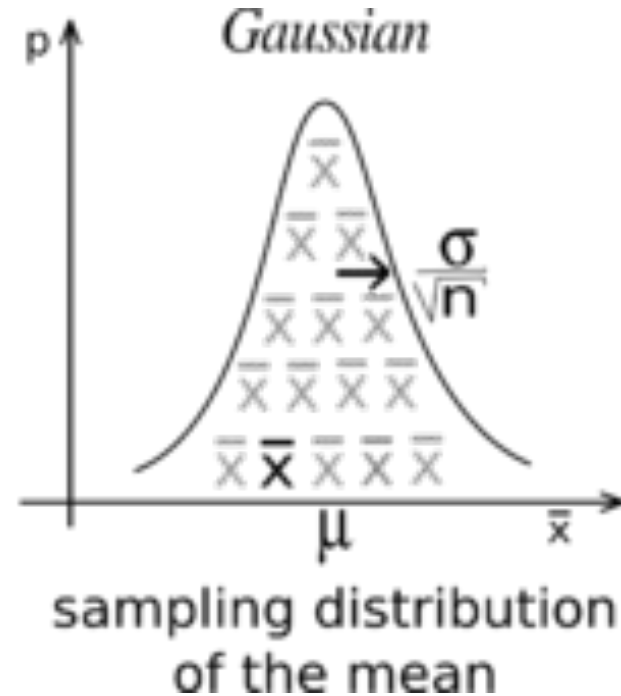
# Закон больших чисел



samples  
of size  $n$

$\bar{x}$

$\bar{x}$



# Распределение Бернулли

$$P(x) = \frac{n!}{(n-x)!x!} p^x q^{n-x}$$

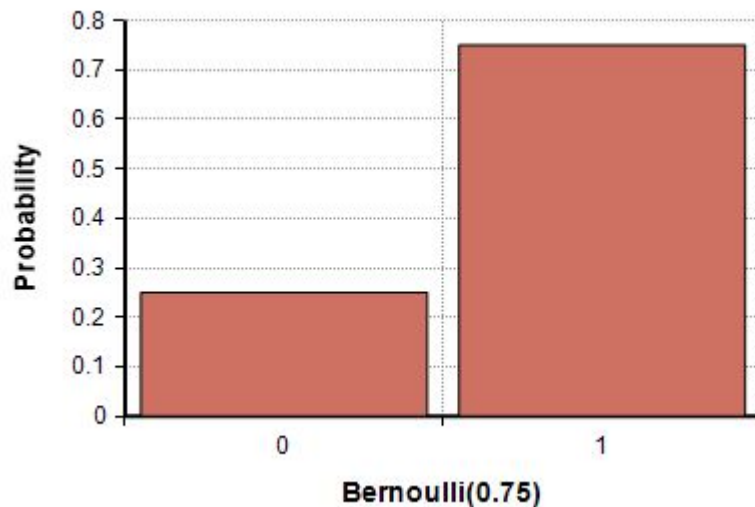
This starts the count of number of ways event can occur. (points to  $n!$ )

This is the probability of success for  $x$  trials. (points to  $p^x$ )

This ends the count of number of ways event can occur. (points to  $(n-x)!$ )

This deletes duplications. (points to  $x!$ )

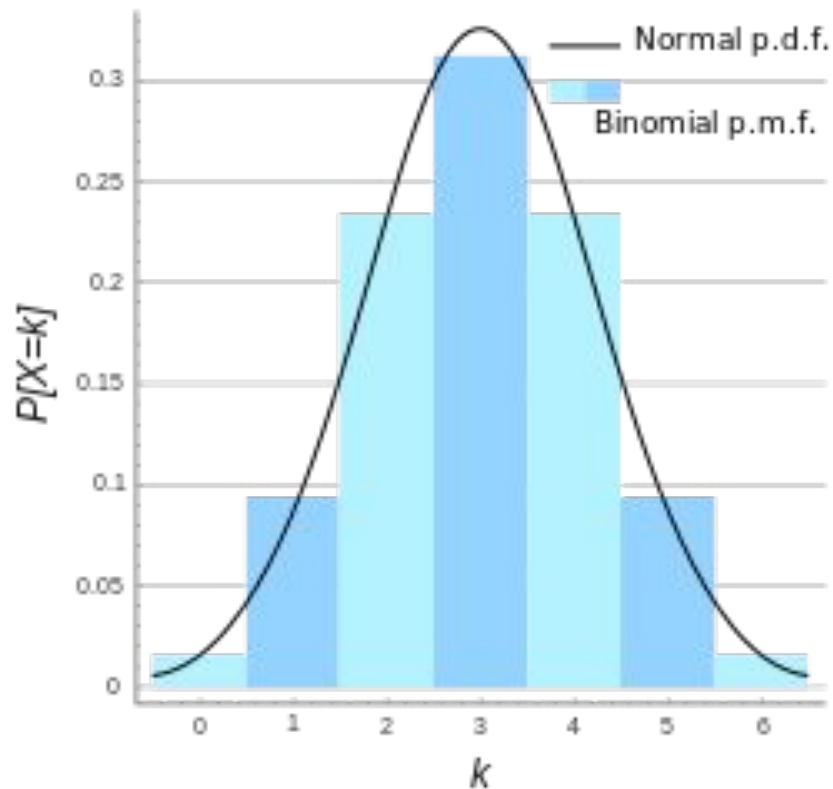
This is the probability of failure for the  $x$  trials. (points to  $q^{n-x}$ )



# Аппроксимация распределения Бернулли Нормальным

$$\mu_{\hat{p}} = p$$

$$\sigma_{\hat{p}} = \sqrt{\frac{p(1-p)}{n}}$$





# Полезные материалы

- [The Ultimate Guide To A/B Testing](#)
- [Udacity: Online Experiment Design and Analysis](#)
- [Statistics for Online Experiments](#)
- [How To Increase Site Performance Through A/B Split Testing](#)