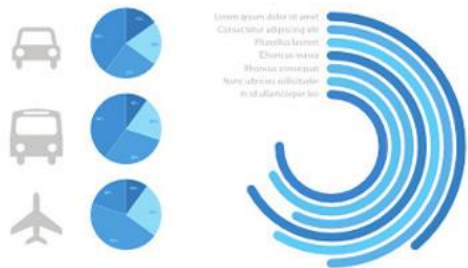


# Данные и чувство прекрасного



World map (political)



Statistics



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ЭФ МГУ'17  
IBS DHR

# План

- Почему визуализировать полезно
- Визуализация и хорошие манеры
- Основные типы визуализаций
- Как это выглядит на практике

# Почему визуализировать полезно

756395068473

658663037576

860372658602

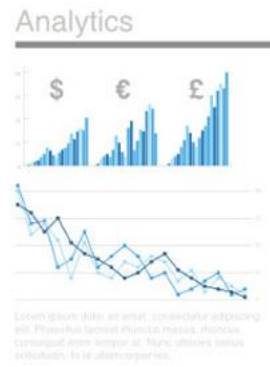
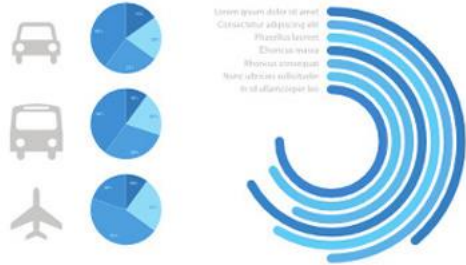
846589107830

756**3**9506847**3**

65866**303**7576

860**3**72658602

8465891078**30**



World map (political)



Statistics



# Визуализация и хорошие манеры

# Визуализация и хорошие манеры

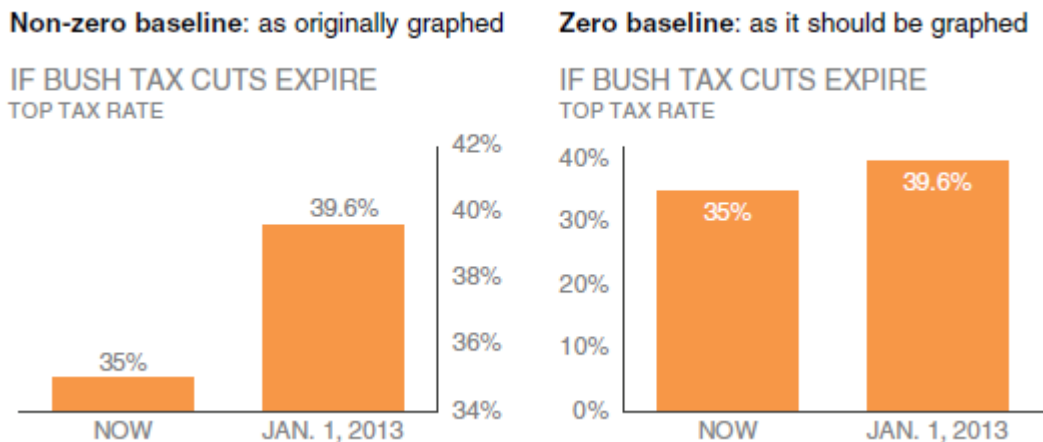
У графика всегда должны быть:

- Название
- Легенда
- Подписанные оси
- Ссылка, если график не ваш

# Визуализация и хорошие манеры

Данные не должны искажаться при визуализации

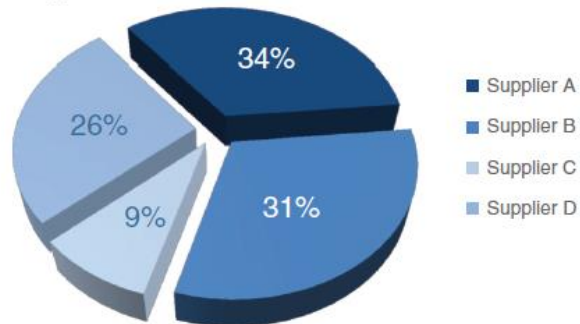
- гистограммы рисуются от 0
- логарифмические шкалы подписываются



# Визуализация и хорошие манеры

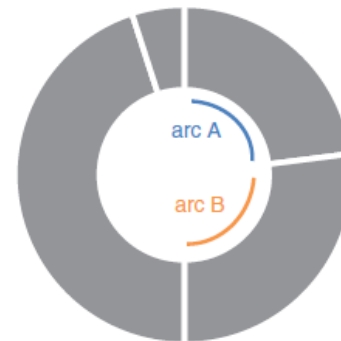
3D графики – плохая идея

Supplier Market Share



Круговые/donut диаграммы -  
тоже (увы)

The donut chart



# Про цвет

- Не больше 5 цветов на одном графике
- Оттенки одного цвета – лучший выбор
- Всё незначительное: единицы измерения, пояснения под графиком можно сделать серым
- В большинстве случаев белый фон выигрывает



# Про цвет

## Country Level Sales Rank Top 5 Drugs

Rainbow distribution in color indicates sales rank in given country from #1 (red) to #10 or higher (dark purple)

| Country | A | B | C  | D  | E  |
|---------|---|---|----|----|----|
| AUS     | 1 | 2 | 3  | 6  | 7  |
| BRA     | 1 | 3 | 4  | 5  | 6  |
| CAN     | 2 | 3 | 6  | 12 | 8  |
| CHI     | 1 | 2 | 8  | 4  | 7  |
| FRA     | 3 | 2 | 4  | 8  | 10 |
| GER     | 3 | 1 | 6  | 5  | 4  |
| IND     | 4 | 1 | 8  | 10 | 5  |
| ITA     | 2 | 4 | 10 | 9  | 8  |
| MEX     | 1 | 5 | 4  | 6  | 3  |
| RUS     | 4 | 3 | 7  | 9  | 12 |
| SPA     | 2 | 3 | 4  | 5  | 11 |
| TUR     | 7 | 2 | 3  | 4  | 8  |
| UK      | 1 | 2 | 3  | 6  | 7  |
| US      | 1 | 2 | 4  | 3  | 5  |

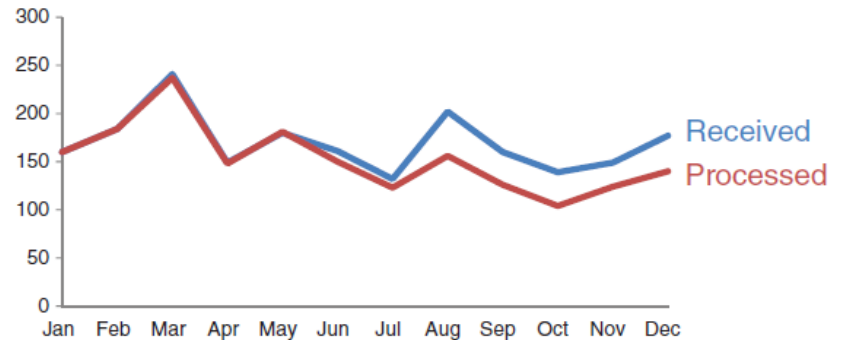
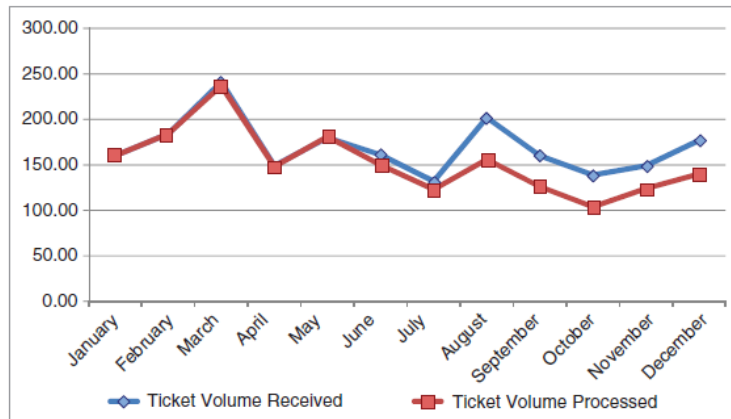
## Top 5 drugs: country-level sales rank

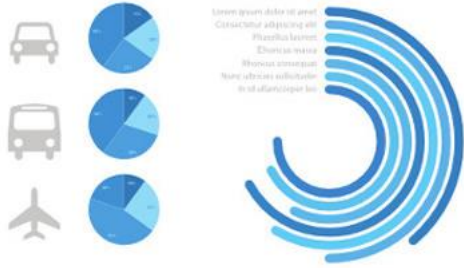
RANK **1** 2 3 4 5+

| COUNTRY   DRUG | A         | B | C  | D  | E  |
|----------------|-----------|---|----|----|----|
|                | Australia | 1 | 2  | 3  | 6  |
| Brazil         | 1         | 3 | 4  | 5  | 6  |
| Canada         | 2         | 3 | 6  | 12 | 8  |
| China          | 1         | 2 | 8  | 4  | 7  |
| France         | 3         | 2 | 4  | 8  | 10 |
| Germany        | 3         | 1 | 6  | 5  | 4  |
| India          | 4         | 1 | 8  | 10 | 5  |
| Italy          | 2         | 4 | 10 | 9  | 8  |
| Mexico         | 1         | 5 | 4  | 6  | 3  |
| Russia         | 4         | 3 | 7  | 9  | 12 |
| Spain          | 2         | 3 | 4  | 5  | 11 |
| Turkey         | 7         | 2 | 3  | 4  | 8  |
| United Kingdom | 1         | 2 | 3  | 6  | 7  |
| United States  | 1         | 2 | 4  | 3  | 5  |

# Про избыточность

- Убираем направляющие
- Убираем метки на графиках
- Переносим легенду на сам график





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### Analytics



Ut enim ipsam voluptatem quia voluptas sit aspernatur aut odit doloribus, sed quia consequuntur magni dolores eos qui ratione voluptatem sequi nesciunt, neque porro quisquam est, qui dolorem ipsum quia dolor sit amet, consectetur adipiscing elit, sed qui ut nesciunt, id quod est blanditiis.

### World map (political)



### Statistics



# Основные типы визуализаций

# Просто текст / карточка / KPI chart

# 20%

of children had a  
**traditional stay-at-home mom**  
in 2012, compared to 41% in 1970

HR-бюджет/ сотрудника (руб.)

**151,56K +26.05%**

Факт (vs. План)

▲ План

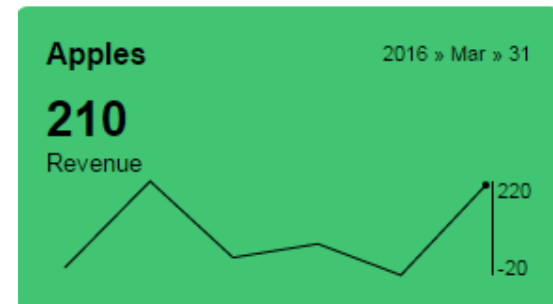
ФОТ / сотрудника (руб.)

**76,2K -0.46%**

Факт (vs. План)

▼ План

KPI Chart



Большая цифра – отличный вариант, если нужно показать 1 или 2 значения

# Таблица

Heavy borders

| Group   | Metric A | Metric B | Metric C |
|---------|----------|----------|----------|
| Group 1 | \$X.X    | Y%       | Z,ZZZ    |
| Group 2 | \$X.X    | Y%       | Z,ZZZ    |
| Group 3 | \$X.X    | Y%       | Z,ZZZ    |
| Group 4 | \$X.X    | Y%       | Z,ZZZ    |
| Group 5 | \$X.X    | Y%       | Z,ZZZ    |

Light borders

| Group   | Metric A | Metric B | Metric C |
|---------|----------|----------|----------|
| Group 1 | \$X.X    | Y%       | Z,ZZZ    |
| Group 2 | \$X.X    | Y%       | Z,ZZZ    |
| Group 3 | \$X.X    | Y%       | Z,ZZZ    |
| Group 4 | \$X.X    | Y%       | Z,ZZZ    |
| Group 5 | \$X.X    | Y%       | Z,ZZZ    |

Minimal borders

| Group   | Metric A | Metric B | Metric C |
|---------|----------|----------|----------|
| Group 1 | \$X.X    | Y%       | Z,ZZZ    |
| Group 2 | \$X.X    | Y%       | Z,ZZZ    |
| Group 3 | \$X.X    | Y%       | Z,ZZZ    |
| Group 4 | \$X.X    | Y%       | Z,ZZZ    |
| Group 5 | \$X.X    | Y%       | Z,ZZZ    |

Таблица полезна, когда много данных в разных единицах измерения  
В остальных случаях более наглядна графика

# Heatmap

Table

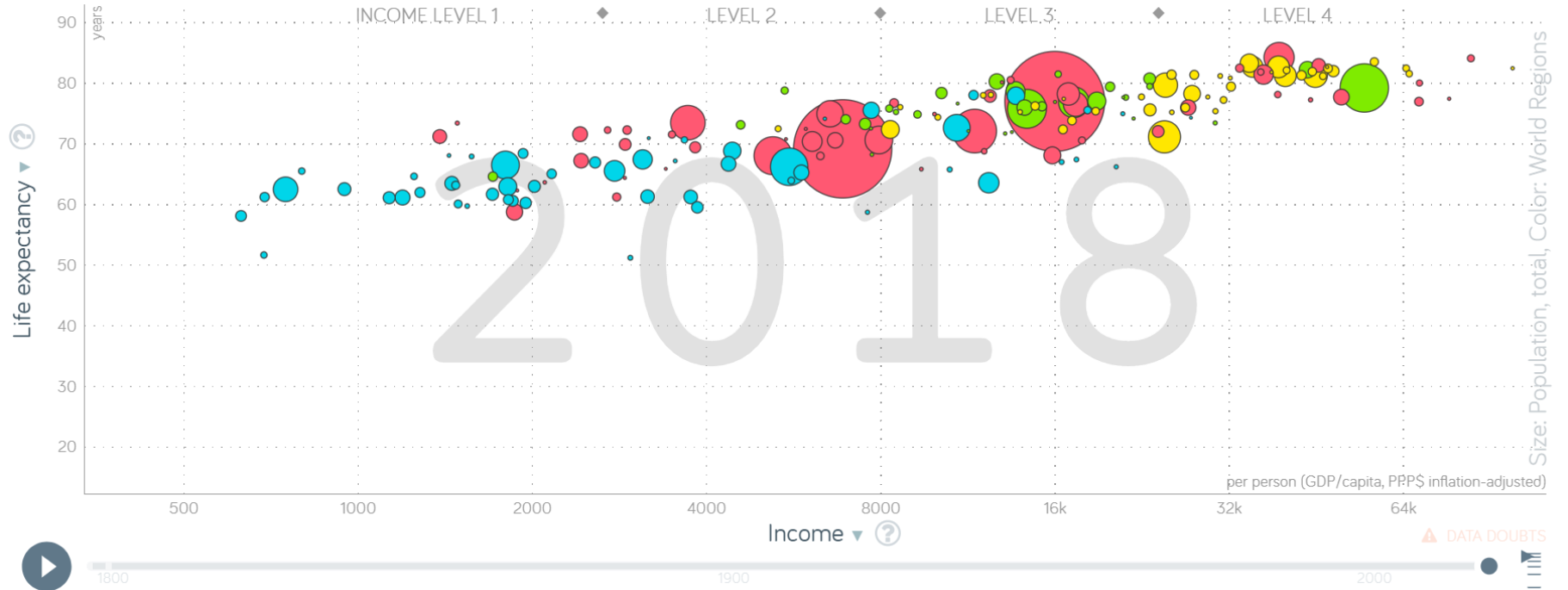
|            | A   | B   | C   |
|------------|-----|-----|-----|
| Category 1 | 15% | 22% | 42% |
| Category 2 | 40% | 36% | 20% |
| Category 3 | 35% | 17% | 34% |
| Category 4 | 30% | 29% | 26% |
| Category 5 | 55% | 30% | 58% |
| Category 6 | 11% | 25% | 49% |

Heatmap

LOW-HIGH

|            | A   | B   | C   |
|------------|-----|-----|-----|
| Category 1 | 15% | 22% | 42% |
| Category 2 | 40% | 36% | 20% |
| Category 3 | 35% | 17% | 34% |
| Category 4 | 30% | 29% | 26% |
| Category 5 | 55% | 30% | 58% |
| Category 6 | 11% | 25% | 49% |

# Scatterplot

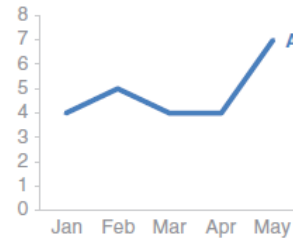


Источник: [www.gapminder.org](http://www.gapminder.org)

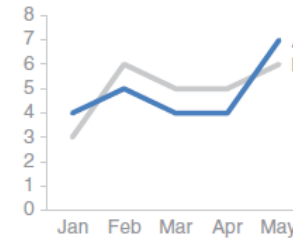
# Графики / Line graphs

Используются в основном для временных рядов

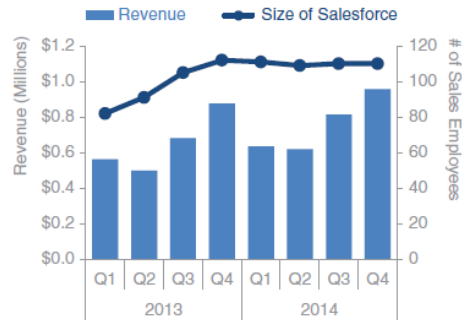
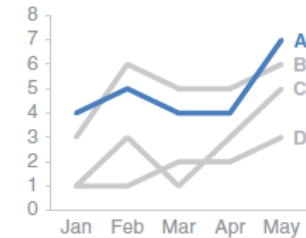
Single series



Two series



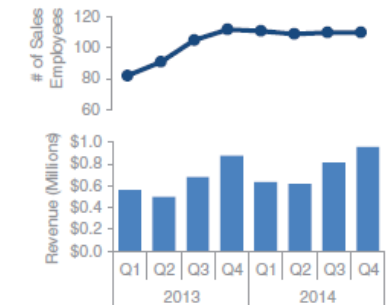
Multiple series



Alternative 1: label directly



Alternative 2: pull apart vertically



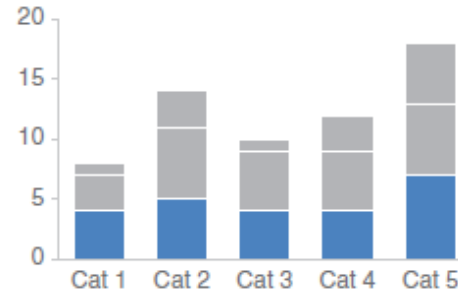
Дополнительные оси сложно считываются



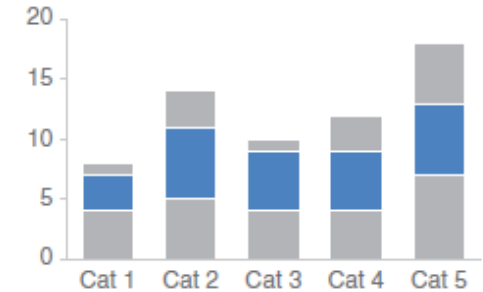
# Гистограммы

- Вертикальные
- Горизонтальные
- С накоплением
- Приведённые к 100%

Comparing **these** is easy



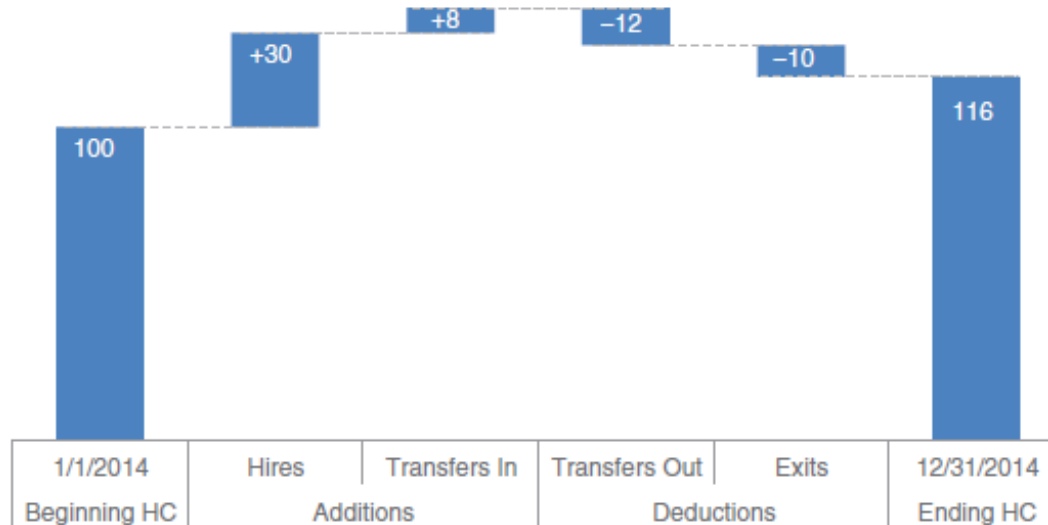
Comparing **these** is hard



# Waterfall chart

## 2014 Headcount math

Though more employees transferred out of the team than transferred in, aggressive hiring means overall headcount (HC) increased 16% over the course of the year.



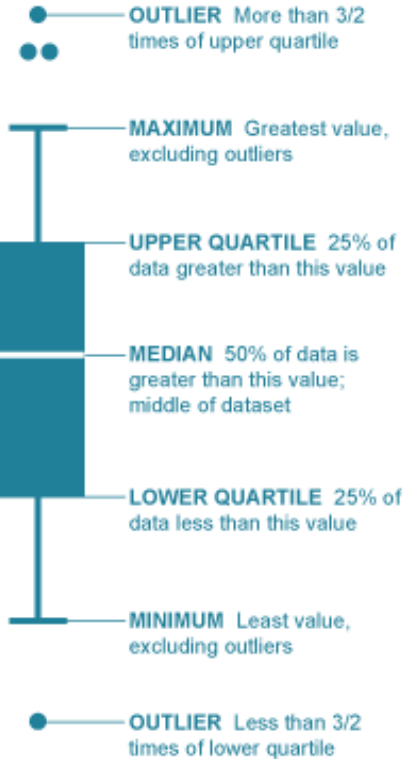
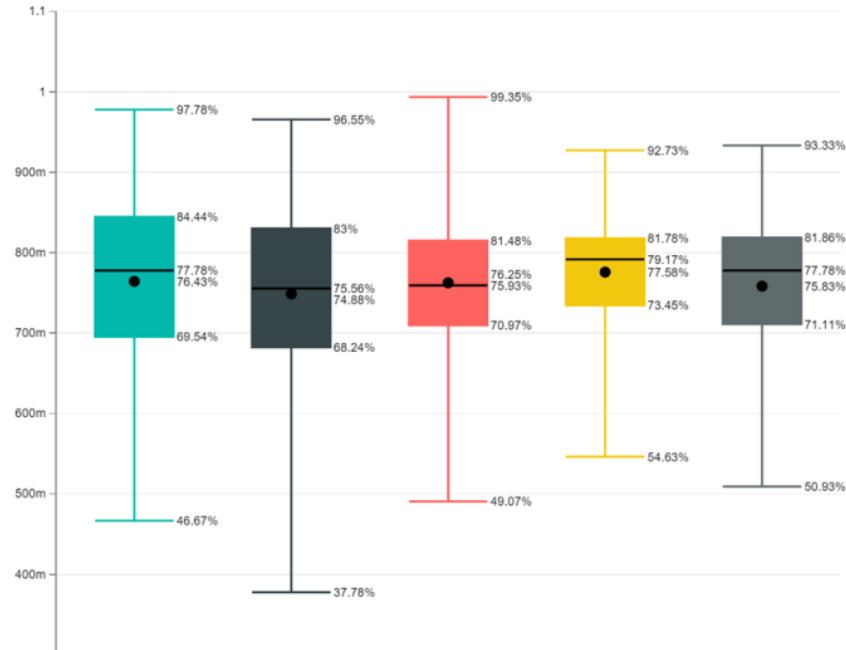
Используем, когда нужно показать составляющие одного целого

Hint: в Excel рисуется как гистограмма с накоплением с нижними блоками цвета фона

# Ящик с усами / boxplot

Grade by Subject and Full Name

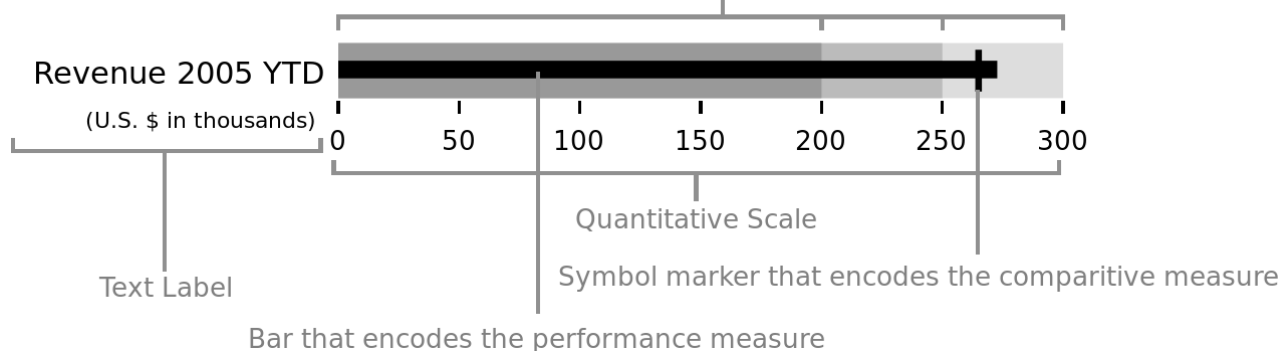
Subject ● Languages ● Life Skills ● Math & Comp Sci ● Science ● Social Studies

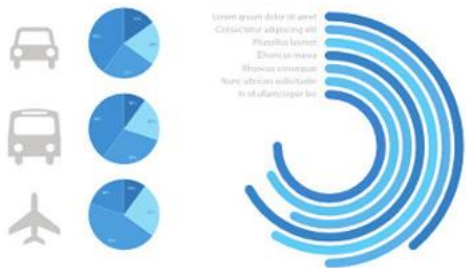


Тяжело считывается большинством людей

# Bulletgraph

Background fill colors that encode qualitative ranges such as bad, satisfactory, and good





Ut enim ipsam voluptatem quia voluptas sit aspernatur aut odit aut fugit, sed quia consequuntur magnam dolores eos qui ratione voluptatem sequi nesciunt, neque porro quisquam est, qui dolorem ipsum quia dolor sit amet, consectetur adipiscing elit, sed qui ut autem voluptatem molestiae possunt reprehenderit id est aliquando.

### Analytics

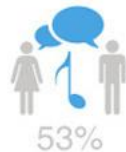
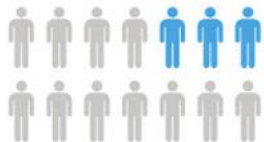


Ut enim ipsam voluptatem quia voluptas sit aspernatur aut odit aut fugit, sed quia consequuntur magnam dolores eos qui ratione voluptatem sequi nesciunt, neque porro quisquam est, qui dolorem ipsum quia dolor sit amet, consectetur adipiscing elit, sed qui ut autem voluptatem molestiae possunt reprehenderit id est aliquando.

### World map (political)



### Statistics



# Как это выглядит на практике

# Dashboard

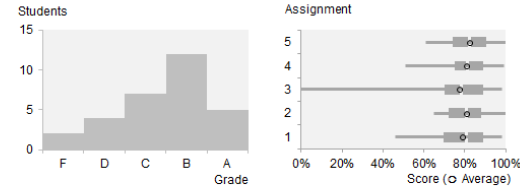
May 1, 2012  
Tuesday

## Grade 10 Algebra Course

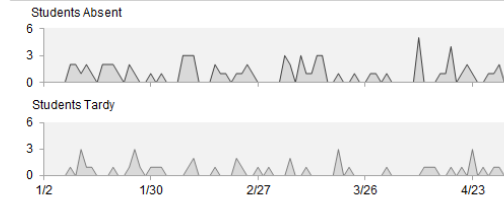
Note: All scores are expressed as percentage of points earned out of the total points possible. [HELP](#)

| Student              | Course Grades |   |   |   |   | Class Discipline |               |       |        | Assignment Scores |            | Last Assign. | Last Assign. % |
|----------------------|---------------|---|---|---|---|------------------|---------------|-------|--------|-------------------|------------|--------------|----------------|
|                      | Last Roll     | F | D | C | B | A                | Current Grade | Tardy | Absent | Referrals         | Detentions |              |                |
| Frederick Chandler   |               |   |   |   |   | F                | 0             | 0     | 0      | 0                 | 0          | 2            | 68%            |
| Bae Kim              |               |   |   |   |   | F                | 0             | 0     | 0      | 0                 | 0          | 3            | 61%            |
| Fiona Reeves         |               |   |   |   |   | D                | 0             | 0     | 0      | 0                 | 0          | 3            | 64%            |
| Brian Francis        |               |   |   |   |   | D                | 0             | 0     | 0      | 0                 | 0          | 2            | 69%            |
| Anthony Harper       |               |   |   |   |   | D                | 0             | 0     | 0      | 0                 | 0          | 1            | 78%            |
| Christopher Murphy   | a             |   |   |   |   | D                | 0             | 0     | 0      | 0                 | 0          | 1            | 78%            |
| Kirsten Holmes       |               |   |   |   |   | C                | 0             | 0     | 0      | 0                 | 0          | 0            | 72%            |
| Roshawn Dawson       |               |   |   |   |   | C                | 0             | 0     | 0      | 0                 | 0          | 0            | 71%            |
| Nikolas Mikhailovich |               |   |   |   |   | C                | 0             | 0     | 0      | 0                 | 0          | 0            | 79%            |
| James Martin         | a             |   |   |   |   | C                | 0             | 0     | 0      | 0                 | 0          | 1            | 75%            |
| Blaine Harper        |               |   |   |   |   | C                | 0             | 0     | 0      | 0                 | 0          | 0            | 74%            |
| George Smith         | t             |   |   |   |   | C                | 0             | 0     | 0      | 0                 | 0          | 1            | 76%            |
| Regan Potrero        |               |   |   |   |   | C                | 0             | 0     | 0      | 0                 | 0          | 1            | 72%            |
| Britta Jones         |               |   |   |   |   | B                | 0             | 0     | 0      | 0                 | 0          | 0            | 77%            |
| Scott Ortiz          |               |   |   |   |   | B                | 0             | 0     | 0      | 0                 | 0          | 1            | 81%            |
| Xu Mei               |               |   |   |   |   | B                | 0             | 0     | 0      | 0                 | 0          | 0            | 85%            |
| Jaime Goss           |               |   |   |   |   | B                | 0             | 0     | 0      | 0                 | 0          | 0            | 86%            |
| Samuel Miller        |               |   |   |   |   | B                | 0             | 0     | 0      | 0                 | 0          | 0            | 84%            |
| Maria Garcia         |               |   |   |   |   | B                | 0             | 0     | 0      | 0                 | 0          | 0            | 88%            |
| Jose Domingo         |               |   |   |   |   | B                | 0             | 0     | 0      | 0                 | 0          | 0            | 84%            |
| Lawrence Parker      |               |   |   |   |   | B                | 0             | 0     | 0      | 0                 | 0          | 0            | 91%            |
| Fariah Jackson       |               |   |   |   |   | B                | 0             | 0     | 0      | 0                 | 0          | 0            | 88%            |
| Sarah Jameson        |               |   |   |   |   | B                | 0             | 0     | 0      | 0                 | 0          | 1            | 89%            |
| David Chenowith      |               |   |   |   |   | B                | 0             | 0     | 0      | 0                 | 0          | 0            | 97%            |
| Alison Perry         |               |   |   |   |   | B                | 0             | 0     | 0      | 0                 | 0          | 0            | 91%            |
| Amala Singh          |               |   |   |   |   | A                | 0             | 0     | 0      | 0                 | 0          | 0            | 99%            |
| Hannah Li            |               |   |   |   |   | A                | 0             | 0     | 0      | 0                 | 0          | 0            | 94%            |
| James Snow           |               |   |   |   |   | A                | 0             | 0     | 0      | 0                 | 0          | 0            | 97%            |
| Donald Chase         |               |   |   |   |   | A                | 0             | 0     | 0      | 0                 | 0          | 0            | 95%            |
| Holly Norton         |               |   |   |   |   | A                | 0             | 0     | 0      | 0                 | 0          | 0            | 100%           |

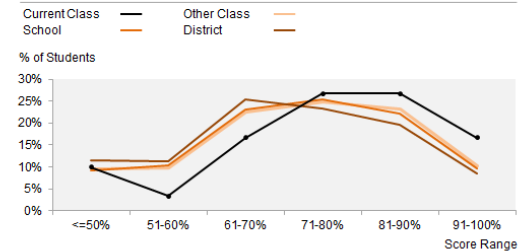
### Grade and Assignment Score Distribution



### Attendance (excluding weekends)



### Standardized Math Assessment Score Distribution



### Standardized Math Assessment Median Score

| Current Class | Other Class | School | District |
|---------------|-------------|--------|----------|
| 79.0%         | 77.4%       | 74.2%  | 71.9%    |

# Что почитать

- Few, Stephen «Information Dashboard Design: Displaying Data for At-a-glance Monitoring» Analytics Press, 2013
- Nussbaumer Knaflic, Cole «Storytelling with Data: A Data Visualization Guide for Business Professionals» Wiley, 2015.
- Tufte, Edward R. «The Visual Display of Quantitative Information» Graphics Press, 2001