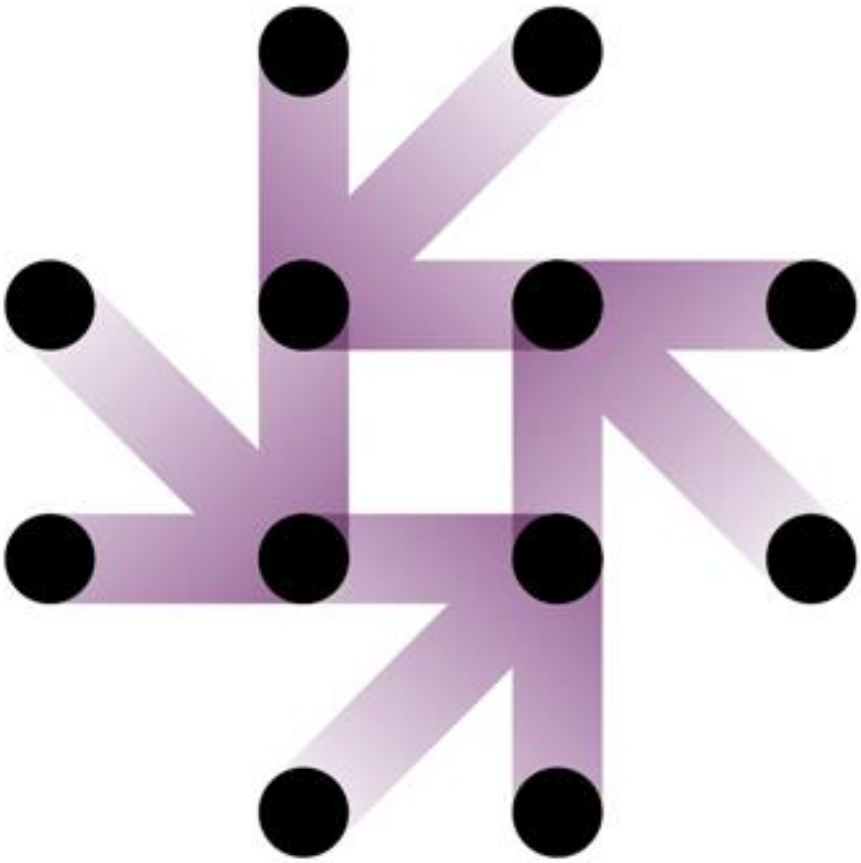
– E X P L A I N –

Handle numbers



Handbook for Students

Table Contents

1 INTRODUCTION

We are all surrounded by numbers. You do not find them only during math classes. On billboards, in newspapers, magazines, radio or TV – we find numbers everywhere and they often are represented through graphs, diagrams or info graphics in order to make simple their meaning.

Infographics have the great advantage to let us grasp intuitively and immediately the significance of even complex mathematical calculations and statistics.
More over, they are a powerful tool to present effectively studies or researches at school and university, but also in the professional field for the development and illustration of projects, products or services.

Infographics are a useful tool to represent data and information for any subject or discipline of your study. Not only for math or statistics, but also whenever you have to show data or information for history, geography, science, to mention but a few.

Being able to handle numbers with info graphics, you will not only deliver better presentations at school, university or work, but also it will help you understand the world you live in. Statistics about media, phone rates, health, incomes and politics will give insights in trend in our society.

Handle Numbers teaches you how to represent your numbers in graphs, charts and info graphics so you can use them to visualize your talks and perform better in oral exams or presentations.

Each learning step is organized into five sections:

Discover: explanations of the key skills
Learn: examples of how to interpret and create graphs and info graphics
Practise: tasks and exercises to help you try out what you have learned
Assess your learning: tools to help you assess your performance and measure your progress
Learning resources: list of useful links to online learning resources

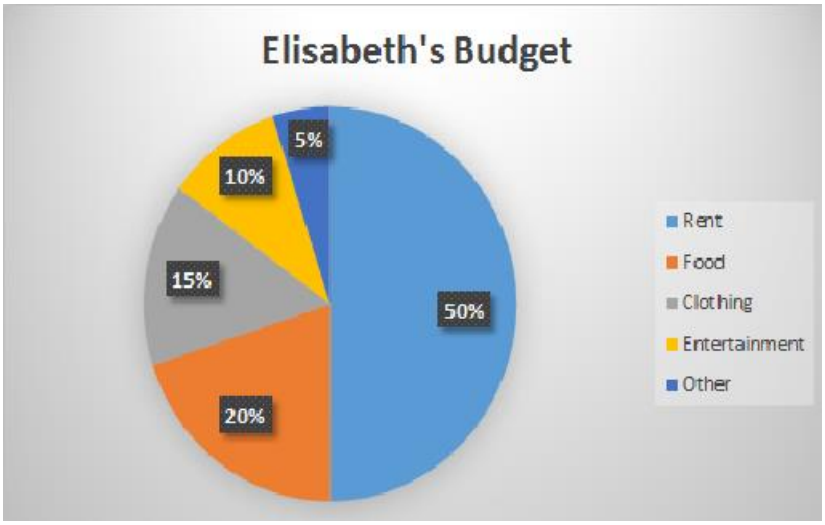
You can either work through Handle numbers chronologically or study the modules that most interest you, in any order you want.

2 ASSESS YOUR SKILLS TO INTERPRET GRAPHS

There are many different types of graphs. All of them convey different information. Some graphs are more complex and others show just one detail of information.

See if you understand these charts. You find the correct answers at the end of the chapter.

1.



Picture: BFI OOE

1a. What does Elisabeth spend the largest part of her income on?

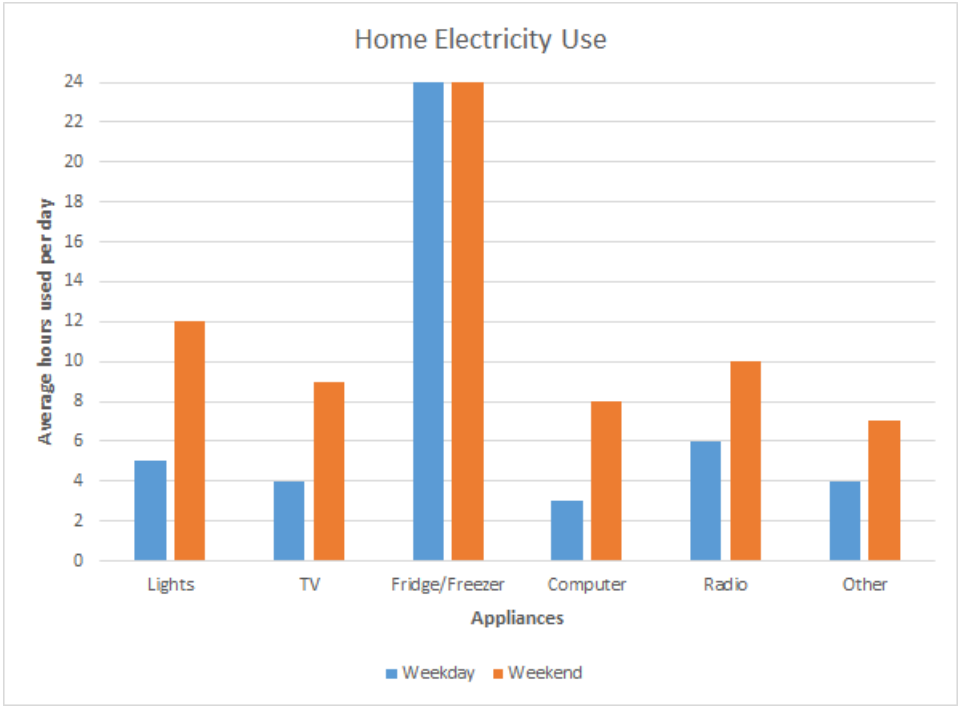
1b. What does she spend the smallest part of her income on?

1c. What does she spend a fifth of her income on?

1d. She spends 10% of her income on _____.

1e. She spends the same amount of money on entertainment and others as on _____.

2.



Picture: BFI OOE

2a. What types of electric appliances does the graph show?

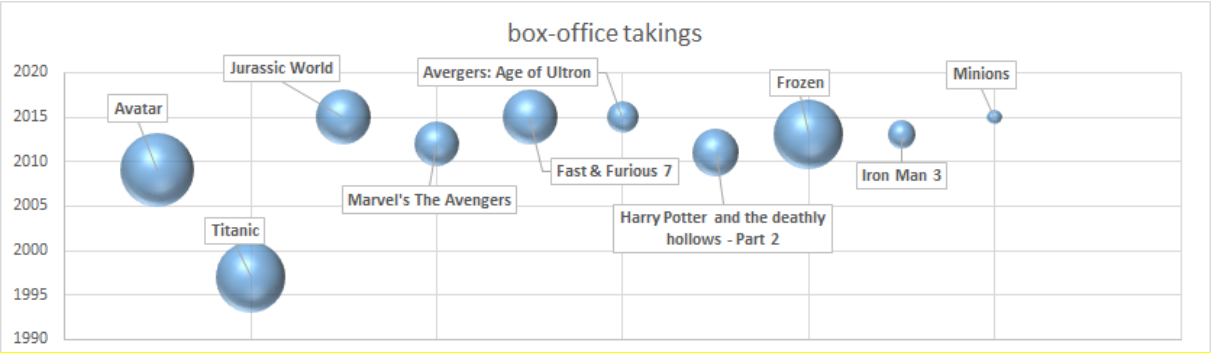
2b. What do the blue bars show?

2c. What do the red bars show?

2d. Weekday or weekend – when is more electricity used?

2e. Why do you think that Fridge and Freezer use the same amount of electricity weekday and weekend?

3.



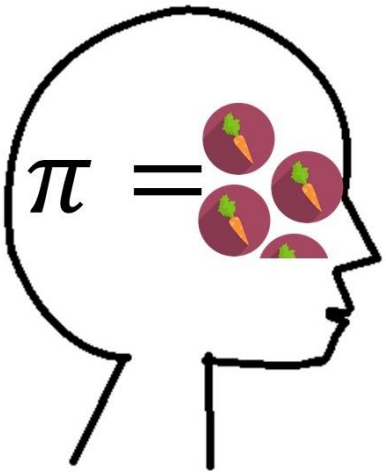
Picture: BFI OOE

3a. Which film has the most viewers?

3b. In which year did Titanic hit the cinemas?

3c. How many viewers watched Fast & Furious 7?

4.



Picture: BFI OOE

4a. This infographic shows…

4b. An infographic is used to/for?

Answers:

1a. Rent; 1a. Other; 1c. Food; 1d. Entertainment; 1e. Clothing; 2a. Lights, Tv, Fridge/Freezer, Computer, Radio, Other; 2b. Average electricity use on a weekday; 2c. Average electricity use on weekend; 2d. Weekend; 2e. Because Fridge and Freezer are on all the time no matter whether you are at home or not, 3a. Avatar, 3b. 1997, 3c. Not clear how many viewers, because we have no reference to the correlation between size and numbers, 4a. the approximate size of Pi, 4b. overview, summary, better to approach people

If you are not sure when to use which graph type, go and look at the next chapter "Graph types and their application".

3 GRAPH TYPES AND THEIR APPLICATION

3.1. Discover – What is a graph?

What is a graph?

A graph is a representation of a topic and **shows the values** usually in lines or bars. Mostly, a graph **represents something that we count**. We could count the numbers of blue and red cars in a street and show our findings in a graph.
Or the hectares of the rainforest.
Or the rainy days in a week.
Or our income or pocket money and the way we spend it.

Therefore a graph shows **a relationship between characteristics (2 or more),** with the means of a line, curve, bars or other symbols. Typically there is a horizontal line (x-axis) to represent an independent variable and a vertical line (y-axis) to represent a depending variable.

Chart is another word for graph.

BASIC CHARTS are bar charts, line charts, pie charts.
MORE ADVANCED CHARTS can be used to show more complex matters.

Remember:
There are many different kinds of graphs.
In general the graphs differentiate in usage.
Which form of graph you use depends on what you want to say or show.

3.2 Learn – Different types of graphs and 3 steps how to choose the ideal one

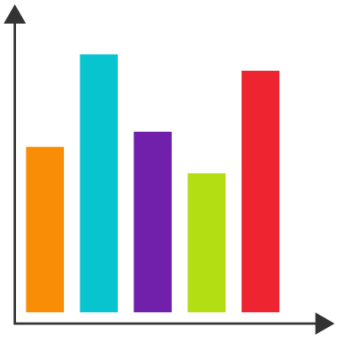
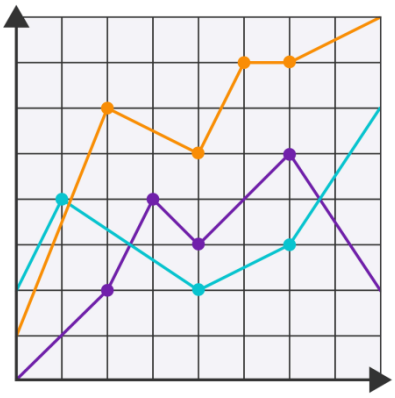
Different types of graphs

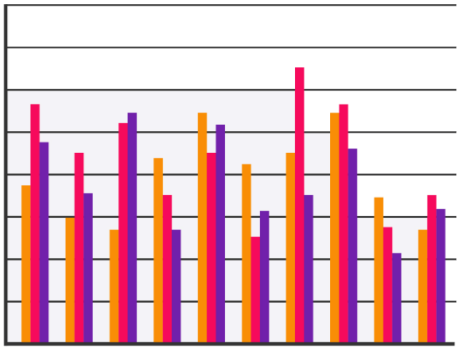
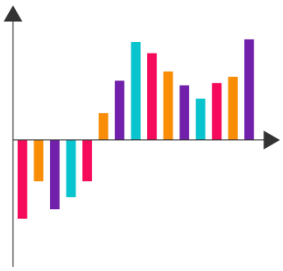
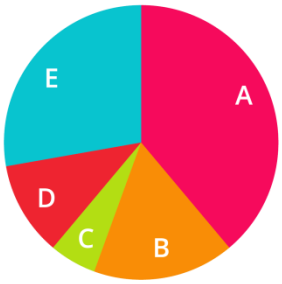
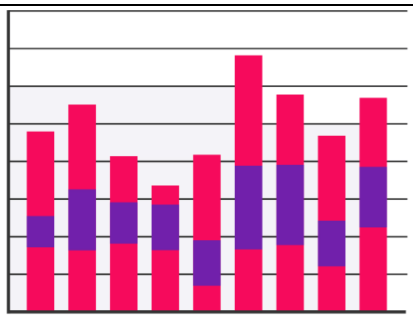
There are different kinds of graphs. To understand a graph shows you, you need to understand the following phrases:

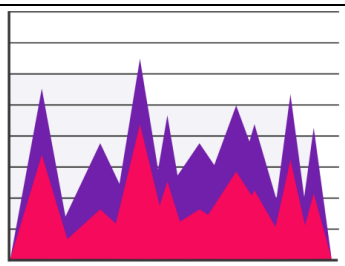
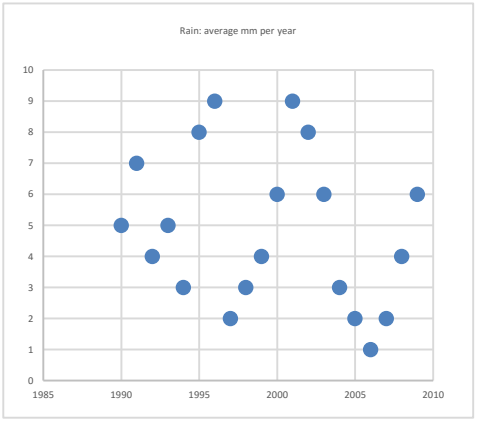
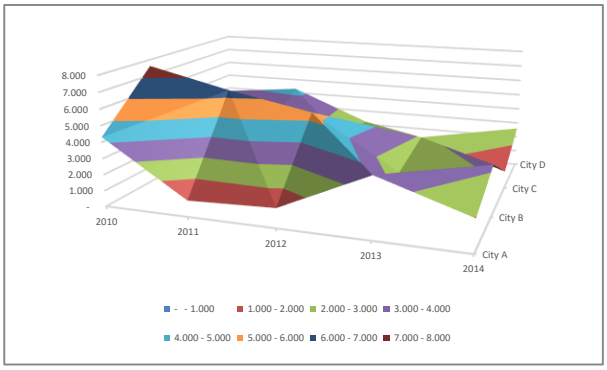
A **comparison** is made when you analyse things to see similarities and differences.
A **contrast** is the difference between two sets of information. Usually used when making a comparison to show differences.
A **proportion** is a part or share. It corresponds to other parts or shares of a whole. Usually the basis is 100 %, and the different proportions are added up to this 100 %.
A **trend** is a pattern that can help us to predict what may happen/develop in the future.
Development is a process of change or transformation.
A **statistical spread** is used to measure the central tendency (like a median) of data.

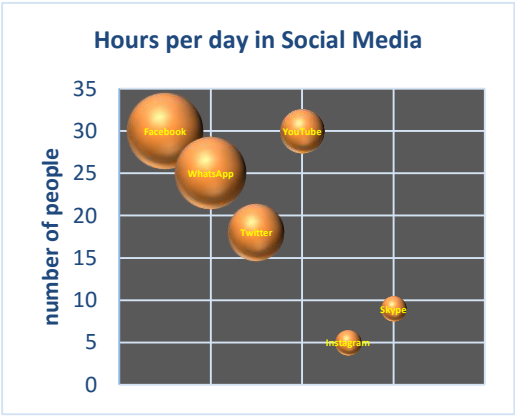
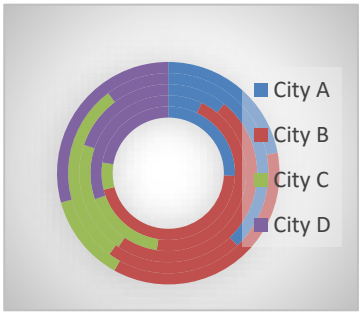
This might seem very mathematical.

Look at this table to learn about graphs. You will find explanations for these phrases.

Name of the graph	What it looks like	What it is used for
Bar chart 1	 Picture: iStock	A **bar chart** is often used to compare values of items at a certain point of time. It uses rectangles (bars) to visualise information. It is mostly to show **proportions**, **trends**, **comparisons** or **contrasts**. **Proportions**: This bar chart could show the outcome of a vote in which 5 different parties have participated. The party represented by the blue bar won, closely followed by the party represented by the red bar. The least votes were given to the party represented by the green bar. **Contrast**: It could also represent the number of sunny days during a five week holiday. Each bar would represent one week. So the chart shows that the second and the fifth week were the sunniest ones. **Comparison** The bar could also show how many students go to school on foot, by bike, bus, car… **Trend** It could show a development over 5 years, how the number of car users have changed.
Line chart	 Picture: iStock	**A Line chart** uses lines to indicate values, usually over a period of time. Therefore it is mostly used to show **trends** or **developments**. This line chart could show a **development,** e.g. how the use of 3 different kinds of social media have developed. The social media represented by the blue line has been well used in the beginning but soon was overtaken by the social media represented by the yellow line. It could also show how a **trend**, e.g. How eating habits have changed over the last year. The yellow line could represent vegetarians.

Group bar chart	 Picture: iStock	**This kind of bar chart** is like the bar chart 1, but adds a 3rd characteristic (the different colored characteristics) In our example the x-axis can represent different sports, the y-axis the number of people and the colored bars men, women and children.
Positive / Negative bar chart	 Picture: iStock	A **positive / negative bar chart** is used to show both positive and negative developments. It can be used for a **Comparison** of positive and negative data, e.g. comparison of revenues and expenditures of a newly opened shop. In the first months there were more costs than incomes, but in the next few months it has changed and the shop owner started to make money.
Pie chart	 Picture: iStock	**A pie chart** is a proportional area chart, made of a circle which is divided into segments. Usually it shows **relative sizes** and compares one component to the whole set (100 %) Relative sizes are a percentage, like a cake slice of the whole cake. This chart could show the money a person spends in a months. Section A could represent money spend on rent, B could represent money spend on food, C could represent money spend on clothes, D could represent money saved and E could represent money spend on phone, media, sports and other.
Stacked bar chart	 Picture: iStock	**This kind of bar chart** is another form of group bar chart, just that the bars are not stacked next to each other but added in one bar. Therefore you can have specific data and the added data as well. **Proportion** For example it could show different people and the how many apples (pink), bananas (violet) and oranges (pink 2) they eat. So it shows the overall consumption of fruit and the specific fruit as well.

		It could show a **comparison** of average media use during weekdays, weekends, and holidays. The bars could represent 9 different months. The bottom of the bar could represent the average use during weekdays, the middle part could represent weekends and the top could represent holidays. **Contrast** Showing different countries and the degrees of summer and winter.
Area diagram	 Picture: iStock	An **Area diagram** shows **trends** over time, not unlike a line chart. This one could show **trends shown over time;** e.g. the amount of rain and snow on mountains. The pink area could represent the snow, the purple area could represent the rain.
Scatter diagram (x,y)	 Picture: BFI OOE	A **scatter diagram** is two or three dimensional. The density and direction of points shows the **relationship between the variables**. It is also known as scatter diagram, scatter graph or scatterplot. Most important areas of use are to show arithmetic average and correlation of data. Our example could be to look for the average height of students. The y-axis shows the height of students, the x-axis represents the ages of students themselves. The scatter diagram has a function to find the average height of students at a specific age.
Surface diagram	 Picture: BFI OOE	A **surface diagram** is a more complex area diagram, as 3 characteristics are possible. It is also mostly used to show **trends** over time. This diagram could show **trends shown over time**; e.g. how much rain fell over a course of time in different regions. In this example the 3 characteristics could be: 1. Rain in mm; 2. Time; 3. Different regions over the course of time in different regions;

Web diagram	 Picture: BFI OOE	A **web diagram** is used for target-performance comparison**.** This one could show a **target-performance comparison';** e.g. What skills and characteristics do you need for a certain job? Here we look at the skills patience, precision, organisation, tidiness, helpfulness and team player. The different jobs are represented by a colour. For example red could represent the skills you need as a nurse. In this case it shows that a nurse has high scores in most areas. Whereas the blue line shows that in this job precision is more important than the other skills. It could represent the skills of an electrician.
Bubble chart	 Picture: BFI OOE	A **bubble chart** is a diagram which is labelled by bubbles. Additionally to the x-axis and y-axis, the size of the bubbles show a third characteristic. This example shows how many hours per day people spend in social Media. The y-axis represents the number of people who use the media. The x-axis stands for the media form (facebook etc.) and the size of the bubble represents the hours the media is used.
Circle chart	 Picture: BFI OOE	A **circle chart** can either be used like a pie chart or a third characteristic can be added to be shown in a circle chart, as more circles are possible**.** It can be used to **depict fractions** (100%) and to make **comparisons.** E.g. Theft (in %) in different cities in different years. The colours represent different cities, the circle rings the different rings and the coloured portions the percentage/amount of thefts.

Infographs	 Picture: iStock	An infographic (information graphic) is a representation of data in a graphic format designed to make the important information easily understandable at a glance. It is used to show and create all kinds of graphs and meanings using data and your imagination. Depending on personal likes and ideas you can use pictures, colours, words or patterns. This infographic is about creativity. It uses the size of words to show the importance. Also colour is used to draw our attention immediately to the words in dark blue. Using the map of the world immediately tell us that creativity is something common all over the world.

For more information about graphs you can go to:
http://math.tutorvista.com/statistics/types-of-graph.html

http://www.mindtools.com/pages/article/Charts_and_Diagrams.htm

In the following table you can find out quickly about when to use what type of graphs:

	Bar Chart 1	**Line Chart**	**Bar Chart 2**	**Positive/ negative bar chart**	**Pie chart**	**Bar chart 3**	**Area diagram**	**Scatter diagram**	**Surficial diagram**	**Web diagram**	**Bubble chart**	**Circle chart**
Proportions	x					x						
Trends	x	x					x		x	x		
Comparisons	x		x	x		x						x
Contrasts	x					x						
Developments		x										
Fractions					x							x
Statistical spread								x			x	

We propose you always follow these **3 steps** to get familiar with the data shown:

Step 1: Look at title, words and pictures. What does the table show?

Step 2: Look at the numbers. What do the numbers tell you?

Step 3: Choose a type of graph for this data. What kind of graph would you choose to effectively represent the data?
The first table gives an overview and explanation. The second table helps you decide what you want to show (comparison or proportion) and therefore what type of graph to use.

Now let´s try out these 3 steps in the next chapter!

3.3 Practise – 3 steps to choose the optimal graph for your data

In the following exercises you have to choose the most suitable graph to represent the data contained in the tables. If necessary read up on the information about the different graphs again in the learn section. Choose among the proposed answers, hit the solution button, and finally discover the correct answer and the reason for that solution.

Remember to use the 3 steps:

Step 1: Look at title, words and pictures. What does the table show?

Step 2: Look at the numbers. What do the numbers tell you?

Step 3: Choose a type of graph for these data. What kind of graph would you choose to effectively represent the data?

Exercise 1 - Students' food likes

60 Students in a school have been interviewed about their food likes. Here below the table shows their answers:

Food	**Students**
A.Pizza	20
B. Spaghetti Bolognese	15
C. Sausages	6
D. Potato Salad	3
E. Baked Beans on toast	2
F. Lasagna	10
G. Roast turkey	4
Total number of students asked:	**60**

Now let´s try out the 3 steps:

Step 1: Look at title, words and pictures. What does the table show?

It shows student´s food preferences in a school

Step 2: Look at the numbers. What do the numbers tell you?
Can you figure out the total of students that have been asked?
Where do you find highest numbers /scores?
Where the lowest numbers?

You can find the total number of students that have been asked for this survey at the bottom: 60 students have been interviewed.
Highest scores you can find for the Italian food: Pizza, Spaghetti Bolognese followed by Lasagna.
Beans on toast scores lowest, it is least liked by the students that have been asked.

Step 3: Choose a type of graph for these data. What kind of graph would you choose to represent effectively these data?

a) bar chart
b) pie chart
c) web diagram

In this example, different graphs could be used, but as each student was allowed only 1 answer. We can know that because we asked 60 students and we got exactly 60 answers. A depiction of the different answers and the size of the fraction is the most useful. Therefore we propose a **pie chart** is the best solution.

Exercise 2 - Jobs and their characteristics

If you think about your future and you think about the work you would like to do, you can read up on characteristics needed for a certain job. So it is easier to decide what kind of job you would like to do or you might be good at.

The table below contains the opinions collected for a survey by the employment service center.
1 = not important
2 = needed sometimes
3 = important
4 = very important

	Patience	Precision	Organisation	Tidiness	Helpfulness	Teamplayer
 **Electrician**	1	4	2	1	2	2
 **Nurse**	3	4	3	4	4	3
 **Teacher**	4	3	4	1	4	0
 **Chef**	2	3	4	4	1	4

Now let´s try out the 3 steps:

Step 1: Look at title, words and pictures. What does the table show?

Answer:
It shows the jobs: electrician, nurse, teacher, chef
It shows characteristics: patience, precision, organisation, tidiness, helpfulness, team player

Step 2: Look at the numbers. What do the numbers tell you?

Answer:
Each skill has been given a value between 1 and 4 where 1 means that a skill is less important and 4 means the skill is very important for this job.

Step 3: Choose a type of graph for these data. What kind of graph would you choose to represent effectively these data?

Looking at the table is quite hard work and it would take some time to read it.

What kind of graph would you use to give an easier overview?

a) bar chart
b) line chart
c) web diagram
d) area diagram

A web diagram is the best solution, as it is usually used for target performance and in our example the different jobs and the importance of the different characteristics can be shown in this diagram. There are 4 different jobs and 6 different characteristics. Therefore a bar chart would be possible, but as there are so many characteristics, it would be rather confusing. As there is no time characteristic to show trends, neither a line chart nor an area diagram is a good possibility.

Exercise 3 - Media use

Studies often focus on differences in behaviour depending on your gender. In this study you can read about different ways that students primarily access information.
Here below the table shows the answers of students that have been asked:

Media	Students male	Students female
TV	25	32
PC	13	35
Smartphone	42	20
Tablet	12	34
Radio	40	23
Books	3	5
Newspapers	2	2
Magazines	6	14
	143	165

Pictures: iStock

Step 1: Look at title, words and pictures. What does the table show?

Answer:
Comparing the media use of Male and female students. 8 types of media are identified, ranging from TV, Smartphones to Newspapers.

Step 2: Look at the numbers. What do the numbers tell you?

Answer:
143 male and 165 female students have been asked.
Male students in this survey prefer Smartphones and Radio, they hardly use books, newspapers and magazines.
Female students in this survey prefer TV, PC and Tablet, they hardly read newspapers and books.
The dislikes are very similar for both genders, with the only variance being that female students like magazines.

Step 3: Choose a type of graph for these data. What kind of graph would you choose to represent effectively these data?

What kind of graph would you use to show differences effectively?
a) group bar chart
b) line chart
c) web diagram
d) pie chart

A **group bar chart** is the best solution, as you can differentiate between 3 characteristics, in this example media, the number of uses and the gender can all be shown and compared.

Exercise 4 - Following Social Media

Do you use social media? What kind do you use? And for how many hours per day? In this table you can find the likes of students and average hours per day that they use it.

social media	number of people	average hours/day
facebook	30	9
Whatsapp	25	8
twitter	18	5
YouTube	30	3
Instagram	5	1
Skype	9	1

Pictures: iStock

Step 1: Look at title, words and pictures. What does the table show?

Answer:
It shows 6 different types of social media, the number of people that use it and how many hours per day they use it in average.

Step 2: Look at the numbers. What do the numbers tell you?

Answer:
Social Media mostly used is Facebook and Youtube, followed closely by Whatsapp. Istagram is used the least.
Facebook and Whatsapp used the most hours per day, with Instagram and Skype used the least amount of hours per day.
Maximum average hours per day 9 and minimum average hours per day: 1
This survey does not give a total of numbers being asked.

Step 3: Choose a type of graph for these data. What kind of graph would you choose to represent effectively these data?

What kind of graph would you use to show differences effectively?

a) pie chart
b) area digram
c) web diagram
d) bubble chart

The **bubble chart** is the best solution as this shows a good statistical spread where we want to compare 3 characteristics.

Exercise 5 - How do you get to school?

Students were asked what means of transportation they use to get to school.

Mode of transportation	Number of students
Train	IIIII
Bus	III
Walking	IIIII II
Bycicle	IIIII II
Blades / Skateboard	III
Tram/Tube	IIIII II
Car	IIIII
Motorcyle	III

Step 1: Look at title, words and pictures. What does the table show?

Answer:
The specific number of students that use 8 different modes of transportation.

Step 2: Look at the numbers. What do the numbers tell you?

Answer:
First we have to find out the exact numbers:

Train	5
Bus	3
Walking	7
Bycicle	7
Blades / Skateboard	3
Tram/Tube	7
Car	5
Motorcyle	3

We know that most people walk, use a bycicle or go by tram or tube. Less people go by bus, motorcycle, blades or skateboard.We do not know how many people have been asked as some might use two or more means of transport to get to school, e.g. they get a lift half way by their parents and walk the rest.

Step 3: Choose a type of graph for these data. What kind of graph would you choose to represent effectively these data?

What kind of graph would you use to show differences effectively?

a) pie chart
b) bar chart
c) web diagram
d) line chart

It is best to show all solutions in a **bar chart 1.** There is more than 1 answer possible but it is best not to use a pie chart

If you like you could try and display your data as a Bar Graph, Line Graph or Pie Chart and print it: http://www.mathsisfun.com/data/data-graph.php

3.4 Assess your learning

Check your knowledge in an online test!

Remember the 3 steps:

Step 1: Look at title, words and pictures. What does the table show?

Step 2: Look at the numbers. What do the numbers tell you?

Step 3: Choose a type of graph for these data. What kind of graph would you choose to effectively represent the data?

Now it is your turn. Try and solve the following assessments. Use a piece of paper to cover the answers. Once you have got you answer, lift the paper and read up on the answer.

Assessment 1:

1. EXAMPLE 6

Compare breaking and entering the following cities over time

	City A	City B	City C	City D
2010	4.300	7.600	1.100	3.760
2011	1.000	6.400	2.430	4.300
2012	1.200	5.400	2.300	2.200
2013	3.690	2.160	2.900	1.000
2014	1.960	3.200	1.130	2.600

Which graph type would you choose?

A. ? Bar Chart 3

B. ? Pie Chart

C. ? Area Diagram

D. ? Line Chart

Answer:

a) Possible answer, but it would need too many bars, 4 bars for each year to show all data.
b) Too many variables to show in a pie chart.
c) Best Solution is the Area diagram, because the area diagram also shows all breakings and enterings and adds them up. Therefore it is the best solution in this example.
d) Possible answer, only if the goal was to just compare the cities.

Assessment 2:

2. EXAMPLE 7

What sport do students do, differentiated by gender?

	Male	Female
Volleyball	40	78
Biking	54	42
Swimming	24	35
Football	89	12
Tennis	31	36

Which graph type would you choose?

A. ? Bar Chart 3

B. ? Pie Chart

C. ? Area Diagram

D. ? Line Chart

Answer:

a) Best solution, Bar Chart 3 because a comparison between males and females can be shown.
b) Not possible, as there are too many characteristics. You could only show either male or female or added numbers in a pie chart.
c) Makes more sense to show a development over time.
d) Makes more sense to show a development over time.

Assessment 3:

3. EXAMPLE 8

How did the mobile phone costs (in €) per month change over time looking at different providers?

	Orange	A1	One	TeleRing
2011	€ 12,00	€ 15,00	€ 8,00	€ 15,00
2012	€ 17,00	€ 15,00	€ 15,00	€ 18,00
2013	€ 15,00	€ 16,00	€ 10,00	€ 18,00
2014	€ 22,00	€ 16,00	€ 18,00	€ 20,00

Which graph type would you choose?

A. ? Bar Chart 3

B. ? Pie Chart

C. ? Area Diagram

D. ? Line Chart

Answer:

a) Possible solution, but to show a development over time, a line chart is better.
b) Too many characteristics for one pie chart
c) Not good as an area diagram would show the added costs and not a comparison of the costs.
d) Best solution to show the difference between the different phone costs over the years.

Assessment 4:

4. EXAMPLE 9

A student wants to look at his monthly costs and revenues:

	Revenues	Costs
January	€ 250,00	-€ 220,00
February	€ 320,00	-€ 200,00
March	€ 150,00	-€ 250,00
April	€ 300,00	-€ 290,00
May	€ 280,00	-€ 150,00
June	€ 500,00	-€ 250,00
July	€ 120,00	-€ 250,00
August	€ 100,00	-€ 240,00
September	€ 340,00	-€ 200,00
October	€ 230,00	-€ 300,00
November	€ 180,00	-€ 250,00
December	€ 450,00	-€ 200,00

Which graph type would you choose?

A. ? Bar chart 3

B. ? Pie Chart

C. ? Line Chart

D. ? Positive-Negative Bar Chart

Answer:

a) Not possible, as a bar chart would automatically create a positive-negative bar chart.
b) Too many characteristics to be shown in a pie chart.
c) Possible solution, but as one line is positive and one negative, a good comparison is not possible.
d) Best solution in this case to make a comparison between revenues and costs.

3.5 Learning resources – Useful links

List of commented links	
Source	Website
Source title	**Types of Graphs**
Description	Information about types of graphs
Link	http://math.tutorvista.com/statistics/types-of-graph.html
Language	English

List of commented links	
Source	Website
Source title	**Types of Graphs**
Description	Information about types of graphs
Link	http://math.tutorvista.com/statistics/types-of-graph.html
Language	English

List of commented links	
Source	Bettermarks
Source title	**Bettermarks: preparing and analysing graphs**
Description	Information, examples and selftests about graphs – interactive tasks, solutions, tipps and anaylsis
Link	http://de.bettermarks.com/mathe-portal/mathebuch/diagramme-erstellen-und-auswerten.html
Language	German, English, Spanish

List of commented links	
Source	www.basic-mathematics.com
Source title	**Types of graphs**
Description	Information about types of graphs
Link	http://www.basic-mathematics.com/types-of-graphs.html
Language	English

List of commented links	
Source	www.mathsisfun.com
Source title	**Data Graphs (Bar, Line, Pie)**

Description	Display your data as a Bar Graph, Line Graph or Pie Chart, then Print it.
Link	http://www.mathsisfun.com/data/data-graph.php
Language	English

List of commented links	
Source	www.typesofgraphs.com
Source title	**Types of graphs**
Description	Information about types of graphs
Link	http://www.typesofgraphs.com/
Language	English

List of commented links	
Source	www.mindtools.com
Source title	**Charts and Graphs - Choosing the Right Format**
Description	Information and tipps what types of graphs to use
Link	http://www.mindtools.com/pages/article/Charts_and_Diagrams.htm
Language	English

List of commented links	
Source	www.skillsyouneed.com
Source title	**Graphs and Charts**
Description	Information about types of graphs, axes, bar graphs and histograms, pictograms, pie charts, line graphs, cartesian graphs
Link	http://www.skillsyouneed.com/num/graphs-charts.html
Language	English

List of commented links	
Source	www.mathsisfun.com
Source title	**Data Graphs (Bar, Line, Pie)**
Description	Display your data as a Bar Graph, Line Graph or Pie Chart, then Print it.
Link	http://www.mathsisfun.com/data/data-graph.php
Language	English

List of commented links	
Source	www.mindtools.com
Source title	**Charts and Graphs - Choosing the Right Format**
Description	Information and tipps what types of graphs to use
Link	http://www.mindtools.com/pages/article/Charts_and_Diagrams.htm
Language	English

4 CREATING GRAPHS

4.1 Discover – How to choose and download a spreadsheet software

Once you have decided what kind of graph to use, it is time to create it.
Creating graphs works best when you use a suitable spread sheet software. You can always use Microsoft Excel but there are other ways as well. Let´s start:

a. Choose a spread sheet software you like to work with.

b. Download and save it.

c. Try it out.

a. Choose a spread sheet software

Here you can find useful links to freeware. Read through them. Look at samples on the websites. Maybe a friend or teacher has a suggestion which software might be suitable for you. To find a program you like, you might need to try different ones. It is as everything in life: you never know until you tried. Follow you instinct and try one out!

Kingsoft Spreadsheets Free 2013 is totally free spreadsheet software alternative to Microsoft Excel that offers a wide range of easy-to-use features which suits both beginners and advanced users.
Link: http://www.kingsoftstore.com/spreadsheets-free.html

Open Office Calc is a free spreadsheet software. Calc a powerful spreadsheet with all the tools you need to calculate, analyze, and present your data in numerical reports or sizzling graphics.
Link: http://www.openoffice.org/product/index.html

Accel Spreadsheet is a standalone component of SSuite Office. Accel Spreadsheet is basically a spreadsheet software like Microsoft excel.
Link: http://www.ssuitesoft.com/accelspreadsheet.htm

Spreadsheet123 is a simple spreadsheet which lets you monitor your spending habits. It is useful for creating a monthly or yearly household budget. It offers spreadsheets for different occasions such as: Household Budget Worksheet, party budget planner, event fund raiser, college student's budget and weekly timesheet template. Link:
http://www.spreadsheet123.com/

QT Calc Express is a free spreadsheet software. It lets you do data analysis, calculations, create various types of charts and graphs, creation of reports and formatting your data.
Link: http://www.ssuitesoft.com/qtcalcexpress.htm

Gnumeric is a free spreadsheet software based upon GNOME. It is a free alternative to popular spreadsheet software Microsoft excel.
Link: http://www.gnumeric.org/

Myrtle is a free spreadsheet software which is programmable and used for statistical analysis. It includes all the functions related to mathematics, probability, statistics and computer science.
Link: http://sourceforge.net/projects/myrtle/

CellPro is a free spreadsheet software. It lets you do data calculations, data analysis, and construct formulas for you.
Link: http://www.crystaloffice.com/cellpro/

PlanMaker is a free and powerful spreadsheet application. It is a part of the Softmaker free office software. It lets you create graphs, charts, borders and WordArt.
Link: http://www.softmakeroffice.com/

Calligra Sheets is a free and powerful spreadsheet application. It is an free alternative to Microsoft Excel. It lets you create charts and graphs.
Link: https://www.calligra.org/get-calligra/

Source of these links and for more information go to
http://listoffreeware.com/list-best-free-spreadsheet-software/

b. Download and save it

Using the PC gets easier the more often we do it. If you need help to **download and save software**, this link will help you:

http://www.learnthenet.com/how-to/download-software/

If you prefer a **video tutorial** how to download software, you can watch this video:

https://www.youtube.com/watch?v=HNAHKqwv214

https://www.youtube.com/watch?v=j-GvGJq96AI

c. Try it out

Look at our example and the graphs we produced using a software. In the LEARN section of this chapter you will also find useful information how to create your graph.

For a project for biology we looked at feeding habits of animals and started to be interested what the **"eating habits" of students** in our school were like. For clear differentiation we used the biological terms. We interviewed students and prepared a table where we put the outcomes of the interview:

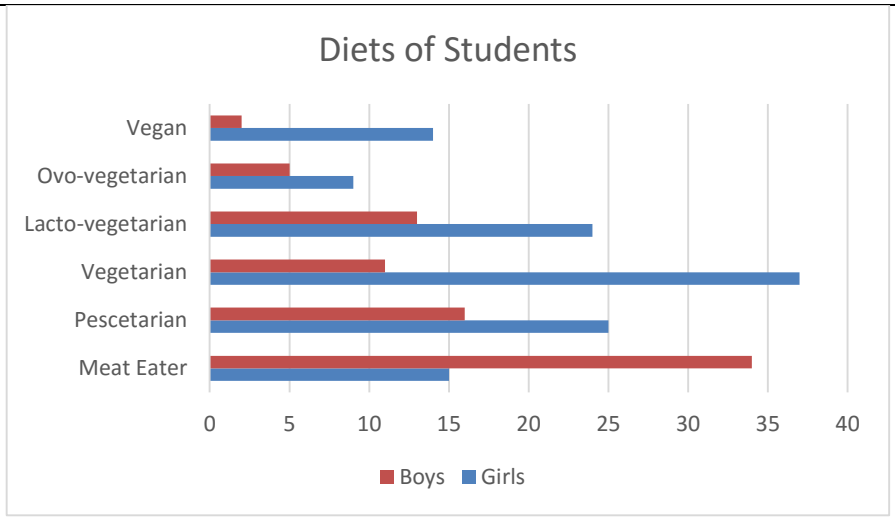
Diets of Students

	Omnivores	Pescetarian	Vegetarian	Lacto-vegetarian	Ovo-vegetarian	Vegan	Tot
Female	15	25	37	24	9	14	
Male	34	16	11	13	5	2	
tot	49	41	48	37	14	16	

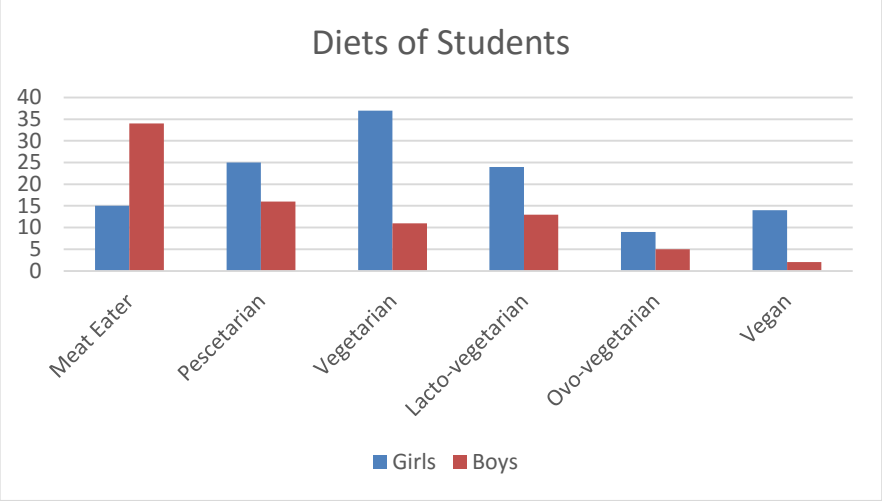
Remember the 3 Steps from chapter 3 to choose the most suitable graph:

Step 1: Look at title, words and pictures. What does the table show?
Step 2: Look at the numbers. What do the numbers tell you?
Step 3: Choose a type of graph for these data. What kind of graph would you choose to effectively represent the data?
We have decided to use a bar chart because we COMPARE the eating habits of boys and girls.

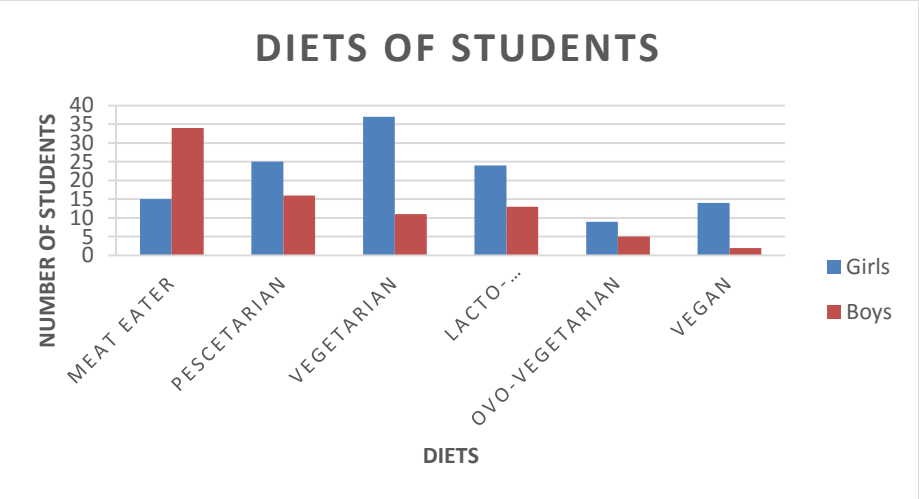
Once you made the choice you can still play around and create the graph you think looks best.



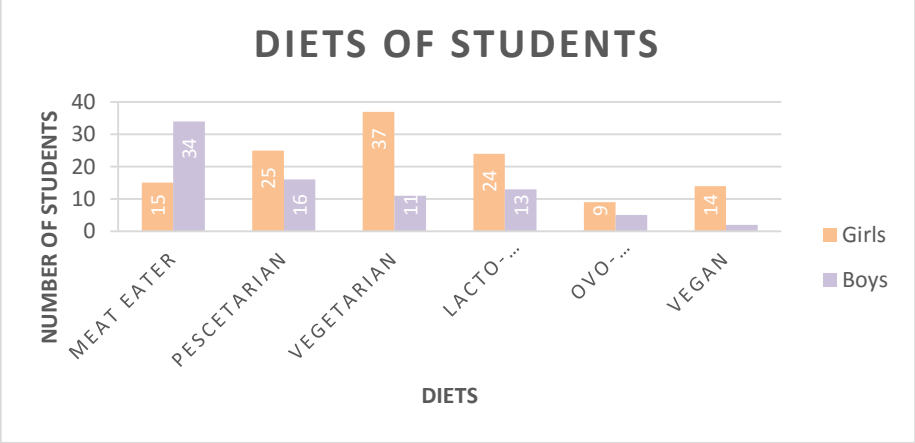
Picture: BFI OOE



Picture: BFI OOE



Picture: BFI OOE



Picture: BFI OOE

As you can see, there are many different ways. For example you can always use your favourite colours suitable to match the task. How to create such a graph, you can learn in the next chapter.

4.2 Learn – How to use a software and create a graph in 5 actions

How to use a spreadsheet application

Once you have decided on a software and the graph you want to draw, it is time to try out the software. The following links can help you:

Create a spreadsheet in Microsoft Excel
https://www.youtube.com/watch?v=8L1OVkw2ZQ8

Microsoft Excel Tutorial - Making a Basic Spreadsheet in Excel
https://www.youtube.com/watch?v=0W_933RnCXM

How to Create Line Chart in Google Spreadsheets
https://www.youtube.com/watch?v=PfhWE-z2Gf8

Google Docs: Spreadsheet Pie Chart
https://www.youtube.com/watch?v=ZZNRxQ9DVT0

How to Create a Bar Graph in Google Docs
https://www.youtube.com/watch?v=713apMqym-w

More advanced:
Making Charts in Google Spreadsheets
https://www.youtube.com/watch?v=kvcxyXYBbeI

5 Actions to create a graph in an application

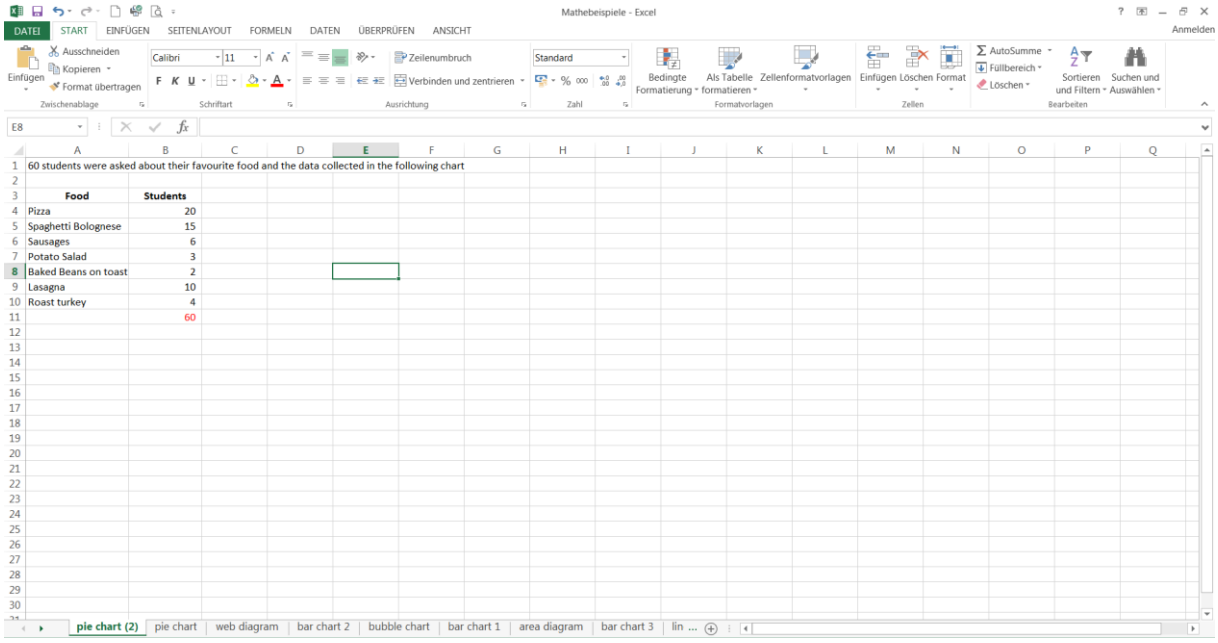
We will show you how to create a graph using a spreadsheet for the following example on a survey about student´s food likes.

Student´s food likes	
Favourite Food	Nr. students
Pizza	20
Spaghetti Bolognese	15
Sausages	6
PotatoSalad	3
BakedBeans on toast	2
Lasagna	10
Roast turkey	4
Total number of students asked:	**60**

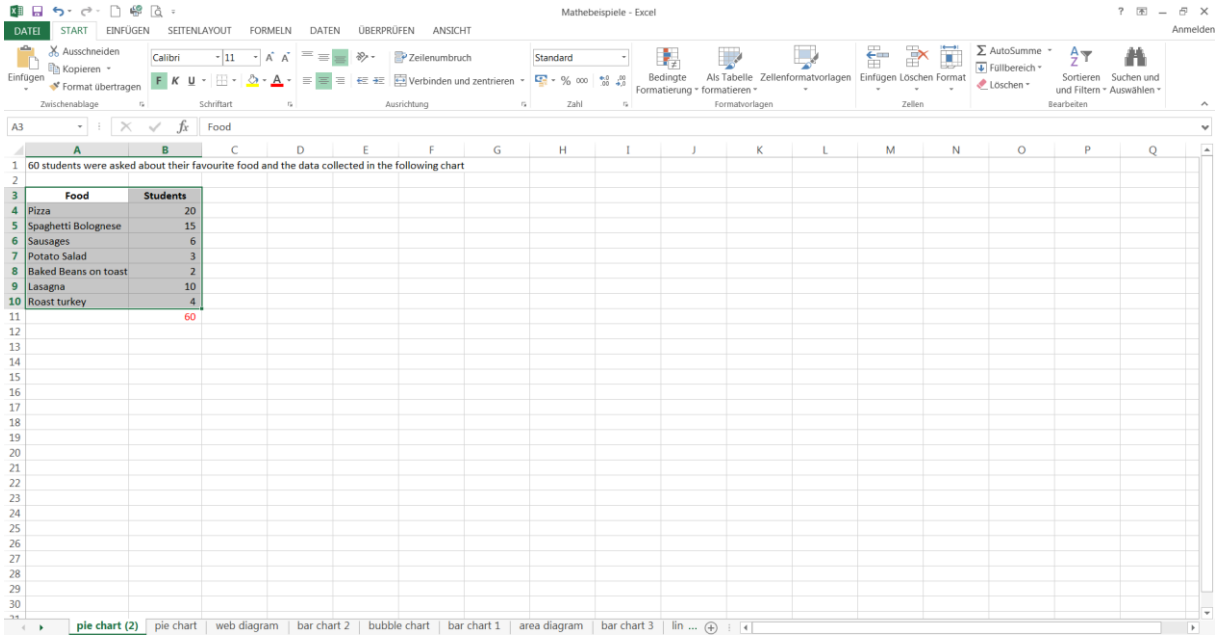
These are the 5 actions to help you create your graph:

Action 1: Open your spread sheet application

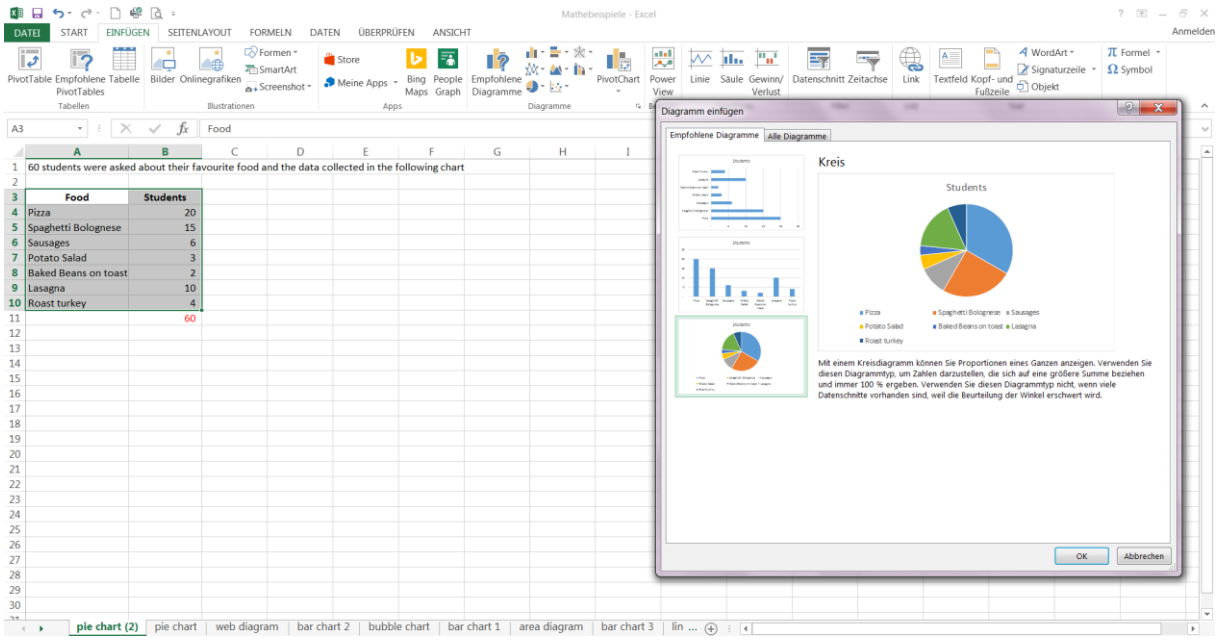
Action 2: First insert the data into a spread sheet



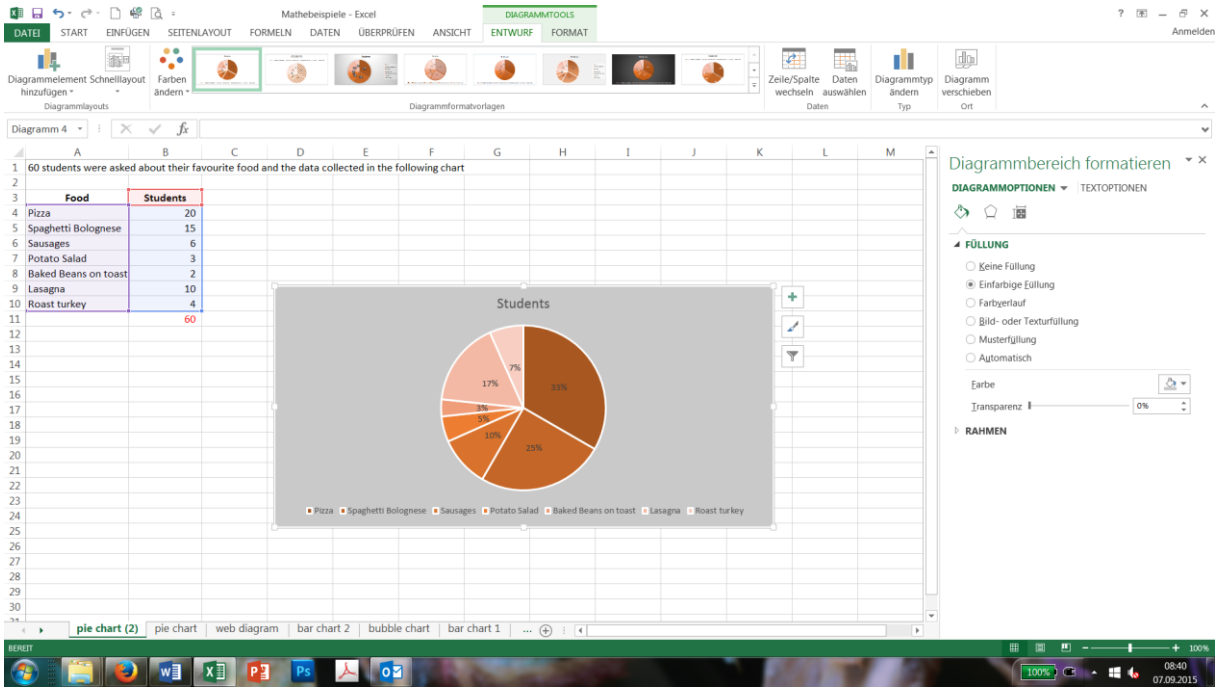
Action 3: Highlight all the data



Action 4: Insert the chosen graph - click on the right command to insert a graph



Action 5: Insert your title, labels, percentage, different colours...



4.3 Practise – Try out the 5 actions to create a graph

Now you can try and create graphs for the following examples.

Exercise 1 - Jobs and their characteristics

If you think about your future and you think about the work you would like to do, you can read up on characteristics needed for a certain job. So it is easier to decide what kind of job you would like to do and you might be good at.

The table below contains the opinions collected for a survey by the employment service center.

1=not important
2 = needed sometimes
3 = important
4=very important

	Patience	Precision	Organization	Tidiness	Helpfulness	Teamplayer
 **Electrician**	1	4	2	1	2	2
 **Nurse**	3	4	3	4	4	3
 **Teacher**	4	3	4	1	4	0
 **Chef**	2	3	4	4	1	4

Remember the **5 Actions** you learned:

Action 1: Open your spread sheet application

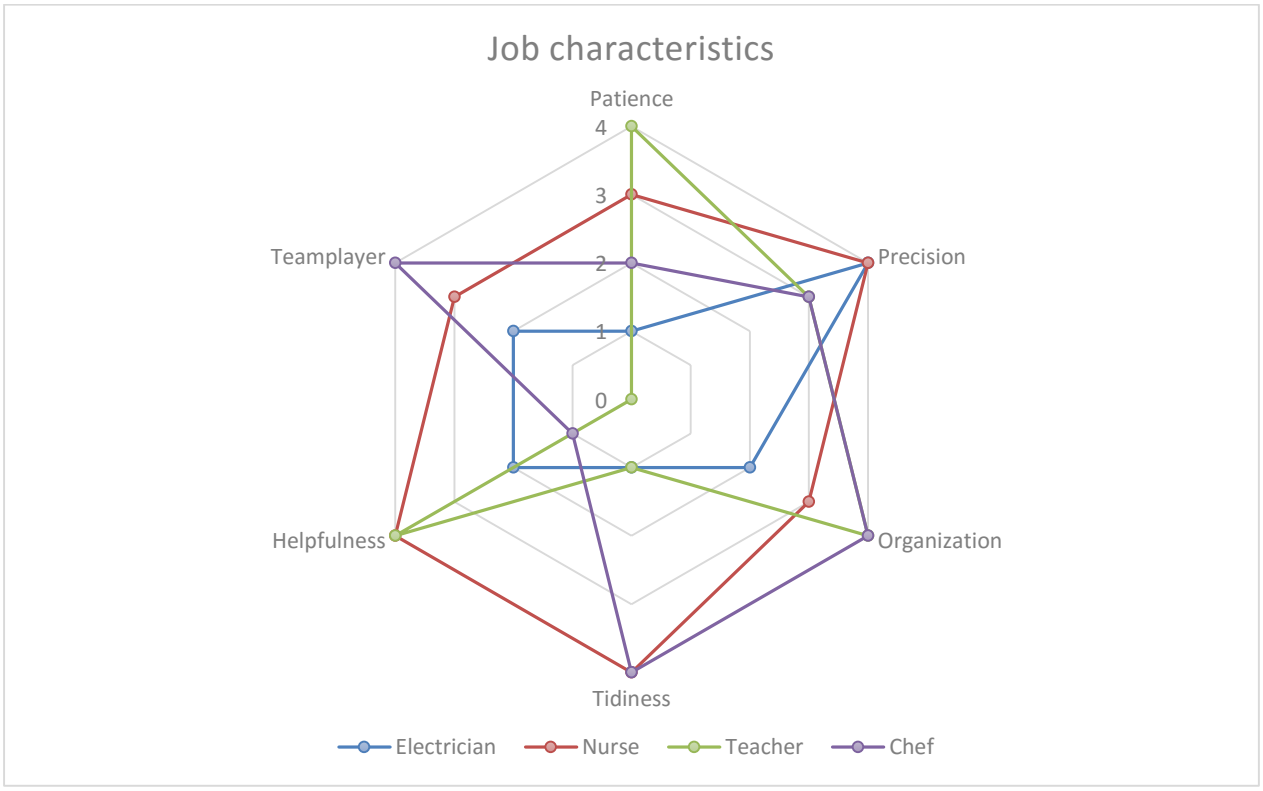
Action 2: First insert the data into a spread sheet

Action 3: Highlight all the data.

Action 4: Insert the chosen graph - click on the right command to insert a graph

Action 5: Insert your title, labels, percentage, different colours…

A possible solution:



Picture: BFI OOE

Exercise 3 - Media use

Studies often focus on differences in behaviour depending on your gender. In this study you can read about different ways that students primarily access information.

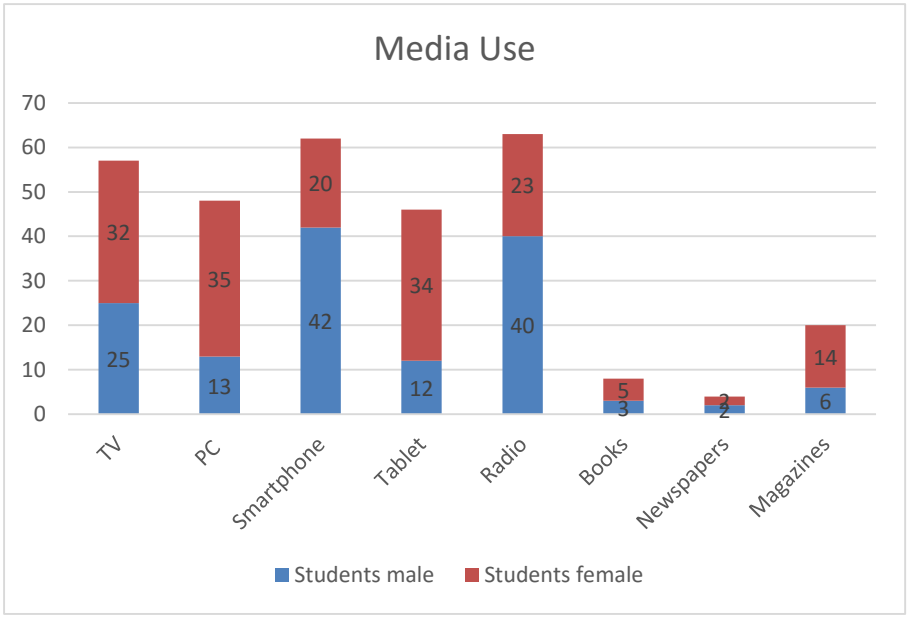
Here below the table shows the answers of students that have been asked:

Which media do students use to access information?


Media	Students male	Students female
TV	25	32
PC	13	35
Smartphone	42	20
Tablet	12	34
Radio	40	23
Books	3	5
Newspapers	2	2
Magazines	6	14

Pictures: iStock

A possible solution:



Picture: BFI OOE

Exercise 4 - Following Social Media

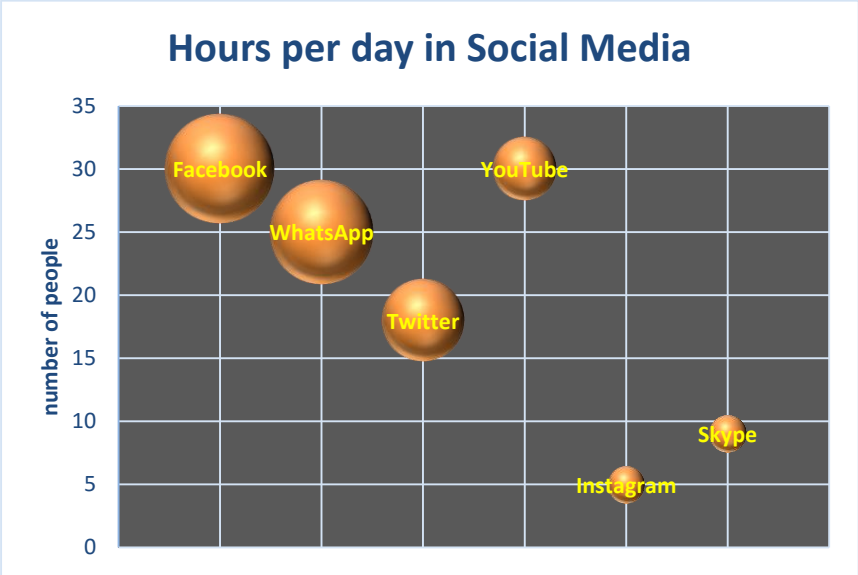
Do you use social media? What kind do you use? And for how many hours per day? In this table you can find the likes of students and average hours per day that they use it.

social media	number of people	average hours/day
facebook	30	9
Whatsapp	25	8
twitter	18	5
YouTube	30	3
Instagram	5	1
Skype	9	1

Pictures: iStock

Do you use the following social media and if yes, for how many hours per day on average?

A possible solution:



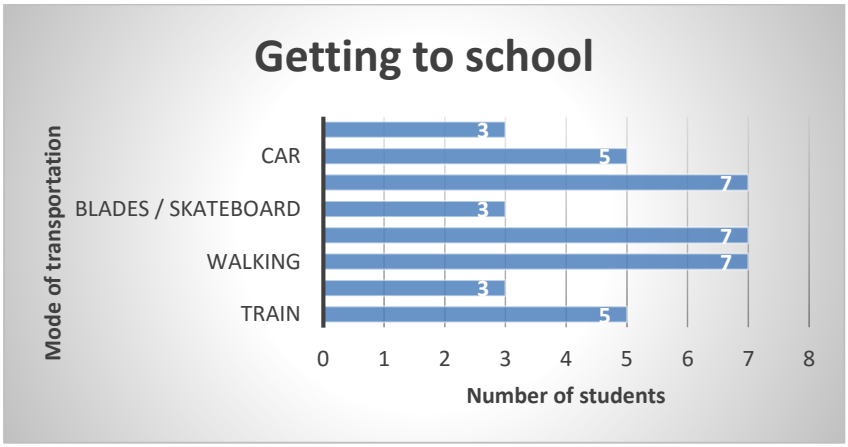
Picture: BFI OOE

Exercise 5 - How do you get to school?

Students were asked what means of transportation they use to get to school.

How do you get to school? (More than 1 answer is possible)

Mode of tranportation	Number of students
Train	IIIII
Bus	III
Walking	IIIII II
Bycicle	IIIII II
Blades / Skateboard	III
Tram/Tube	IIIII II
Car	IIIII
Motorcyle	III



Picture: BFI OOE

4.4 Assess your learning

Now let´s see if you can apply the 5 Actions to solve these exercises.

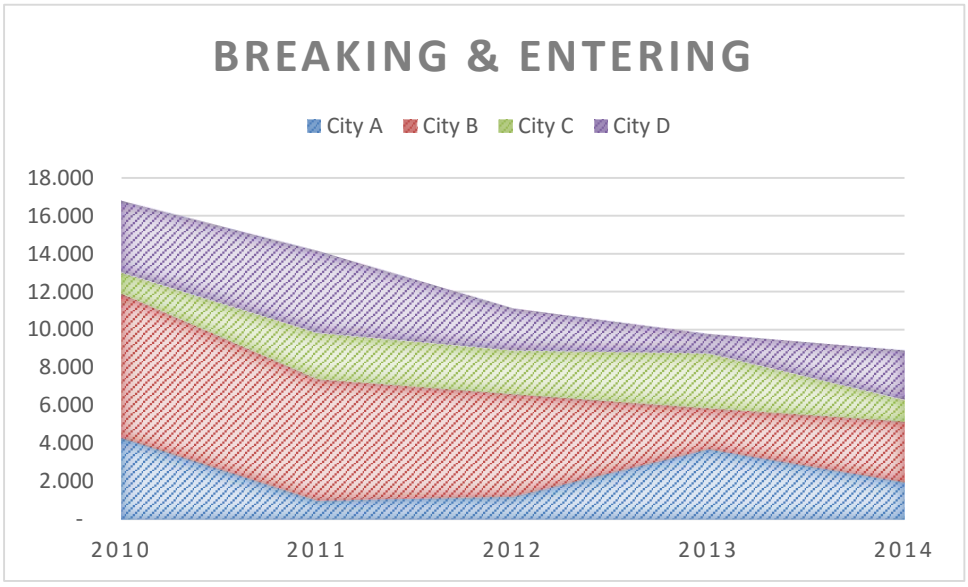
Assessment 1: Breaking and Entering

Create a graph or chart using a software to show the following data:

Comparison of numbers of burglaries in the following cities
between the years 2010 and 2014

	City-A	City B	City C	City D
2010	4.300	7.600	1.100	3.760
2011	1.000	6.400	2.430	4.300
2012	1.200	5.400	2.300	2.200
2013	3.690	2.160	2.900	1.000
2014	1.960	3.200	1.130	2.600

A possible solution:



Picture: BFI OOE

This graph adds the numbers of breaking and enterings in the years e.g. 2010: blue shows 4300, red 7600 (4300+7600 =11900) and so on… so we can a) make estimations for specific a specific city and b) for all cities

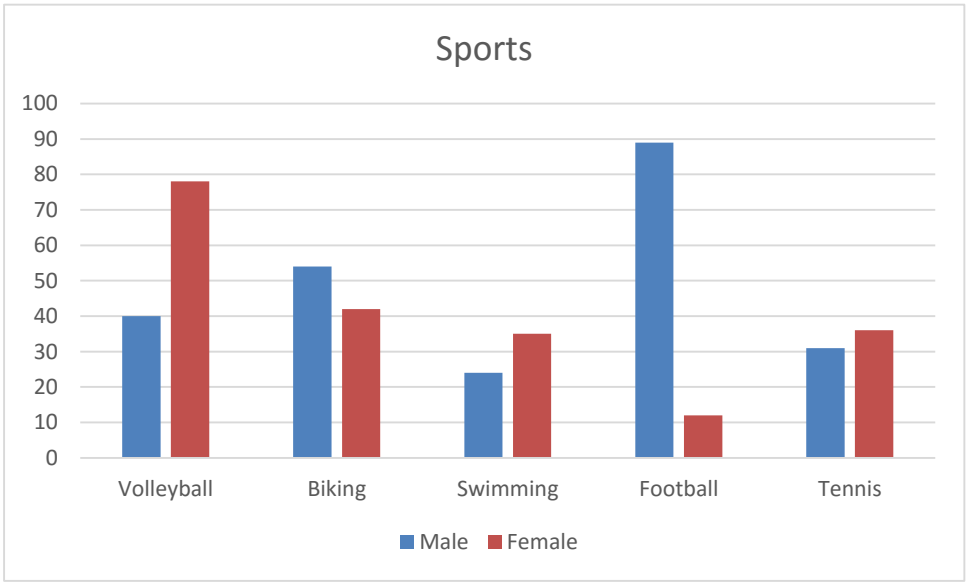
Assessment 2: Sports

Create a graph or chart using a software to show the following data:

What sport do students do, differentiated by gender?

	Male	Female
Volleyball	40	78
Biking	54	42
Swimming	24	35
Football	89	12
Tennis	31	36

A possible solution:



Picture: BFI OOE

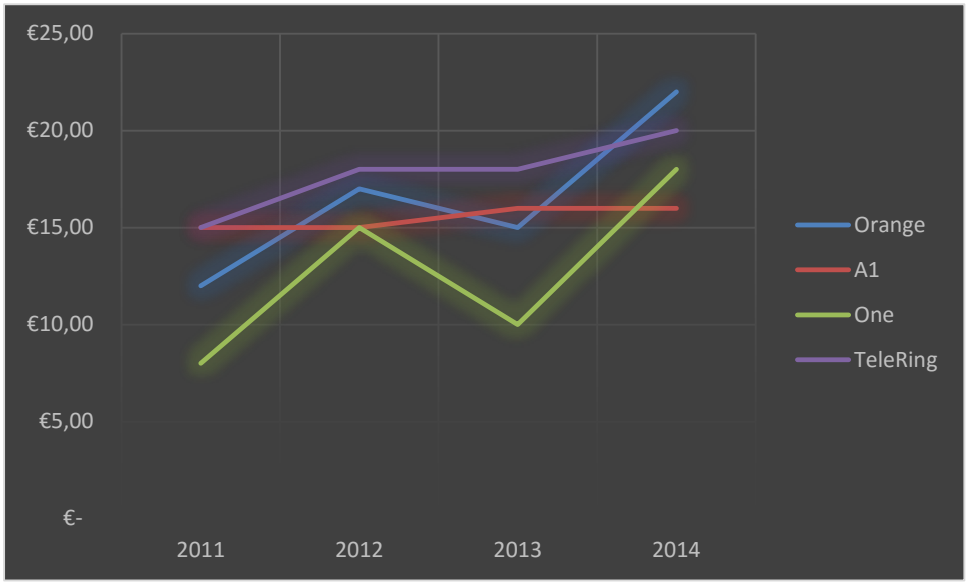
Assessment 3: Mobile phone costs

Create a graph or chart using software to show the following data:

How did the mobile phone costs (in €) per month change over time looking at different providers?

	Orange	A1	One	TeleRing
2011	€ 12,00	€ 15,00	€ 8,00	€ 15,00
2012	€ 17,00	€ 15,00	€ 15,00	€ 18,00
2013	€ 15,00	€ 16,00	€ 10,00	€ 18,00
2014	€ 22,00	€ 16,00	€ 18,00	€ 20,00

A possible solution:



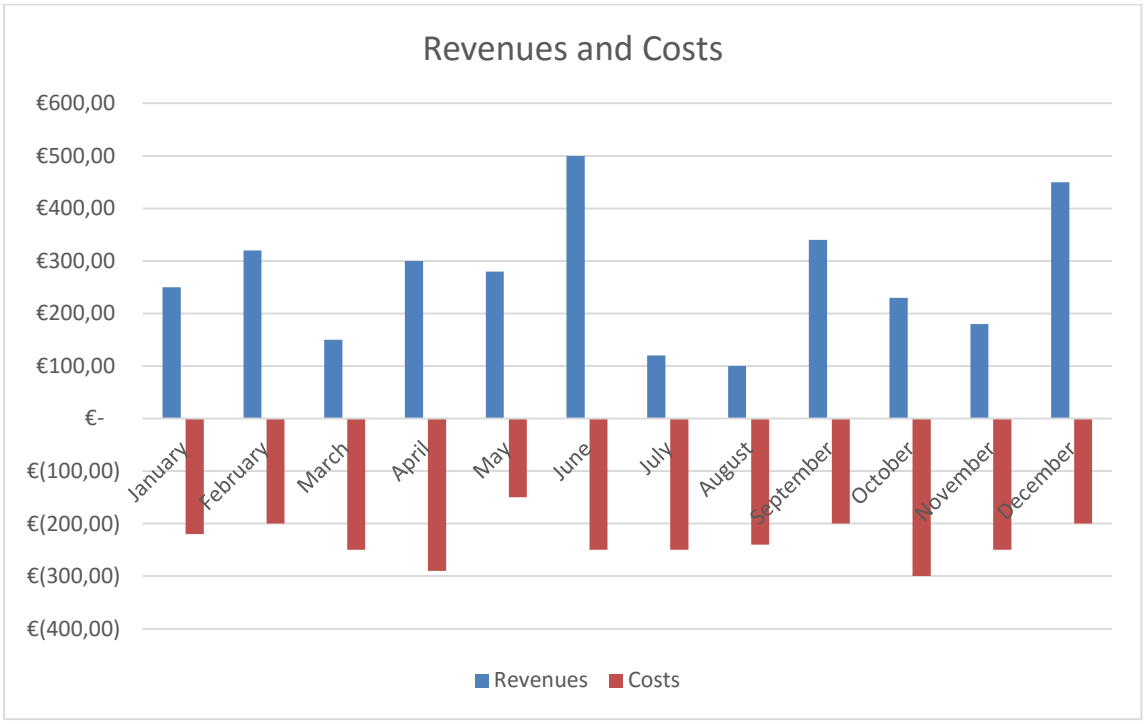
Picture: BFI OOE

Assessment 4 -Monthly Costs and Revenues

Create a graph or chart using a software to show the following data:

A student wants to look at his monthly costs and revenues:

	Revenues	Costs
January	€ 250,00	-€ 220,00
February	€ 320,00	-€ 200,00
March	€ 150,00	-€ 250,00
April	€ 300,00	-€ 290,00
May	€ 280,00	-€ 150,00
June	€ 500,00	-€ 250,00
July	€ 120,00	-€ 250,00
August	€ 100,00	-€ 240,00
September	€ 340,00	-€ 200,00
October	€ 230,00	-€ 300,00
November	€ 180,00	-€ 250,00
December	€ 450,00	-€ 200,00



Picture: BFI OOE

4.5 Learning resources – Useful links

List of commented links	
Source	www.openoffice.org
Source title	**Apache Open Office**
Description	Apache OpenOffice is the leading open-source office software suite for word processing, spreadsheets, presentations, graphics, databases and more. It is available in many languages and works on all common computers. It stores all your data in an international open standard format and can also read and write files from other common office software packages. It can be downloaded and used completely free of charge for any purpose.
Link	https://www.openoffice.org/de/
Language	English, German

List of commented links	
Source	www.kingsoftstore.com
Source title	**Kingsoft Spreadsheets Free 2013**
Description	Kingsoft Spreadsheets Free 2013 is totally free spreadsheet software alternative to Microsoft Excel that offers a wide range of easy-to-use features which suits both beginners and advanced users.
Link	http://www.kingsoftstore.com/spreadsheets-free.html
Language	English

List of commented links	
Source	www.openoffice.org
Source title	**Open Office Calc**
Description	Open Office Calc is a free spreadsheet software. Calc a powerful spreadsheet with all the tools you need to calculate, analyze, and present your data in numerical reports or sizzling graphics.
Link	http://www.openoffice.org/product/index.html
Language	English

List of commented links	
Source	www.ssuitesoft.com
Source title	**Accel Spreadsheet**
Description	Accel Spreadsheet is a standalone component of SSuite Office. Accel Spreadsheet is basically a spreadsheet software like Microsoft excel.
Link	http://www.ssuitesoft.com/accelspreadsheet.htm
Language	English, German

List of commented links	
Source	www.spreadsheet123.com
Source title	**Spreadsheet123**
Description	Spreadsheet123 is a simple spreadsheet which lets you monitor your spending habits. It is useful for creating a monthly or yearly household budget. It offers spreadsheets for different occasions such as: Household Budget Worksheet, party budget planner, event fund raiser, colleage students budget and weekly timesheet template.
Link	http://www.spreadsheet123.com/
Language	English

List of commented links	
Source	www.ssuitesoft.com
Source title	**QT Calc Express**
Description	QT Calc Express is a free spreadsheet software. It lets you do data analysis, calculations, create various types of charts and graphs, creation of reports and formatting your data.
Link	http://www.ssuitesoft.com/qtcalcexpress.htm
Language	English

List of commented links	
Source	www.gnumeric.org
Source title	**Gnumeric**

Description	Gnumeric is a free spreadsheet software based upon GNOME. It is a free alternative to popular spreadsheet software Microsoft excel.
Link	http://www.gnumeric.org/
Language	English

List of commented links	
Source	www.sourceforge.net
Source title	**Myrtle**
Description	Myrtle is a simple programmable spreadsheet and statistical analysis software specifically designed for learning statistics. It provides the standard spreadsheet functionality one would expect like multiple tabbed sheets, relative and absolute row and column referencing in formulas, and a large catalog of built-in functions. Functions specific to logic and computer science, mathematics, probability, and statistics are available. Student's can easily create, customize, and update plots and graphical summaries of their analyses.
Link	http://sourceforge.net/projects/myrtle/
Language	English

List of commented links	
Source	www.crystaloffice.com
Source title	**CellPro**
Description	CellPro is a free spreadsheet software. It lets you do data calculations, data analysis, and construct formulas for you. There is also a support section.
Link	http://www.crystaloffice.com/cellpro/
Language	English

List of commented links	
Source	www.softmakeroffice.com
Source title	**PlanMaker**
Description	PlanMaker is a free and powerful spreadsheet application. It is a part of the Softmaker free office software. It lets you create graphs, charts, borders and WordArt.
Link	http://www.softmakeroffice.com/
Language	English

List of commented links	
Source	www.calligra.org
Source title	**Calligra Sheets**
Description	Calligra Sheets is a free and powerful spreadsheet application. It is an free alternative to Microsoft Excel. It lets you create charts and graphs. The Calligra project, being part of the KDE community, is dedicated to producing Free Software. Therefore you can download and install the Calligra Suite free of charge. The Calligra project only provides source

	code that can be build, but the suite can be installed on various operating systems using contributed installation packages. There is a help forum for FAQs.
Link	https://www.calligra.org/get-calligra/
Language	English

List of commented links	
Source	www.listoffreeware.com
Source title	**List of freeware**
Description	Here you find a detailed description of the spreadsheets software we propose in this chapter.
Link	http://listoffreeware.com/list-best-free-spreadsheet-software/
Language	English

List of commented links	
Source	www.learnthenet.com
Source title	**Learn the Net**
Description	Step-by-Step: Downloading Software: Follow these steps for downloading software, games or any other files from the Internet if you use a PC running Windows XP,Vista or Windows 7.
Link	http://www.learnthenet.com/how-to/download-software/
Language	English

List of commented links	
Source	www.youtube.com
Source title	**How to download software for free**
Description	This video explains how to download software for free in 4 minutes.
Link	https://www.youtube.com/watch?v=HNAHKqwv214
Language	English

List of commented links	
Source	www.youtube.com
Source title	**Windows 8.1 How to install free office suite open office**
Description	This video explains how to install free office suite open office in 13 minutes.
Link	https://www.youtube.com/watch?v=j-GvGJq96AI
Language	English

List of commented links	
Source	www.ebizmba.com
Source title	**Top 15 Most Popular Search Engines | November 2015**
Description	Top 15 Most Popular Search Engines | November 2015

	Here are the top 15 Most Popular Search Engines as derived from our ***eBizMBA Rank*** which is a continually updated average of each website's ***Alexa*** Global Traffic Rank, and U.S. Traffic Rank from both ***Compete*** and ***Quantcast***.
Link	http://www.ebizmba.com/articles/search-engines
Language	English

List of commented links	
Source	www.searchengineland.com
Source title	**How to use Google to search**
Description	Google is the most popular search engine in the world. But while so many people use it, few actually get formal instructions on how to search with Google. Here you will find tips on how to search on Google.
Link	http://searchengineland.com/guide/how-to-use-google-to-search
Language	English

List of commented links	
Source	www.infoplease.com
Source title	**Finding information on the internet**
Description	There is an enormous amount of information on the Web! However, there's an easy way for you to find specific information without searching through every site yourself. Just use a search engine. Here are some tips to help you make the most of search engines.
Link	http://www.infoplease.com/homework/u2searchengines.html
Language	English

List of commented links	
Source	am.air.org
Source title	**AM Statistic Software**
Description	AM is a statistical software package for analyzing data from complex samples, especially large-scale assessments.
Link	http://am.air.org/
Language	English

List of commented links	
Source	NIST – National Institute of Standard and Technology
Source title	**Dataplot**
Description	Dataplot is a free, public-domain, multi-platform software system for scientific visualization, statistical analysis, and non-linear modeling.
Link	http://www.itl.nist.gov/div898/software/dataplot/
Language	English

List of commented links	
Source	www.gnumeric.org

Source title	**Gnumeric**
Description	Gnumeric is an open-source spreadsheet program.
Link	http://www.gnumeric.org/?ckattempt=1
Language	English

List of commented links	
Source	folk.uio.no – University of Oslo
Source title	**Past 3.x - the Past of the Future**
Description	Past is free software for scientific data analysis, with functions for data manipulation, plotting, univariate and multivariate statistics, ecological analysis, time series and spatial analysis, morphometrics and stratigraphy.
Link	http://folk.uio.no/ohammer/past/
Language	English

List of commented links	
Source	GNU Operating System
Source title	**GNU PSPP**
Description	GNU PSPP is a program for statistical analysis of sampled data. It is a replacement free of charge for the proprietary program SPSS, and appears very similar to it with a few exceptions.
Link	http://www.gnu.org/software/pspp/
Language	English

5 INFOGRAPHICS

5.1 Discover – What infographics are and which tools can you use to create them

People sometimes find graphs difficult to understand due to the large amount of numbers and information. It is also difficult to get a feel for a topic when you are shown 10 different graphs, one after another, without zoning out. Infographics are a good tool to visualize your data.

What are Infographics?

Infographics are **visual representations of figures, data, information, behaviours, and events.** They have the advantage to present complex data like statistics or mathematical functions in a more intuitive and understandable way. They can **highlight visually relationships between different items or variables** that otherwise would be difficult to grasp if expressed only in words or in figures.

Infographics present contents **combining in a creative words, numbers, photos, illustrations, graphics, and videos**. They can enhance communication and for this reason are often used for marketing and commercial purposes.

At school and university Infographics can be used to add value to research presentations in any subject.

Examples of Infographics

Effective and meaningful Infographics are the combination of **quality content** based on sound analysis and interesting data, with **graphic design** not only to highlight statistics but also to make them easy to understand.

If you want to get an idea of what Infographics are, just have a look in the Internet; you can find there hundreds of examples that could inspire you to represent numbers, data and concepts in a creative way.

http://www.dailyinfographic.com
Daily Infographic collects excellent Infographics. In the **education section** you can find interesting Infographics about **History, Languages, Science and other school and academic subjects**.

www.fix.com
Fix.com is a lifestyle blog with hundreds of excellent Infographics about **food**, **cooking**, **landscaping**, **gardening**, **outdoor activities**, **health**, **home maintenance** and **repairs**.

http://visual.ly/
Website providing Infographics for companies. Here you find excellent examples of awarded Infographics. Some meaningful examples:
-Get inspired: http://visual.ly/get-inspired
- Infographics awarded: http://visual.ly/product/infographic-design
- Philosophic graphics: http://visual.ly/philographics

http://feltron.com/
Nicholas Felton website is famous for his Personal Annual Reports, which are Infographics showing maps and statistics about our **daily routines**.

http://alphadesigner.com
Mapping and Illustrating Stereotypes: an example of **conceptual Infographics**.

http://waitbutwhy.com/2014/05/life-weeks.html
Life represented in weeks: combining numbers and facts.

http://www.mnn.com/health/fitness-well-being/stories/how-to-be-happy-infographic
Infographic showing the factors that play a role in how happy we are.

http://www.mnn.com/money/sustainable-business-practices/sponsorstory/what-can-1-million-trees-do-infographic
From Mother Nature Network website. Infographic provided by UPS showing the impact of trees on the **environment**.

http://magazine.good.is/infographics
GOOD magazine Infographics section, where can be found interesting examples of Infographics with **animated gifs**.

http://www.gapminder.org/

Examples of dynamic charts about **world development**.

http://geocommons.com
Sophisticated representation of data on **maps of the world**.

What tools can I use to create an infographic?

Everyone can create some simple Infographics for presentations at school or university.

You can use common tools like spreadsheets and PowerPoint. They are included in most software packages and are fairly easy to use.

Bearing in mind that you as student might not want to pay a lot of money to download an infographic tool, we recommend using **Powerpoint**.

- It is included in most software packages such as Microsoft Office
- It is fairly easy to use.
- As you might need it for presentations sooner or later, you might as well try it out.

There are also effective tools in the Internet. For most of these online applications you have to pay a fee, but there are also some free or limited applications. Use a search engine, for example google to look for "Infographic tools" to see which are available at the moment and most suitable for your needs.

Here below we have collected some websites where you can find some useful Infographic tools.

Easel.ly - www.easel.ly
Easel.ly is a website that features thousands of free infographic templates and design objects which users can customize to create and share their visual ideas online. Using the site is as easy as dragging and dropping design elements, and users can either choose a template from an extensive library, or they can upload their own background image and start from scratch.

Infogr.am - https://infogr.am/
Useful if you have to represent graphs starting from figures available in spreadsheets or tables.

Piktochar – www.piktochart.com
Piktochart is an easy infographic design application that requires very little effort to produce beautiful and high quality graphics.

Daytum - http://daytum.com/
An online tool that help collect and communicate personal statistics.

5.2 Learn – Tips to create infographics, licence rights of pictures and 7 creative steps

Tips to create Infographics

When using infographics there are a lots of possible solutions. Your creativity has no limits when using infographics. Even for designers producing a good infographic can be quiet challenging. Remember: He Who Dares, Wins!!

Here we have collected some tips for you how to create an easy infographic.

- Find a **software** you like to work with. Links to suitable software you find in the DISCOVER section of this chapter.
- Before starting to use software, try to **imagine** what it could look like. You could draw a sketch on a piece of paper. You could also **search the internet for ideas**.
- Use **pictures** that clearly say what you want to say.
- Use suitable pictures for your **audience**. Ask yourself: who do I want to address? What kind of pictures does my audience like to look at?
- Check the **licence right** of your pictures. You can learn more about this in the next chapter 5.2.2.
- "What do you think I want to show in this infographic?" **Test** your infographic on a friend or family member. Ask them for improvement. The higher the importance of your infographic, the more opinions you should gather.

Neil Patel is the Chief Evangelist of KISSmetrics and blogs at Quick Sprout. Here his ***"12 Infographic Tips That You Wish You Knew Years Ago"***: https://blog.kissmetrics.com/12-infographic-tips/

Some more links if you would like to learn more:

What You Can Learn From These 10 Infographics - Here you can read about a range of 10 contemporary infographics and some key takeaways that you can gain from each individual design. Link: https://blog.kissmetrics.com/10-infographics/

The 90 best infographics - The best infographics may look like they were simple to create in Photoshop, but designing an effective piece of data visualization is usually anything but. Here some great examples. Link:http://www.creativebloq.com/graphic-design-tips/information-graphics-1232836

Would you like some tips for creating successful infographics? Here are **7 tips for creating successful infographics:** Link: http://socialmarketingwriting.com/7-tips-for-creating-successful-infographics/

7 Super Tips for Creating Powerful Infographics - With the rise of the "visual web," content marketing is becoming more image-centric. As we embrace this trend of marketing without words and communicating visually, infographics have become one of the most effective ways to share your message, establish authority and drive traffic and shares across social platforms…. Link: http://www.entrepreneur.com/article/229818

5 Steps to Creating a Powerful Infographic - To be successful, an infographic needs resonant content and great design. Here are 5 tips for creating an effective infographic: Link: http://blog.slideshare.net/2013/12/16/5-steps-to-creating-a-powerful-infographic/

And some more **Top Tips from Experts on What Makes a Great Infographic**
Link: http://www.easel.ly/blog/top-tips-from-experts-on-what-makes-a-great-infographic/

10 Tips for (journalists) Designing Infographics- A good infographic will not only inform readers, but will also create interest and convince people to read your article similar to how good headlines and photos attract readers. Here are 10 tips for designing better infographics
Link: http://www.coolinfographics.com/blog/2010/4/27/10-tips-for-journalists-designing-infographics.html

About licence rights of pictures

If you want to use pictures that you find in the internet to **publish**, for example for a study work or on social media, you need to know how to find pictures with the correct license rights.

In Google you can find pictures with a suitable licence like that:

1. Search for images using keywords as usual.
2. When results are returned click "Search Tools"
3. Choose "Usage Rights". Select an option from the dropdown menu.

5 important facts about using photos form the internet and rules for using images on blogs

1. Who is the owner of a photo?
The moment you take a photograph, you own the copyright to it.

2. Can I use photos that are published in social media for public presentations?

Content that's published online is still protected by copyright law. If you've ever downloaded images from the net and **republished** them, used them in posters or newsletters without permission, you may have been breaking the law.

3. What are Creative Commons?

Creative Commons allow the owner to select permissions she/he wants to give to people, for free. With Creative Commons licensing you can give away all rights to your work, or just some of them. The most common licensing is an Attribution license, which lets anyone use your image in any way they like, as long as they give you credit.

4. How can I find out about usage right on Google?

1. Search for images using keywords as usual.

2. When results are returned click "Search Tools"
3. Choose "Usage Rights". Select an option from the dropdown menu.

5. What do I need to do if I want to use a picture and the licence right is not clear?
You should contact the original rights-holder for permission. Only use it if you have a written allowance.

For more information on license rights go to: http://www.macworld.co.uk/how-to/mac-software/law-using-free-images-found-online-3526354/

You want to learn more about **Creative Commons**? You own great pictures and presentations you would like to be available for reuse by others? This is the link: http://creativecommons.org/

From table and graph to infographic – the 7 creative Steps

We will teach you the **7 Creative Steps** to create an infographic.

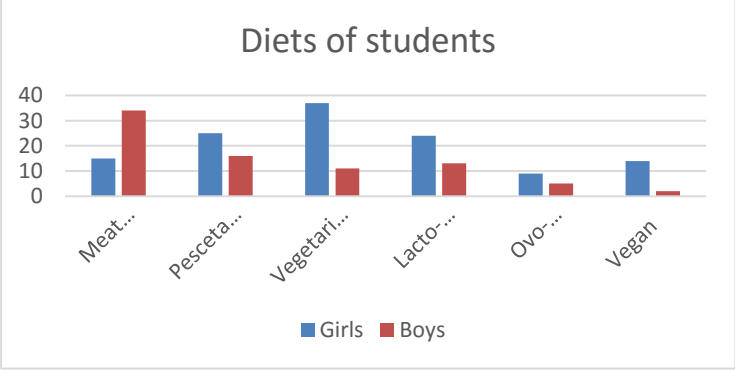
Let´s look at an example how to create an infographic.

For a project for biology we looked at feeding habits of animals and started to be interested what the **"eating habits" of students** in our school were like. For clear differentiation we used the biological terms. We interviewed students and prepared a table where we put the outcomes of the interview:

Diets of Students

	Omnivores	Pescetarian	Vegetarian	Lacto-vegetarian?	Ovo-vegetarian	Vegan	Tot
Female	15	25	37	24	9	14	
Male	34	16	11	13	5	2	
tot	49	41	48	37	14	16	

Now let´s see this data in a bar chart:



Picture: BFI OOE

There are blue bars to show the likes of female students and red bars to show the likes of male students.
It is easy to see the preferred diets. Immediately you find out that most female students are vegetarians whereas male students prefer meat.

If you want to go further into detail you can look closer and read the numbers. This graph is good, if you look for specific information.
But if you, as creator of the graph, would like to make more people interested in your data, a good tip is to use pictures.
When we see pictures that we can relate to – such as food in our case – we are far more likely to look at data.

Therefore you need to follow the **7 Creative Steps**:

Creative step 1: Create pictures for the items
Associate for each item a meaningful picture (creative moment). Then create or find them.
In our example we could use a picture of meat to represent omnivores and a picture of fish to represent the diet of Pescatarian.

Creative step 2: Use a software that you can handle.
We used Powerpoint as it is fairly easy to create with pictures and add word and numbers.

Creative step 3: Find a way to show large numbers and small numbers.
Use the size of pictures to show the importance: big pictures represent big numbers, small pictures represent small numbers.
In our case we use circles of different sizes to show if a larger or smaller number of people prefer a diet.

Creative step 4: Add words and numbers if necessary
We added the letters "m" for males and "f" for females and the numbers of persons following this diet.

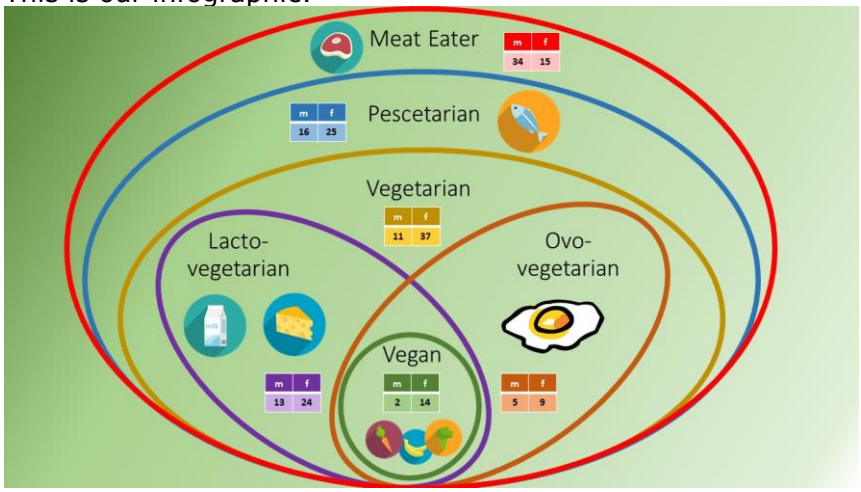
Creative step 5: Find a suitable background

We chose a light green. On this background is a good contrast to our pictures.

Creative step 6: Create a meaningful title
In our case it could be "Omnivores vs. Vegetarians".

Creative step 7: Save it as a presentation and then as picture in a jpg.

This is our infographic:



Pictures: iStock

What information can you get out of this infographic?

Immediately we can grasp that the creator wanted to say something about **different kinds of food diets** and how **eating habits** can be divided into differerent groups, which move up from a **small group (vegan)** to **larger groups (eg: vegetarian, pescetarian)** by adding different food groups. Using the picture, different words are explained as well as just a statistic. Now it is clear that a lacto-vegetarian eats vegetables and fruits like a vegan, but also cheese and milk – even if you do not know the meaning of all words.

What can you interpret that Ovo-vegetarians eat?
Ovo-vegetarians include eggs as an animal product in their diet to supply their body with animal fat and animal protein – but they renounce diary products.

In this infographic it is less important to read the different likes according to gender. If you are interested, you can read the numbers – so everything our creator wanted to show is there.

Which of the 7 Steps did we not follow?
Go back and have a look? Do you manage to find the mistake?

There is no title in this infographic!

Creating an infographic with a Presentation Application

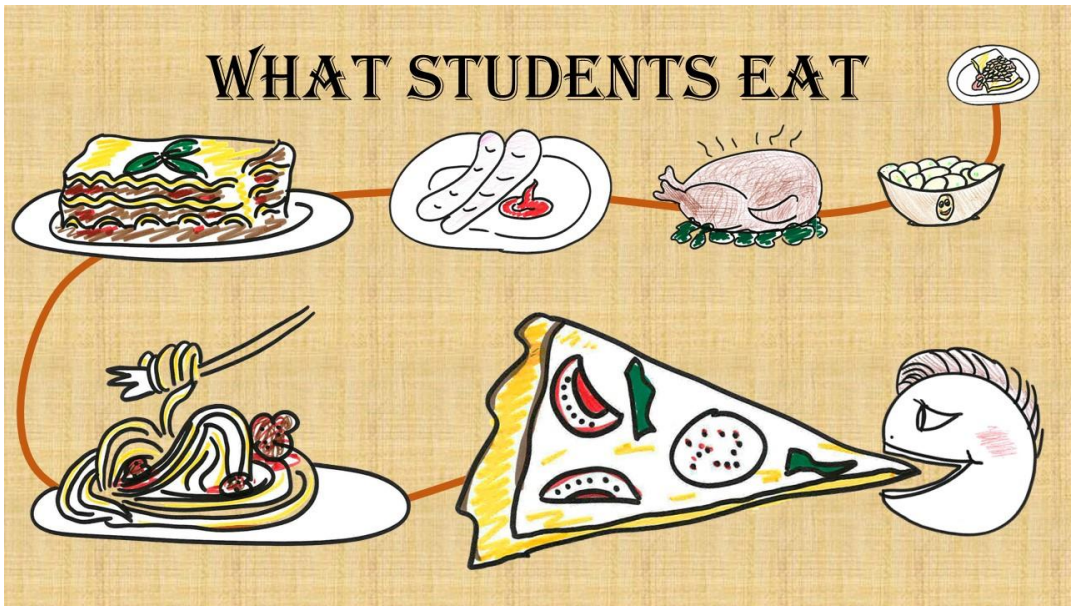
To learn to use PowerPoint or another presentation application there is only one way: **GIVE IT A GO!**
Let´s try and create an infographic for the following data using Powerpoint for the following data about **Students' food likes.**

60 Students in a school have been interviewed about their food likes. Here below the table shows their answers:

Food	**Students**
A.Pizza	20
B. Spaghetti Bolognese	15
C. Sausages	6
D. Potato Salad	3
E. Baked Beans on toast	2
F. Lasagna	10
G. Roast turkey	4
Total number of students asked:	**60**

Here are the **7 Creative Steps** we recommend to create an infographic using a presentation application eg. PowerPoint:
Creative step 1: Create pictures for the items
Creative step 2: Use the templates that come with PowerPoint and keep it simple.
Creative step 3: Find a way to show large numbers and small numbers.
Creative step 4: Add words and numbers if necessary
Creative step 5: Find a suitable background
Creative step 6: Create a meaningful title
Creative step 7: Save it as a presentation and then as picture in a jpg.

Our final result is this picture:



Picture: BFI OOE

5.3 Practise – Create your own infographics

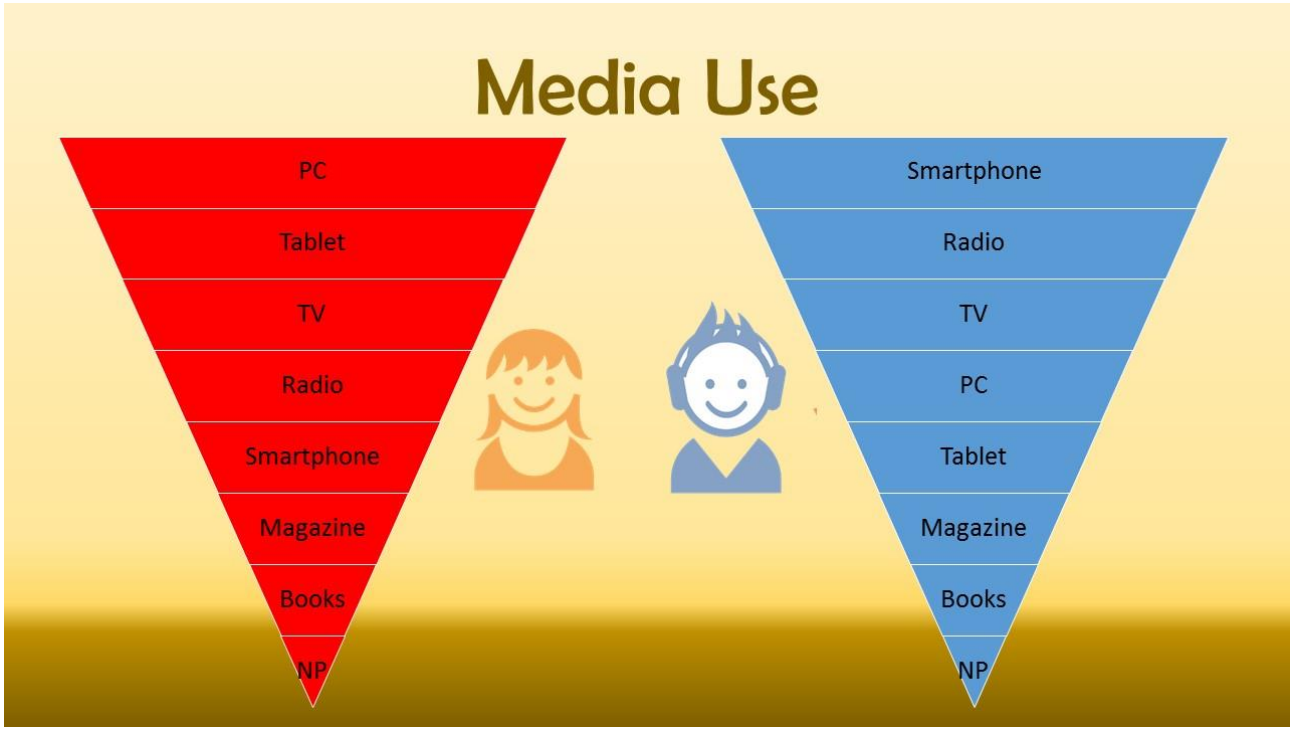
Now it is your turn. Have a go at creating an infographic. Create Infographics based on the data. Remember the 7 Creative Steps to create infographics. The first exercises will show you a possible infographic. **Keep in mind there are thousands of ways.**

Exercise 1 - Media use
Studies often focus on differences in behaviour depending on your gender. In this study you can read about different ways that students primarily access information.
Here below the table shows the answers of students that have been asked:


Media	Students male	Students female
TV	25	32
PC	13	35
Smartphone	42	20
Tablet	12	34
Radio	40	23
Books	3	5
Newspapers	2	2
Magazines	6	14
	143	165

Pictures: iStock

Now create your own infographic!
Afterwards you can compare it with our possible solution:



Pictures: iStock

Exercise 2 - How do you get to school?

Students were asked what means of transportation they use to get to school.

Mode of transportation	**Number of students**
Train	IIIII
Bus	III
Walking	IIIII II
Bycicle	IIIII II
Blades / Skateboard	III
Tram/Tube	IIIII II
Car	IIIII
Motorcyle	III

Now create your own infographic!
Afterwards you can compare it with our possible solution:

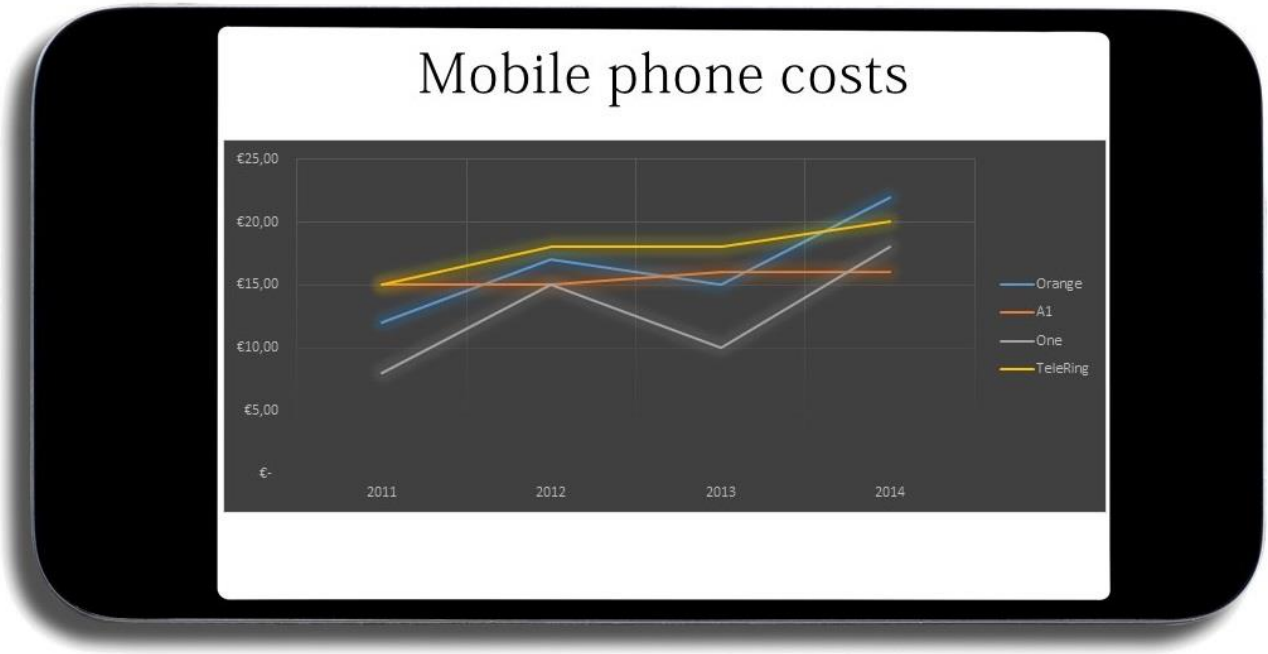
Pictures: iStock

Exercise 3 - Mobile phone costs

How did the mobile phone costs (in €) per month change over time looking at different providers?

	Orange	A1	One	TeleRing
2011	€ 12,00	€ 15,00	€ 8,00	€ 15,00
2012	€ 17,00	€ 15,00	€ 15,00	€ 18,00
2013	€ 15,00	€ 16,00	€ 10,00	€ 18,00
2014	€ 22,00	€ 16,00	€ 18,00	€ 20,00

Now create your own infographic!
Afterwards you can compare it with our possible solution:



Pictures: iStock

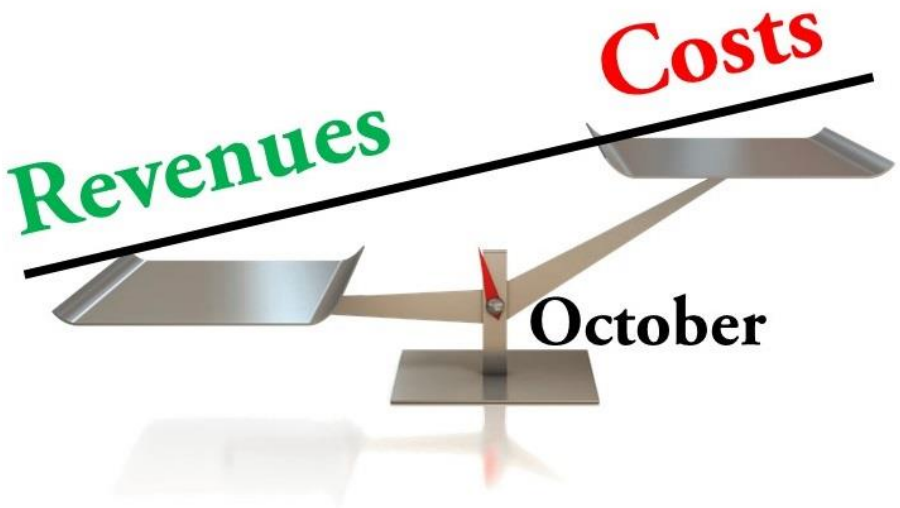
Exercise 4 -Monthly Costs and Revenues

Task: Create an infographic for the month October.

A student wants to look at his monthly costs and revenues:

	Revenues	Costs
January	€ 250,00	-€ 220,00
February	€ 320,00	-€ 200,00
March	€ 150,00	-€ 250,00
April	€ 300,00	-€ 290,00
May	€ 280,00	-€ 150,00
June	€ 500,00	-€ 250,00
July	€ 120,00	-€ 250,00
August	€ 100,00	-€ 240,00
September	€ 340,00	-€ 200,00
October	€ 380,00	-€ 250,00
November	€ 180,00	-€ 250,00
December	€ 450,00	-€ 200,00

Now create your own infographic!
Afterwards you can compare it with our possible solution:



Pictures: iStock

Exercise 5 - Jobs and their characteristics

If you think about your future and you think about the work you would like to do, you can read up on characteristics needed for a certain job. So it is easier to decide what kind of job you would like to do and you might be good at.
The table below contains the opinions collected for a survey by the employment service center.
1 = not important
2 = needed sometimes
3 = important
4 = very important

	Patience	Precision	Organization	Tidiness	Helpfulness	Teamplayer
 **Electrician**	1	4	2	1	2	2
 **Nurse**	3	4	3	4	4	3
 **Teacher**	4	3	4	1	4	0
 **Chef**	2	3	4	4	1	4

Now create your own infographic!
If you need inspiration, go and search in the internet for infographics on this topic.

Exercise 6 - Following Social Media

Do you use social media? What kind do you use? And for how many hours per day? In this table you can find the likes of students and average hours per day that they use it.

social media	number of people	average hours/day
facebook	30	9
Whatsapp	25	8
twitter	18	5
YouTube	30	3
Instagram	5	1
Skype	9	1

Pictures: iStock

Now create your own infographic!
If you need inspiration, go and search in the internet for infographics on this topic.

Exercise 7: Breaking and Entering

Create an infographic using a software to show the following data:

Comparison of numbers of burglaries in the following cities over time

	City-A	City B	City C	City D
2010	4,300	7,600	1,100	3,760
2011	1,000	6,400	2,430	4,300
2012	1,200	5,400	2,300	2,200
2013	3,690	2,160	2,900	1,000
2014	1,960	3,200	1,130	2,600

Now create your own infographic!
If you need inspiration, go and search in the internet for infographics on this topic.

Exercise 8: Sports

Create a graph or chart using a software to show the following data:
What sport do students do, differentiated by gender?

	Male	Female
Volleyball	40	78
Biking	54	42
Swimming	24	35
Football	89	12
Tennis	31	36

Now create your own infographic!
If you need inspiration, go and search in the internet for infographics on this topic.

5.4 Assess your learning – Answer the quiz

Let´s see if you can answer these questions about creating infographics! Answer the questions on a piece of paper and then compare them wit the answer below.

1. What could you do to if you have no idea what your infographic could look like?

2. What questions do I need to ask myself to reach my audience?

3. How do I keep it simple and focused?

4. How do I find out about licence rights of pictures?

5. What are the 7 Creative Steps?

6. How can I find the ideal pictures for the items that I want to show?

7. How can I show large numbers and small numbers without using the numbers?

8. Do I need to add words and numbers?

9. How do I find a suitable background?

10. What should I do before I go and use my infographic for a presentation?

Answers:
1. Search the internet.

2. Who do I want to address? What kind of pictures does my audience like to look at?

3. Only show the most important numbers, such as highs, lows and average. Do not use full sentences, just key words and short phrases?

4. In Google you can find pictures with a suitable licence like that:

Search for images using keywords as usual.

When results are returned click "Search Tools"

Choose "Usage Rights". Select an option from the dropdown menu.

5. Creative step 1: Create pictures for the items

Creative step 2: Use the templates that come with PowerPoint and keep it simple.

Creative step 3: Find a way to show large numbers and small numbers.

Creative step 4: Add words and numbers if necessary

Creative step 5: Find a suitable background

Creative step 6: Create a meaningful title

Creative step 7: Save it as a presentation and then as picture in a jpg.

6. Associate for each item a meaningful picture (creative moment). Then create or find them. For sports you could use the means you need to perform it such as a ball to represent football, a bike to represent cycling etc.

7. Use the size of pictures to show the importance: big pictures represent big numbers, small pictures represent small numbers.

8. Less is more in infographics but using no words or numbers might mislead the viewer. So ask yourself: what is the minimum of numbers and words I need to add to make my infographic understood?

9. Depending on your pictures, words and phrases your background needs to help them "shine". It should be a good contrast to the pictures and words. Try out different versions!

10. Show your infographic to at least 3 people and see if they understand your infographic. If they ask questions, these questions will help you revise or change in your infographic.

1.1 Learning resources – Useful links

List of commented links	
Source	www.forbes.com
Source title	**Are Infographics Still Effective As Part Of Your Content Strategy? Article by Ross Crooks**
Description	A short article about the real effectiveness of Infographics, presenting the different points of views on this matter and arguing that what remains essential in an infographic ist the quality of the content that is represented.
Link	http://www.forbes.com/sites/rosscrooks/2014/01/14/are-infographics-still-effective/
Language	English

List of commented links	
Source	piktochart.com
Source title	**Piktochart**
Description	Piktochart is an easy infographic design app that requires very little effort to produce beautiful, high quality graphics.
Link	http://piktochart.com/
Language	English

List of commented links	
Source	www.easel.ly
Source title	**Easely**
Description	Easel.ly is a website that features thousands of free infographic templates and design objects which users can customize to create and share their visual ideas online. Using the site is as easy as dragging and dropping design elements, and users can either choose a template from our extensive library, or they can upload their own background image and start from scratch.
Link	http://www.easel.ly/blog/about-us/
Language	English

List of commented links	
Source	www.wikihow.com
Source title	**Explanation on how to use Powerpoint**
Description	Written explanation an how to use Powerpoint including screenshots
Link	http://www.wikihow.com/Use-Microsoft-Office-PowerPoint
Language	English

List of commented links	
Source	www.youtube.com
Source title	**Powerpoint for beginners**
Description	Tutorial video to use Powerpoint, about 7 minutes
Link	https://www.youtube.com/watch?v=xsNHJzz09QE
Language	English

List of commented links	
Source	www.youtube.com
Source title	**Making your first Powerpoint**
Description	Tutorial video to use Powerpoint, about 7 minutes
Link	https://www.youtube.com/watch?v=1NlDjGqYSn0
Language	English

6 INTERPRETING GRAPHS CONTENT

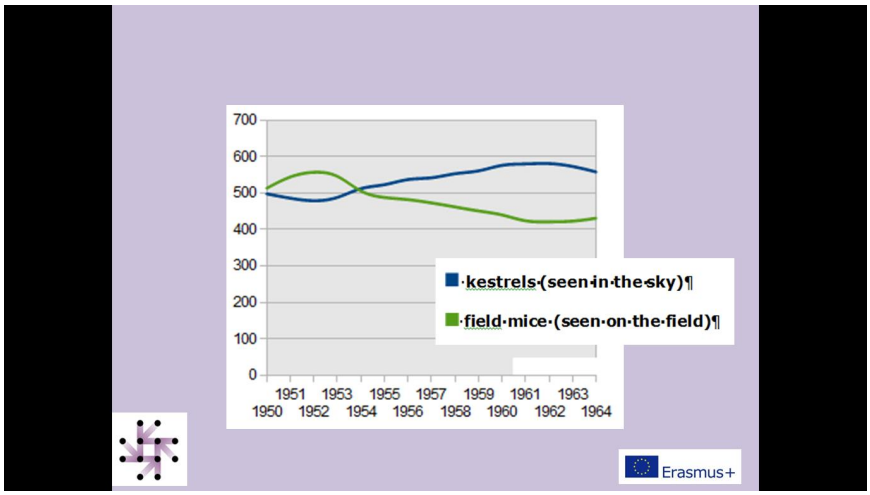
6.1 Discover – How to explain graph

Knowing how to interpret graphs can help us make sense of the world around us. In our working life it has become a crucial skill, in factories graphs monitor production. In Business they use graphs to analyse their performance, even in music composing programs graphs are used to show music variations. In hospitals the inablitity to read graphs that are displayed on monitors can be dangerous.

You might find reading and interpreting graphs confusing and misleading. But bare in mine the creator of the graph wants to tell you something. Here an example:

Before Roy Varey became a biologist he spent his school holidays at his grandparents. There was a huge field and he became interested in the animals living there. So he started his summer hobby: counting animals. His favourites were kestrels. As he realised that the numbers changed over the years, he started comparing their numbers with the number of their favourite prey: the field mice. For many years he noted the numbers in his diary. He wanted to compare the sightings of the years. Therefore he put the data into the form of a graph

Let´s find out what story this graph tries to tell us:



In which years did Roy collect data?

We find the answer on the x-axis: from 1950 to 1964

How many kestrels did he see in the first year?

We find the answer on the y-axis: approximately 500, it shows there were a few more mice than kestrels.

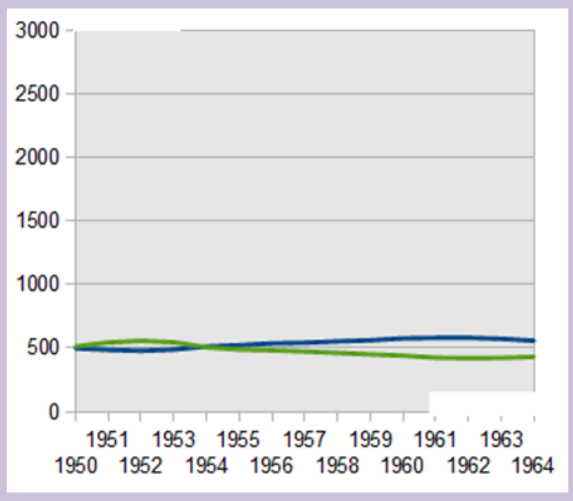
What happened in the next 2 years?

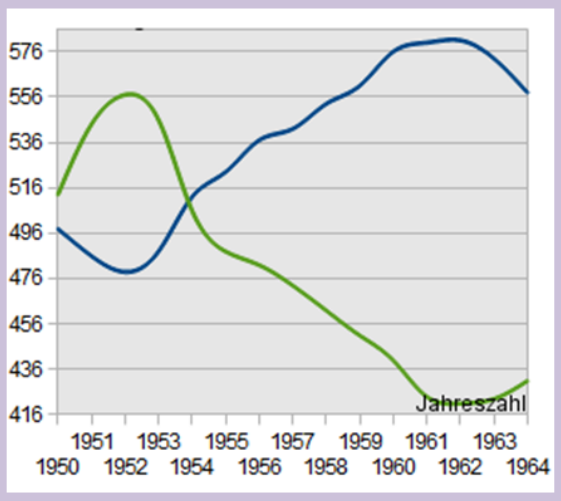
The green line increases which means the number of mice rose, the blue line fell which means the number of kestrels decreased.

Did the trend of the first years continue?

No. There has been a change in 1954. Since then there were more kestrels than mice.

Now look at these 2 graphs about mice and kestrels. They look very different from the first one. What stories do they tell us?





What story does the left graph tell?

The left graph tells you that the numbers of mice and kestrels are nearly the same and do not change much over the years. The graph emphasizes the stability of numbers of mice and kestrels.

What story does the right graph tell?

The one on the right tells you that the numbers of mice and kestrels change drastically over time. The graph emphasizes the change and drop of field mice over the years and the increase of kestrels.

But why are they so different even though they are based on the same data?
What is the truth? Remember the following sentence: ***„Never trust a diagram that you have not faked yourself."*** It sounds like a joke but there is a lot of truth in in.
How you can interpret a diagram truthfully, you can learn in the next chapter.

6.2 Learn – Phrases and 6 Analysis Steps to interpret a graph

Useful phrases to interpret a graph

As every graph tells a story, the creator has to be a good story teller. She or he needs basic knowledge in creating and interpreting the graphs produced.
Also the person trying to understand the story, needs some basic knowledge about graphs. Otherwise reading a graph is like reading a text in a foreign language.

Introducing…

THE TOPIC	THE GRAPH
I'd like you to look at … Let me show you … Let's have a look at … Let's turn to… To illustrate my point let's look at… As you can see from these… If you look at … you'll see/notice/understand…	This graph shows… The diagram outlines… This table lists… This chart represents… This chart depicts… This chart breaks down…

Some vocabulary you need to know:

To go up:	increase, rise, rocket, climb, lift, grow, go up, jump, surge, shoot up, soar, rocket, a rise, an increase, growth, an upward/rising/increasing trend, an improvement, a jump, a surge, extend, expand, push/put/step up, progression
To go down	decrease, drop, decline, fall, go down, slump, plummet, a fall, a decrease, a decline, a downward/falling/decreasing trend, a slump
No change	Remain stable/constant/steady at, stay at the same level, stabilize, keep stable, hold constant
Indicating a change of direction	level out/off, stand at, stop falling/rising, stop falling and start rising, stop rising and start falling, change
Frequent change	Fluctuate, fluctuation
At the top	Reach a peak, peak, reach its/their highest point
At the bottom	Reach/hit a low (point), hit/reach its/their lowest point

Change can be described concerning their change:

degree	dramatic(ally), vast(ly), huge(ly), a lot, significant(ly), considerable/ly, moderate(ly), slight(ly), substantial(ly), a little
speed	rapid(ly), quick(ly), swift(ly), gradual(ly), gentle/ly, little by little, slow(ly), quiet(ly)

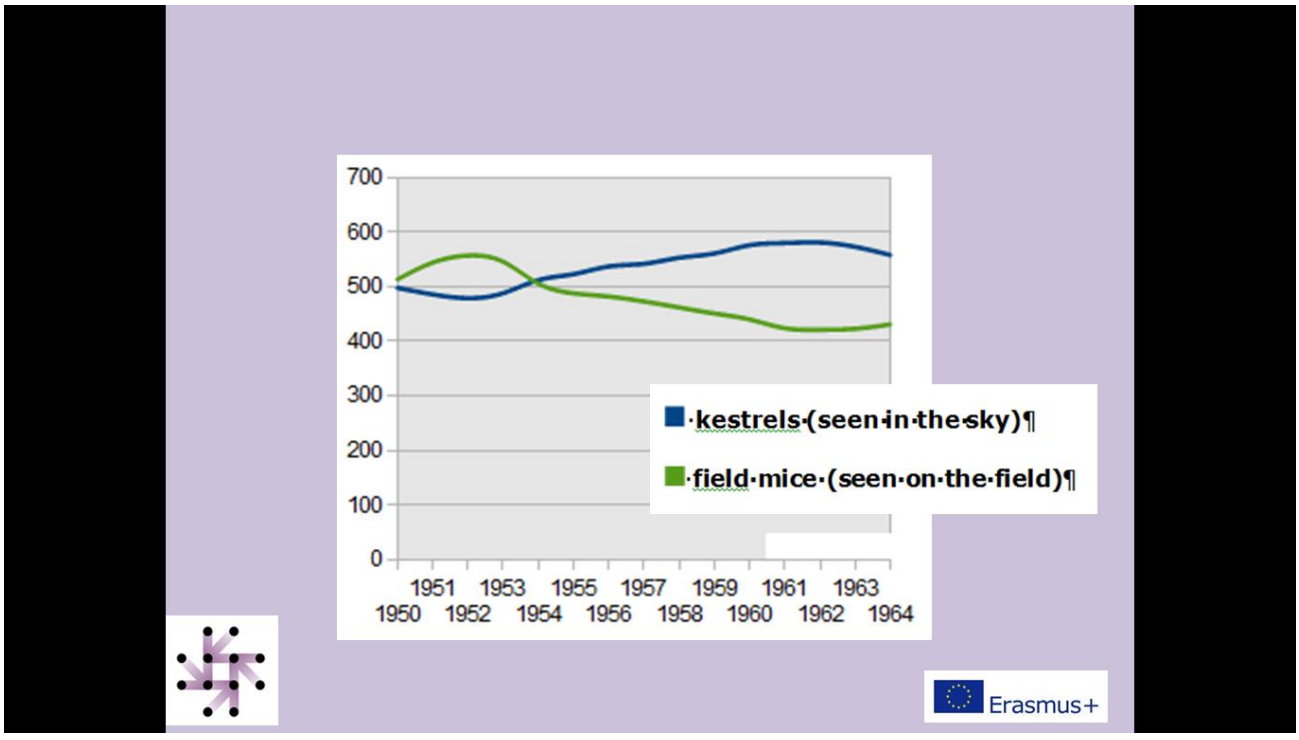
Some prepositions for describing elements in a graph

Prepositions	A rise FROM x TO y TO INCREASE BY 5 % AN INCREASE OF 5 % IN kestrel sightings

Getting to know the 6 Analysis Steps to interpret a graph

Let´s continue with our example of mice and kestrels from the previous chapter:

In our example Roy counted how many kestrels and how many field mice are in a field. For many years he notes the numbers in his diary. He produced this line chart.



Let´s try to interpret this example carefully.

Analysis 1: Reading basics

First you have to read the labels and the legend of the diagram. What does it visualize?

In our example…

- **x-Axis**: You can read what years the animals have been sighted.
- **y-Axis**: You can read the numbers of sightings.
- **Blue line**: The number of sighted kestrels.

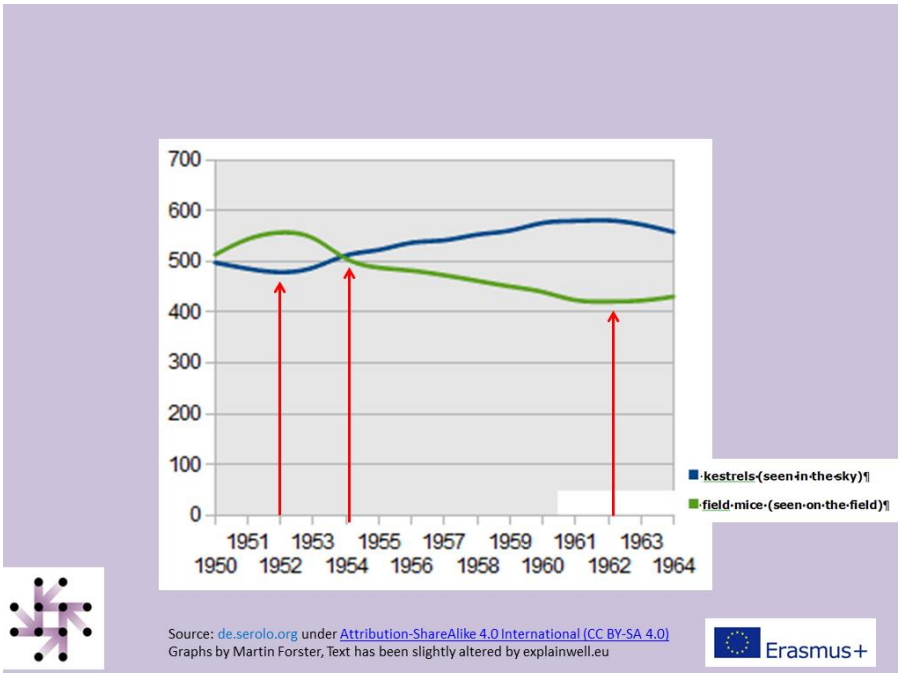
- **Green line**: The number of sighted field mice.

So this diagram visualises how many kestrels and field mice have been sighted over the years by Roy.

Analysis 2: Reading important numbers

First we have to read the most important points. Important points are peaks, lows, turning points and intersection points.

In our example…



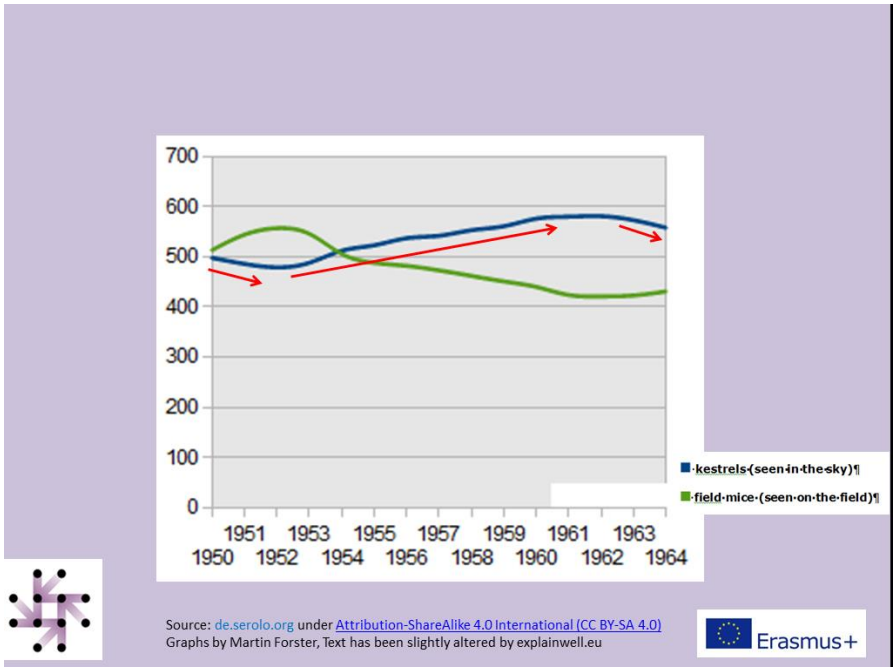
- **1952**: A peak of the mice line and a low of the kestrel's line. A turning point for both lines.
- **1954**: An intersection point between the kestrel's line and mice line.
- **1962**: A low point of the mice line and a highpoint for the kestrel's line. A turning point for both lines.

Analysis 3: Define trends

Now it is important to define all significant trends.

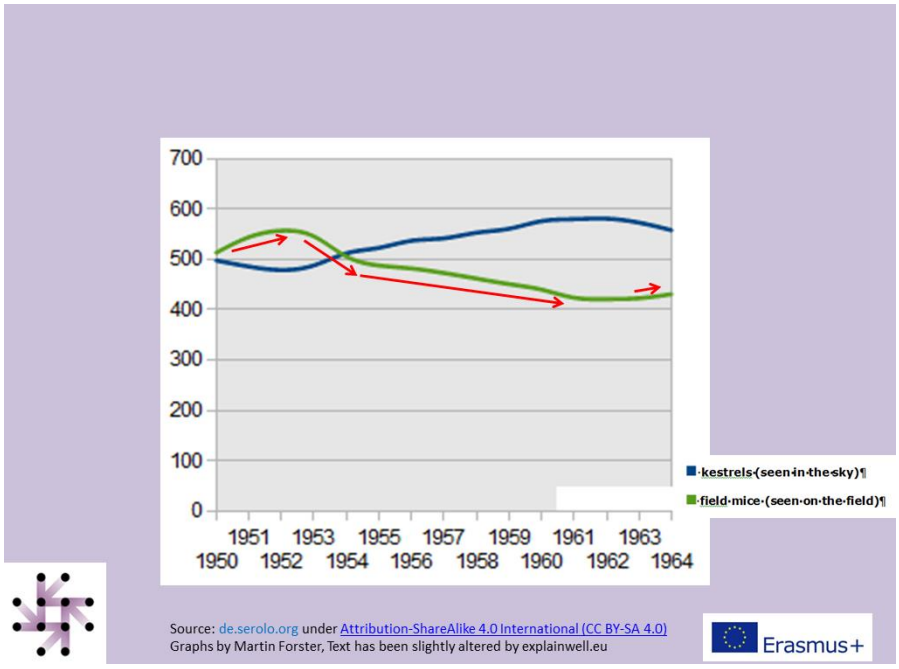
In our example…

Sightings of **kestrels:**



- From 1950 to 1952 they drop.
- Since 1952 they rise steadily.
- Since 1962 they drop slightly again.

Sightings of **field mice:**

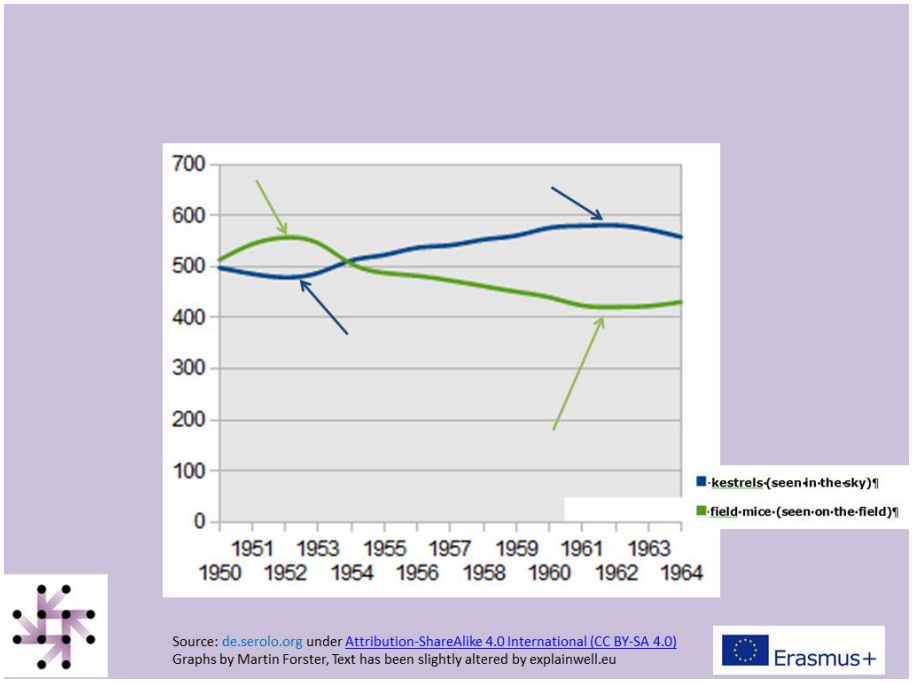


- From 1950 to 1952 they rise significantly.
- Since 1952 they drop significantly.
- Since 1954 they drop much slower.
- Since 1962 they rise again slowly.

Analysis 4: Compare trends

Knowing the trends, we can compare them, to find out differences and relations. Are there common trends? Is there a pattern?

In our example…



- When there are many sightings of field mice, there are fewer sightings of kestrels.
- When there are many sightings of kestrels, there are fewer sightings of field mice

Analysis 5: Analyse trends

Finally we can establish hypotheses how the data is related. These hypotheses have to be questioned and assessed.

In our example…

A) *"Mice eat kestrels. Therefore there are many kestrels when there are less mice."*

- According to our diagram this is possible. But: We know that mice do not eat kestrels.

B) *"The kestrels hunt the mice. Therefore there can only be a lot of mice when there are fewer kestrels."*

- Mice are typical food for *kestrels*. This hypothesis could be correct.

C) *"The Mice hide from the kestrels. When there are many kestrels to see, we cannot see many mice."*

- Prey animals often shelter from their hunters. Also this hypothesis could be correct.

D) *"The relation between sightings of kestrels and mice is only a translucent connection. The numbers of sightings have very different reasons."*

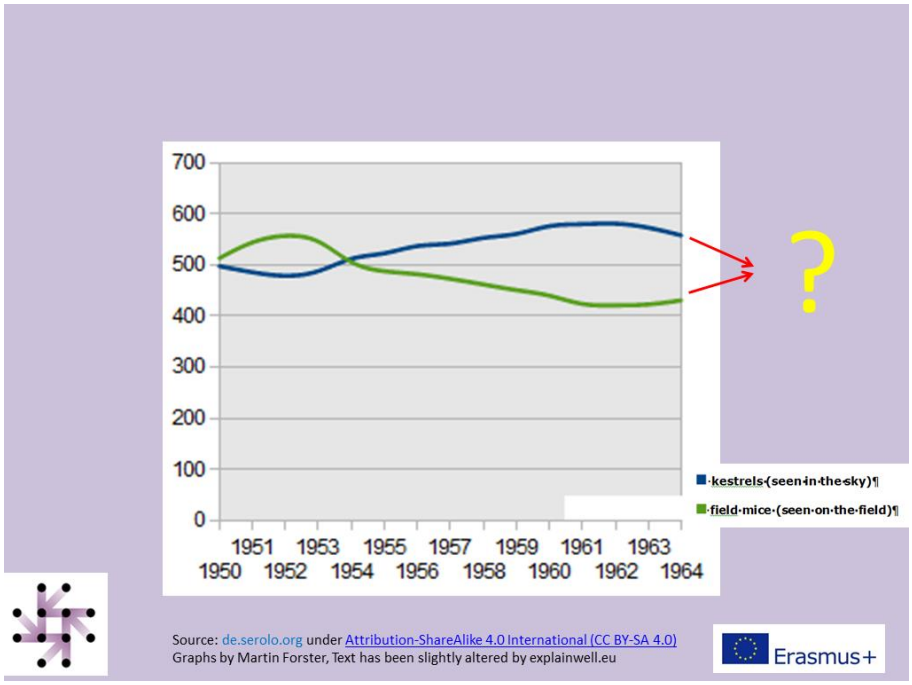
- Very often there are only translucent connections. There can be many reasons why Mr. Varney sights a certain number of animals each year. Also this hypothesis could be correct.

Analysis 6: Predict a development

Based on the development of the diagram and the established hypothesis we can predict future developments of the diagram.

But be careful: Predictions are always only speculations!

In our example…



- Towards the end the lines become closer again. If they continue like that there will be an intersection at some point.
- In the coming years there might be more sightings of mice than kestrels.

Conclusion

A diagram helps to **draft a hypothesis**. To check a hypothesis very often you need to do an experiment. Based on a diagram, graph or chart we can predict a development in the future. But we have to be aware that it is **only a prediction**.

This example about kestrels and mice has been published by courtesy of de.serolo.org.

Concept and graphs by author Martin Forster.

Note: Some words in the graphs have been deleted to make it suitable for international use. Arrows to explain graphs have been added.
Some text has been changed slightly to suit the audience of explainwell.eu.
You can find the original under: https://de.serlo.org/biologie/kompetenzen-in-der-biologie/diagramme/wie-wertet-man-ein-diagramm-aus
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6.3 Practise – Do´s and Don'ts

6.3.1 Do´s and Don´ts for creating and interpreting graphs

Before you have a go at interpreting graphs, here some do´s and don´ts.

Do´s and Don´ts for creating graphs

DO'S	DON'TS
State the numbers of people asked	Do not just give a graph or infographics without further information
Choose a graph that shows the info you want to emphasize	Do not read predictions as facts! Always say that they are predictions when looking at the data you have as facts
As shown in 6.2, a diagram can easily be manipulated – so be careful to use all data to give an overview, then go into detail	Do not use pictures you are not allowed to use!
Use labels on the axes.	

Do´s and Don´ts for interpreting graphs

DO'S	DON'TS
Read all numbers and information.	Do not just look at the line or curve and draw a conclusion.
When you want to look at trends, be careful always to state, that looking at the facts, you THINK that the development will go in a specific direction	Do not read predictions as facts! Always say that they are predictions when looking at the data you have as facts
Test your hypothesis, if they are even possible	Do not take every graph to be true. Bare in mind that the creator wants to tell you something. They might try and manipulate you.
	Do not just describe the X and Y axis, but give the information (eg: "as you can see the x-axis represents the years of sightings and the y-axis the number of sightings")
	Do not just state what the graph does (eg. "The line went up") but state what is behind the line (eg: "the number of kestrels dropped slightly in the next 5 years")
	Don't use shorthand (eg: "mice dropped") but whole sentences (eg: "The number of mice dropped significantly in the following five summers").

Now that you know your Do´s and Don´ts let´s give it a try!

6.3.2. Exercises to interpret graphs

How would you interpret the graphs shown below? What did you learn looking at this graph? What can you not know?

Use the Steps of the Analysis of the previous chapter.

Analysis 1: Reading basics

Read the labels and the legend of the diagram. What does it visualise?

Analysis 2: Reading important numbers

Read the most important points. Important points are peaks, lows, turning points and intersection points.

Analysis 3: Define trends

Define all significant trends.

Analysis 4: Compare trends

Knowing the trends, compare them, to find out differences and relations.

Are there common trends? Is there a pattern?

Analysis 5: Analyse trends

Establish hypotheses how the data are related. These hypotheses have to be questioned and assessed.

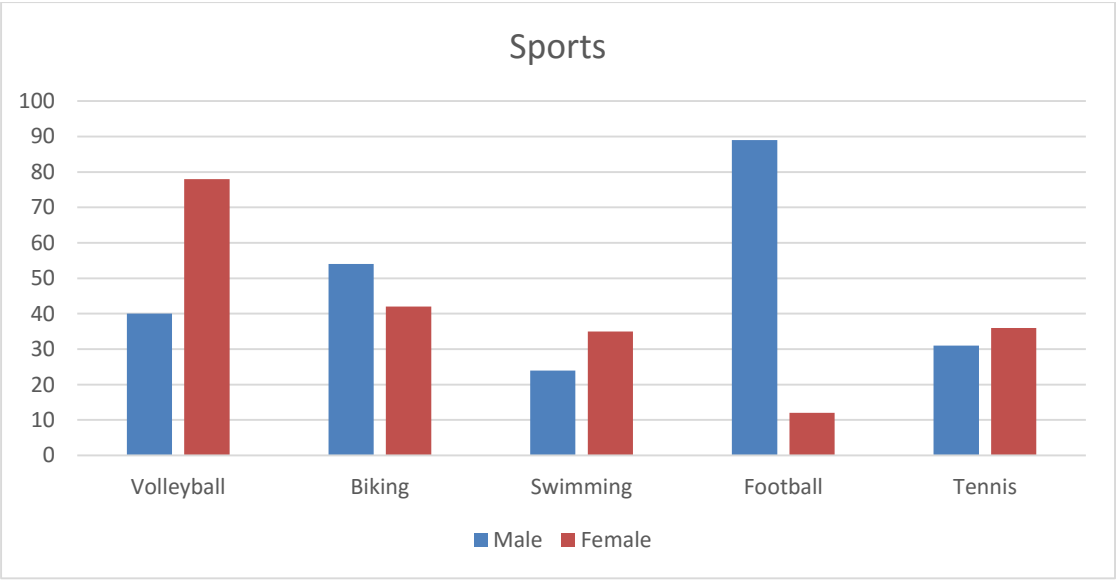
Analysis 6: Predict a development

Based on the development of the diagram and the established hypothesis we can predict future developments of the diagram.

But be careful: Predictions are always only speculations!

Exercise 1: Favourite sports of students

What sport do students do, differentiated by gender?



Picture: BFI OOE

Analysis 1: Reading basics

Read the labels and the legend of the diagram. What does it visualize?

x-Axis: Here you can read what kind of sports have been mentioned in the answers.

y-Axis: Here you can read the numbers. We don't know, if the axis is in percent or in numbers, because the name of the axis is missing. That should be stated first. If the axis is in percent, we do not know how many people were asked, but if the axis is in numbers, we know the exact number of people who play the sports. We also don't know, if an asked person gave just one answer or if more answers were allowed.

Blue bar: Answers of male persons.

Red bar: Answers of female persons.

The title states: What sport do students do, differentiated by gender? – We know therefore that only students were asked, but not which school/university etc.

Comparison: We know the favorite sports, if more males or females prefer a sport.

Analysis 2: Reading important numbers

Read the most important points: peaks, lows, turning points, intersection points…

Peaks: Almost 90 males play football. Almost 80 females play volley ball.

Lows: Football is played by the least females. Swimming has the lowest scores for males.

As this is a bar chart there are no turning points and intersection points.

But we can look at most significant differences between the genders: Volleyball and football show a big difference between the genders. Biking and Tennis show a small difference between the genders.

Analysis 3: Define trends

Define all significant trends.

For these students asked there seem to be gender differences: females, prefer volleyball, males like to play football.

Analysis 4: Compare trends

Knowing the trends, compare them, to find out differences and relations. Are there common trends? Is there a pattern?

Is seems that sports that cost little, eg Volleyball and football can be played outside in parks, score high.

Analysis 5: Analyse trends

Establish hypotheses how the data are related. These hypotheses have to be questioned and assessed.

Hypotheses 1: a student does not have much money, so the students that have been interviewed do sports that cost only little money. This could be possible.

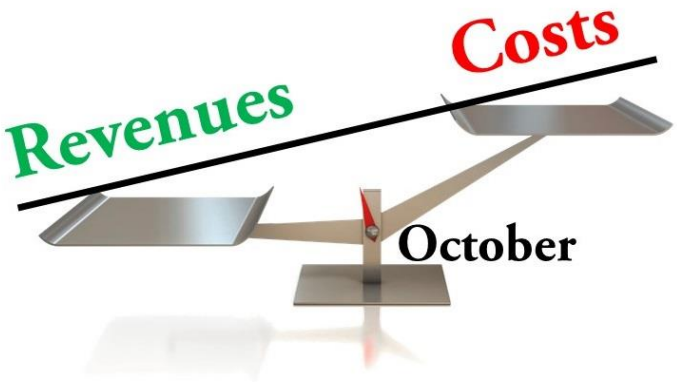
Hypotheses 2: maybe there is no swimming pool or tennis court in the village the live in. Therefore less students take time or find a way to travel to these places. This could be possible but we do not know anything about the village they live in. If we knew the village, we could search the internet and find out about the infratucture.

Analysis 6: Predict a development

Based on the development of the diagram and the established hypothesis we can predict future developments of the diagram.

If we stick to hypotheses 1 "students do sports that cost little" we can predict that there will not be a big change in the future unless the community offers other sports possibilities at low costs.

Exercise 2: Revenue and Costs



Picture: iStock

Analysis 1: Reading basics

Read the labels and the legend of the diagram. What does it visualize?

The title states: Revenues and Costs. It is about money coming and money spent.

As you can see, an infographic without numbers can only be used to make a point and to emphasize your outcome.

We know that this graphic is about the month October.

The scale tells us that there is no balance, but that the costs are much higher.

Analysis 2: Reading important numbers

Read the most important points: peaks, lows, turning points, intersection points…

This a very simple graphic: the revenues weigh less than the costs, which means that more money has been spent then gained in October.

Analysis 3: Define trends

Define all significant trends.

As this is just the look at one months, we can not define a trend. We can only state: If there will be more costs than incomes for a longer period, there will be trouble.

Analysis 4: Compare trends

Knowing the trends, compare them, to find out differences and relations. Are there common trends? Is there a pattern?

In our case this is not possible.

Analysis 5: Analyse trends

Establish hypotheses how the data are related. These hypotheses have to be questioned and assessed.

Hypotheses 1: There has been a special event in this months that there have been extraordinary spendings. We do not have sufficient information to prove that.

Hypotheses 2: This person or institution does not know how to handle money. Also for this hypotheses we do not have a proof.

If we could look at the other months of the year or maybe the previous year, we might be able to do an analysis.

Analysis 6: Predict a development

Based on the development of the diagram and the established hypothesis we can predict future developments of the diagram.

If there will be more costs than incomes for a longer period, there will be trouble.

6.4 Learning resources – Useful links

List of commented links	
Source	Study.com
Source title	**Reading and Interpreting Line Graphs**
Description	A video turorial about interpreting line graphs.
Link	http://study.com/academy/lesson/reading-and-interpreting-line-graphs.html
Language	English

List of commented links	
Source	youtube
Source title	**How to Describe Graphs and Trends in English**
Description	A video tutorial on using the correctl vocabulary to describe graphs in 8 minutes.
Link	https://www.youtube.com/watch?v=N1uAImH4GwA
Language	English

List of commented links	
Source	de.serlo.org
Source title	**Serolo Biologie: Aufgaben zu Diagrammen**
Description	Practice your knowledge about diagrams
Link	https://de.serlo.org/mathe/stochastik/daten-und-datendarstellung/diagramme/aufgaben-zu-diagrammen/
Language	Deutsch

List of commented links	
Source	de.serlo.org
Source title	**Serolo Biologie: Wie wertet man ein Diagramm aus?**
Description	How to explain diagrams
Link	https://de.serlo.org/biologie/kompetenzen-in-der-biologie/diagramme/wie-wertet-man-ein-diagramm-aus
Language	German

List of commented links	
Source	mathsgoodies.com
Source title	**Practice Exercises: Data and Graphs**
Description	Online test for you to read graphs.
Link	http://www.mathgoodies.com/lessons/graphs/practice_unit11.html
Language	English

List of commented links	
Source	ixl.com
Source title	**Interpret bar graphs, line graphs, and histograms**
Description	Online test for you to read graphs.
Link	https://www.ixl.com/math/algebra-1/interpret-bar-graphs-line-graphs-and-histograms
Language	English

GLOSSARY

Term	Definition
Data	Data is information (usually numbers or symbols) that show ideas, objects or conditions in an unorganised form. Therefore graphs, charts or diagrams are used to summarise these data.
Graph	A graph is a drawing showing a relationship (usually) between numbers. Means of a line, curve, bars or other symbols are used. Typically there is a horizontal line (x-axis) to represent an independent variable and a vertical line (y-axis) to represent a depending variable.
Chart	Chart is another word for graph.
Diagram	1. A diagram is a collection of points showing coordinates in a mathematical function. 2. A diagram is a drawing to illustrate or visually explain a thing or an idea. It outlines its component parts and the relationships among them.
Survey	A survey is a study questioning an section of people to find out about attitudes, opinions …
Spreadsheet	A spreadsheet is a tabular worksheet. It has rows and columns to show data. As software it allows you to fill in numeric data. It helps to analyse and to present it as charts and graphs.
Comparison	A comparison is made when you analyse things to see similarities and differences.
Contrast	A contrast is the difference between two sets of information. Usually used when making a comparison to show differences.
Proportion	A proportion is a part or share. It corresponds to other parts or shares of a whole. Usually the basis is 100 %, and the different proportions are added up to this 100 %.
Trend	A trend is a pattern that we can only predict will happen/develop in the future.
Development	Development is a process of change or transformation.
Statistical spread	Is used to measure the central tendency (like a median) of data
Bar chart	A bar chart is often used to compare values of items at a certain point of time. It uses rectangles (bars) to visualize information. It is mostly to show proportions, trends, comparisons or contrasts.
Line chart	A line chart uses lines to indicate values, usually over a period of time. Therefore it is mostly used to show trends or developments.
Pie chart	A pie chart is a proportional area chart, made of a circle which is divided into segments. Usually it shows relative sizes and compares one component to the whole set (100 %)
Area diagram	An area diagram shows trends over time, not unlike a line chart.
Scatter diagram (x,y)	A scatter diagram is two or three dimensional. The density and direction of points shows the relationship between the variables. It is also known as scatter diagram, scatter graph or scatterplot.

	Most important areas of use are to show arithmetic average and correlation
Surficial diagram	A surficial diagram is a more complex area diagram, as 3 characteristics are possible. It is also mostly used to show trends over time.
Web diagram	A web diagram is used for target-performance comparison-
Bubble chart	A bubble chart is a diagram which is labelled by bubbles. Additionally to the x-axis and y-axis, the size of the bubbles show a third characteristic
Circle chart	A circle chart can either be used like a pie chart or a third characteristic can be added to be shown in a circle chart, as more circles are possible
Infographics	An infographic is a visual image or picture, containing either just a picture or data as well. It represents information based on data and is made to grasp the most important information immediately.

CREDITS

The learning resources have been developed within the Erasmus+ program "EXPLAIN" by:

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- FIT – Fast Track into Information Technology Ltd. (Ireland)
- BFI – Berufsfoerderungsinstitut Oberoesterreich (Austria)
- Universitatea Dunarea De Jos Din Galati (Romania)
- EVTA – Association Européenne pour la Formation Professionnelle AEFP / European Vocational Training Association (Belgium)
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These organisations are active in the field of secondary and university education, vocational and educational training.

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