TEACHING SEQUENCE ABOUT STATISTICS
Troisième - Seconde

I.R.E.M. de Clermont-Ferrand
Groupe Maths en Anglais

2015 - 2016
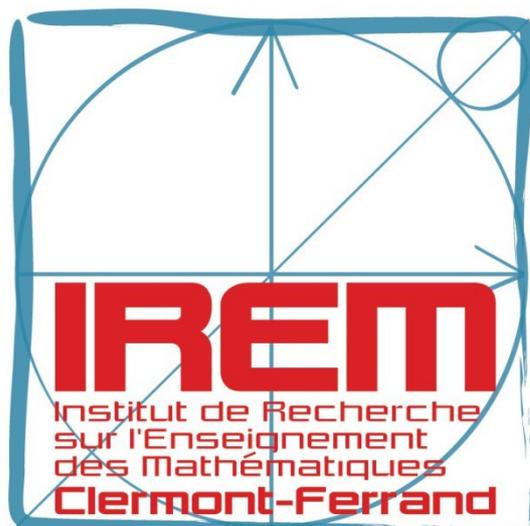
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Statistics
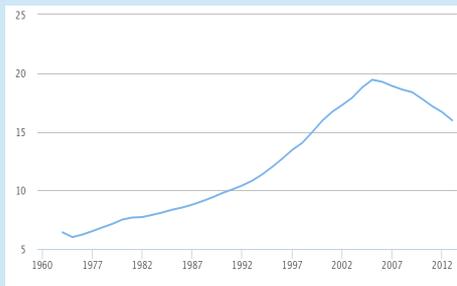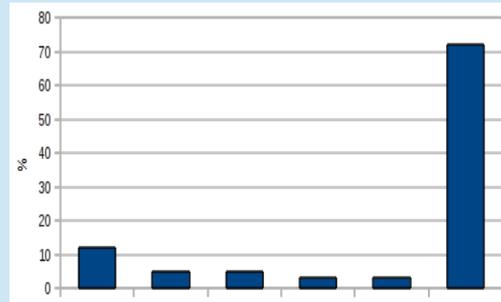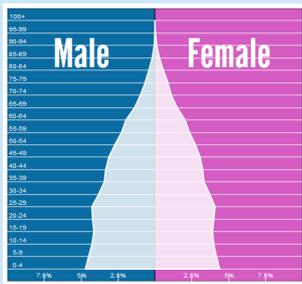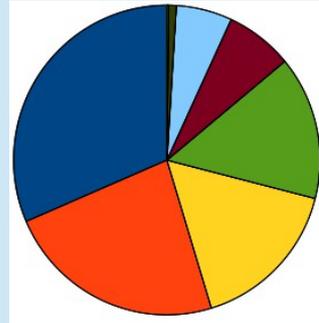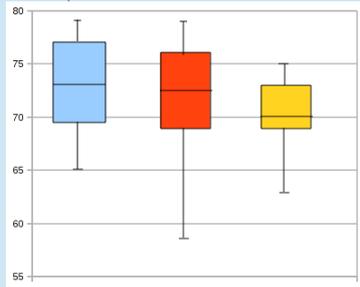
Préambule

Ce livret est une proposition de séquence de statistiques, clés en main, pour faire travailler les élèves en anglais. Elle s'adresse à des élèves de niveau 3ème ou seconde. Cette séquence a été construite dans le cadre du groupe IREM maths en anglais de l'académie de Clermont-Ferrand et testée dans plusieurs classes de collèges et de lycées.

La séquence se découpe en trois parties qui peuvent être traitées séparément. L'ordre des parties n'est qu'indicatif. Pour chaque partie, vous trouverez une fiche d'explications, en anglais, pour l'enseignant et des documents pour les élèves.

La première partie permet d'étudier des statistiques mondiales à partir d'une petite vidéo et d'un graphique présentant la diversité du genre humain. Le principe est d'assimiler la population mondiale à un groupe de 100 personnes.

La deuxième partie, qui s'inspire de la première, propose aux élèves de faire une étude statistique dans leur établissement en assimilant ce dernier à un groupe de 100 élèves. Cette partie peut se conclure par la présentation d'un poster.

Une troisième partie a pour objectif de faire apprendre du vocabulaire statistique, en particulier pour décrire des graphiques.

Nous remercions chaleureusement Susan Leahy pour son travail de relecture.

Teaching Sequence about Statistics

Table of Contents

Teaching Sequence about Statistics **Overall Organization**	3ème, 2nd ou 1ère euro
	4 to 6 hours

Keywords: statistics; median, mode, mean, quartiles; charts; diversity

Outline: We first study worldwide statistics from a short video focusing on human diversity. Then, students learn specific vocabulary about statistics, and especially how to describe statistical charts. Finally, they collect and analyse their own statistical data, which they present in a poster session.

Mathematical skills: Comparing; extracting data from a statistical chart; Describing a statistical chart; Analysing statistical data, drawing charts.

Language focus: Percentages, chart description, statistics.

Language skills: Listening – Writing - Speaking.

Prerequisites: Percentages; statistical charts, classical knowledge on statistics (median, mode, mean, quartiles)

Materials: overhead projector; computer room.

Contents:

The sequence consists of 3 independent activities lasting 4 to 6 hours.

1. **Activity 1: The World as 100 People**   **40 min**

   ✓ We use a short video and a statistical chart to make pupils react to human diversity all over the world.

2. **Activity 2: My School as 100 People; Part 1**.   **10 min**
   ✓ Presentation of the project
   ✓ Working in teams students receive 2 questions
   ✓ Their Homework is to make a survey on other students and build up their statistical data

3. **Activity 3: Charts Matching Game**.   **1 h**
   ✓ Half of the students receive a card with a basic statistic chart, the other half have a description of one of those charts.
   ✓ Students mingle to find their partners without showing the cards.

4. **Activity 2: My School as 100 People; Part 2**.   **2 to 4 h**
   ✓ Working in teams the students analyse their statistical data previously collected and have to create a poster (1 to 2 hours in the computer room).
   ✓ Then they present their posters in front of the other students (1 to 2 hours).

Teaching Sequence about Statistics	3ème, 2nd ou 1ère euro
<u>Activity 1</u>: The World as 100 People	40 minutes

<u>Keywords</u>: statistics; charts; diversity

<u>Outline</u>: Learners discover and discuss demographic and cultural diversity using percentages.

<u>Mathematical skills</u>: Comparing; extracting data from a statistical chart.

<u>Language focus</u>: Percentages.

<u>Language skills</u>: Listening – Speaking.

<u>Prerequisites</u>: Percentages.

<u>Materials</u>: overhead projector; video file; statistical chart file;

document 1 "Video Questions List".

<u>Preparation and procedure</u>:

1. **<u>Part 1: Watching the Video</u>** **25 min**

<u>video link</u>:
http://www.100people.org/wp/the-100-people-project-an-introduction/

- ✓ Students receive a document with some questions that they have to read before watching the video.
- ✓ Students watch the video 2 or 3 times. Students write their answers to some questions (other questions will be answered in Part 2)
- ✓ Then they discuss all together the answers and the video in general.

2. **<u>Part 2: Statistical chart.</u>** **15 min**

<u>chart link</u>: http://visual.ly/world-100-people

- ✓ In order to answer the other questions, we show the chart and give it to the students.
- ✓ The students have to answer the remaining questions,
- ✓ Then we discuss all together about the different topics.

Teaching Sequence about Statistics **Activity 2: My School as 100 People**	3ème, 2nd ou 1ère euro
	10 minutes + 2 to 4 h

Keywords: statistics; median, mode, mean, quartiles; charts; diversity

Outline: Students will have to carry out a survey on 50 students, dealing with various questions. They will then analyse their data and draw some charts.

The final results will be presented in a poster session.

Mathematical skills: Analysing statistical data, drawing charts.

Language focus: Percentages, statistics.

Language skills: Writing – Speaking.

Prerequisites: standard knowledge on statistics (median, mode, mean, quartiles).

Materials:

document 2: "Explanation and Task Delivery"; document 3: "Vocabulary List"; document 4: "Evaluation Sheet"; computer room.

Preparation and procedure:

1. **Part 1: Explanation and task delivery**   **10 min**
   - ✓ The teacher explains the principles of the project and the various tasks awaiting the students
   - ✓ Each team of students chooses their 2 questions.
   - ✓ Their Homework is to ask 50 pupils to answer the two chosen questions.

2. **Part 2: Statistical analysis (at least 1 week later).**   **1 or 2 h**
   - ✓ In a computer room, each team of students will analyse their statistical data: creating charts and computing mean, median, quartiles, etc.
   - ✓ They also prepare a poster and the speech they will make.
   - ✓ Their Homework is to finish the poster if needed.

3. **Part 3: Final presentation (at least 1 week later).**   **1 or 2 h**
   - ✓ Each team presents their poster in front of the other students.
   - ✓ Either the teacher or the other teams evaluate them with the evaluation sheet

Teaching Sequence about Statistics	3ème, 2nd ou 1ère euro
Activity 3: Charts Matching Game	1 hour

Keywords: statistics; charts; diversity

Outline: Half of the students receive a card with a basic statistical chart, the other half have a description of one of those charts. Students mingle to find their partners without showing the cards.

Mathematical skills: Describing a statistical chart.

Language focus: Percentages, chart description.

Language skills: Listening – Speaking.

Prerequisites: statistical charts

Materials:

document 5: "Chart Description Vocabulary", document 6: "Statistical Charts",

document 7: "Charts descriptions"; document 8: "Final Slideshow".

Preparation and procedure:

1. **Part 1: Let's play the game**   **25 min**
   ✓ Each student receives the first document "Chart Description Vocabulary",
   ✓ Half of the students receive a card with a basic statistic chart, the other half have a description of one of those charts.
   ✓ Students stand in two lines, one with descriptions and one with charts. One by one, students read their description. Those who think they have the corresponding chart raise their hands.
   ✓ Then students with the charts go towards their pair description and verify if they match.

2. **Part 2: Results.**   **20 min**
   ✓ The various charts are projected on the white board and the pupils read their descriptions.
   ✓ We discuss the content of each chart.

	Teaching Sequence about Statistics
	## <u>Activity 1</u>: **The World as 100 People**
Doc. 1	## **Video Questions List**

1. Explain the title: "The World as 100 People".

2. At the beginning of the video, how many people were there in the world?

3. If the world were 100 people, how many Europeans would there be?

4. If the world were 100 people, how many Africans would there be?

5. If the world were 100 people, how many would have no safe water?

6. If the world were 100 people, how many people would have no cell phones?

7. If the world were 100 people, how many would have no shelter?

8. If the world were 100 people, how many would not have internet access?

9. If the world were 100 people, how many would be unable to read?

10. If the world were 100 people, how many would be undernourished or starving?

11. Give another example detailed in the video.

12. How many schools and students were involved in this project? From how many countries?

13. What had each student to do?

14. To what were astronauts pointing on the 3rd day of their trip?

15. Explain the sentence of astronaut Bin Salman al-Saud.

16. Why did the 100 People Foundation create this video?

17. If people learnt to speak the same language, what would happen?

	Teaching Sequence about Statistics
	## <u>Activity 2</u>: My School as 100 People
Doc. 2	## Explanation and Task Delivery

In teams of 2 or 3 students, you have to choose two questions, one in each list below. With those two questions, you will have different tasks to do:

- carry out a survey on about 50 students, asking the two chosen questions,
- compute all the data,
- calculate statistics you know (mean, mode, median, quartiles...) and more if you can, for each variable,
- make charts for each variable,
- make a poster with all those results.

You will have to present your work in front of the other students.

<u>Your Homework for next time is</u>:
Carry out a survey on about 50 students, asking the two chosen questions.

<u>Quantitative questions:</u>
1. How many hours do you spend doing your homework per week?
2. How many hours do you practice sport per week?
3. How old are you?
4. How many brothers and sisters have you got?
5. How many books do you read per year?
6. How tall are you?
7. What's your shoe size?
8. How many times do you need to come to school each morning?
9. How many hours do you sleep per night?
10. How many hours do you spend in front of a screen (TV, computers, smart phones, tablets) per day?

<u>Qualitative questions:</u>
1. What's your favourite sport?
2. What's your favourite colour?
3. What's your favourite pet?
4. What's the colour of your eyes?
5. What's the colour of your hair?
6. Which car brand do you prefer?
7. What's your favourite leisure activity?
8. What's your favourite school subject?
9. By which means of transport do you come in school?
10. What's your favourite fruit?

Activity 2: My School as 100 People

| Doc. 3 | **Vocabulary List - Statistics** |

1. **Bar graph** - a diagram representing the frequency distribution for nominal or discrete data. It consists of a sequence of bars, or rectangles, corresponding to the possible values, and the length of each is proportional to the frequency.

2. **Bins** - a term used to describe class intervals on a histogram.

3. **Box-and-whisker plot** - a diagram constructed from a set of numerical data showing a box that indicates the middle 50% of the marked observations together with lines, sometimes called 'whiskers', that go out from the quartile to the most extreme data value.

4. **Circle graph** - a graph for categorical data. The proportion of elements belonging to each category is proportionally represented as a pie-shaped sector of a circle. Sometimes called a pie chart.

5. **Class intervals** - a subdivision within a range of values. In a histogram, the range of values is divided into sections, known as class intervals, also referred to as "bins."

6. **Cumulative frequency** - the sum of the frequencies of all the values up to a given value.

7. **Data** - the observations gathered from an experiment, survey or observational study.

8. **Expected value** - it is the average value of a random quantity that has been repeatedly observed in replications of an experiment.

9. **Frequency** - the number of times that a particular value occurs as an observation.

10. **Histogram** - A bar graph presenting the frequencies of occurrence of class intervals. Sometimes called a frequency histogram.

11. **Inter-quartile range** - the difference between the first quartile and third quartile in a set of data, (IQR).

12. **Line plot** - a line graph that orders the data along a real number line. Also called a dot plot.

13. **Mean** - Suppose there are N individuals in the population. Let values for the i individual be denoted by x_i. The mean of x is the number $(x_1 + ... + x_n)/n$

14. **Median** - suppose the observations in a set of numerical data are ranked in ascending order. The median is the middle observation if there is an odd number of observations, and is the average of the two middlemost observations if there is an even number of observations.

15. **Mode** - The mode is the most frequently occurring value in a set of discrete data. There can be more than one mode if two or more values are equally common.

16. **Percentile** - the n-th percentile is the value x such that n percent of the population is less than or equal to x. The 25th, 50th and 75th percentiles are called quartiles.

17. **Pie chart (also known as a circle graph)** - a graph for categorical data. The proportion of elements belonging to each category is proportionally represented as a pie-shaped sector of a circle.

18. **Population** - the entire set of items from which data can be selected. For example, a poll given to a sample of voters is designed to measure the preferences of the population of all voters.

19. **Quartile** - for numerical data ranked in ascending order, the quartiles are values derived from the data which divide the data into four equal parts.

20. **Range** - the range of a sample (or a data set) is a measure of the spread or the dispersion of the observations. It is the difference between the largest and the smallest observed value.

21. **Sample** - a subset of a population that is obtained through some process, possibly random.

22. **Standard deviation** - standard deviation is a measure of the spread or dispersion of a set of data. It is defined as the square root of the variance.

23. **Statistics** - the branch of mathematics that deals with the collection, organization, and interpretation of data.

24. **Variance** - a measure of the amount of spread (variation) in a set of data; the larger the variance, the more scattered the observations on average.

25. **Venn diagram** - a graphic means of showing intersection and union of sets by representing them as bounded regions.

Activity 2: My School as 100 People

Doc. 4	Evaluation Sheet

		2 points	1 point	0 points
Poster	care			
	originality			
Contents	statistical calculations			
	charts			
	organisation			
Oral	time			
	facility with presentation			
	voice			
	speech distribution			
Questions	reactions			
Comments				
			Mark:	/20

1) Various types of statistical charts (or diagrams)

My students' favorite colors
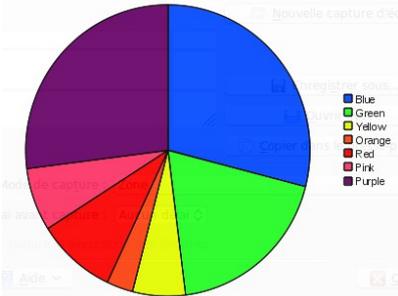
A pie chart is a circular chart divided into sectors, illustrating numerical proportion.
In a pie chart, the central angle of each sector is proportional to the quantity it represents.

Nutrition in the World
adapted from 100 people project
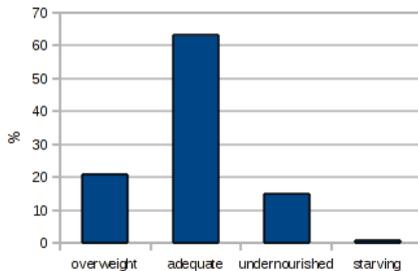
A bar chart or bar graph is a chart with rectangular bars with lengths proportional to the values that they represent. The bars can be plotted vertically or horizontally.

Heights of 30 people
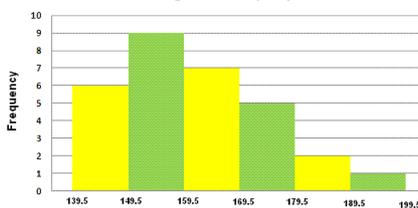
A histogram is a representation of tabulated frequencies, shown as adjacent rectangles, over discrete intervals (bins), with an area proportional to the frequency of the observations in the interval.

World Population from 1900 to 2007
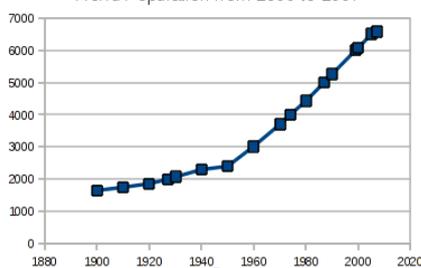
A line chart or line graph is a type of chart which displays information as a series of data points called "markers" connected by straight line segments. Line charts show how data changes at equal intervals of time.

Height of my students
Box plot
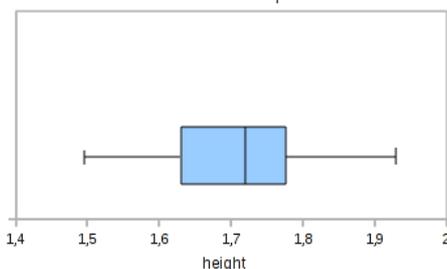
A box plot or boxplot is a convenient way of graphically depicting groups of numerical data through their quartiles. Box plots may also have lines extending vertically from the boxes (whiskers) indicating variability outside the upper and lower quartiles, hence the terms box-and-whisker plot and box-and-whisker diagram. Outliers may be plotted as individual points.

2) Some vocabulary:

Title

line segment

point

Label the vertical axis

Scale

Label the horizontal axis
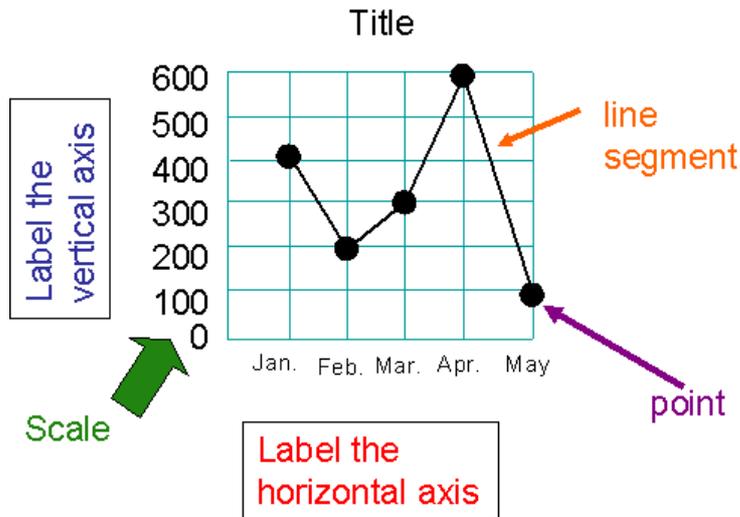
This graph shows... The pie chart represents … This line chart depicts …	
to increase, to rise, to go up, to grow, to progress, to jump, to reach a peak.	to decrease, to reduce, to fall, to drop, to go down, to decline, to collapse.
an increase, a rise, a growth, an extension, a progression, a jump, a peak.	a decrease, a reduction, a fall, a drop, a decline, a collapse.
to remain stable, to hold constant, to stabilize, stability.	to stop falling/rising, to stop falling and start rising, to stop rising and start falling.
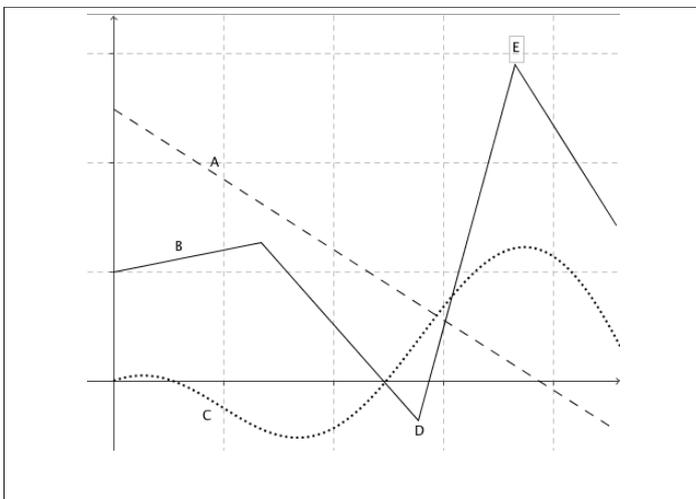
to reach a peak: E
to reach a low point: D
a curve: C
a bumpy curve: B
a straight line: A
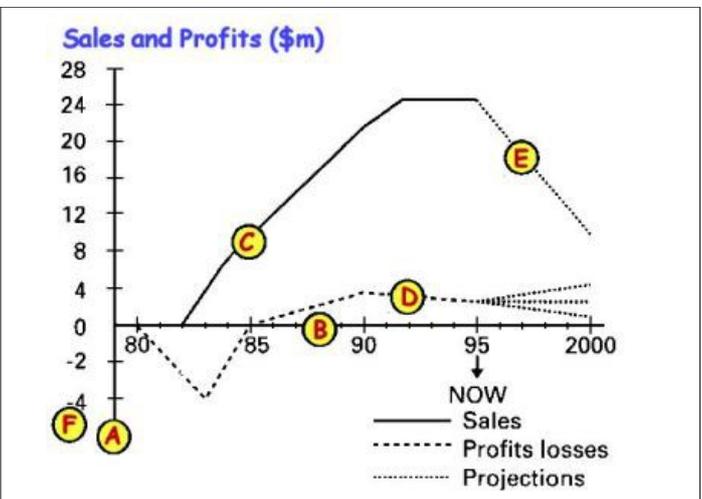
the x axis: B
the y axis: A
the scale: F
a solid line: C
a broken line: D
a dotted line: E

Teaching Sequence about Statistics
Activity 3: Charts Matching Game

Doc. 6	**Statistical Charts.**

Chart 1
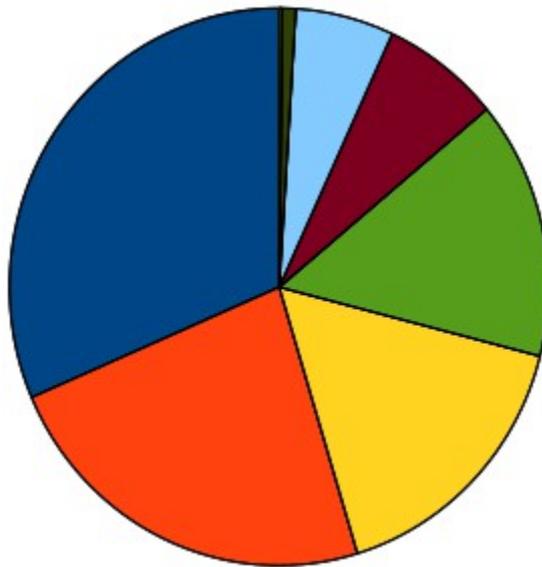
Chart 2
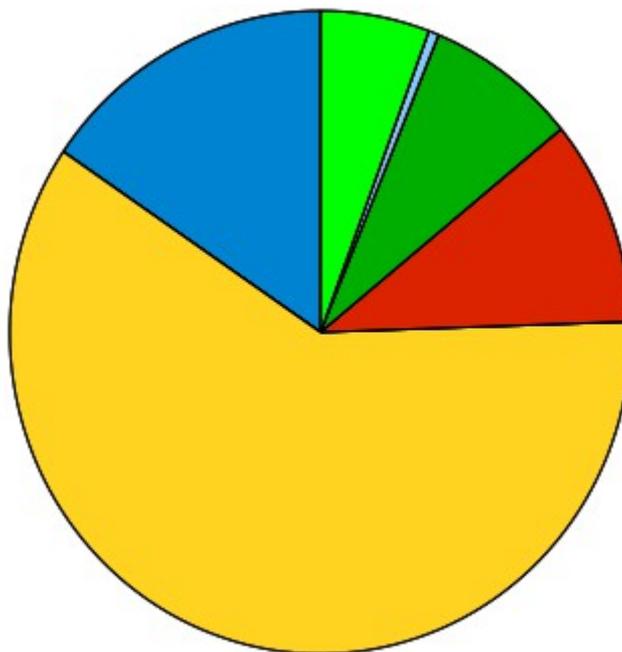
Chart 3
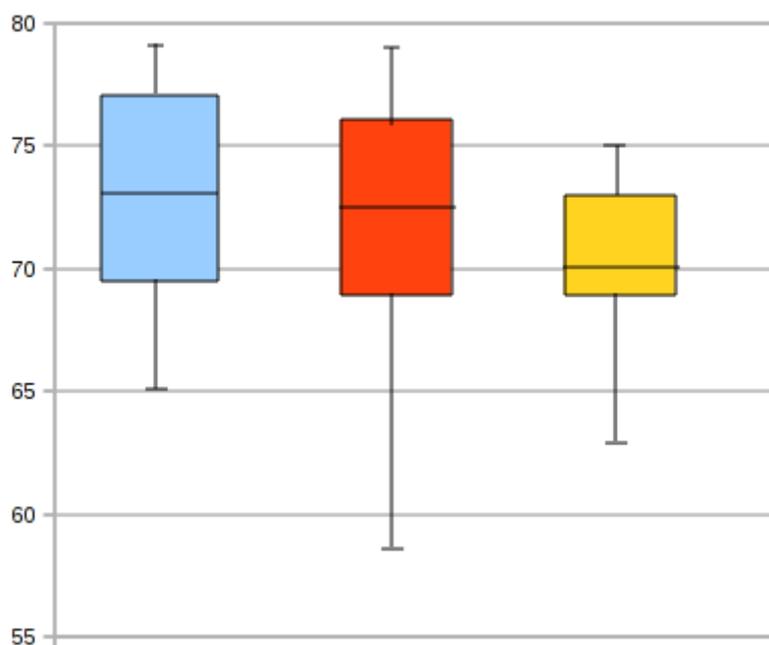
Chart 4
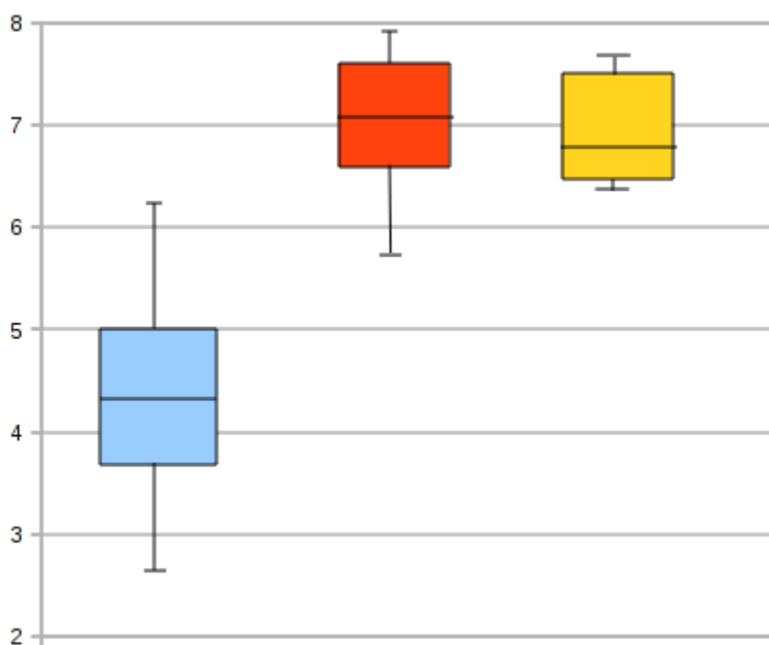
Chart 5
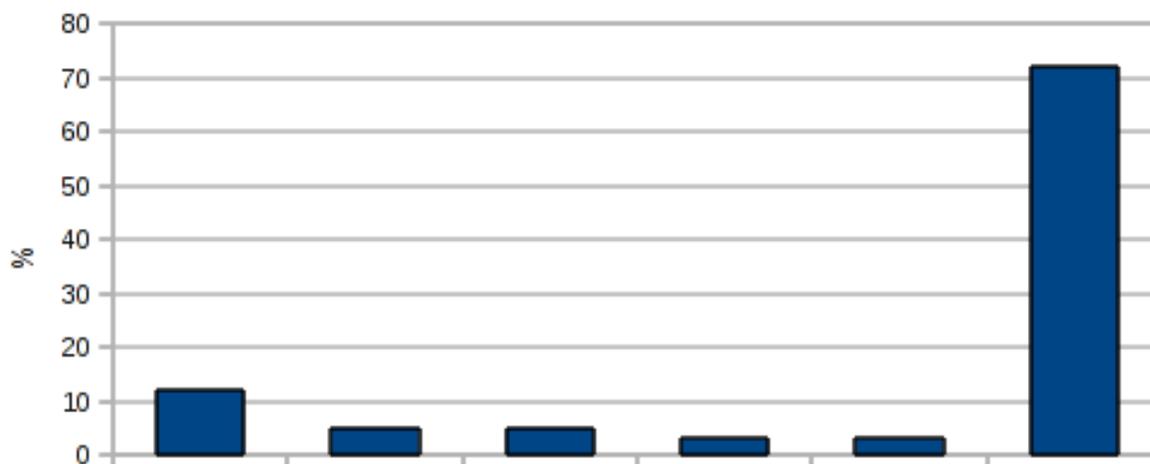
Chart 6
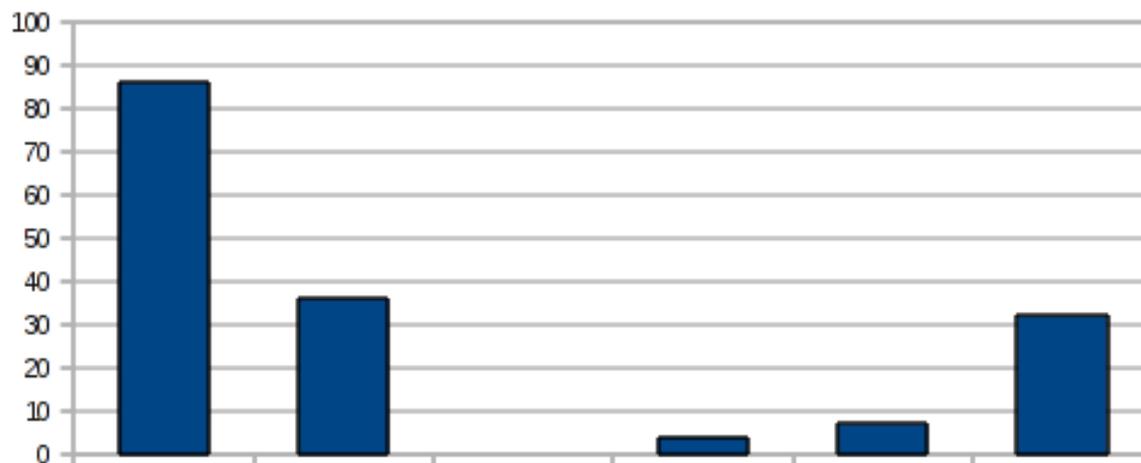
Chart 7
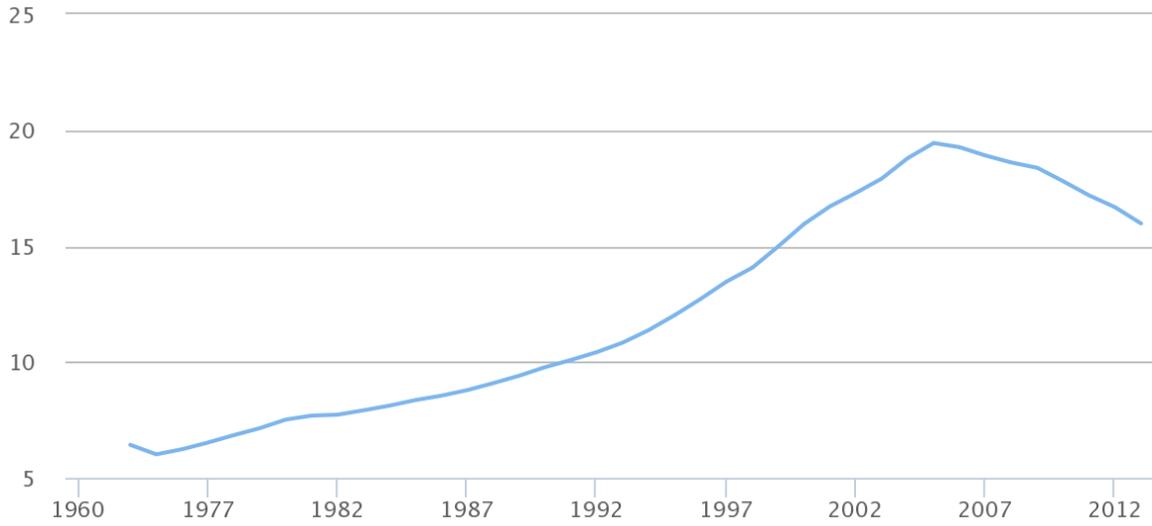
Chart 8
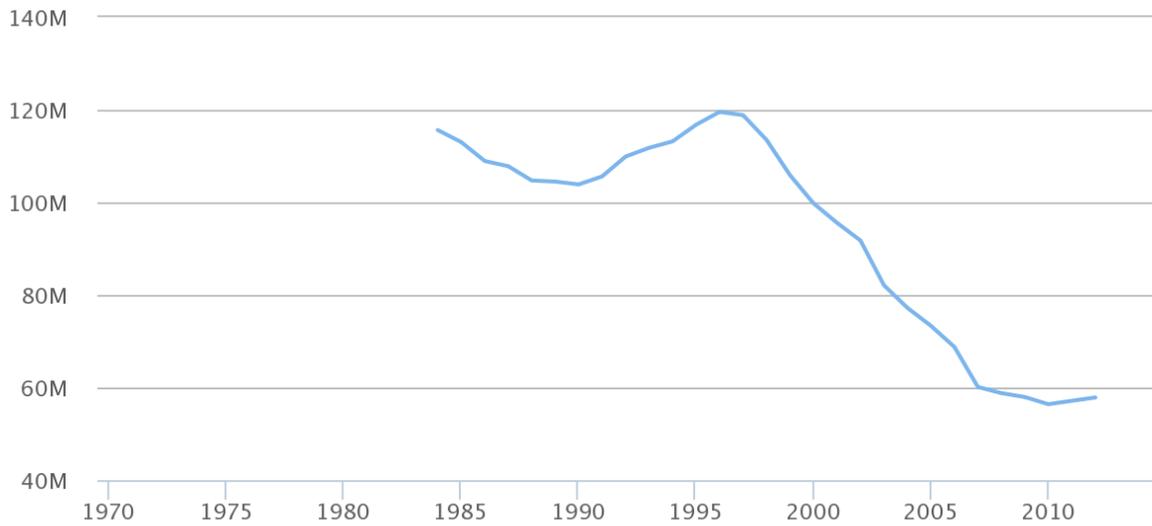
Chart 9
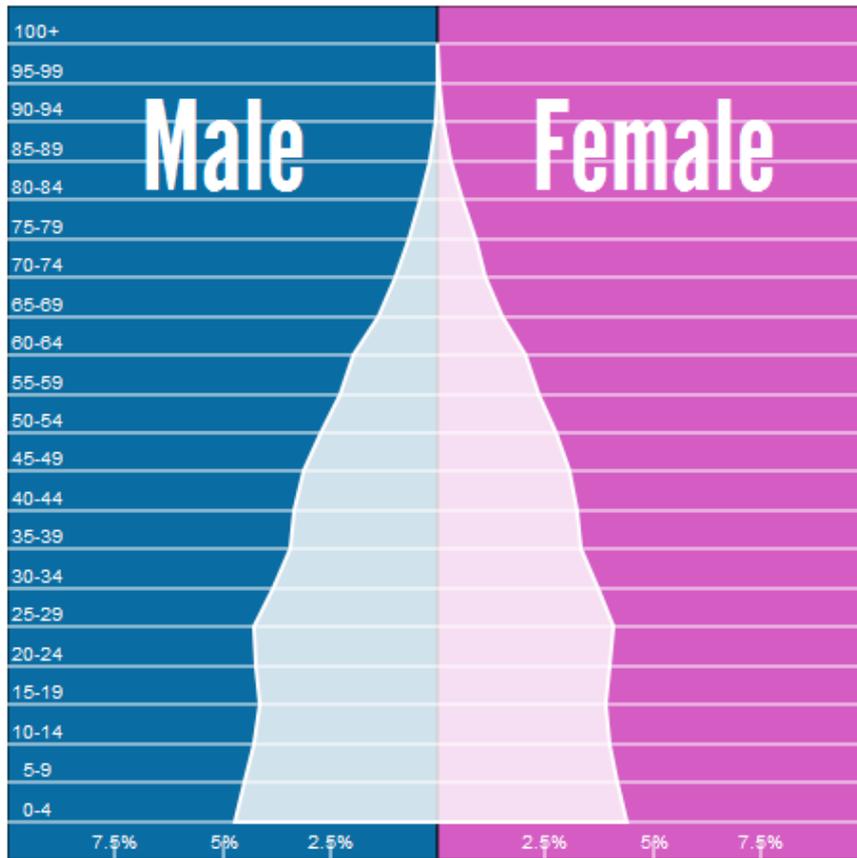
Chart 10
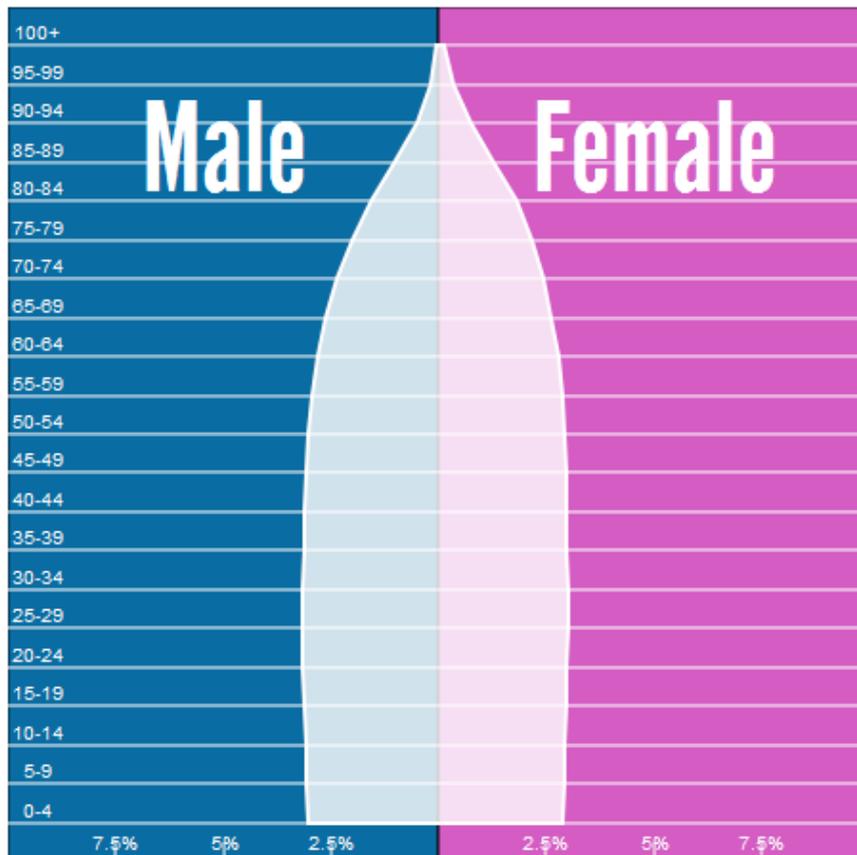
Activity 3: Charts Matching Game

Doc. 7	**Chart Descriptions.**

Description A

This diagram describes the world population by continent. It is a circular chart with 7 sectors. The main sector corresponds to Asia, and to 60% of the population: more than half of the world's population lives in Asia! The smallest one is so small that we don't even see it (less than 0.0001%) and corresponds to Antarctica. Europe only corresponds to 10% of the world's population.

Description B

This diagram represents the happiness index score in various places of the world. There are 3 box-and-whisker diagrams represented vertically. The means are respectively 4.3; 7.1 and 6.8 approximatively. The lowest box-and-whisker diagram goes from 2.6 to 6.2; it corresponds to happiness in Sub-Saharan Africa. The second box plot corresponds to the Eurozone, which has the highest mean value. The quartiles of the last box plot (which corresponds to South America) are 6.5 and 7.5.

Description C

This diagram represents the repartition of the first language in the World. It is a bar graph with 6 vertical bars, corresponding to values from 3 to 72. The first bar corresponds to Chinese: 12% of the people on our planet speak Chinese as their first language. This is far more than English, which only corresponds to 5%. The last bar, other languages, corresponds to a maximum value of 72%: there are so many different languages on earth that it is impossible to represent all of them.

Description D

This diagram describes the percentages of different religions in the world. It is a pie chart with 8 sectors, but 1 of them (Judaism) is so small that we can hardly see it (it represents only 0.2%).
The widest sector corresponds to 31.5% of the population (Christianity), then we have a sector for 23.2% (Islam). Unaffiliated (or non-religious) people correspond to 16.3% of the world's population.

Description E

This diagram represents the numbers of under-fives malnourished in various places in the world. It is a bar graph with 6 vertical bars, corresponding to values from 0 to 86. The third bar corresponds to a 0 value, and to Europe, where there are few malnourished children. The maximum value of 86 corresponds to the first bar: in South Asia, there are 86 million under-fives who are malnourished. East Asia and South Africa correspond to 30 to 35 million under-fives malnourished.

Description F

This diagram describes the life expectancy in various parts of the world. We have 3 vertical box plots, represented in a diagram with values from 55 to 80. As far as the first boxplot is concerned, the mean value is 73, and the quartiles are 69.5 and 77: it corresponds to life expectancy in Europe and Asia. The second box plot as the larger range: the minimum value is 58.5 whereas the maximum value is 79. It corresponds to North America. The last box plot has the smallest mean value, and corresponds to South America.

Description G

This diagram represents the number of primary-school-age children not enrolled in primary or secondary school in the world. It's a line chart from 1984 to 2012.

In 1984 the number of children not enrolled in school was 115.6 million. This number decreased a little until 1990 (103.9 million), then increased until 1996 (119.5 million), then fell again to 56.4 million in 2010, but rose again to 57.8 million children in 2012.

Description H

This diagram represents the evolution of the percentage of people in the world having a landline telephone. It's a line graph from 1970 to 2013.

In 1970, 6.42 people out of 100 had a landline telephone subscription. The number declined a little until 1975 (6.1% subscriptions) then increased until 2005 (19.4% subscriptions) and then decreased until 2013 (16% subscriptions).

Description I

This diagram represents the age of the world's population in 2015. It's a population age pyramid.

In 2015 4.7% of the world's males and 4.4% of the females are between 0 and 4 years old; 4.2% of the males and 3.9% of the females are between 15 and 19 years old; 1% of the males and 1.1% of the females are between 70 and 74 years old; 0.2% of the males and 0.3% of the females are between 85 and 89 years old.

Description J

This diagram represents the estimated age of the world's population in 2100. It's a population age pyramid.

In 2100 3% of the world's males and 2.9% of the females will be between 0 and 4 years old; 3.1% of the males and 3% of the females will be between 15 and 19 years old; 2.4% of the males and of the females will be between 70 and 74 years old; 1 % of the males and 1.3% of the females will be between 85 and 89 years old.