Unit 11. GRAPHS AND STATISTICS.

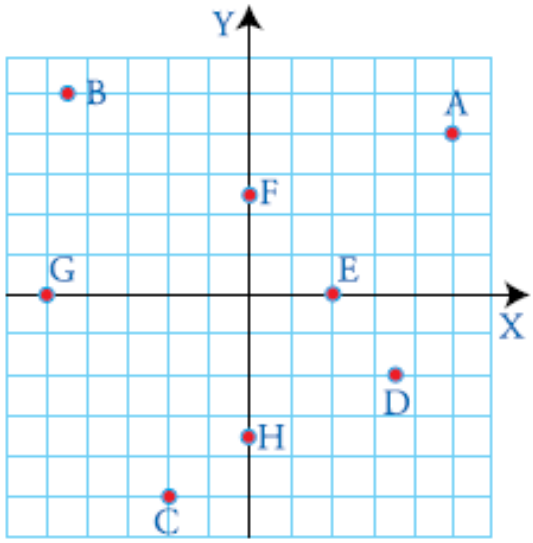
1.CARTESIAN COORDINATES.

Let's watch the following videos to revise something about plotting points in the Cartesian axes.

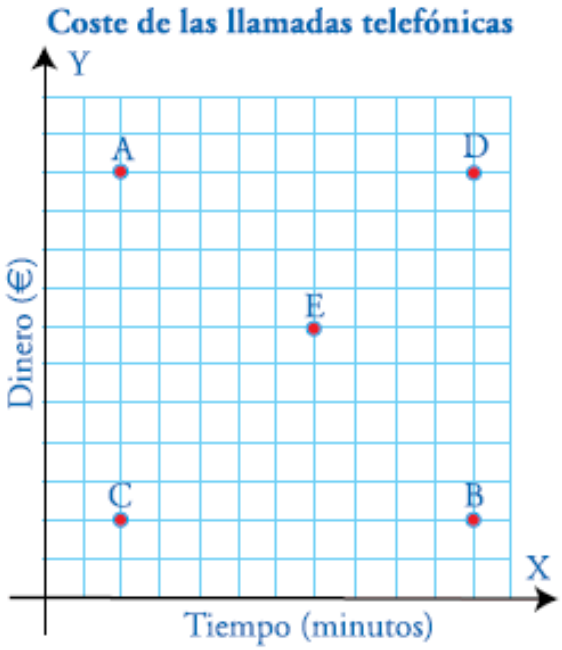
Video 1: http://www.youtube.com/watch?v=7h74ad7IWiI&feature=related

Video 2: http://www.brightstorm.com/math/algebra/graphs-and-functions/plotting-points-and-naming-quadrants

Example 1: Write the coordinates of the following points:



Example 2: Interpret these points in the following graph:

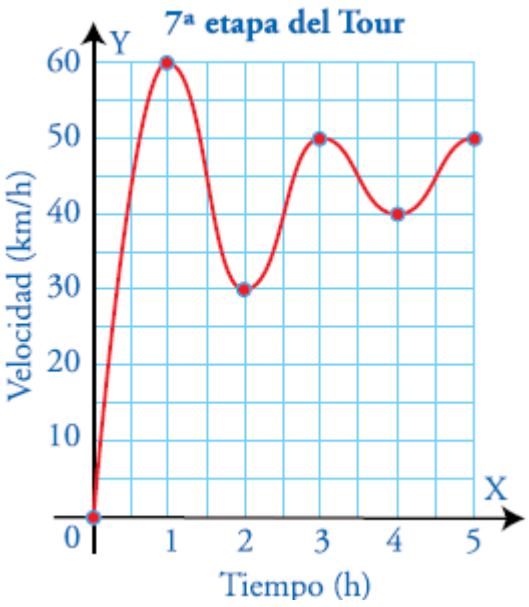


2. INTERPRETATION GRAPHS.

Example 1: Write everything you can about the graph:

Example 2: Write everything you can about the graph:

Example 3: Write everything you can about the graph:



Example 4: Page 267, exercise 4.

a) ……

b) ……

c) ……

Example 5. Page 267, exercise 5.

Example 6: Page 267, exercise 6.

a) ……

b) ……

c) ……

d) ……

e) ……..

2. SOMETHING ABOUT STATISTICS.

2.1. What are data?

Data are a collection of facts, such as values or measurements.

They can be numbers, words, measurements, observations or even just descriptions of things.

2.2. Qualitative vs Quantitative

Data can be qualitative or quantitative.

- **Qualitative data** is descriptive information (it *describes* something)
- **Quantitative data**, is numerical information (numbers).

And **Quantitative data** can also be Discrete or Continuous:

- **Discrete data** can only take certain values (like whole numbers)
- **Continuous data** can take any value (within a range)

Put simply: **Discrete data** are counted, **Continuous data** are measured.

Example: What do we know about Arrow the Dog?

Qualitative:

- He is brown and black
- He has long hair
- He has lots of energy

Quantitative:

- Discrete:
  - He has 4 legs
  - He has 2 brothers
- Continuous:
  - He weighs 25.5 kg
  - He is 565 mm tall

To help you remember think "**Quant**itative is about **Quantity**"

2.3. Collecting

Data can be collected in many ways. The simplest way is direct observation.

Example: you want to find how many cars pass by a certain point on a road in a 10-minute interval.

So: simply stand at that point on the road, and count the cars that pass by in that interval.

You can also collect data by doing a survey.

2.4. Census or Sample

A **Census** is when you collect data for **every** member of the group (the whole "population").

A **Sample** is when you collect data just from **selected members** of the group.

Example: there are 120 people in your local football club.

You can ask everyone (all 120) what their age is. That is a census.

Or you could just choose the people that are there this afternoon. That is a sample.

A census is accurate, but hard to do. A sample is not as accurate, but may be good enough, and it is a lot easier.

QUESTION 1. Which one of the following are quantitative data?

A . She is black and white.

B. She has two ears.

C. She has short hair.

D. She has a long tail.

QUESTION 2. Which one of the following are continuous data?

A. She has two eyes.

B. She has five kittens.

C. She weighs 5.4 kg.

D. She has four paws.

QUESTION 3. Which one of the following are discrete data?

A. He is 45.2 cm long.

B. She is 22.3 cm high.

C. She weighs 5.4 kg.

D. She has 30 teeth.

QUESTION 4. A census collects information about:

(Don't worry if you get it wrong ... you can learn from your mistakes.)

A. All members of the population.

B. All adult members of the population.

C. A large sample of the population.

D. A small sample of the population.

2.5. FREQUENCY DISTRIBUTION TABLE.

When you collect data in a statistic study a table of frequency is used to sum up and organise the information. Look at the following example:

Example: Asking the pupils in 1º B how many brothers and sisters they have got, we get the following answers:

2, 1, 1, 1, 2, 3, 4, 1, 1, 2, 3, 2, 2, 4, 2, 3, 2, 3, 1, 1, 1, 2, 1, 1, 3

Let's fill the gaps in the table:

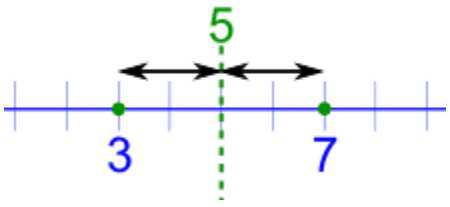
Nº Brothers	Absolute Frequency	Relative Frequency

2.6. Finding a Central Value

When you have two or more numbers it is useful to find a value for the "centre".

Example: what is the central value for 3 and 7?

Answer: Half-way in-between, which is 5.



You can calculate it by adding 3 and 7 and then dividing the result by 2:

(3+7) / 2 = 10/2 = 5

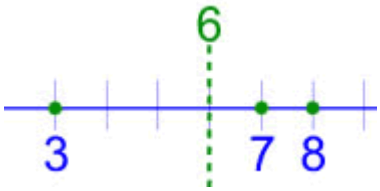
What about 3 or more numbers?

You can use the same idea when you have 3 or more numbers:

Example: what is the central value of 3, 7 and 8?

Answer: You calculate it by adding 3, 7 and 8 and then dividing the results by 3 (because there are 3 numbers):

(3+7+8) / 3 = 18/3 = 6



Notice that we divided by 3 because we had 3 numbers ... very important!

2.7. The Mean or Average.

So far we have been calculating the Mean (or the Average):

Mean: Add up the numbers and divide by how many numbers there are.

But sometimes the Mean can be misleading (it can lead you to come to a wrong conclusion):

Example: Birthday Activities

Uncle Bob wants to know the average age at the party, to choose an activity.

There will be 6 kids aged 13, and also 5 babies aged 1.

Add up all the ages, and divide by 11 (because there are 11 numbers):

(13+13+13+13+13+13+1+1+1+1+1) / 11 = **7.5...**

The mean age is about **7½**, so he gets a **Jumping Castle**!

The 13 year olds are embarrassed,
and the 1-year olds can't jump!

The Mean was **accurate**, but in this case it was **not useful**.

2.8. The Median

But you could also use the Median: simply list all numbers in order and choose the middle one:

Example: Birthday Activities (continued)

List the ages in order:

1, 1, 1, 1, 1, 13, 13, 13, 13, 13, 13

Choose the middle number:

1, 1, 1, 1, 1, **13**, 13, 13, 13, 13, 13

The Median age is **13** ... so let's have a **Disco**!

Sometimes there are **two** middle numbers. Just average them:

Example: What is the Median of 3, 4, 7, 9, 12, 15

There are two numbers in the middle:

3, 4, 7, 9, 12, 15

So we average them:

(7+9) / 2 = 16/2 = 8

The Median is **8**

2.9. The Mode

The Mode is the value that occurs most often:

Example: Birthday Activities (continued)

Group the numbers so we can count them:

1, 1, 1, 1, 1, 13, 13, 13, 13, 13, 13

"13" occurs 6 times, "1" occurs only 5 times, so the mode is **13**.

However, the Mode can be tricky, there can sometimes be more than one Mode.

Example: What is the Mode of 3, 4, 4, 5, 6, 6, 7

Well ... 4 occurs twice but 6 **also** occurs twice.

So **both 4 and 6** are modes.

When there are two modes in a series of numbers it is called "bimodal", when there are three or more modes we call it "multimodal".

Conclusion

There are other ways of measuring central values, but **Mean, Median and Mode** are the most common.

Use the one that best suits your data. Or better still, use all three!

QUESTION 5. In his end-of-year exams, Joe scored the following:

Science 3.4
English 9.
History 8.7
Math 3.4
Geography 5.5

What was the mean?

What was the median?

What was the mode?

QUESTION 6. The table below shows the average temperatures for London, England, for each month of the year.

Month	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.
Average temperature (°F)	38	39	43	46	52	58	62	62	57	51	44	42

a)What is the mean of these values?

b) What is the median of these values?

c) What is the mode of these values?

EXERCISE 7. Exercise 9. Page 269.

EXERCISE 10.

Sam's team has scored the following numbers of goals in their recent matches:

2, 3, 1, 2, 1, 3, 2, 3, 4, 5, 4, 2, 2, 3

a) Calculate the frequency distribution table.

b) Calculate the average or mean.

c) Calculate the median.

d) Calculate the mode.

2.9. GRAPHS

EXAMPLE: BARS DIAGRAM.

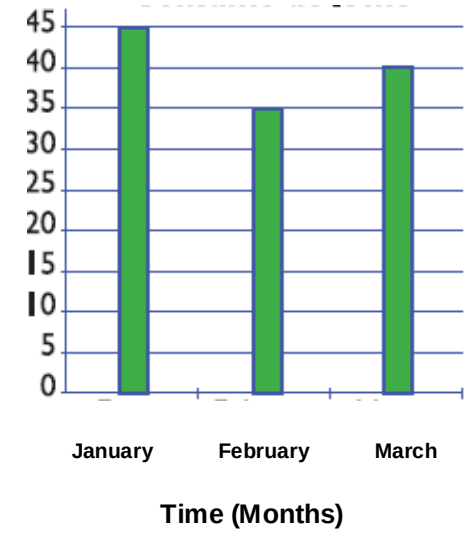
1. In a survey about soft drinks which young people drink, the results have been:

KIND OF SOFT DRINK	NUMBER OF YOUNG PEOPLE
ORANGE	20
LEMON	25
COLA	35
TROPICAL FRUITS	15

Represent the information using a bars diagram .

2. In the following bars diagram we have a family's consumption of milk in a three-month period. Make the frequency distribution table using the appropriate information.

Comsumption of milk



EXAMPLE: PICTOGRAM

Make a pictogram which represents the number of cars sold by a dealer.

TIME(YEAR)	2001	2002	2003	2004	2005	2006
Nº CARS	40	45	50	45	60	50

EXAMPLE: SECTORS DIAGRAM

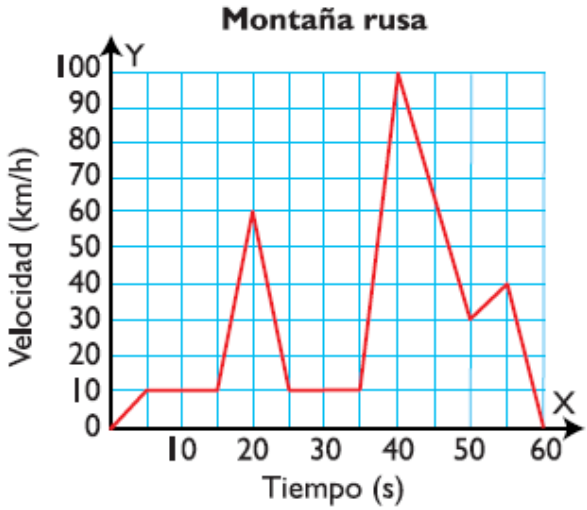
Make a sectors diagram using the following information:

DAY	Nº OF DAYS
Cloudy	4
Sunny spells	8
Rainy	5
Sunny	13

MORE EXERCISES

ABOUT STATISTICS.

1.The following graph represents the speed (km/h) of a roller-coaster wagon during the time it takes to go all the way around:



a) Is it a graph of points or a line graph?

b) Interpret the interval from 0 seconds to 5 seconds.

c) Interpret the interval from 5 seconds to 15 seconds.

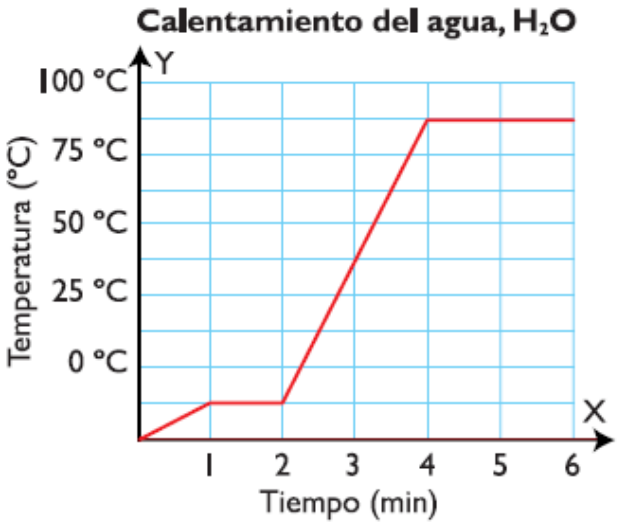
d) Interpret the interval from 15 seconds to 20 seconds.

e) Interpret the interval from 35 seconds to 50 seconds.

f) Interpret the interval from 55 seconds to 60 seconds.

g) When does the wagon reach the maximum speed?

2. In the laboratory we heat a piece of ice and we get the following graph, where the temperature and the time are linked:



a) How many degrees centigrade does the temperature increase in the first minute?

b) How many degrees does it increase in the second minute? Can you explain the reason?

3. This is the graph that represents the temperature of water when we make coffee:

a) Is it a graph of points or a line graph?

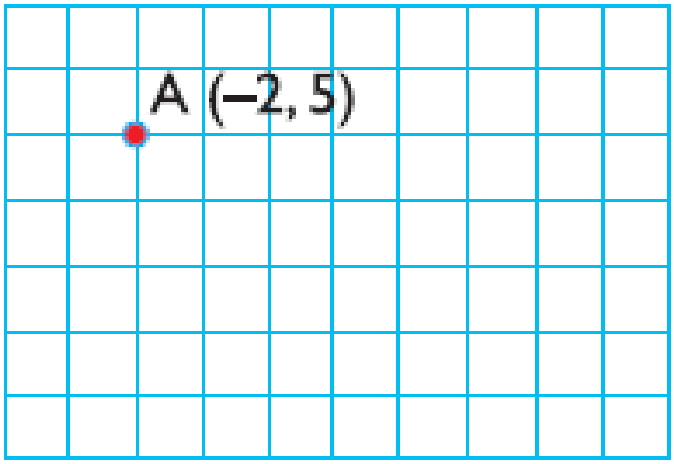
b) Interpret the interval from 0 to 4 minutes.

c) Interpret the interval from 4 to 6 minutes.

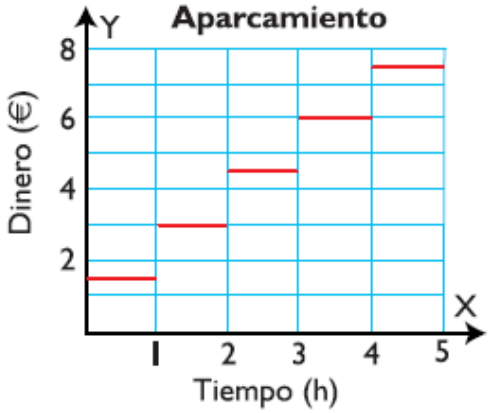
d) Interpret the interval from 6 minutes.

e) If we drink coffee 13 minutes after making it, what temperature is it?

4. Would you know how to draw the Cartesian axes?



5. This is the graph of the price in a parking lot:



a) Is it a graph of points or a line graph?

b) Interpret the interval from 0 to 1 hour.

c) If we have a car parked for 2 hours, how much is it?

d) If we have a car parked for 2 hours and 59 minutes, how much is it?