I.E.S Andreu Nin. El Vendrell

EL VENDRELL

- **Population:** 30.000
- 60 km south from Barcelona
- 3 coastal areas.
- **Main source of wealth**: tertiary sector

El Vendrell

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I.E.S Andreu Nin

- About 80 **teachers**, and 950 **students**
- Covering compulsory education, Batxillerat, and Vocational education (Administration, Commerce, Electronics and Electricity, Electromechanics)
- **Immigration**. 1st course: 50%; 2nd,3rd and 4th: 35-40%.
- Reception classroom for new-arrived students
- **Pla de millora**
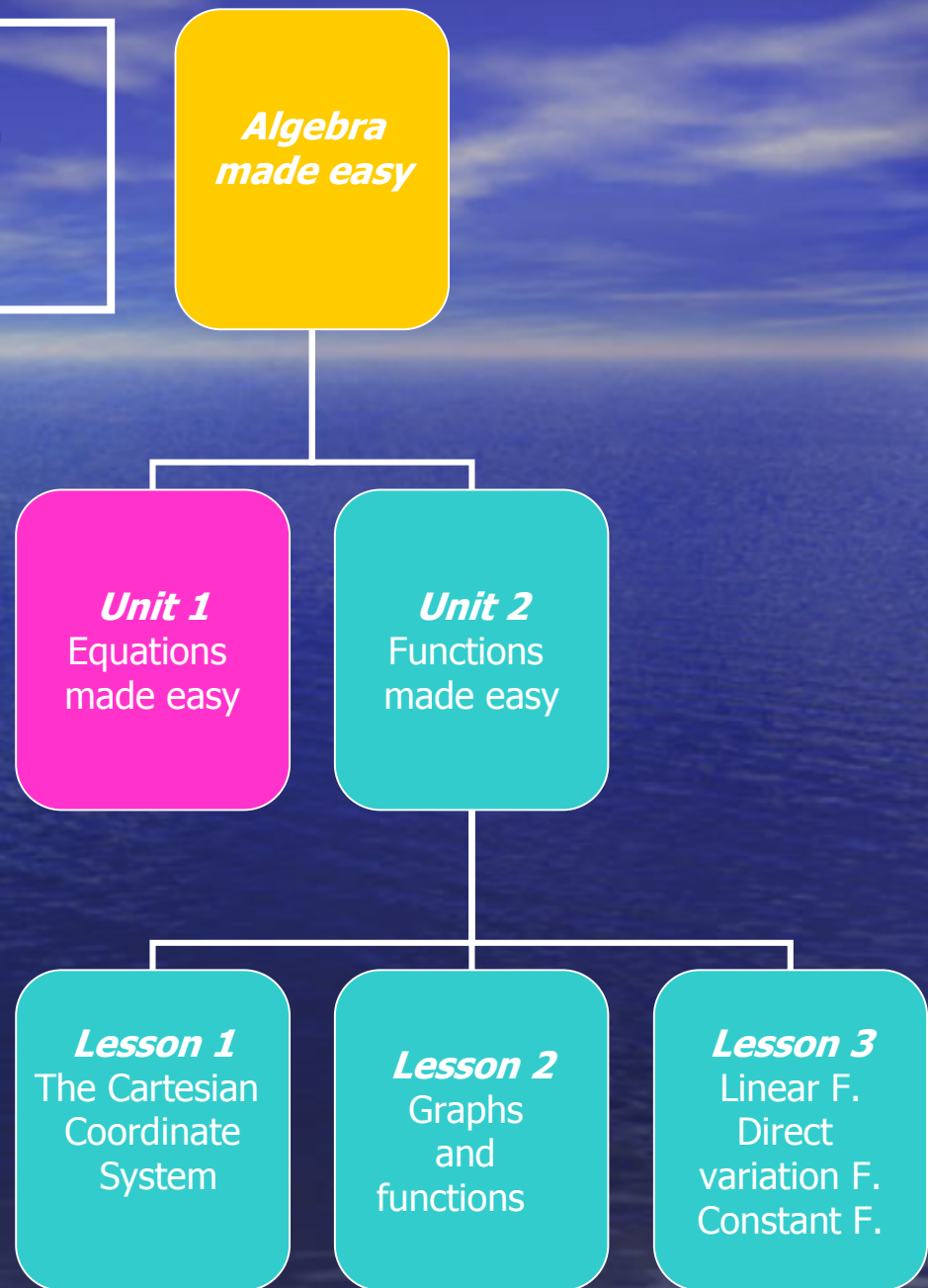

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CLIL PROJECT

- **<u>Subject:</u>** Algebra made easy: Equations and functions. (Optional subject). 35 hours per term.

- **<u>Level:</u>** 2nd E.S.O (13-14 year-old students)

- **<u>Teachers involved:</u>** Mª Luz Esteve (Maths teacher) and Noemí García (English teacher)
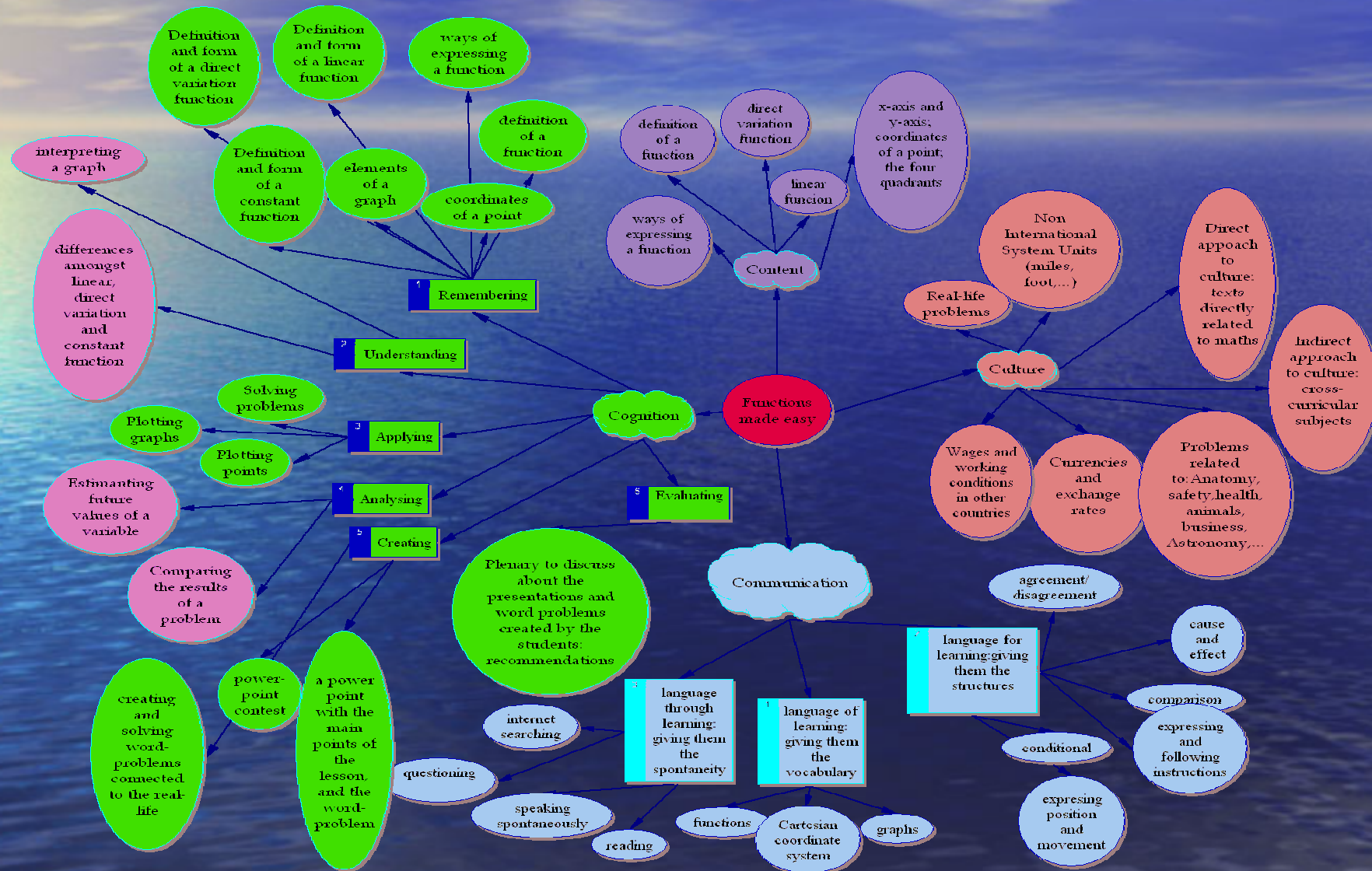
CLIL PROJECT

- **<u>Materials prepared in Nottingham:</u>** Functions made easy (15 hours)

- **<u>Starting date:</u>** December 2007, and during 2 terms in school year 2007-2008
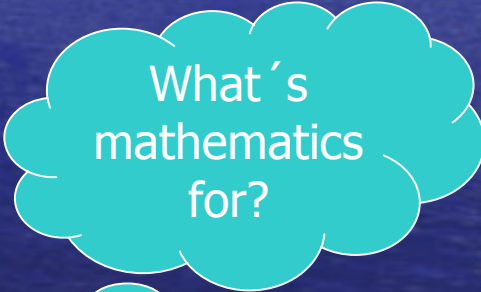
Algebra made easy

Unit 1 Equations made easy

Unit 2 Functions made easy

Lesson 1 The Cartesian Coordinate System

Lesson 2 Graphs and functions

Lesson 3 Linear F. Direct variation F. Constant F.

Functions made easy: mind map

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Structure of lessons

- **Theory:** short and clear sentences + visuals + questions + activities to clarify and understand concepts (T.1,T.2,T.3,...)

- **Activities (real life problems)**

- **Final activity:**
  - Head and tails
  - Contest (lesson 2 and 3): asking questions
  - PowerPoint presentation: main points, creating real life problems, recording the presentation.
  - PowerPoint contest

What´s mathematics for?

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Focus on:

- **<u>Talking:</u>** Why?
  - activities in pairs and report the results in the plenary: instructions
  - <u>Games</u>
  - PowerPoint presentations (Plenary: recommendations, +/- aspects).
- **<u>Reading:</u>** <u>Why?</u>
  - texts
  - word problems: <u>instructions</u>

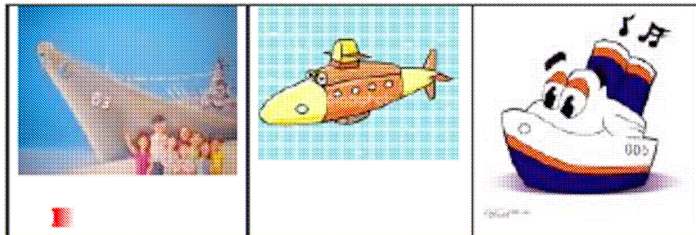Mª Luz Esteve Crespo

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INSTRUCTIONS TO SOLVE WORD PROBLEMS

- Read the problem on your own.
- The problem will be read aloud in turns in the class.
- Read the problem on your own again, and as many times you need to fully understand it.
- Highlight the main points (the main data)
- Summarize the problem:
  - The data you have: write them on the left of your notebook.
  - what you are looking for.
- Talk to your partner, and explain each other what you have to find, and the way to find it.
- Start to solve the problem. Do this task individually, but when you finish comment the results with your partner.
- Prepare a summary of the process you have followed to solve the problem for the plenary, and give the solutions.

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Games & I.C.T

Card game: questions

$y = 1.6x$

5 miles is equal to 8 km

ACTIVITY 6. Game: SINK THE SHIPS. A game for 2 players.

Preparation: each player secretly puts the following ships on his or her graph: **1 submarine** (1 dot); **2 destroyers** (2 dots each), **1 cruiser** (3 dots), **1 battleship** (4 dots).
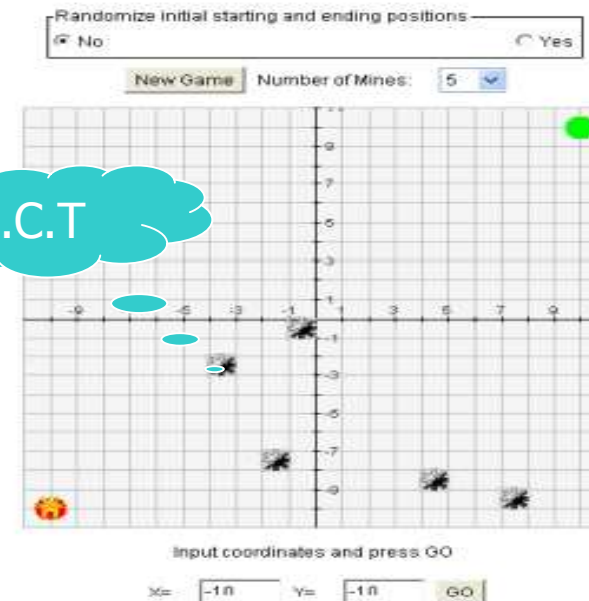
Randomize initial starting and ending positions
○ No ○ Yes

New Game   Number of Mines: 5

I.C.T

Input coordinates and press GO
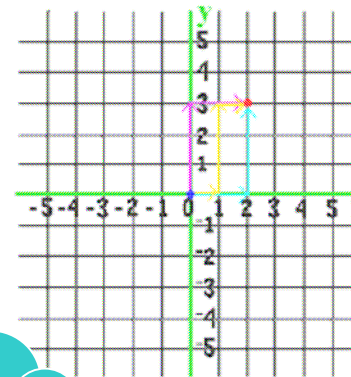
X= -10   Y= -10   GO

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Content

- Based on the official syllabus

(Decret 75/1996 de 5 de març, pel qual s´estableix l´ordenació dels crèdits variables d´E.S.O)

CONTENT GIVEN BY:
- Images/pictures
- Short sentences
- Questions
- Teacher explanations

Coordinates

- We can describe the position of a point, using two numbered lines (called AXES).
- What's the name of the horizontal axis?
- What's the name of the vertical axis
- What's the origin?

I.1.QUESTIONS (fill in the gaps): do in pairs and report the results in the plenary.

- Can you describe how to get to the red point from zero? I would go up _____ units and then right _____ units.
- How else can we get there? We can first go _____ units to the right, and then _____ units up. Or we can go _____ right, _____ up, and _____ more right.

Content

Interpreting graphs

WHAT ARE SOME FEATURES OR CHARACTERISTICS OF A GRAPH?

* A TITLE that describes what the graph shows.

* A GRID that is used to plot points or other data.

* A HORIZONTAL AXIS or X-axis that is labelled with the name of a variable and the units represented (the independent variable).

* A VERTICAL AXIS or Y-axis that is labelled with the name of a variable and the units represented. (the dependent variable).
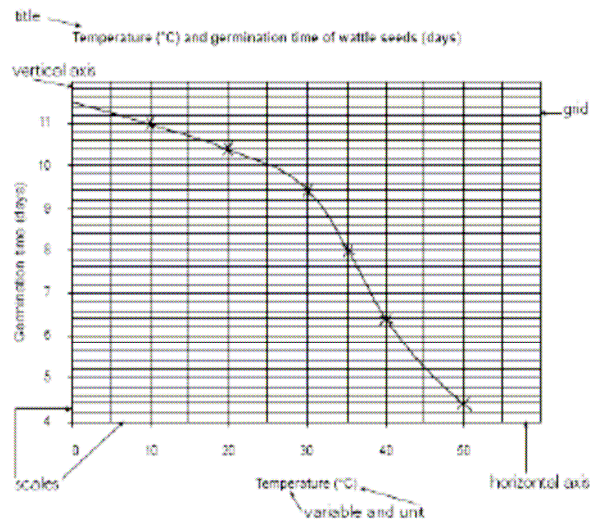
EXAMPLE:

In the book *Stuart Little* by E. B. White, the chapter titled "The Sailboat Race" tells what happened to Stuart during a boat race on a windy day.
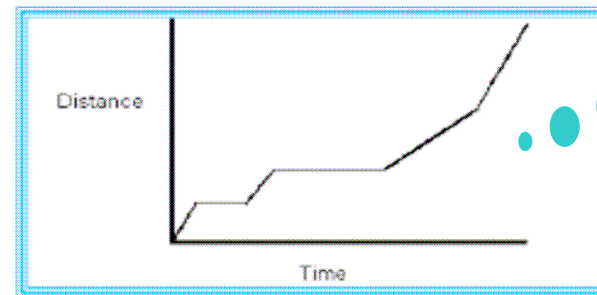
His race was interrupted first by a huge wave that turned over his boat.

And again later when he sails into a huge paper bag and could not get out for an extended period of time.

This adventure might be represented by the following graph:

Real life example

T.4. Match each sentence with the correct part of the graph. (pairs)

1) He starts racing

2) The huge wave turn over his boat

3) He races again

4) He sails into a huge paper bag

5) He gets out of the bag and and goes on racing

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Content

Linear functions

- In a linear function: **y varies linearly with x.**
- The graph of a linear function is a **straight-line** (but neither horizontal nor vertical)
- The general equation of a straight line is given in the form:
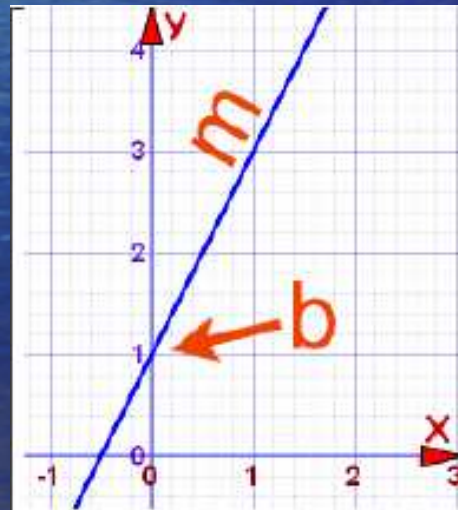
$$y = mx + b$$

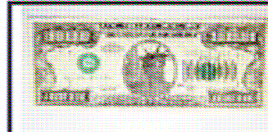| Gradient or slope: how step the line is	y-intercept: where the line crosses the Y axis

Culture

Word problems: linear functions to convert dollars into euros

➡ ACTIVIY6. On June 16, 2006, the conversion rate from Euro to U.S. dollars was approximately 0.8 to 1: every0.8 Euros were worth 1 U.S. dollar. (1 $=0,8 €).
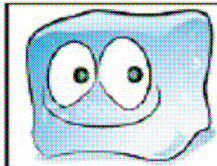
	1 dollar=0,8 euros	

a) Choosing dollars to be the independent variable and Euros to be the dependent variable make a graph of coordinate system. Mark every dollar on the dollar axis and every 0.8 Euros on the Euro axis.

➡ ACTIVIY 18. Work in pairs and then we will report the results in the plenary.

There are two common systems for measuring temperature, Celsius and Fahrenheit.

Water freezes at 0° Celsius (0°C) and 32° Fahrenheit (32° F); it boils at 100°C and 212° F.

(a) Assuming that the Celsius temperature (TC) and the Fahrenheit temperature (TF) are related by a linear equation, find the equation.

Word problems: Linear equation to convert ºCelsius into ºFahrenheit

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Culture

➡ **ACTIVIY 4.**

The fixed cost for a company to operate a certain plant is $3,000 (electricity, gas, water…) per day. It also costs $4 for each unit produced in the plant. Express the daily cost "C" of operating the plant as a function of the number "n" of units produced. Work in pairs and then we will report the results in the plenary class.

➡ **ACTIVIY 7.** Work in pairs and later we will report the results in the plenary.

Anatomy. Anthropologists use the length of certain bones of a human skeleton to estimate the height of the living person.
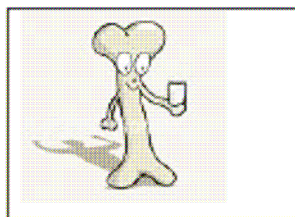
One of these bones is the femur, which extends from the hip to the knee.

To estimate the height in centimetres of a female with a femur of length "x", this function can be used:

$h(x) = 61,41 + 2,32x$

h= woman's height in cm

x= femur's length in cm

Word problem: Calculating the cost of a product: fixed and variable expenses

Word problems: Estimating the height of a person (femur length)

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Culture: Texts

1.Direct approach.

...however, we can talk about rug designs in terms of Cartesian coordinates.

Y AXIS

10

5

x

-10   -5   5   10

(0,0)
ORIGIN   -5

-10

X AXIS
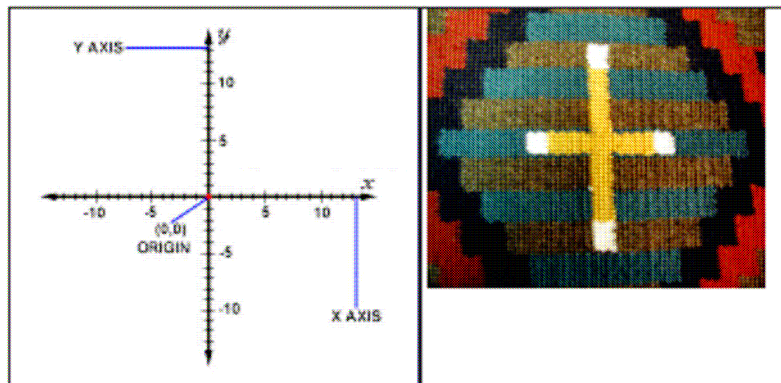
This rug design resembles the Cartesian grid on the left, and allows us to see how the position of any design element on a rug can be described according to a Cartesian coordinate relative to the centre of the rug, which is like the "origin" of a Cartesian grid.

QUESTIONS:

1. Where are the Navajos from? They are from...... (search for information in the net).

2. Can you explain the meaning of "weaving"? It means......

3. Is "Weaving" taught to Non-Navajo pe...

4. Why does the ru...

The design of a navajo rug resembles the Cartesian Grid

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Culture: Texts

Cartesian Coordinates and Graffiti.

Graffiti artists often work in sketchbooks before they begin painting the graffiti. The sketchbooks sometimes use a grid to help plan the design. More commonly, the graffiti writers use the brickwork as a grid, as we can see in this picture below.
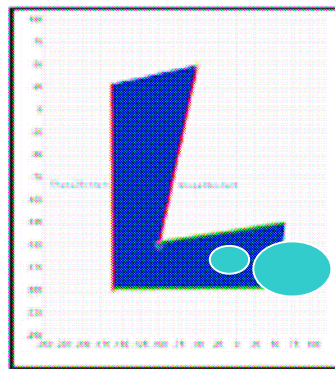
These grids are much like the Cartesian coordinate system in mathematics

The graffiti writers use the brick wall as a grid. These grids resemble the Cartesian coordinate system

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Culture: Texts

2. Indirect approach:
Cross-curricular topics

Geysers are rare. There are about 500 of them in Yellowstone National Park in the western United States, about 200 on the Kamchatka Peninsula in Russia, about 40 in New Zealand, 16 in Iceland, and another 50 scattered throughout the world in many other volcanic areas. Perhaps the most famous geyser is Old Faithful in Yellowstone National Park. It spouts a ... water and steam to a height of about 30 to 55 metres on ... minute timetable.
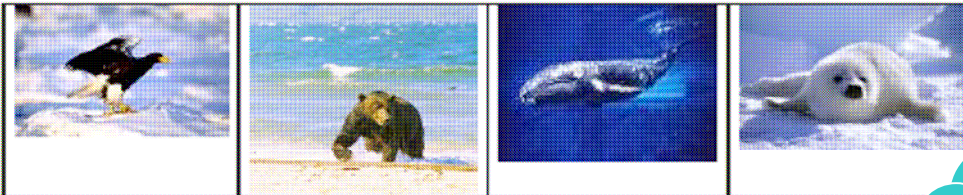
Geysers in the world

http://www.Kamchatkapeninsula.com/

Kamchatka is a peninsula comparable in size to Japan. Its volcanic belt is made up of 29 active craters. There is more than half of the world's Steller's Sea Eagles, as well as the largest population of brown bears.

The waters around Kamchatka are inhabited by the rare gray whale and approximately 300,000 seals and sea lions.

Linear function: Predicting the eruptions

ACTIVIY 15. OLD FAITHFUL is a famous geyser.

The equation y=14x+27 can be used to predict its eruptions.

$$Y=14x + 27$$

Y= time until the next eruption (in minutes)

X= the length of the eruption (in minutes)

Local economy depends on mining/logging. Pollution problems: missiles. Eco-tourism: helping families without destroying the environment

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Culture: texts

POVERTY

Poverty is not having enough money to have important things like food, water, shelter, or toilets. Many people in different countries live in poverty, especially in developing areas of Africa, Latin America and Asia.

There are different ways to measure poverty. The World Bank says that extreme poverty is when someone needs to live on less than US$ 1 a day. Moderate poverty is when people need to live on less than 2 such dollars a day.

In the developed world many people are seen as the working poor. They have a job, but do not earn enough money. They need to spend a lot of that money for living expenditures, so that at the end of the day, little of it is left.

ACTIVIY 22. **Analyzing and Choosing a First Job (work in pairs).**

Do you have a job? If not, what will your first job be? What expenses will you have? How much money will you actually earn? How can you compare earnings between two jobs? Linear equations can help you answer all these questions. We are going to imagine that we are living in the United States.

Find Out by Graphing

- Find the hourly wage (the salary per hour) for two jobs that interest you.

Text. Poverty. Wages in non developed countries.

Working in the States.

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Cognition: Evaluating and Creating

- Final activity: the students have to create a PowerPoint presentation with:
  - Main points of the lesson
  - Examples or word problems created and solved by the students
  - PowerPoint contest
  - Plenary: +/- points, recommendations, possible mistakes,...

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Communication

ACTIVITY 7. Researching tasks (work in pairs, then you will report the results in the plenary).
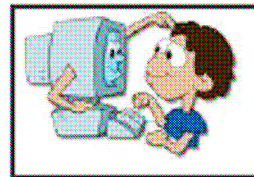
- You are going to study how many junk messages you receive for a week in your hotmail (7 days).
- Represent the results in a table.
- Represent the results in the Cartesian coordinate system.
- We will comment on the results in the plenary classroom.

I have received...............junk messages during this week.

I have received..............messages more than....................

I have received ....messages less than....................

Language scaffolding: Language for comparing. Sentence starters

ACTIVITY 1. IS THERE ANY RELATIONSHIP BETWEEN THOSE VARIABLES? Work in groups, and we will report the result in the plenary.

Weight — Age of a person

Age — Height

The bill of water consumption — Water consumption (m³) of a family

The weight of a melon — The melon price

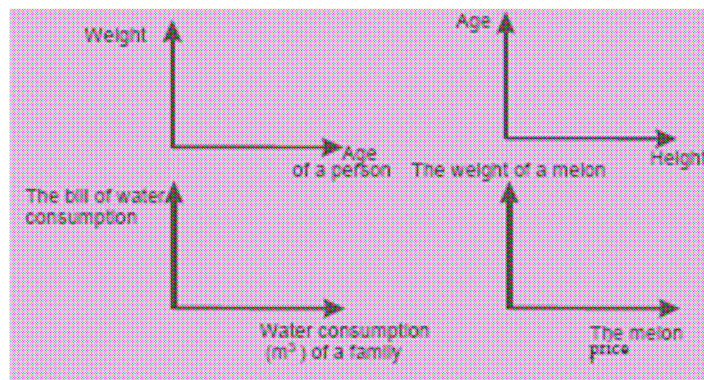| There is a relationship between...and... | Because/as/since | If the "..." increases, the "..." increases/decreases |
| There isn't any relationship between...and... | Because/as/since | If the "..."increases, the "..." doesn't increase/decrease |
| The "..." is function of the "..." | | |

ACTIVITY 9. GAME. We are going to divide the class in 3-people groups.

- Each group has to prepare questions (at least 8 questions) about this unit. Try to make the questions original, funny, creative, …
- In turns, the first group asks (aloud) a question to the next group. If the answer is right, the group gets 5 points. Then the second group asks another question to the following group, and so on.
- The winner is the group with the maximum score.

| What's the definition of....? |
| Can you define the word.................? |
| Can you locate the point (...,...) in the coordinate system? |
| How many.....? |
| How......? |
| When......? |
| Do you know......? |
| Is it true that..........? |
| Am I right If I say that.......? |
| Who..........? |

Scaffolding: Giving reasons .Substitution tables

Language scaffolding: Questioning. Questions starters.

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ACTIVITY 11. A TRIP TO THE COUNTRYSIDE (Answer the following questions, work in pairs and later plenary). Maria, Luís, and José went on a trip to the countryside, as the following graph shows:

Distance (Km)

[Graph with points A, B, C, D, E, F, G showing distance vs time. Y-axis marks at 35, 50, 85. X-axis (Time in Hours) marks at 9, 10, 12, 14, 16, 17, 18.30]
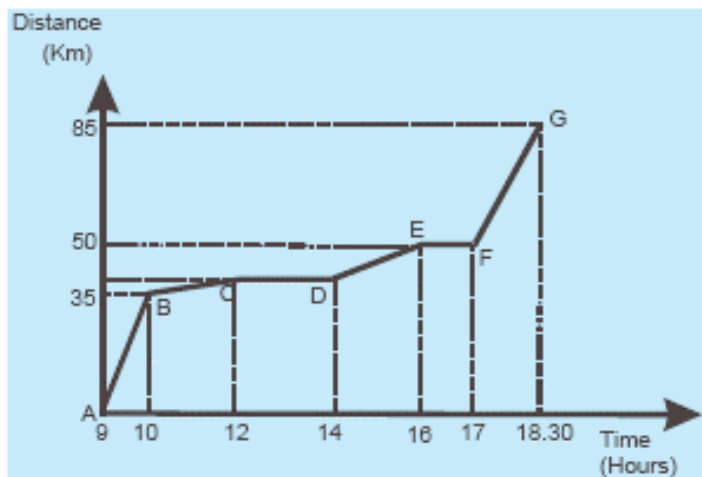
- Which is the independent variable?
- Which is the dependent variable?
- Is this function continuous or discontinuous?

- When did they stop to have lunch and relax?
- Between which points did they walk faster? And the slowlier?
- Draw a table of values to represent the data.
- Write a story about the trip.

Last week, they decided to go to...	They walked for..hours
They talked about...	They brought..........for lunch
They saw a dog, a cat...	They stopped at an old Church...
As they were tired they stopped at....for..hours.	Luis and Maria got angry because... They were happy because...
They arrived at a wonderful lake, cottage, river...	They swam, they took a rest, they played football...
In the afternoon they stopped for..hours and they..	They came back at.....o'clock...because..

Language scaffolding for writing and talking. Sentence starters

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ACTIVITY 10. The verbs in the box can be used to describe changes seen on graphs. Answer the questions (work in pairs, and then we'll report the results in the plenary).

PEAK		RISE	SOAR	FLUCTUATE	DECLINE	DROP	CLIMB	INCREASE

Fill in the gaps

1. In the year 1990, tadpole populations began to _____ rapidly.
2. Tadpole populations reached a _____ in 1992.
3. Between 1992 and 1993, populations of tadpoles _____
4. Tadpole population _____ after 1993.
5. Between 1995 and 1999, populations _____
6. How many tadpoles were in the pond at its highest point? _____
7. How many tadpoles were present in the pond in 1998? _____
8. Between 1998 and 1999, tadpole populations _____

b) Join these heads with the correct tails:

"y" varies …	…a measure of its inclination or steepness
The graph of a linear function is …	…positive in an increasing linear function
The y-intercept is…	…linearly with x in a linear function.
The gradient or slope indicates …	…no slope in a constant function
The slope of the line is …	…the vertical axis
the slope is …	…a straight-line (but neither horizontal nor vertical)
the slope is …	…through the origin (0,0).
there is …	…how many units increase or decrease "y", if we increase "x" in 1 unit.
The constant function crosses …	…directly proportional to "x" in a direct variation function.
The "y"	…negative in a decreasing linear
	…line crosses the y- axis

Scaffolding for writing and talking:
Heads and tails

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b) We are going to divide the class in groups of three. Each group has to prepare the questions related to the chart above. For example:

- What does the slope indicate?

- Where does the line cross the y-axis?

▌ In turns, the first group asks aloud, a question to the next group. If the answer is right, the group gets 5 points. Then the second group asks another question to the following group, and so on. The winner is the group with the maximum score.

▌ If the question is not correct, 5 point will be subtracted from the total number of points.

▌ If the answer is not correct, 5 points will be subtracted from the total number of points.

What's.....?	What's the definition of...?
Can you define...?	Where...?
Can you describe...?	Is true that...?

Scaffolding for talking: Questions starters

Conclusion: 4c´s + 3 A´s

- Changing the way of preparing materials

Creativity
(students and teacher)

Activities for visual,
auditive and
kinaesthetic learners

Real life applications

Scaffolding

Plenary /group work
(students)

Research on the Internet
(students)

Swapping roles:
Students transformed in teachers

Visuals

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