Unit 2: Graphic representation

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Contents

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Prior knowledge

Activity: Summarize your general knowledge on this topic.

Keywords

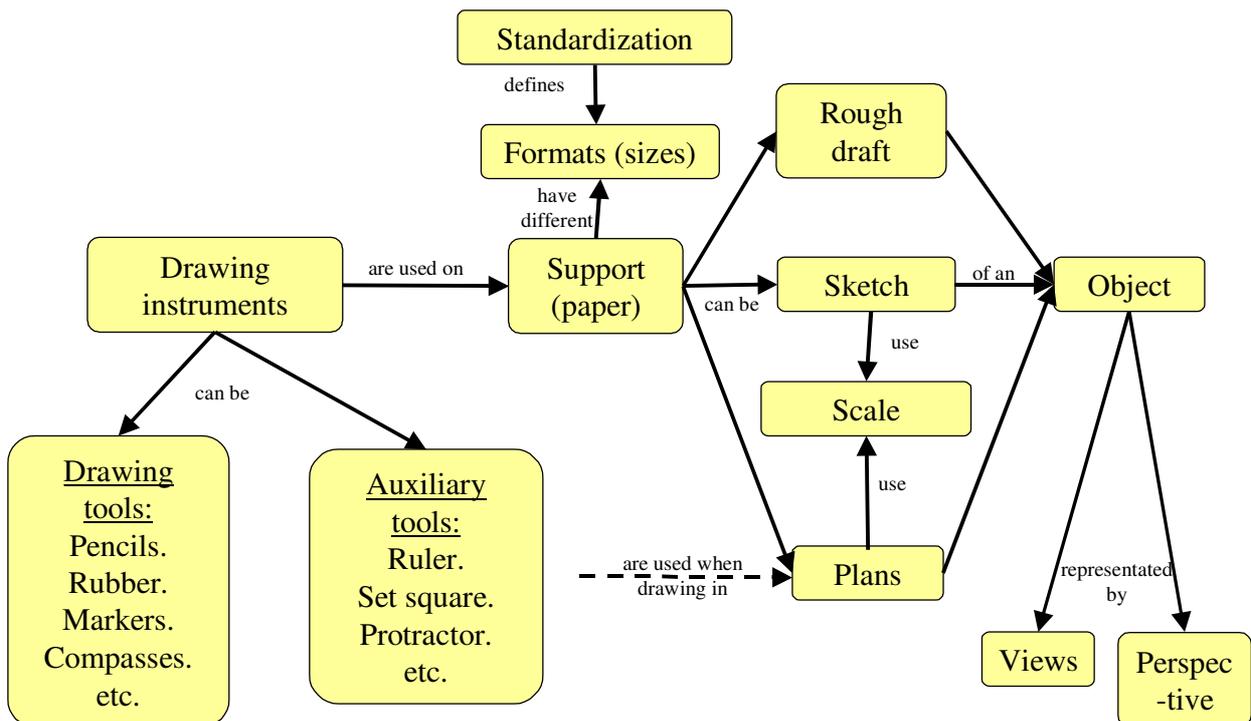**Activity:** Copy following keywords, explaining their meaning and translate them into Spanish.

lead	reduce
graphite	enlarge
clay	plane
size	projection
format	height
segment	width
angle	depth
vertex / vertices	front view
set square	side view
edge	overhead view

Mindmap of the unit

Activity: Analize and try to understand following mindmap

**T.P.R. 1st ESO.
Unit 2 Graphic representation**

Standardization

defines

Formats (sizes)

have different

Drawing instruments — *are used on* → Support (paper)

Rough draft

Sketch — *of an* → Object

can be

Scale

use

Drawing instruments *can be*:

Drawing tools:
Pencils.
Rubber.
Markers.
Compasses.
etc.

Auxiliary tools:
Ruler.
Set square.
Protractor.
etc.

are used when drawing in → Plans

use

Object *represented by* → Views

Perspec-tive

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2.1. Introduction

Activity: Think about the following questions: Why do we draw? What types of drawing do you know? How are they different? Which one do you think is most appropriate for technology? What type did you use in the design section of your first project?

Definition:

Technical drawing (or graphic representation) is an universal conventional language, bound by specific rules, which makes it possible to transmit all the information needed to manufacture an object.

2.2. Graphic materials

Activity: Think about the following questions: What materials do we use for technical drawing?

To represent an object we need two basic elements: the support (usually paper) and drawing instruments (usually pencil).

Support

Paper is the most commonly used support for technical drawing.

There are different sizes of paper. These sizes are standardized and are called **formats**. The most common format is the DIN A-4 (210x 297 mm; DIN=**D**eutsche **I**ndustrie**n**orm).

Activity: Copy from the board the formats with different colours and how they are bound by the "folding rule".

"Folding rule": For each format, the rule is that:
- ✓ Its **surface** area is half of the previous format.
- ✓ Its **length** is the width of the previous format.
- ✓ Its **width** is half the length of the previous format.
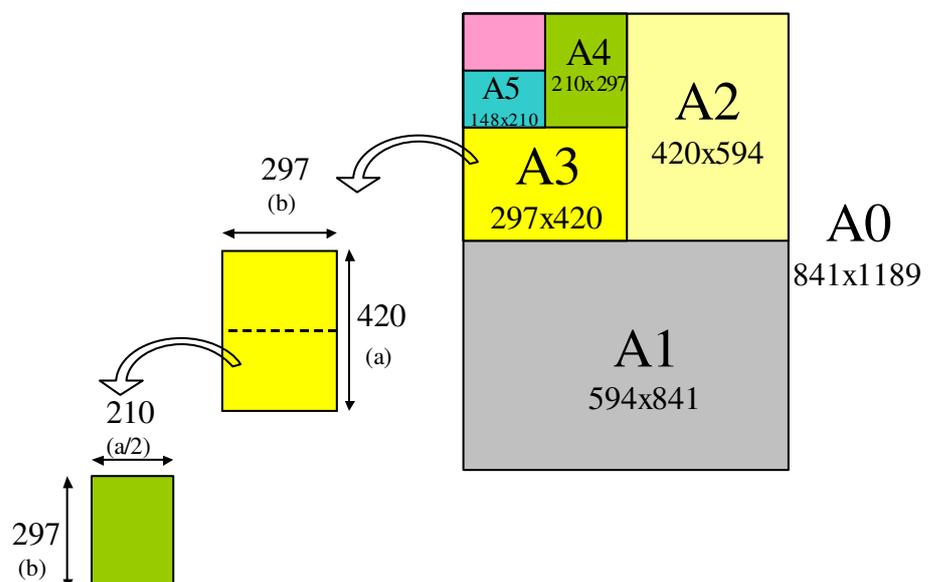
Sizes of the formats			
Format	Width (mm)	Length (mm)	Surface (m^2)
DIN A-0	841	1189	1
DIN A-1	594	841	0,5
DIN A-2	420	594	0,25
DIN A-3	297	420	0,125
DIN A-4	210	297	0,0625
DIN A-5	148	210	0,0312
DIN A-6	105	148	0,0156

Drawing instruments

Pencils (or the propelling pencil) are instruments that contain a bar of graphite and clay, called **lead**, incased in a wooden support (or metal or plastic tube). The lead is softer (dark lead) or harder (grey lead) depending on the amount of graphite it contains.

Activity: Draw lines with pencils of different hardness (exchange with your partner if necessary) and npay attention to the tone, letter and number on the pencil.

Standard of lead hardness										
HARD				MEDIUM			SOFT			
5H	4H	3H	2H	H	F	HB	B	2B	3B	4B
Technical drawing				Technical and artistic drawing			Artistic drawing			

How it's made: Pencils (video)
https://www.youtube.com/watch?v=88wM22q5cd8
How it's made: Graphite lead (video)
https://www.youtube.com/watch?v=zkP3i1MQJWA

2.3. Drawing tools

The rubber

There are basically two types of rubber: **soft rubber** for erasing the traces of soft pencils, and **hard rubber** for erasing that of hard pencil or ink. When using the rubber, first make sure it is completely clean, then move it gently in one direction on the surface of the paper.
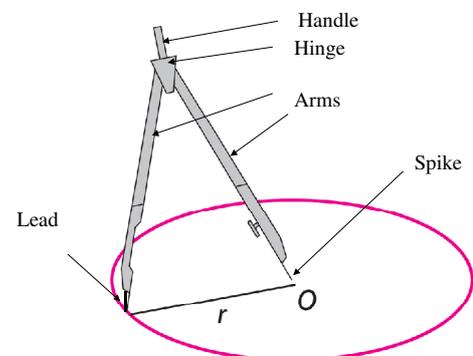
The compass:

This instrument is used to draw **curved lines** and to carry over distances.

Activity: In your notebook, draw your compass freehand at full scale (1:1), indicating its different parts. This drawing is called a sketch.

Activity: Use of the compass
Draw a circle of 20 mm in diameter and concentric to it two more circles of 30 mm and 40 mm of diameter.

The ruler:
This instrument is used to draw **straight lines** and measure segments. In order to measure properly, one must:

1. Put the 0 line at the beginning of the segment,
2. Read the measurement at the point of the ruler that matches the end of the segment
3. Write the measurement in cm with a decimal to express the mm.

**Activity:** Measure the sizes of your project.

Protractor:
This instrument is used to measure and draw **angles**:

1. Align the **line of reference** (0º-180º) with one of the sides of the angle (X), and the centre of the protractor with the **vertex** of the angle (Y)
2. Read the measurement of the angle at the intersection of the opposite side of the angle (Z) and the graduated semicircle of the protractor.
3. Write the measurement of the angles in degrees, using the symbol º.
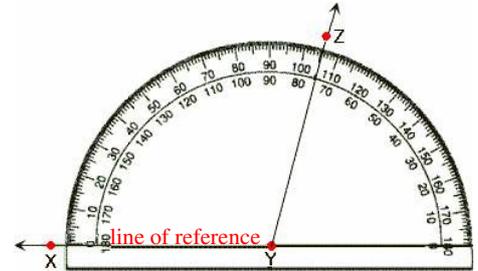
Set squares:
Set squares are two triangles used for drawing **parallel** and **perpendicular** lines:

1. Triangle with 90º, 45º and 45º angles (escuadra)
2. Triangle with 90º, 60º and 30º angles (cartabón)
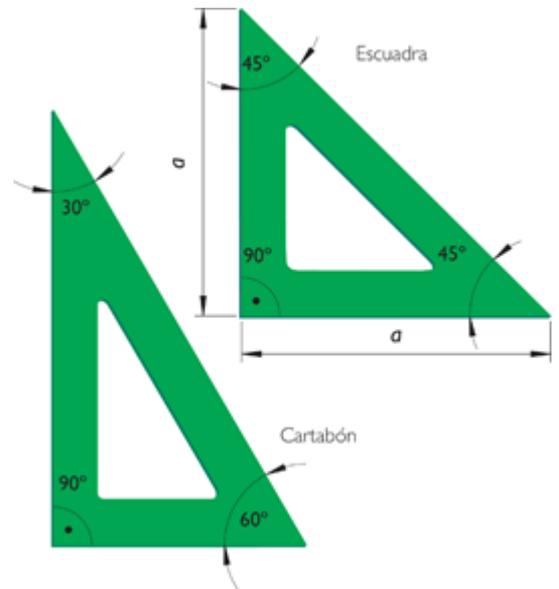
To draw parallel and perpendicular straight lines you simply slide the first triangle (escuadra) over the hypotenuse of the second triangle (cartabón).

Parallel lines

1st   2nd

Perpendicular lines

1st   2nd
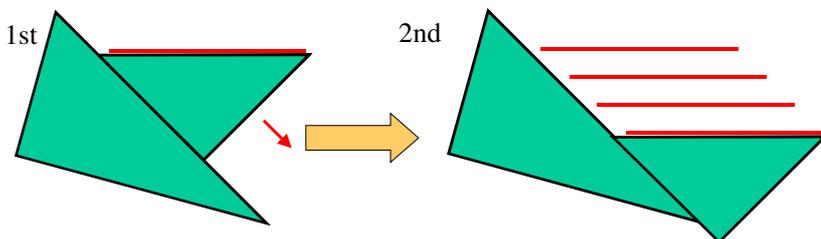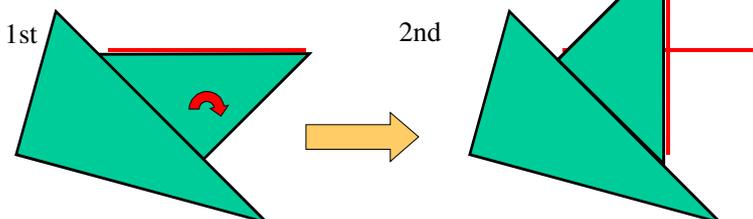
Activity: Use of the set square

Draw six squares with 5 cm sides and
-Nº 1: Draw two crossing lines and measure and express the angles
-Nº 2 to 6: fill them with parallel lines that should be:
-Nº 2: horizontal, 10 mm apart
-Nº 3: vertical, 10 mm apart
-Nº 4: inclined, with a 45º angle and 10mm apart
-Nº 5: inclined, with a 60º angle and 10mm apart
-Nº 6: inclined, with a 30º angle and 10mm apart

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2.4. Scale and dimensions

Scale

The scale is the proportion (relationship) between the size of the drawings and the size of the real object.

$$\text{Scale} = \frac{\text{Size of the drawing}}{\text{Size of the real object}}$$

In technical drawing, we use different types of scales.

Types of scale	Which is larger?	Examples
Full scale (escala natural)	None. Both are the same size.	1:1
Reduced scale (escala de reducción)	The object.	1:2 ; 1:3
Enlarged scale (escala de ampliación)	The drawing.	2:1 ; 3:1

What is a scale drawing (video):
http://www.virtualnerd.com/middle-math/ratios-proportions-percent/scale-drawings-models/scale-drawing-definition
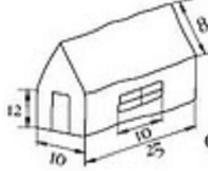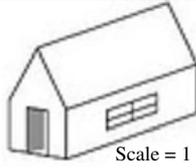
Dimensions

The dimensions of the drawing show the real measurements of an object. They help us understand the drawing.

Activity: Copy the following exercises and solve them in your notebook

1) Write these grades of pencils in order from the hardest to the softest: 2H, H, 3B, 5H, HB, 6B, 3H

2) Match each adjective to its antonym: *Thick, Small, High, Soft, Big, Thin, Hard, Low*.

3) Draw the angles 15º, 30º, 45º, 60º, 75º, 90º, 105º, 120º, 135º, 150º, 165º and 180º using the set squares. (clue: 15º = 45º-30º, 75º = 45º + 30º, 105º = 60º + 45º, 120º = 180º-60º....)

4) Make the following patterrn
   a. Draw a straight line 15 cm long
   b. Divide it into 3 cm segments
   c. Use each division mark as the centre of a circle with a 2 cm radius
   d. Use the same centres to draw circles with a 1,5 cm radius
   e. Colour the pattern

5) Draw your pencil sharpener at these scales: a) 1:1, b) 1:2 and c) 2:1

6) Select the correct adjective for each statement:
   a. An object is *smaller/larger* than the drawing in an enlarged scale
   b. The drawing in *an enlarged / a reduced* scale is smaller than the object

7) What scale would you use to draw a fork on a A4 paper? What scale would you use for a chair?

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2.5. Graphic systems

An object can be represented in different ways or graphic systems. Depending on the drawing tools and instruments used, the graphic system can be:

Graphic System	Characteristics	Example
Rough draft (boceto)	✓ Freehand ✓ Clarity and imagination	
Sketch (croquis)	✓ Freehand ✓ Incorporates all data / scale	
Plan (plano)	✓ With ruler, compass... ✓ Use of a scale	 Scale = 1 :10

Activity: In Unit 1 you drew the workshop. Was it a draft, a sketch or a plan? Why? And what about the drawing you made of your compass or your first project?

Rule for drawing:
First draw using a hard lead (i.e. F or H) and once you are sure, trace darker lines using a soft lead (i.e. HB or B).

The views of an object:
The different views of an object are the images produced when we look at it from different positions; (it is like placing the object suspended between three planes perpendicular to one another and project the object on them).

View of the object	We look at the object from	We say the object is projected perpendicularly onto
Front view (alzado)	the front	Vertical Plane
Side view (perfil)	one side	Profile Plane
Overhead view (planta)	above	Horizontal plane

According to the European standard, the overhead view is always drawn **below** the front view, and the lateral view is drawn to the **right** of the front view (see image).

Front view
Side view
Alzado
Perfil
Object
Objeto
Overhead view
Planta

Front view
Side view
Alzado
Perfil
Overhead view
Planta
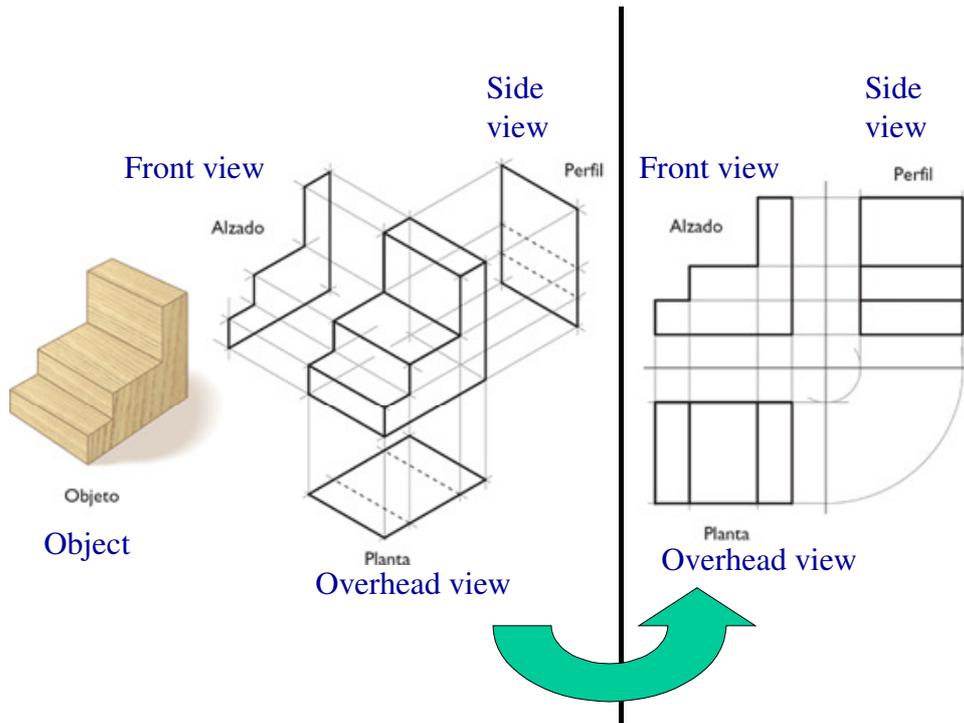
Activity:
Copy from the board the three views of an object (i.e. eraser).
Draw the three views of your sharpener at a scale of 2:1.
Work with the computer to solve the view-exercises proposed by your teacher
View exercises (website)
http://www.educacionplastica.net/3dcube_model/vistas_3d_2x2.html

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2.6. Introduction to perspective

Perspective is the representation on a plane (2 dimensions) of an object (3 dimensions).

As drawing boxes in perspective is easy, we can use them to draw any object in perspective, following these 3 steps:

- 1st) the object is "divided" into several boxes, which are represented in perspective
- 2nd) the details of the object are included in the boxes, paying attention to the proportions
- 3rd) the unnecessary lines are erased and the edges are profiled.
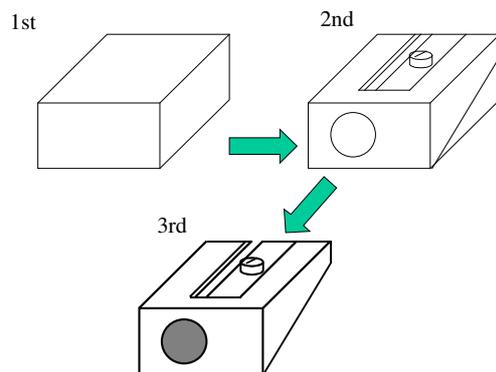
Activity: Draw your sharpener in perspective.

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