People's Democratic Republic of Algeria
Ministry of Higher Education and Scientific Research
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# Institute of Science and Technology
# Department of Civil and Hydraulic Engineering

# Technical Drawing

## Practical Work / 2nd Year Bachelor / Civil and Hydraulic Engineering

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Academic Year: 2025/2026

# Chapter III:
# PERSPECTIVES

## Definition of Perspective

It is a technique for representing three-dimensional (3D) objects on a two-dimensional (2D) surface, taking into account the effects of distance and the position of the objects in space relative to the observer.

A perspective view allows for a quick understanding of the shapes, the overall three-dimensional appearance of an object, as well as the details that characterize it.

## The Elements of Perspective

**The view of our three ground lines can change, just like any element in the scene. Here are the parameters that can alter the perspective of an object:**

**Eye height relative to the ground** (= horizon = line of sight)

**Point of view**: the position from which we observe an object

**Horizon line**: the line corresponding to the horizontal level of the eyes

**Vanishing points**: points toward which two parallel lines appear to converge on the horizon.

**If even one of these parameters changes, the perspective of the object changes.**
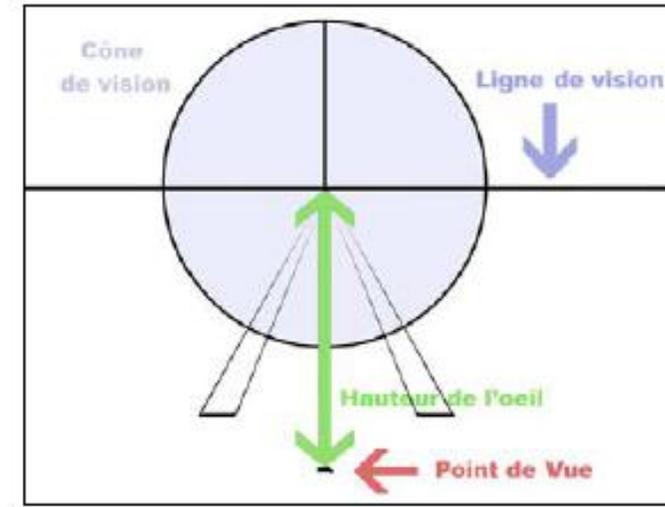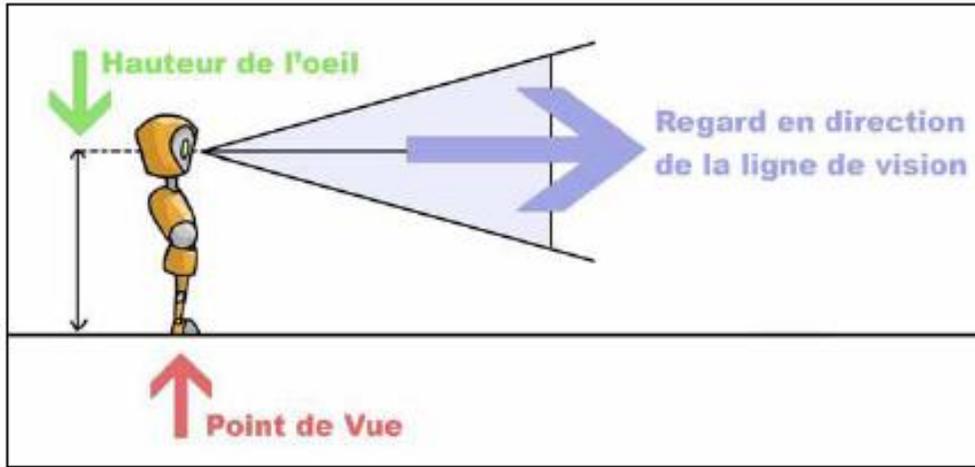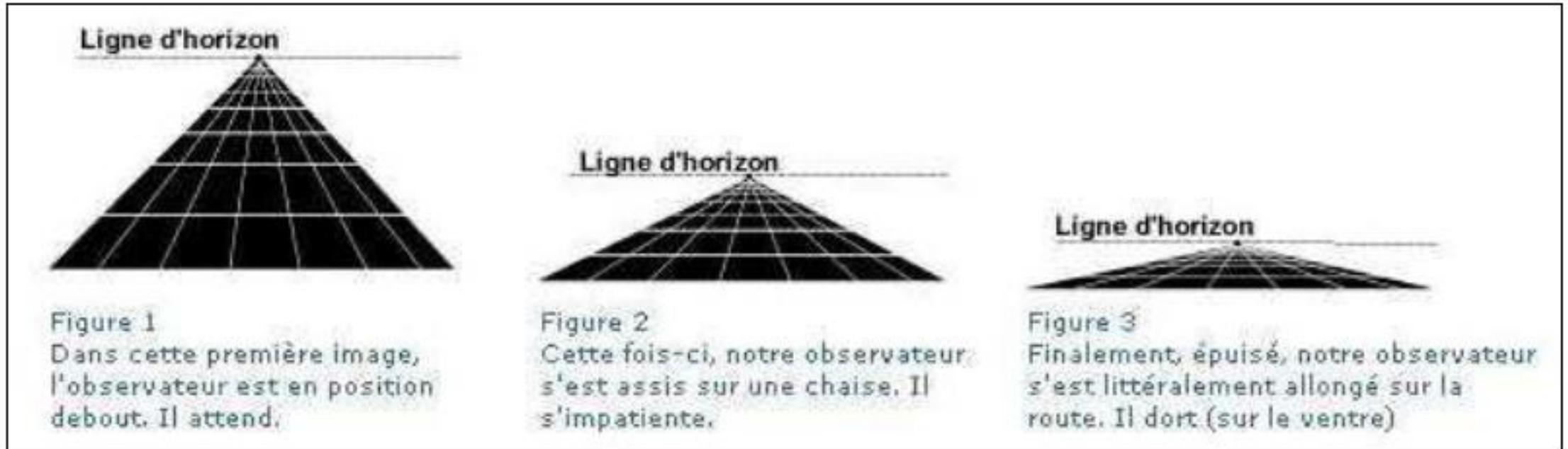
**Fig 1.** The Line of Sight and the Point of View



**Fig 2.** The Horizon Line

## 1) Cavalier Perspective

It is the oblique representation of an object projected onto a projection plane.

The front face is not distorted.

The angle of the receding lines with the horizontal is between 30° and 45°.

Frontal surfaces parallel to the XOY plane (or to the observer's front) are drawn at their true size.

End surfaces (perpendicular to the frontal surfaces) are distorted and drawn along receding lines inclined at the same angle "a" and scaled according to the same ratio "k": the **reduction coefficient of the receding lines**.
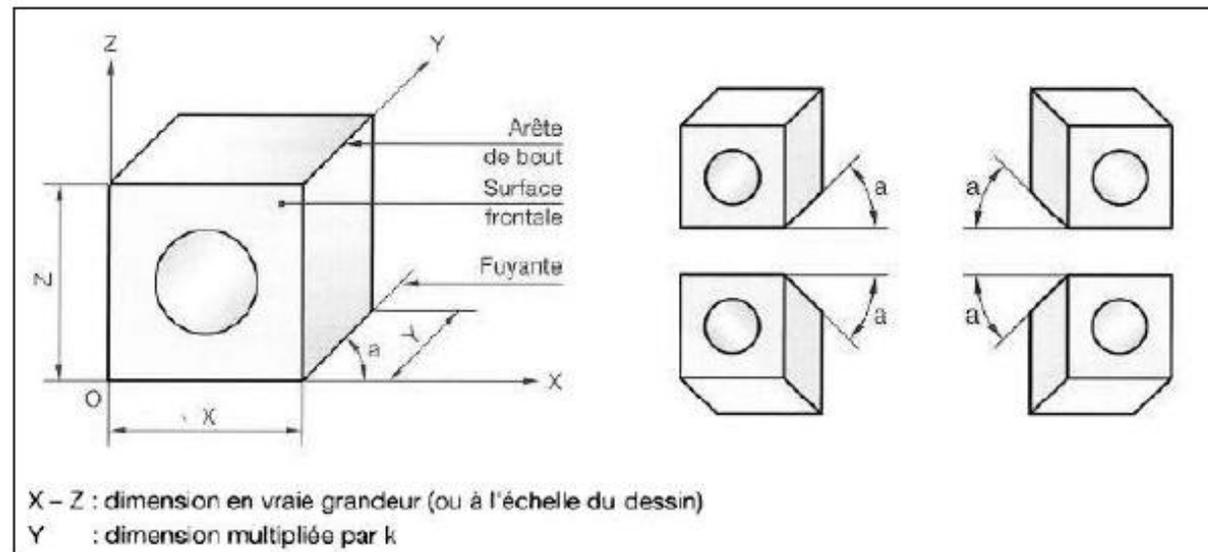


**Fig 3.** Cavalier Perspective

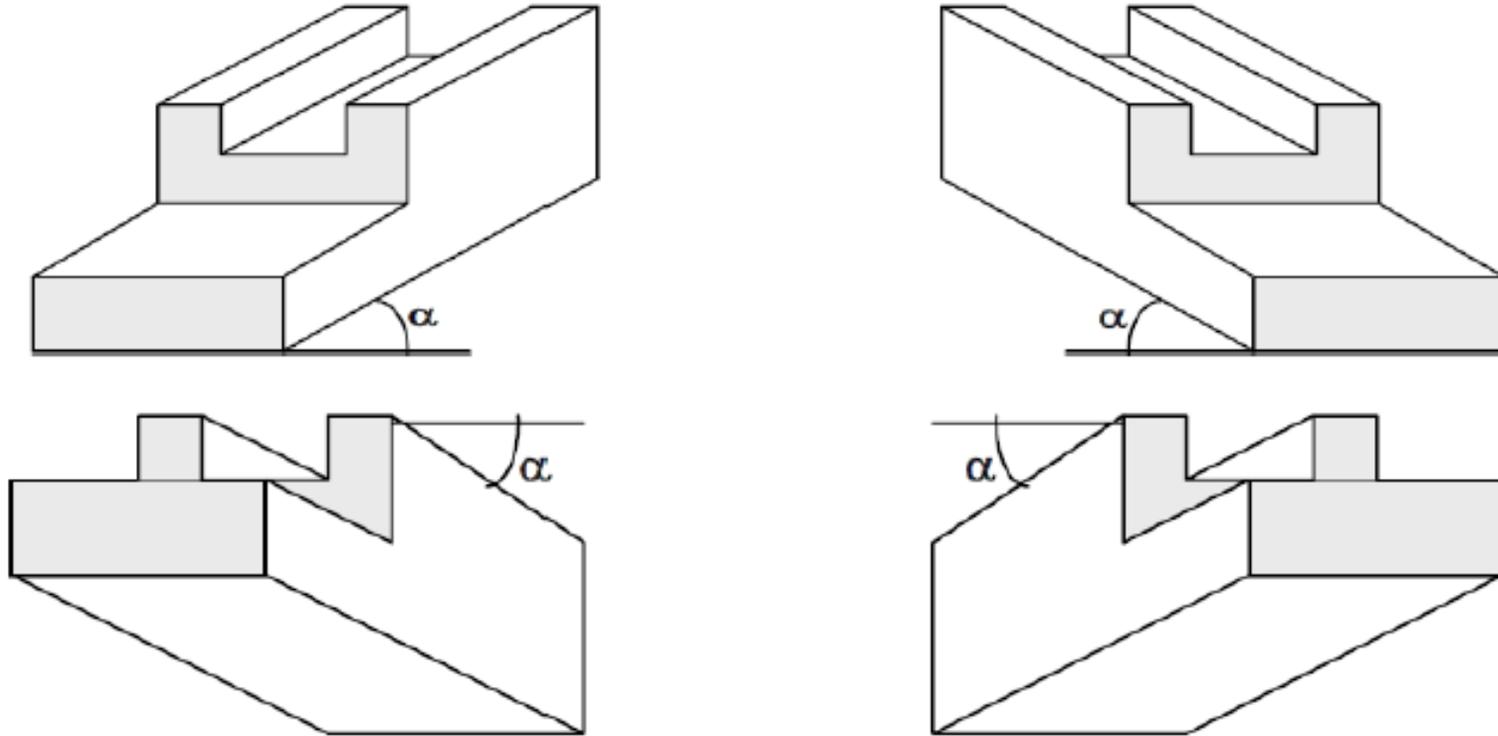Depending on the orientation of the receding lines, four views can be obtained.



**Fig 4.** Orientation of the Receding Lines

**To create a cavalier perspective, follow these steps in order:**

Choose the main face of the object.

Draw the frontal face parallel to the projection plane.

Draw the receding lines inclined at an angle **a**.

Project onto these receding lines the edges of the faces perpendicular to the frontal face, using a ratio **k**.

**<u>Recommendations:</u>**

Choose the frontal face that is the most important or informative.

To make the drawing more readable, do not represent hidden edges, symmetry planes, or axes that are not necessary for understanding.

To simplify the drawings, place the most complex faces of the object (cylindrical shapes, etc.) parallel to the projection plane (easier to draw at true size, no distortion, no ellipses).
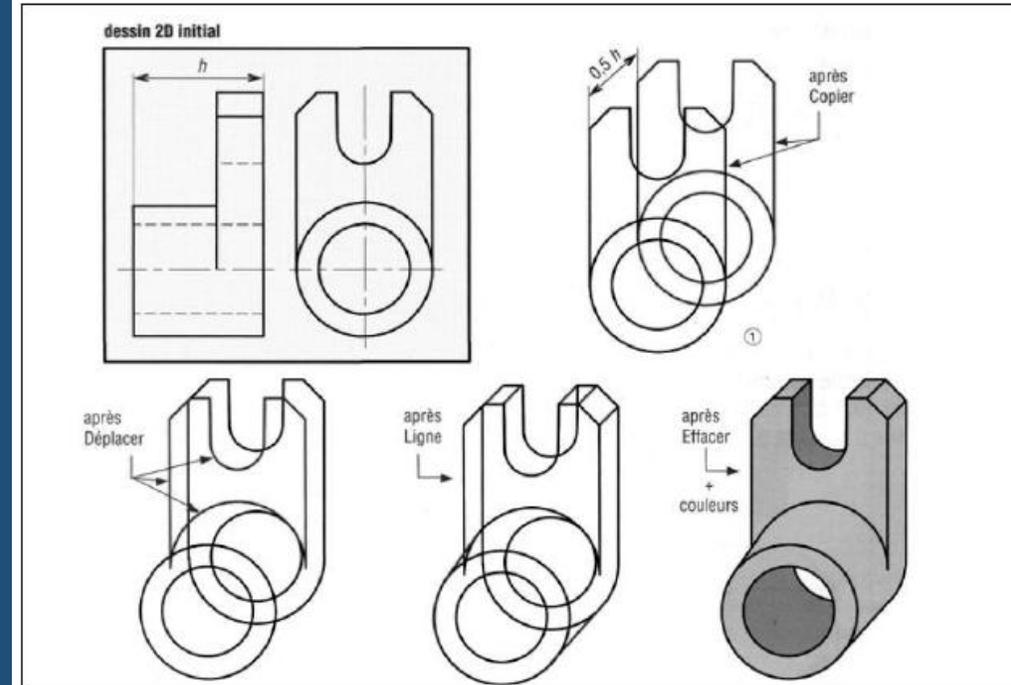


**Fig 5.** Drawings of a Cavalier Perspective

## Construction :

a- Project the front face onto the chosen projection plane. Envelope shapes, axes.

b- Draw the direction of the vanishing lines with the chosen angle a.

c- Draw the vanishing parts, reducing them by the chosen ratio k.

Envelope shapes.

d- Study the shape details in the same way.

e- Finalize the drawing: center lines, dashed lines, solid lines.

(4) The axes and apparent outlines of the shapes of revolution are essential.

(5) The characteristics                of

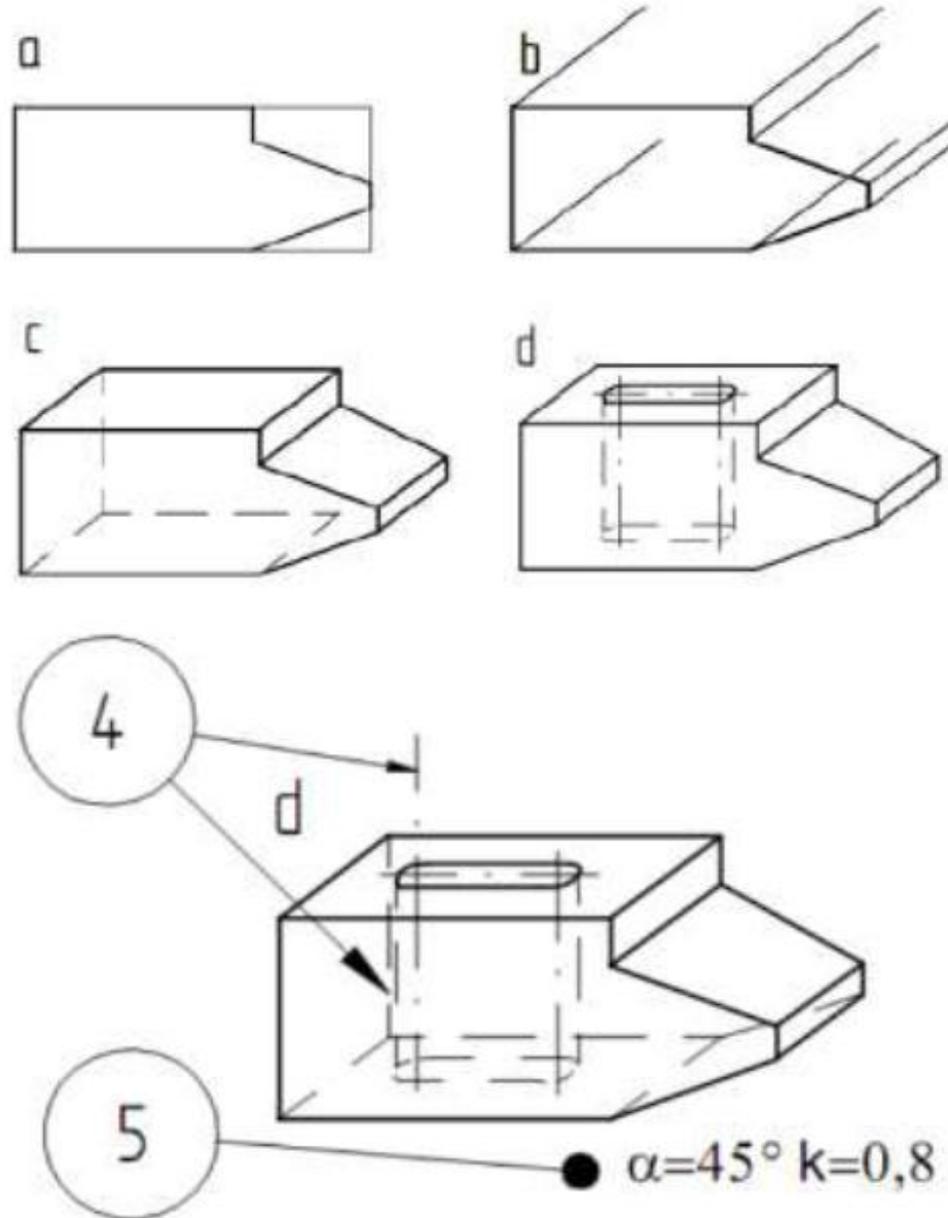the perspective must be      indicated      on

the

drawing



$\alpha = 45°$  k=0,8

**Fig 6.** Construction of a Cavalier Perspective

## 2) Axonometric Perspective

The term *axonometry*, or *axonometric perspective* (axon: axis, metry: measure), refers to an orthogonal perspective.
Orthogonal perspective is drawn on a plane that is oblique relative to the main faces of the object to be presented.
In this perspective, three types are recommended depending on the inclination of the receding lines: isometric perspective, dimetric perspective, and trimetric perspective. The receding lines form an angle between 30° and 45° (to the right and to the left).

**Fig 7.** Different Cases of Axonometric Perspectives

### Trimetric Perspective

- The three angles do not have the same value: $\alpha \neq \beta \neq \gamma$
- The edges a, b, and e do not have the same value: $a \neq b \neq c$
- The dimensions a, b, and e are all less than L; $a < L$; $b < L$; $c < L$

Projection used for representation, separating edge projections as much as possible

The cube's side length = L
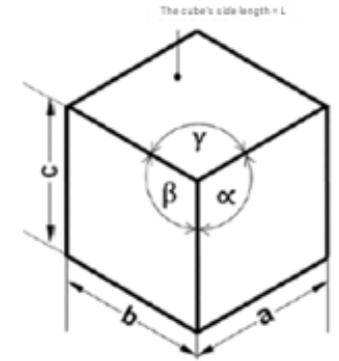
### Dimetric Perspective

- The two angles ß and y have the same value: $\beta = \gamma \alpha$
- The edges b and c have the same value: $b = c \neq a$
- The dimensions a, b, and e are all less than L; $a < L$; $b < L$; $c < L$

Projection used for representing pieces with a dominant face.

The cube's side length = L
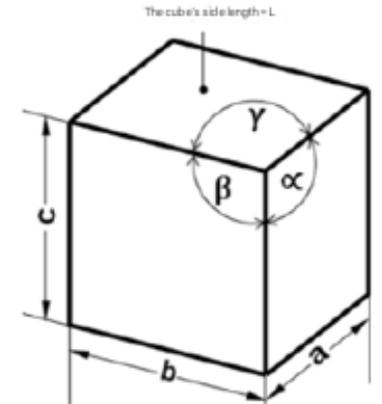
### Isometric Perspective

- Axonometric projection in which all angles are equal.
- $\alpha = \beta = \gamma = 120°$

Projection used for simple executions.

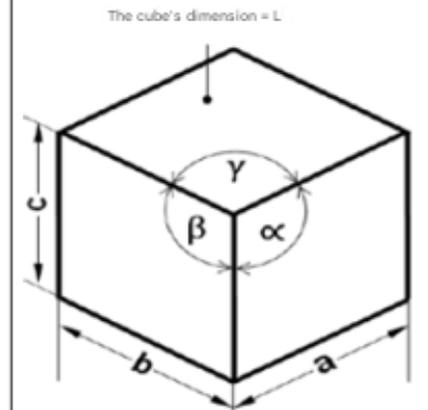Of all axonometric perspectives, it is the most commonly used.

The cube's dimension = L

# Isometric Perspective

Isometric perspective is a method of representing objects in which the three spatial directions (X, Y, and Z) are given equal importance, hence the term *isometric*, meaning "equal measures."
In an isometric representation of an object, all elements are distorted (lines, circles, etc.), except for the vertical edges, which remain vertical. All receding lines are inclined at 30° to the horizontal.
Dimensions are scaled by the coefficient **k = 0.82**. In practice, three coefficients [0.82; 0.58; 1] are required to draw the perspective.



**Fig 8.** Characteristics of Isometric Perspectives

The isometric axes are at 120° from each other. The initial orientation should be chosen to best represent the object in its natural position. For some long objects, one of the axes can be chosen to be horizontal.
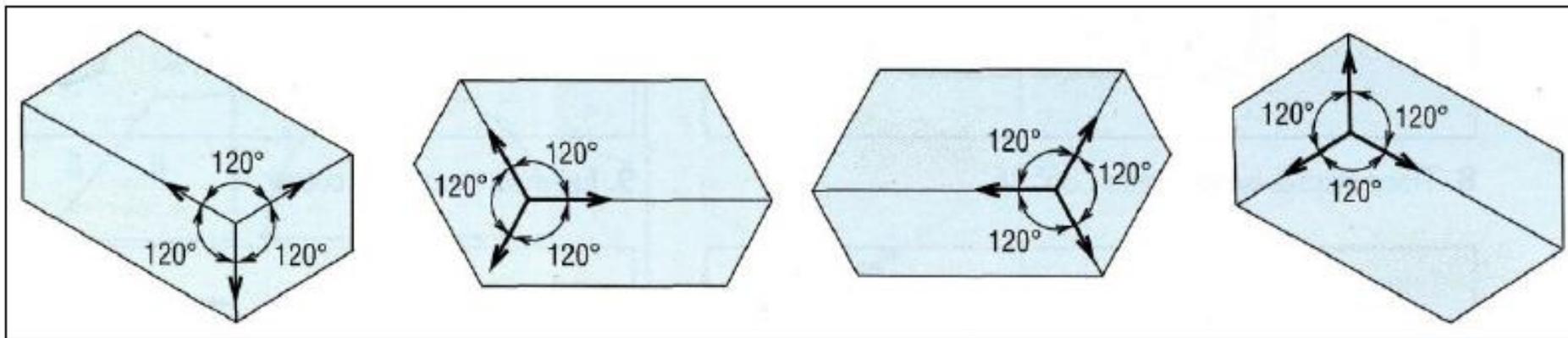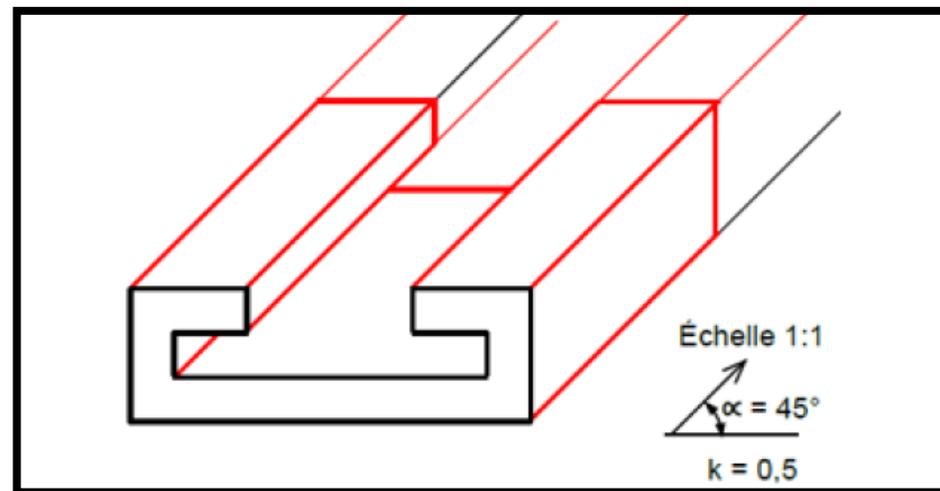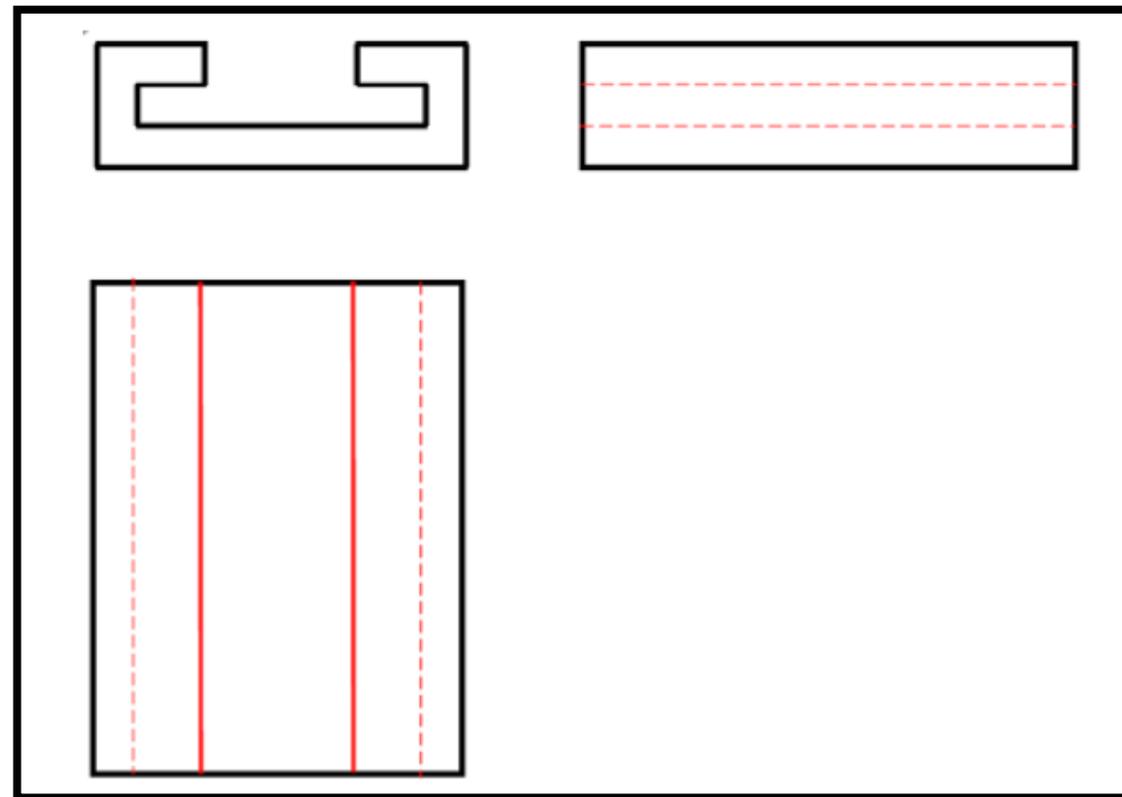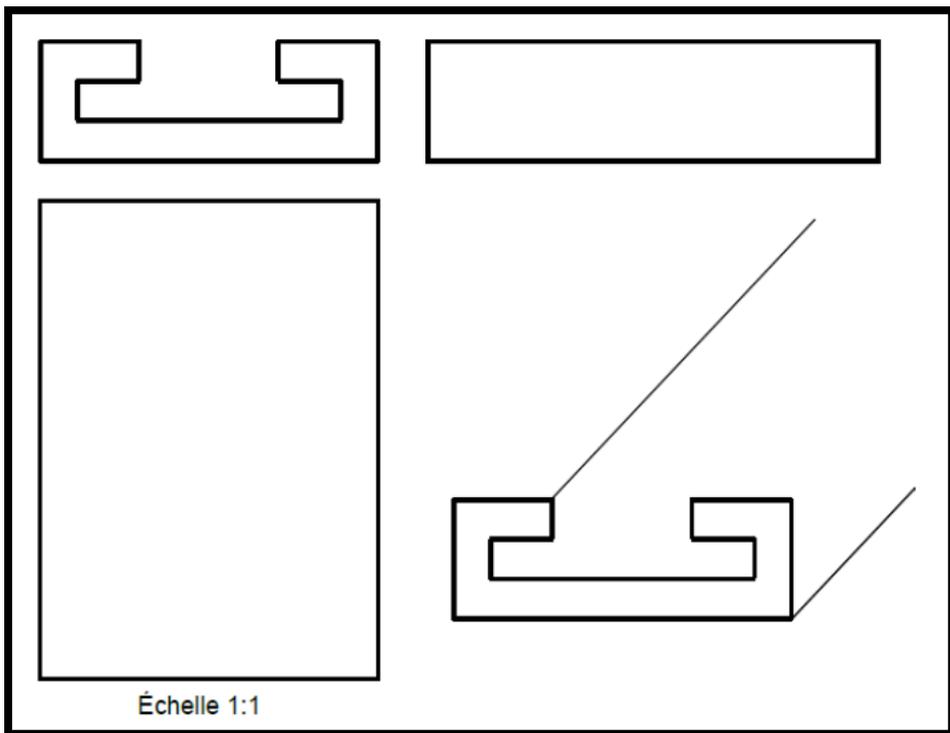


**Fig 9**. Possible Positions of the Isometric Axes

Isometric perspective gives equal visual importance to the three faces of a projected cube.

**Example**

Complete the left view and the top view, and draw the cavalier perspective based on the front view at a 1:1 scale, with k = 0.5 and ∝ = 45°.

Échelle 1:1

Échelle 1:1

∝ = 45°

k = 0,5

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