

Civil Engineering Drawing

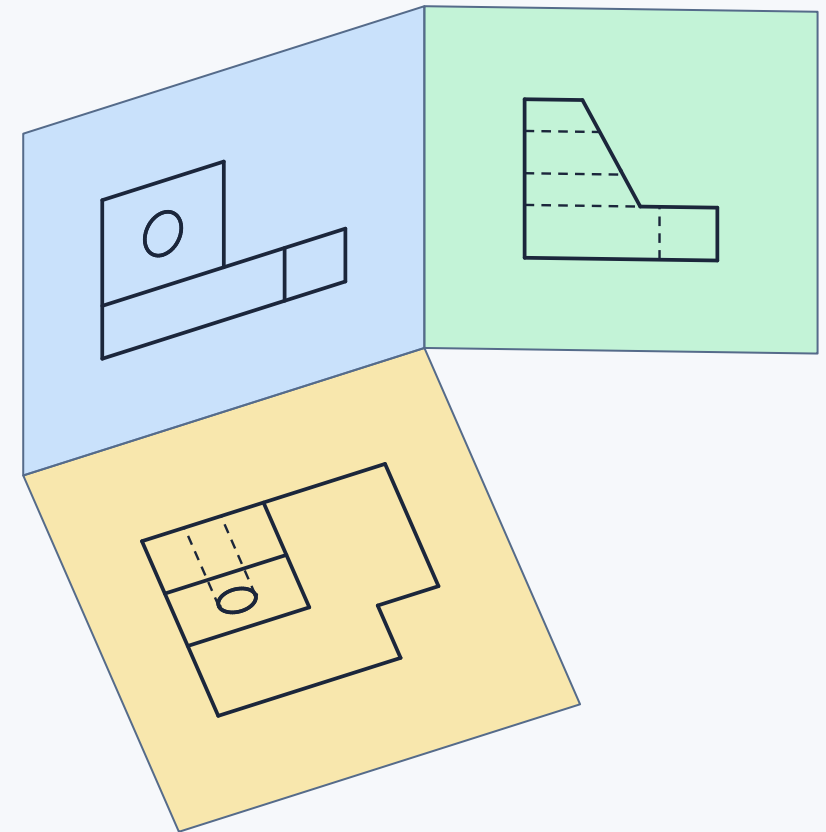
Part 2 · The Grammar of Drawing

The sheet, line types, dimensions and scale, and the first orthographic views.

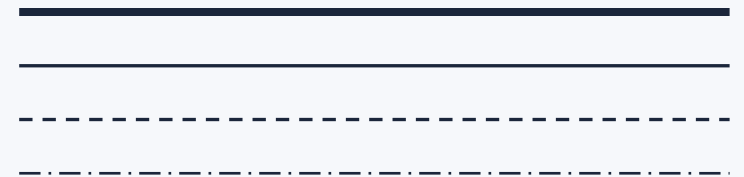
- The drawing sheet
- Line types
- Dimensions
- Scale
- Orthographic views: 3D → 2D

Asst. Prof. Dr. Abdulhadi PALA

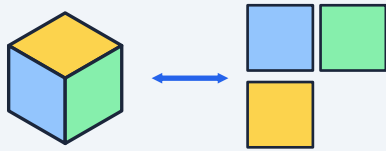
Gaziantep University · Faculty of Engineering · Civil Engineering Department · Fall 2026–2027



ORTHOGRAPHIC VIEWS · 3D → 2D

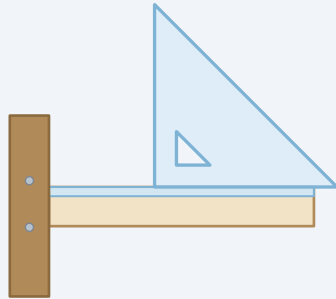


Part 1 in one slide



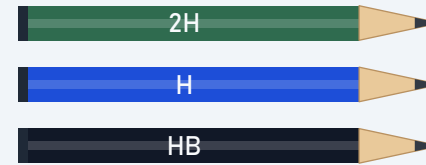
Two directions

3D → 2D: orthographic views
2D → 3D: isometric drawing



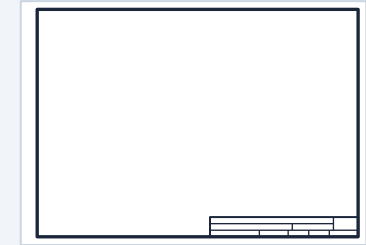
Instruments

T-square: horizontal lines
Set squares: vertical and angled lines



Pencils

2H construction · H thin
HB thick: light first, dark later



Sheets

A3 and A4 template sheets
frame and title block printed

Today

2.1

The drawing sheet

Frame and title block



2.2

Line types

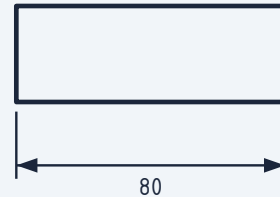
Each line has a meaning



2.3

Dimensions

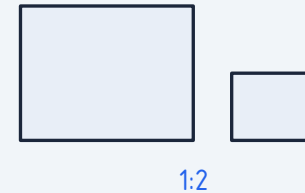
Rules for writing sizes



2.4

Scale

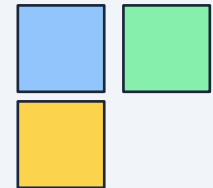
Real size and drawn size



2.5

Orthographic views

3D → 2D, first-angle



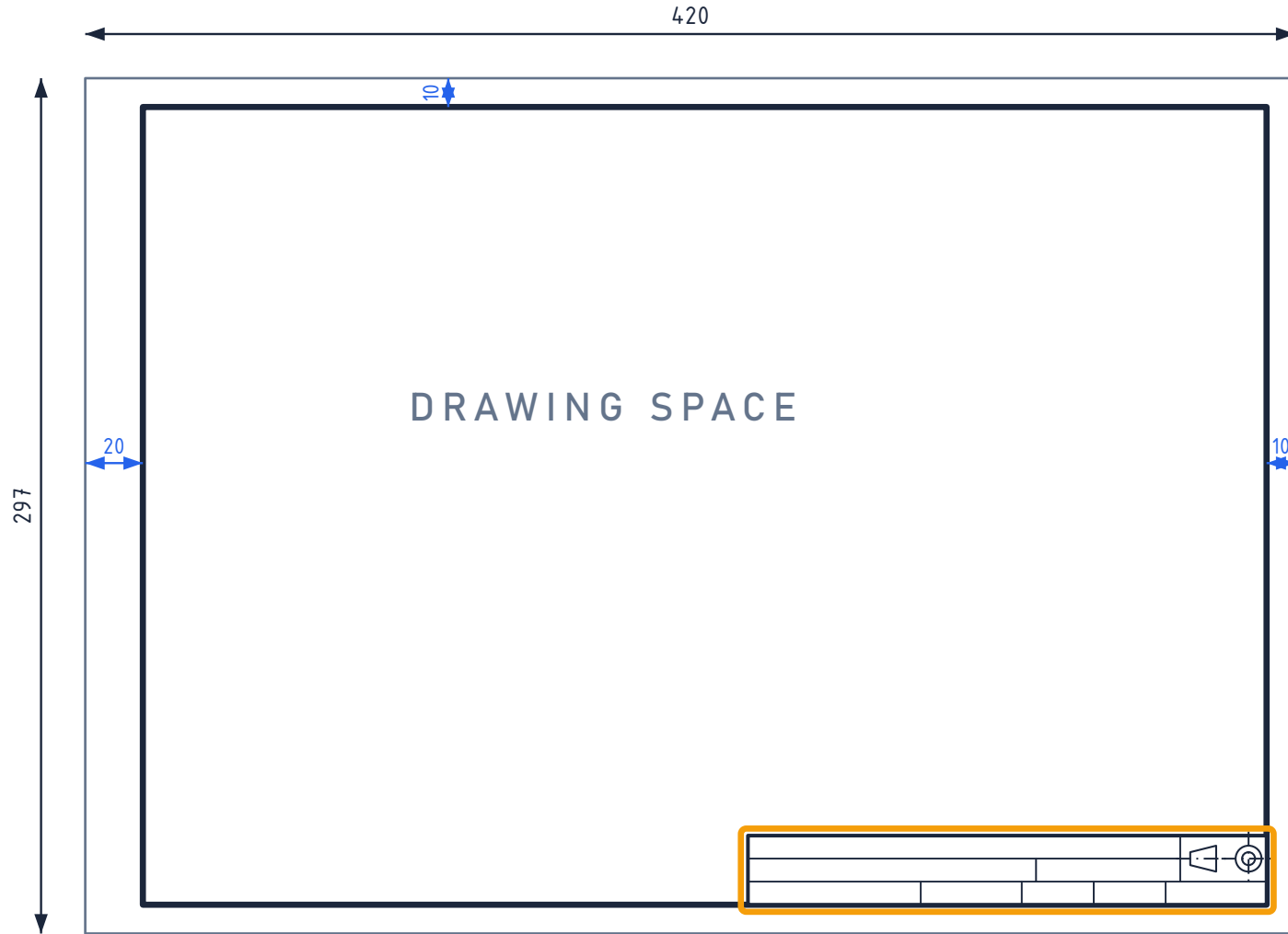
2.1

The drawing sheet

Frame, margins and the title block of our template sheets.



Anatomy of a drawing sheet



Frame

Thick continuous line (HB). The drawing stays inside it.

Filing margin

20 mm on the left, for binding and filing.

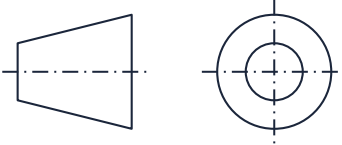
Other margins

10 mm on the top, right and bottom.

Title block

Bottom right corner, 180 mm wide.

The title block of this course

GAZİANTEP UNIVERSITY · CIVIL ENGINEERING DEPARTMENT · CE 101				
TITLE SHEET 1 – LINE TYPES		SCALE 1:1		
NAME SURNAME XXX XXX	STUDENT No. 2026xxxxxx	EDUCATION I / II I	DATE 07.10.2026	SIGNATURE 

First-angle projection symbol

Capital letters

Write every field in capital letters, like the sample.

Letter height

3.5 mm for the fields, 5 mm for the title. Use light guide lines.

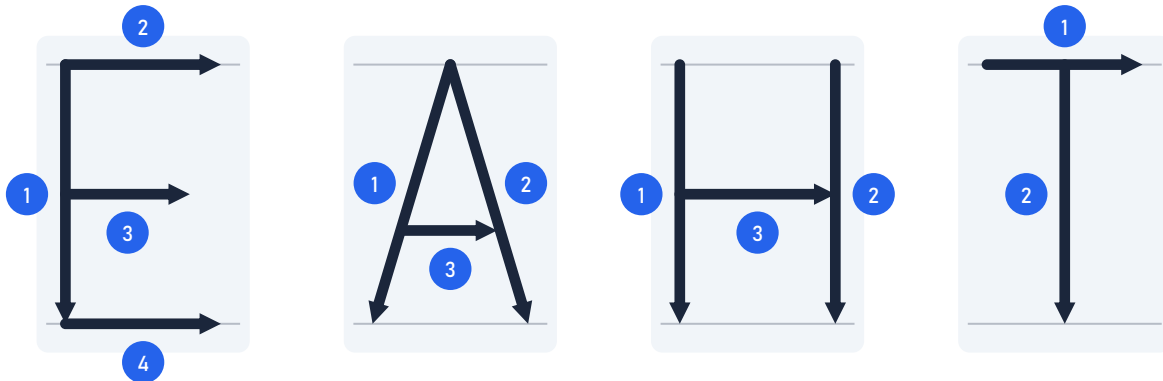
Scale

Write the scale of the drawing, for example 1:1 or 1:2.

Writing in the title block

CIVIL ENGINEERING

guide lines



✓ SCALE 1:2

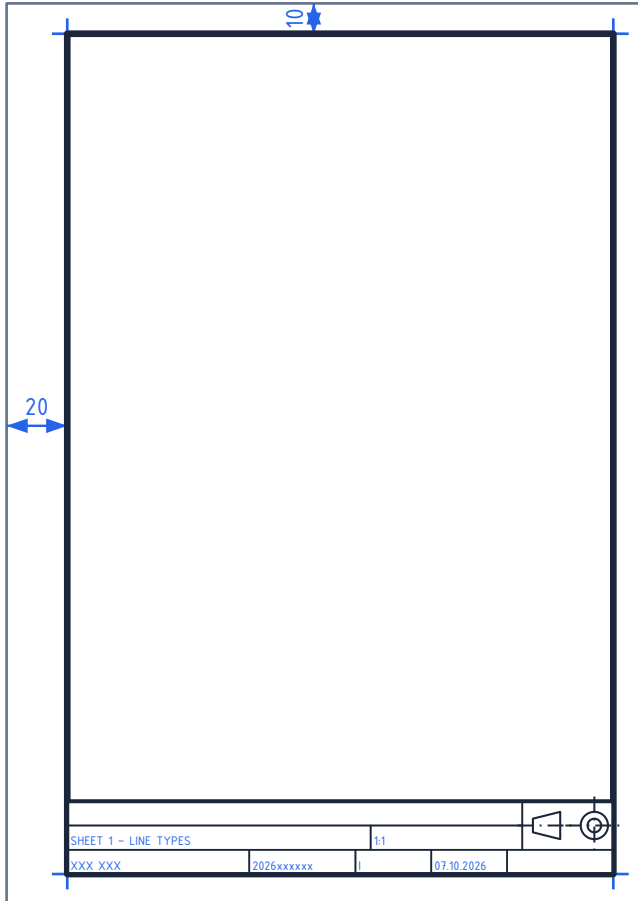
✗ *Scale 1:2*

lower case, uneven height

How to write

- Draw two light guide lines first (2H).
- Capital letters only, upright.
- Every letter touches both guide lines.
- Straight strokes: top to bottom, left to right.
- Heights: 3.5 mm in the fields, 5 mm for the title.

How the frame is drawn



- 1 Mark the corners**
Light points: 20 mm from the left edge, 10 mm from the other edges.
- 2 Draw the frame**
Thick lines (HB), with the T-square and a set square.
- 3 Draw the title block**
180 mm wide, bottom right; thin lines inside (H).
- 4 Fill it in**
Capital letters, on light guide lines.

On your template these are printed. Know them anyway: you will set them up in CAD.

Key terms



Frame

The thick border line. The drawing stays inside it.



Filing margin

The wider 20 mm margin on the left, used for binding and filing.



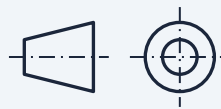
Drawing space

The area inside the frame, above the title block.



Title block

The table in the bottom right corner: who drew what, when, at which scale.



Projection symbol

Shows the method used to place the views. Ours: first-angle.

ABC

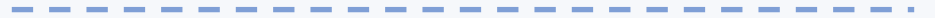
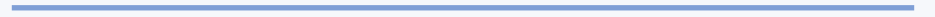
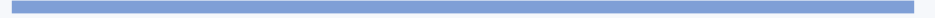
Lettering

Writing on drawings: capital letters of standard heights (3.5, 5, 7 mm).

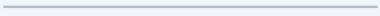
2.2

Line types

Every line has a meaning.
Read them like an alphabet.

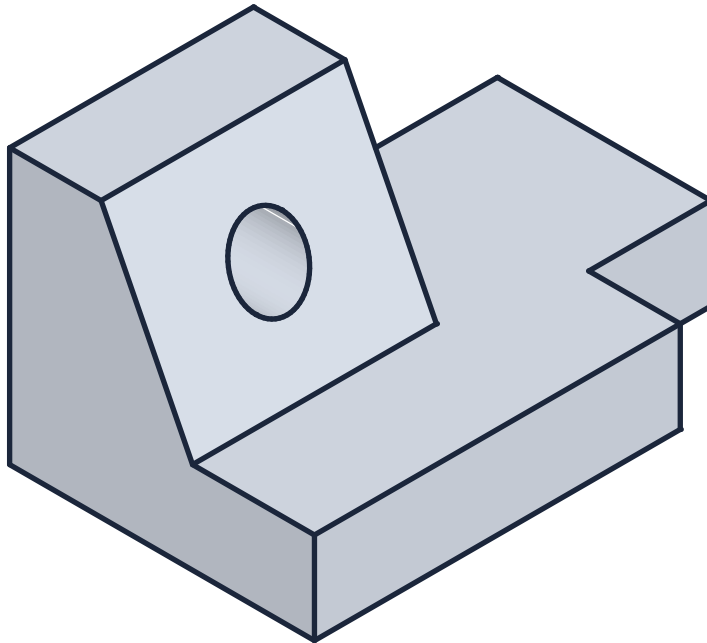


Line types and their meanings

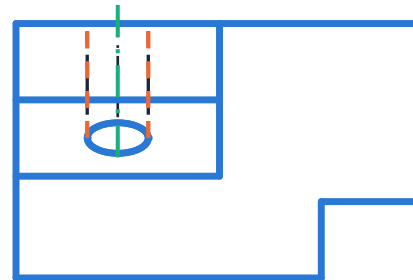
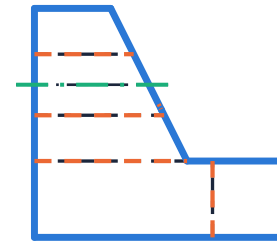
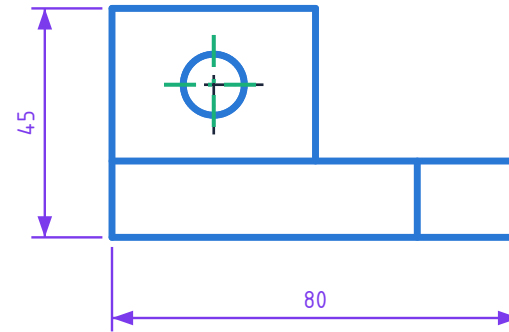
LINE	NAME (ISO 128)	USED FOR	PENCIL
	Continuous wide	Visible edges and outlines; the frame	HB
	Continuous narrow	Dimension, extension and leader lines; hatching	H
	Dashed narrow	Hidden edges	H
	Long-dashed dotted narrow	Centre lines, axes, lines of symmetry	H
	Construction line	Laying out the drawing first; stays very light	2H

Only visible edges are thick. Every other line is thin: about half as thick.

One object, every line type



ISOMETRIC DRAWING



Visible edges: continuous wide



Hidden edges: dashed narrow

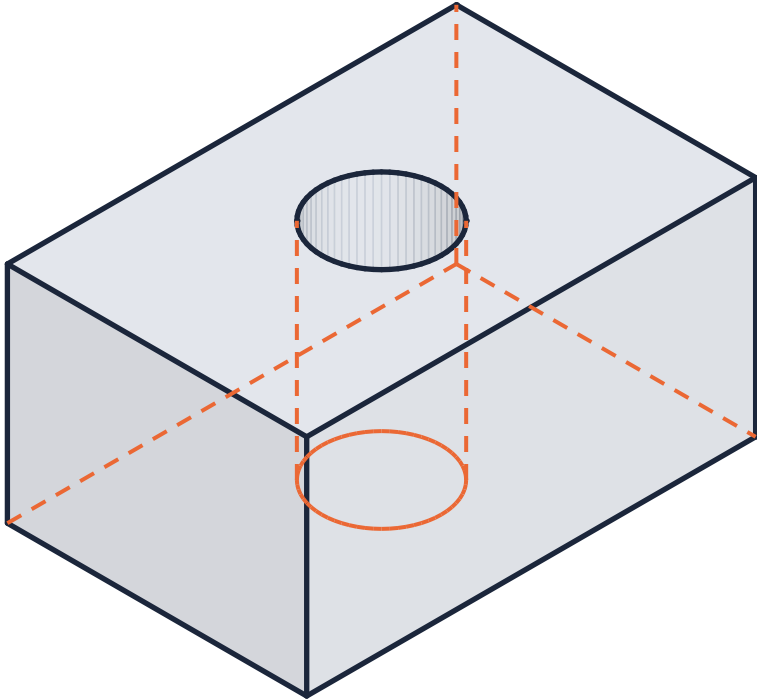


Centre lines: long-dashed dotted

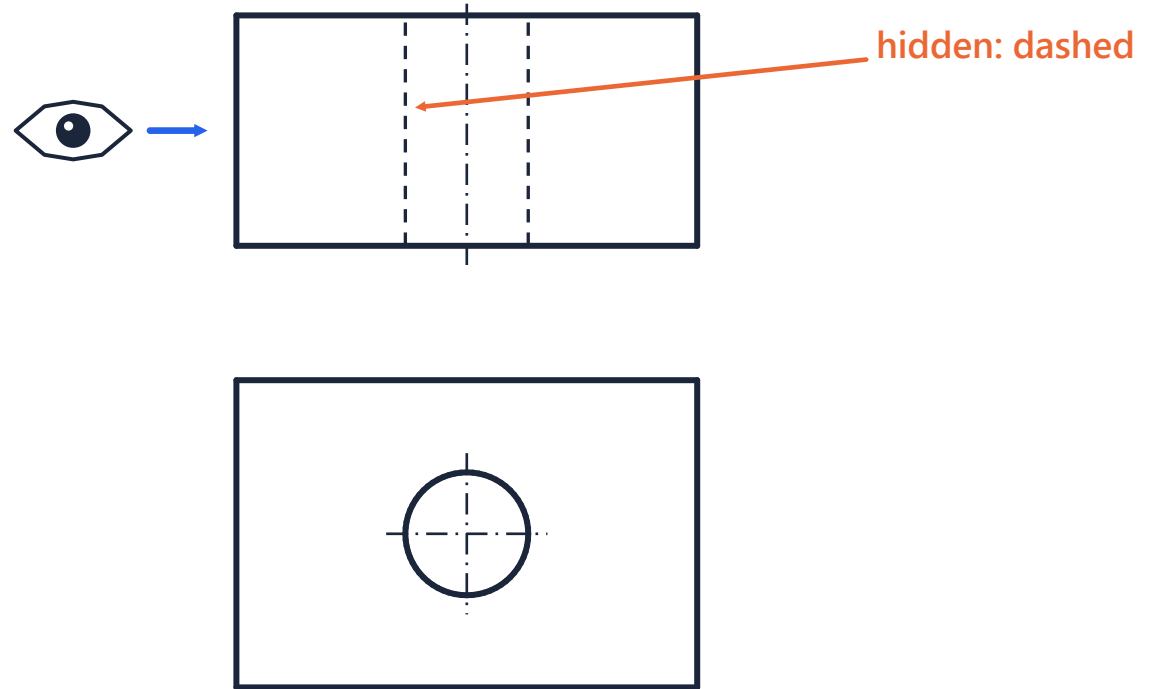


Dimensions: continuous narrow

Hidden lines: edges you cannot see



THE HOLE, SEEN THROUGH THE BLOCK



The same hole: dashed where it is hidden, a full circle where you can see it.

When two lines fall on the same place

Visible beats hidden



both fall on one place ...



... draw only this one

Visible beats centre line



both fall on one place ...

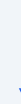


... draw only this one

Hidden beats centre line



both fall on one place ...



... draw only this one

Order of importance: visible > hidden > centre line.

Draw them right

A hidden line starts on the outline



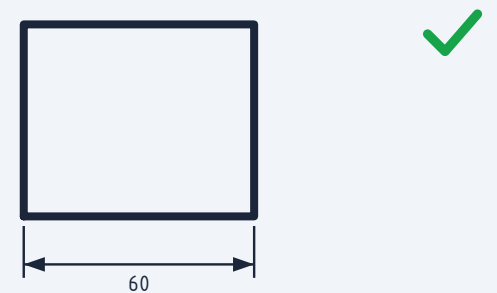
Hidden lines meet at corners



Centre lines cross on long dashes



Thick and thin must differ



These small details decide whether a drawing looks professional.

Key terms



Visible line

Continuous wide line: an edge you can see from that direction.



Hidden line

Dashed narrow line: an edge that is there but hidden behind material.



Centre line

Long-dashed dotted narrow line: the axis of a hole or the middle of a symmetric shape.



Thick and thin

Only visible edges are thick; all other lines are thin, about half as thick.



Line precedence

If lines coincide: visible, then hidden, then centre line.



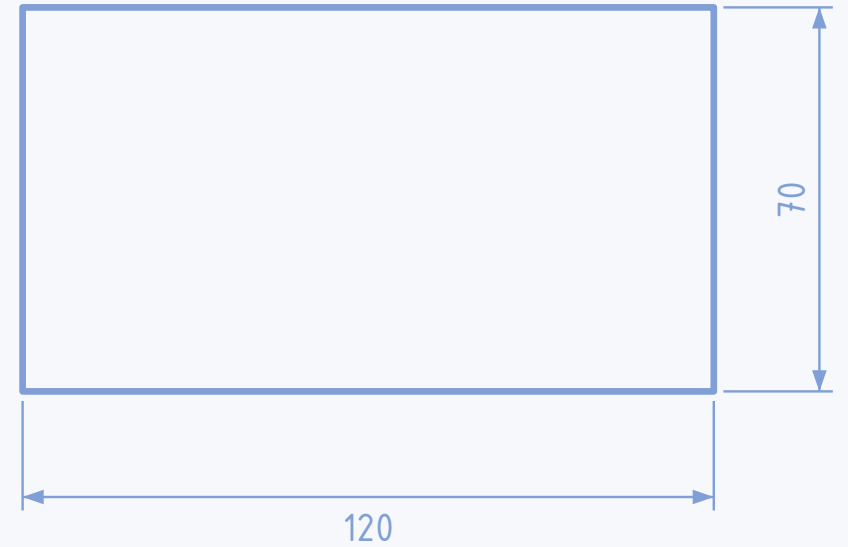
Construction line

A very light 2H line used to lay out the drawing.

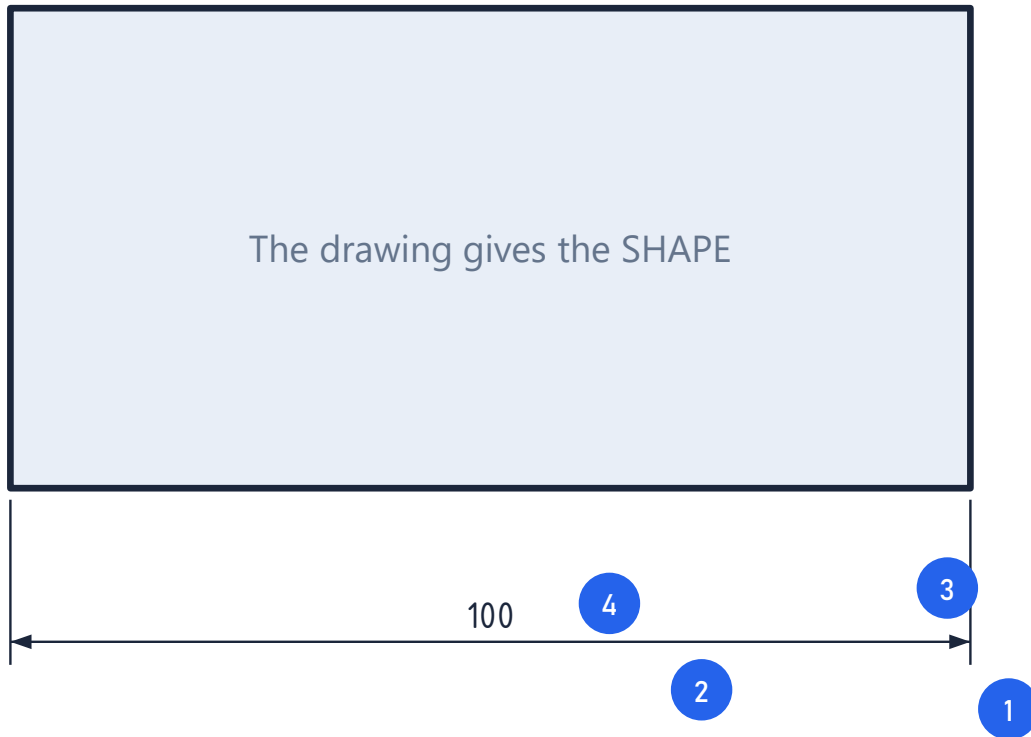
2.3

Dimensions

The drawing gives the shape.
The dimensions give the size.



The parts of a dimension



The drawing gives the SHAPE

Extension line

1

thin; starts ~1 mm from the object, ends 2–3 mm past the dimension line

Dimension line

2

thin, parallel to the measured length

Arrowheads

3

filled, narrow, touching the extension lines

Dimension value

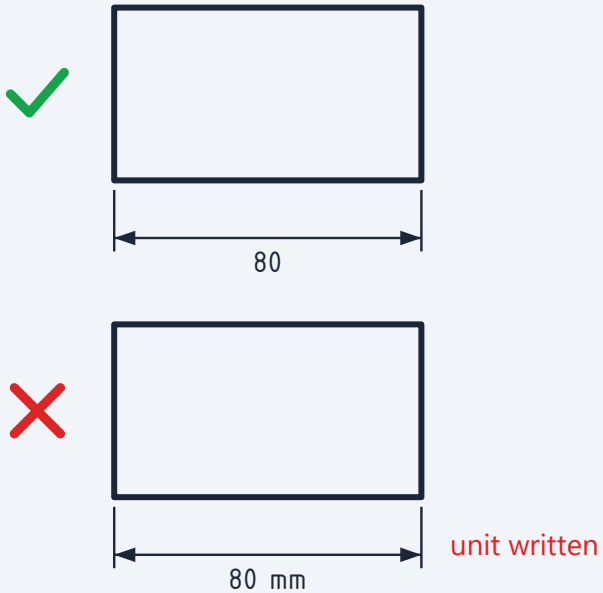
4

the REAL size in mm, above the line, no unit

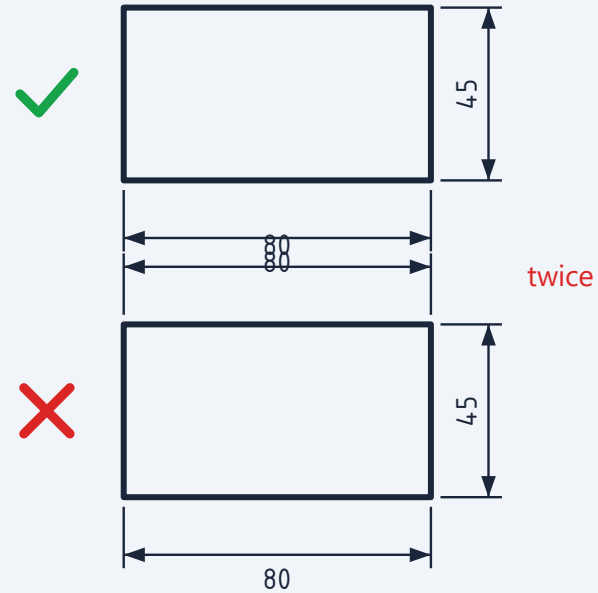
The lines give the shape. The dimensions give the size.

Dimensioning rules (1)

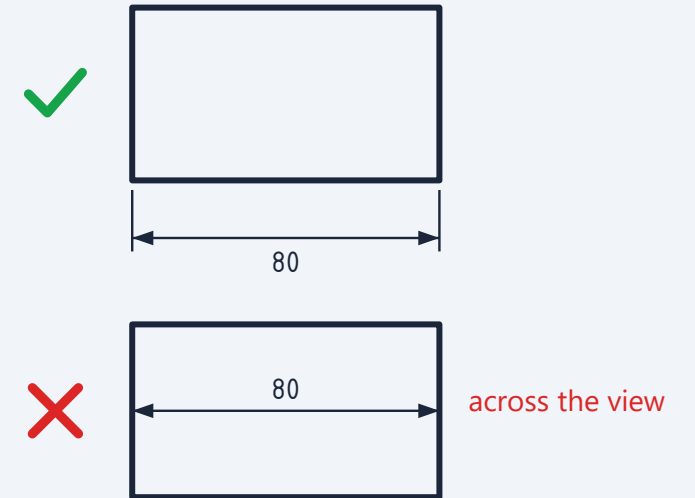
Millimetres, unit not written



Each size is given once

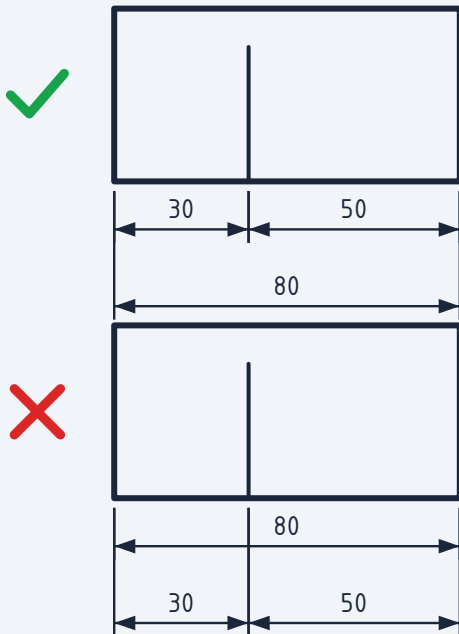


Outside the view

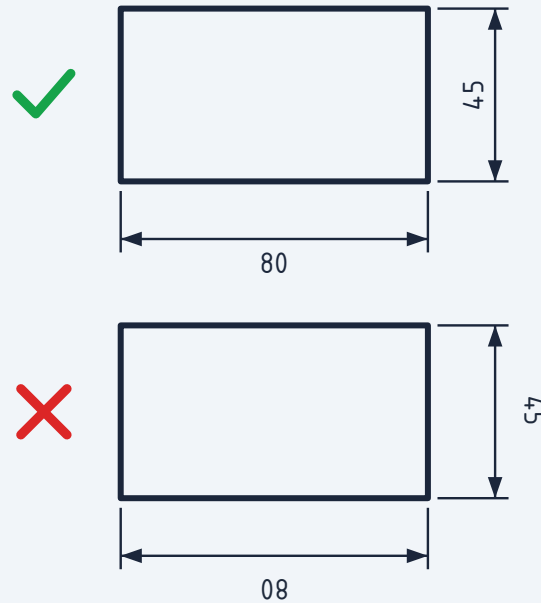


Dimensioning rules (2)

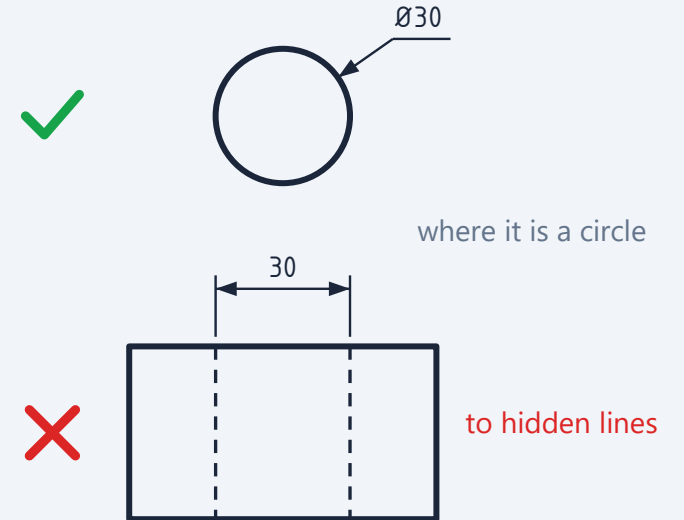
Small inside, large outside



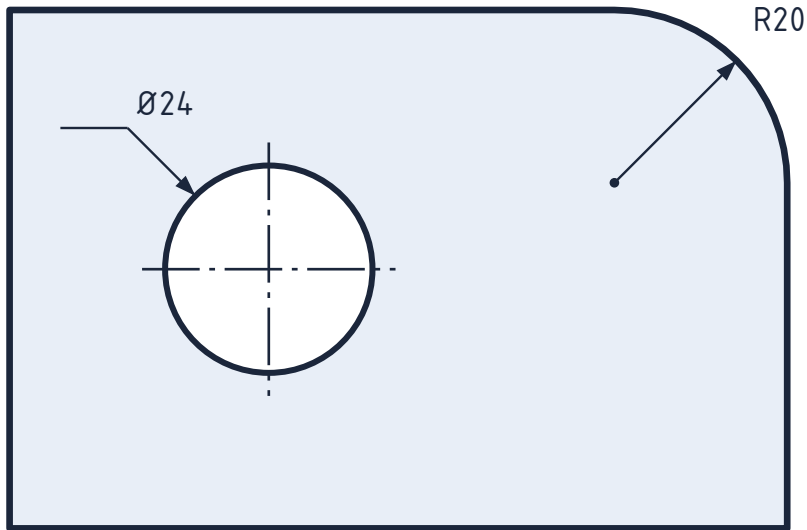
Read from the bottom or the right



Not to hidden lines



Circles and arcs: Ø and R



Ø Diameter

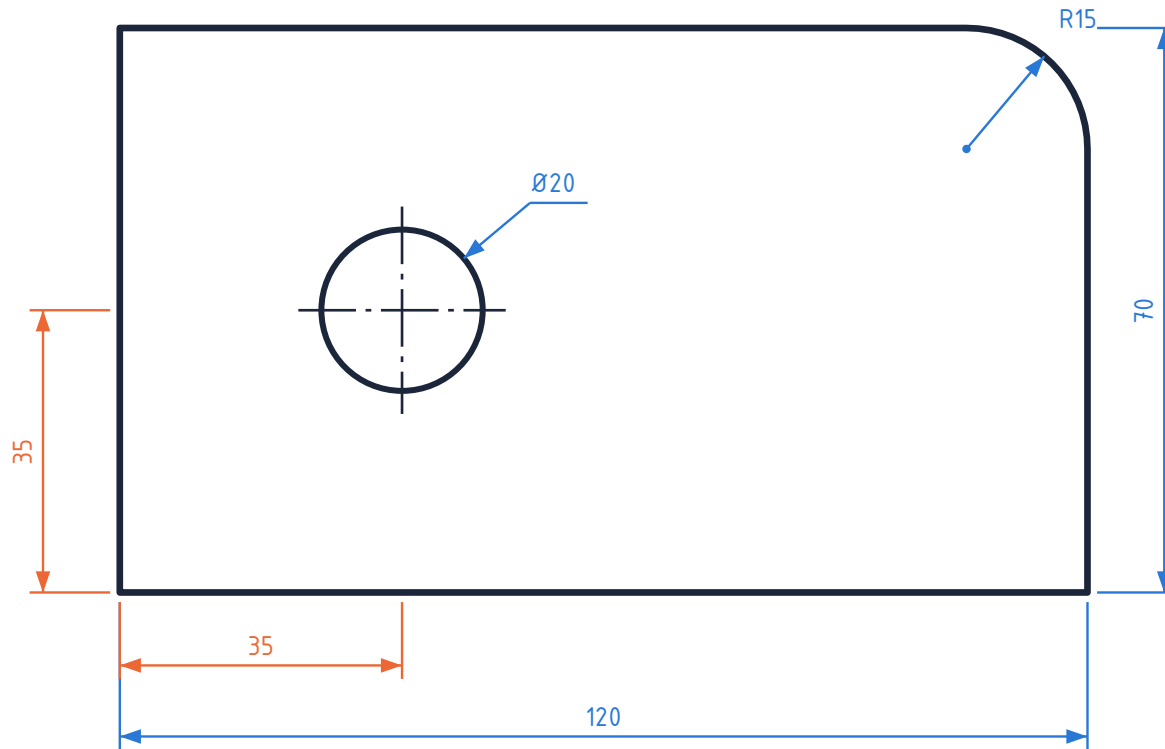
A full circle (a hole, a round column) is dimensioned by its diameter.

R Radius

An arc (a rounded corner) is dimensioned by its radius, from its centre.

Circle → Ø (diameter). Arc → R (radius).

A fully dimensioned plate



Size dimensions

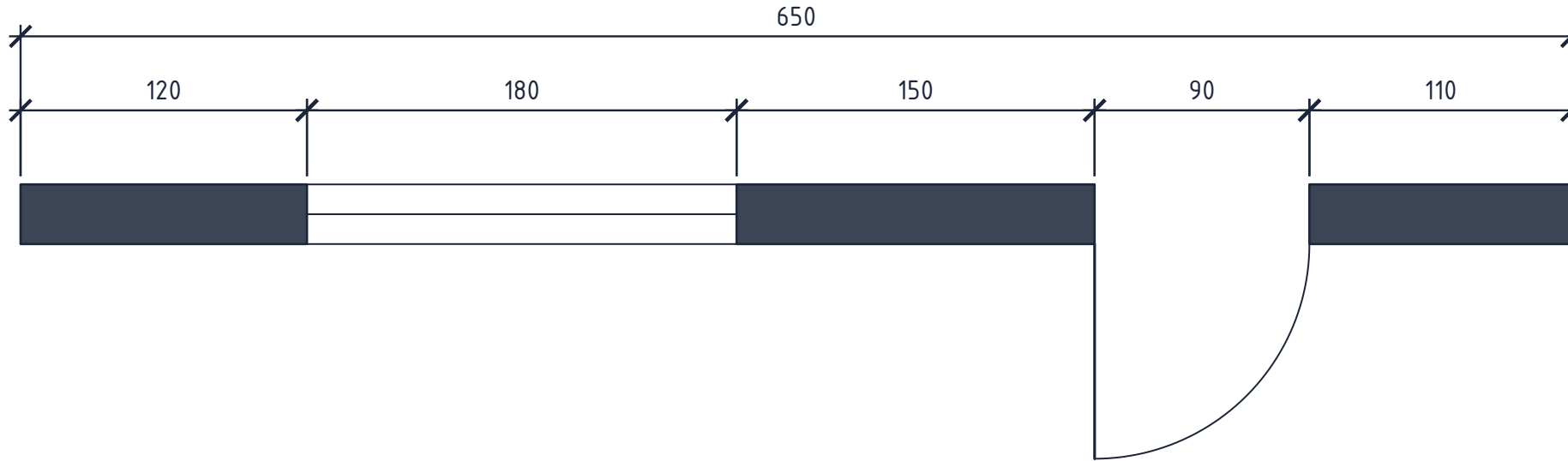
How big: length, height, $\varnothing$ of the hole, R of the corner.

Location dimensions

Where: the position of the hole's centre.

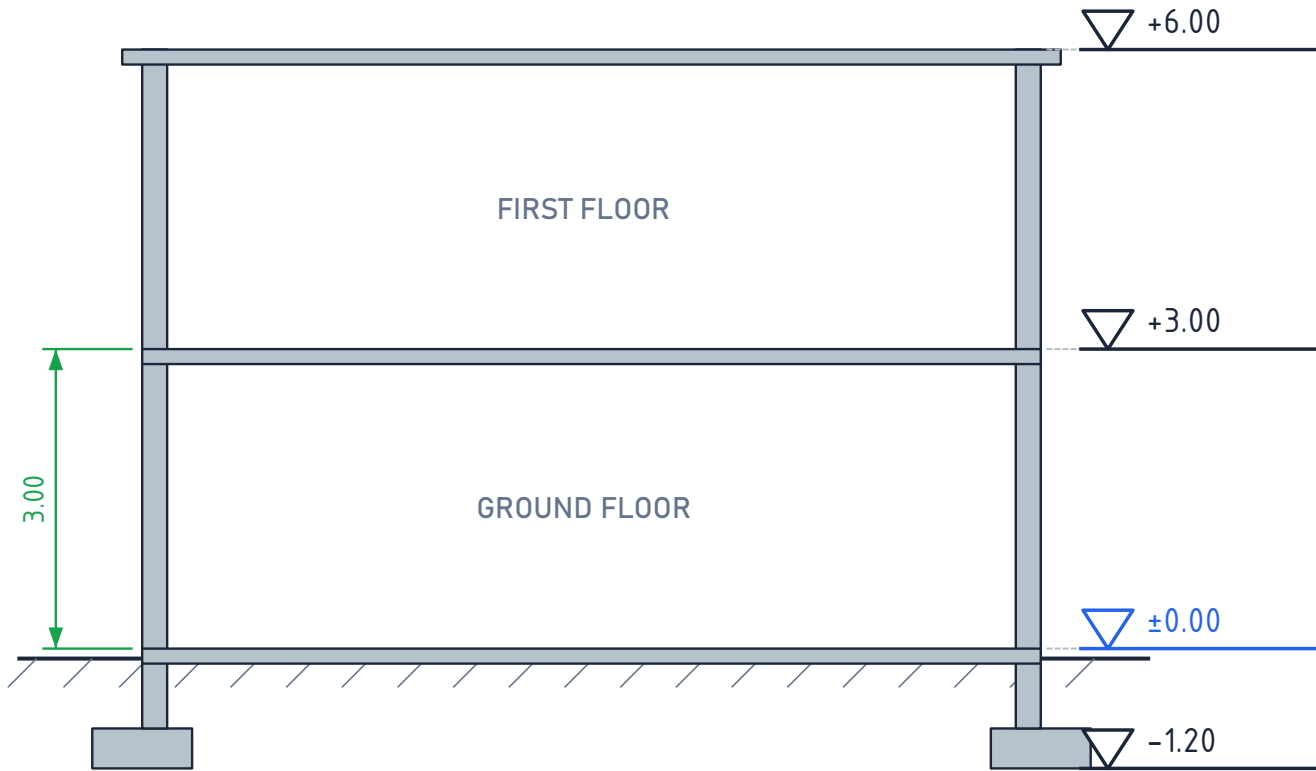
Complete: nothing to guess, nothing repeated.

Dimensions on building drawings



- Units: often centimetres on architectural plans (the sheet says so)
- Oblique ticks instead of arrowheads
- Chains of dimensions, with the overall size outside
- Heights are shown with level marks (next slide)

Levels: heights on building drawings



Reference level ±0.00

Usually the finished floor at the entrance. Every other height is measured from it.

Above: +

+3.00 is 3 m above ±0.00: the first floor.

Below: —

-1.20 is 1.20 m below ±0.00: the bottom of the foundation.

Heights between levels

$+3.00 - \pm 0.00 = 3.00$ m: the storey height.

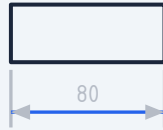
Levels are in metres; the tip of the triangle touches the surface.

Key terms



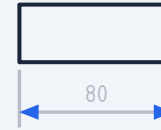
Extension line

Thin line that carries an edge of the object out to the dimension.



Dimension line

Thin line with arrowheads, parallel to the measured length.



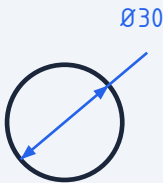
Arrowhead

The filled end of a dimension line. Building plans often use oblique ticks.



Dimension value

The number: the real size in millimetres, no unit written.



Diameter Ø

The size of a full circle, measured through its centre.



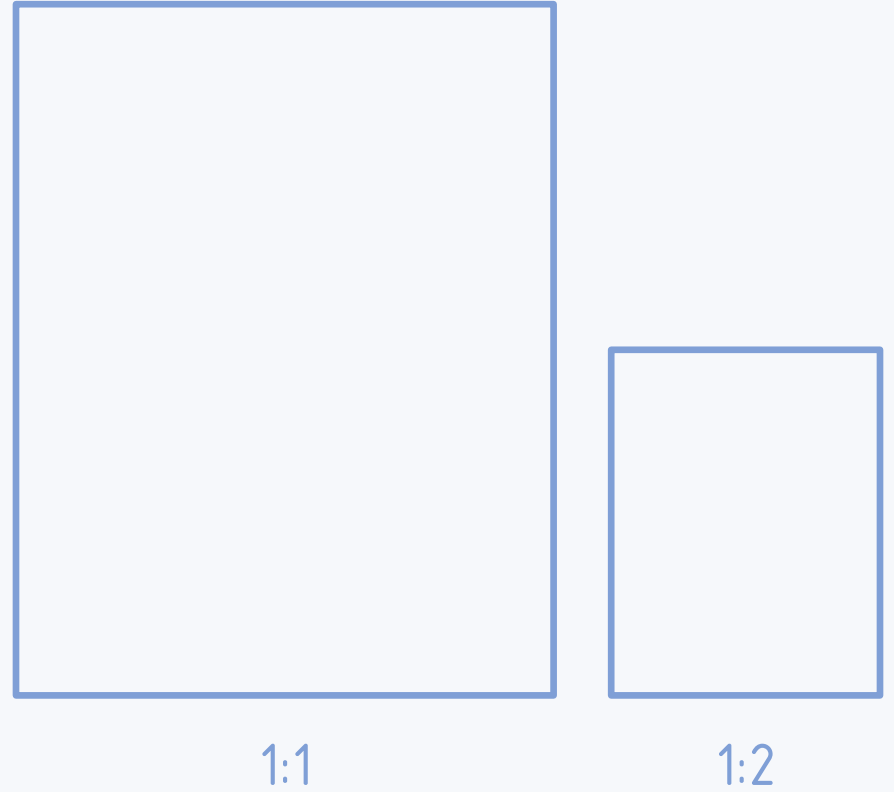
Radius R

The size of an arc, from its centre to the curve.

2.4

Scale

Large objects on small sheets,
and why the numbers never change.



What is a scale?

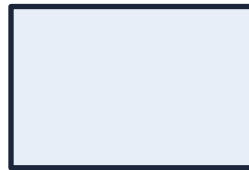
SCALE = drawing size : real size

1:50 → 1 mm on paper is 50 mm in reality.



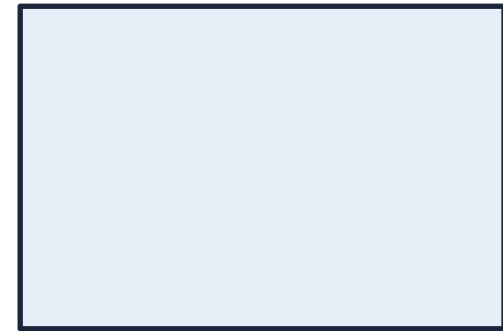
1:2 **Reduction**

Drawing smaller than the object: plans, sections, details



1:1 **Full size**

Drawing the same size as the object



2:1 **Enlargement**

Drawing larger than the object: small parts (rare in civil)

Common scales in civil engineering

1:1 1:2 1:5

Small details, connections, full-size parts

1:10 1:20

Construction and reinforcement details, beam and column sections

1:50

Building plans, sections and elevations

1:100

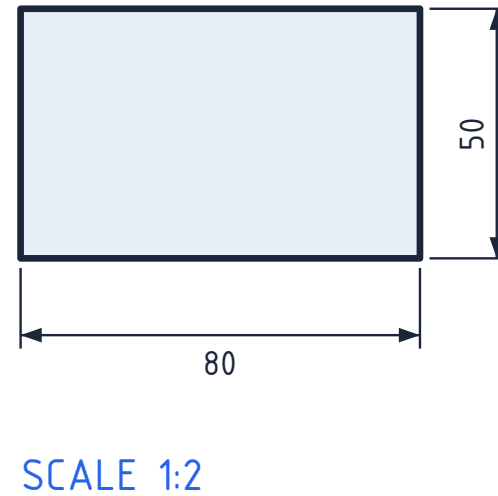
Plans and elevations of whole buildings

1:200 1:500 1:1000

Site plans, layouts, maps

Recommended scales (ISO 5455): 1, 2 and 5, and their multiples of 10.

The golden rule of scale



Whatever the scale, the dimensions are always the REAL sizes of the object.

Working with a scale

Real → drawing: divide

A wall 4000 mm long, at 1:50

$$4000 \div 50 = 80 \text{ mm on the paper}$$

Drawing → real: multiply

A line 50 mm long, on a 1:5 drawing

$$50 \times 5 = 250 \text{ mm} = 25 \text{ cm}$$

1 A beam 6 m long is drawn at 1:20. How long is it on the paper?

$$6000 \div 20 = 300 \text{ mm}$$

2 On a 1:100 plan a room measures 36 mm. How long is it really?

$$36 \times 100 = 3600 \text{ mm} = 3.6 \text{ m}$$

Key terms

1:50 Scale

Size on the drawing : real size.
Written in the title block, e.g. SCALE
1:50.

1:1 Full size

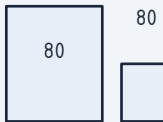
Scale 1:1: the drawing is as big as
the object.

1:100 Reduction scale

Drawing smaller than the object: 1:2,
1:5, 1:10 ... 1:100.

2:1 Enlargement scale

Drawing larger than the object: 2:1,
5:1, 10:1.



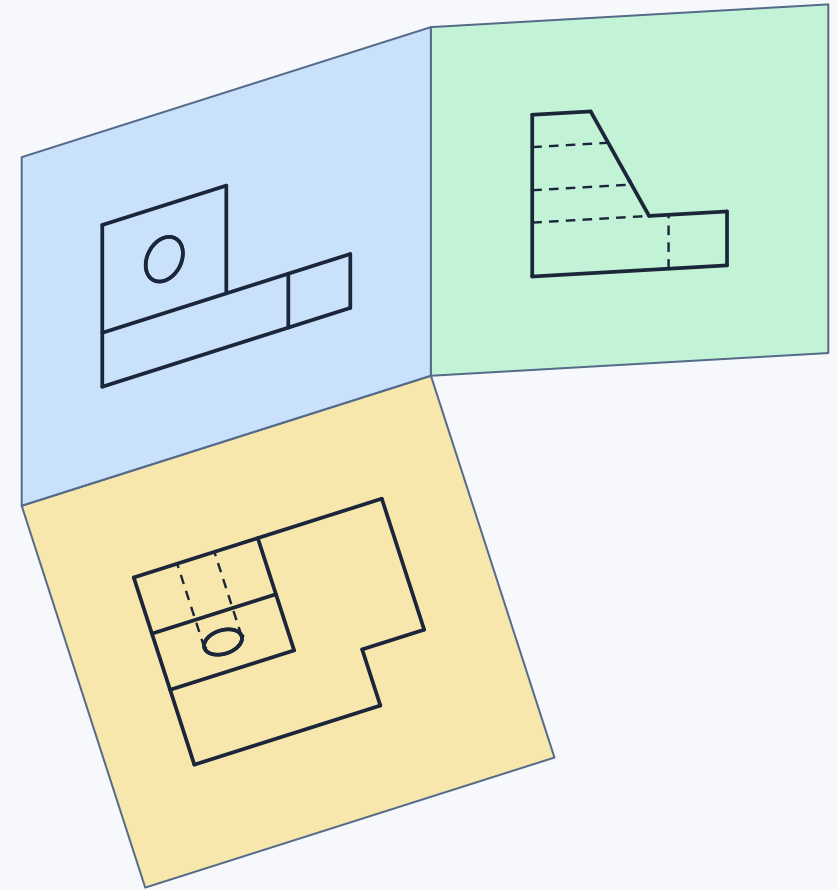
Real size

The true size of the object: always
the number written on the drawing.

2.5

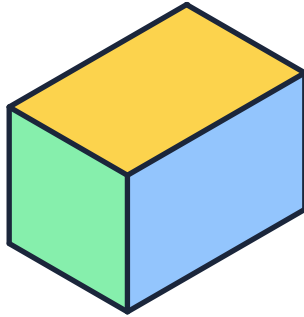
Orthographic views

From a 3D object to 2D views:
3D → 2D, the first-angle way.

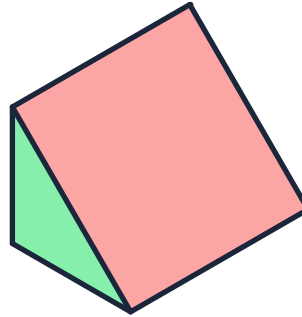


One view is not enough

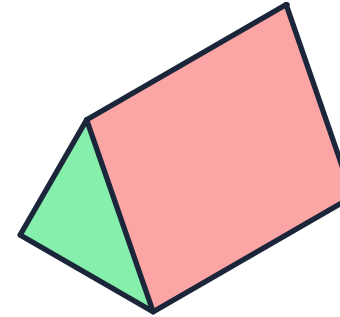
3D



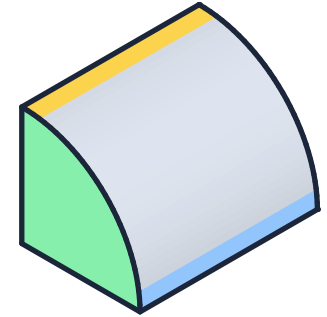
Block



Ramp



Roof



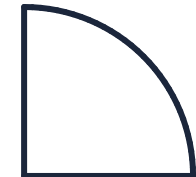
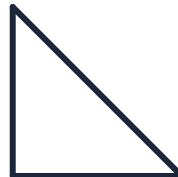
Quarter round

FRONT

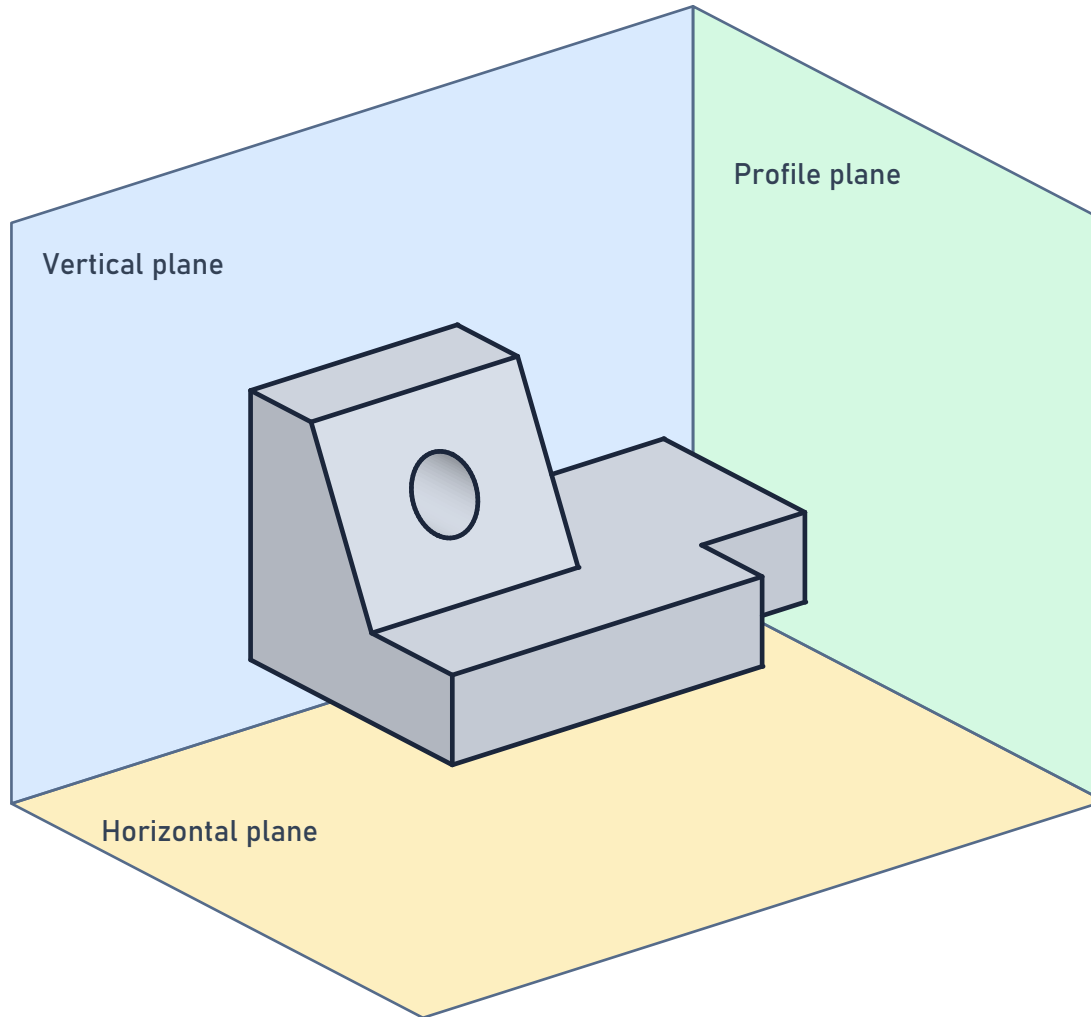


The same front view ... four different objects.

SIDE



First-angle projection: the glass box

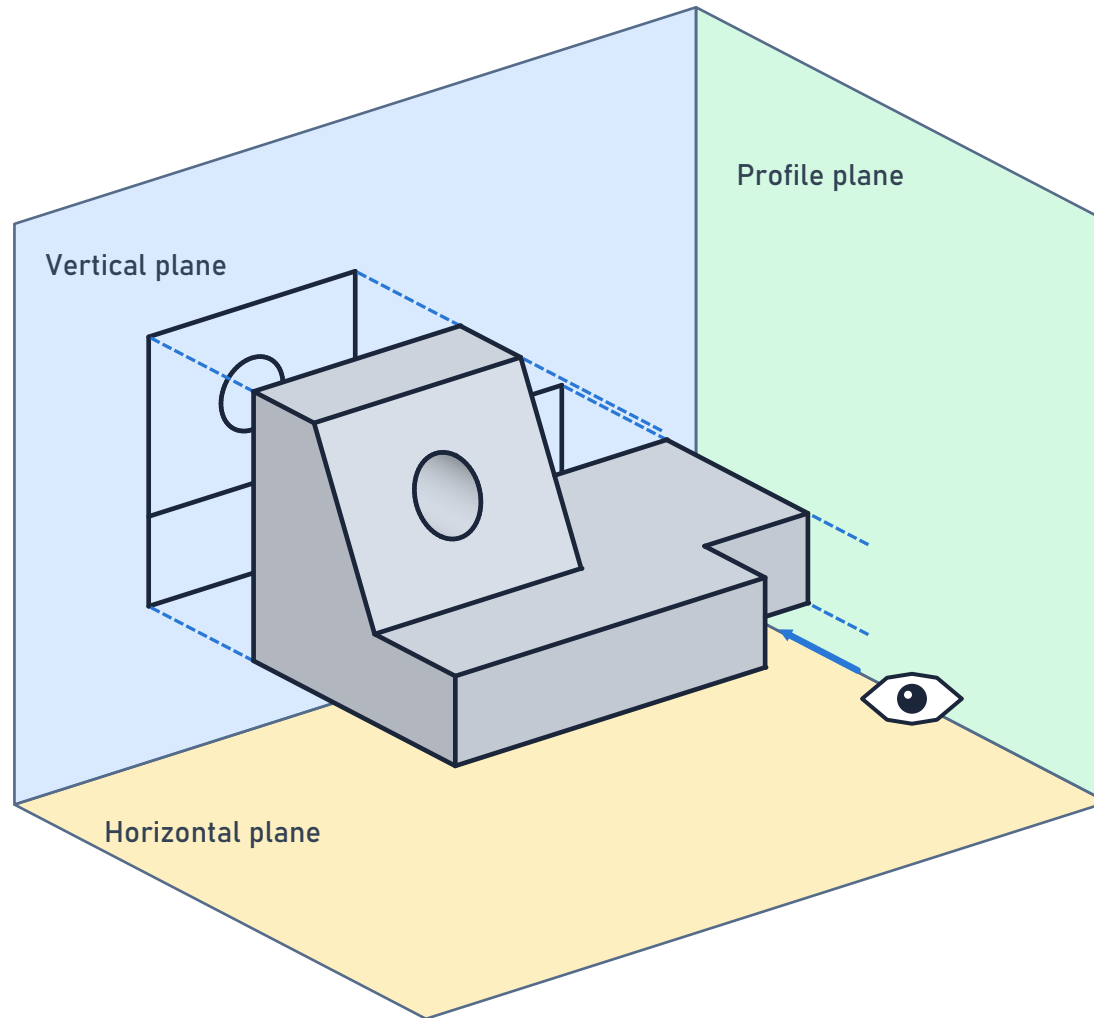


1 Three planes

The object sits in front of three planes: one behind it, one below it and one on its right. You stand in front of it.



First-angle projection: the glass box

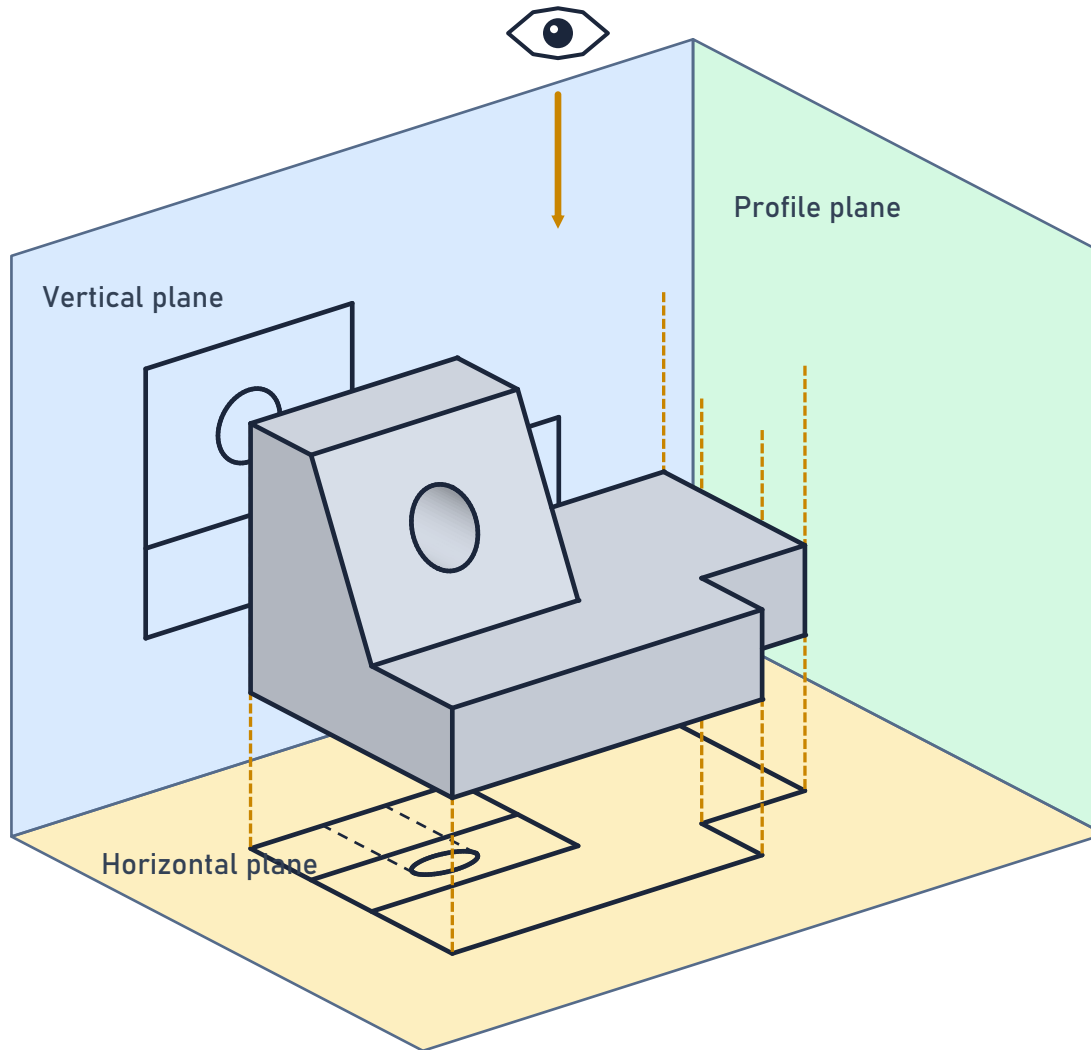


2 Front view

Look from the front. Parallel lines of sight carry every edge straight to the plane BEHIND the object.



First-angle projection: the glass box

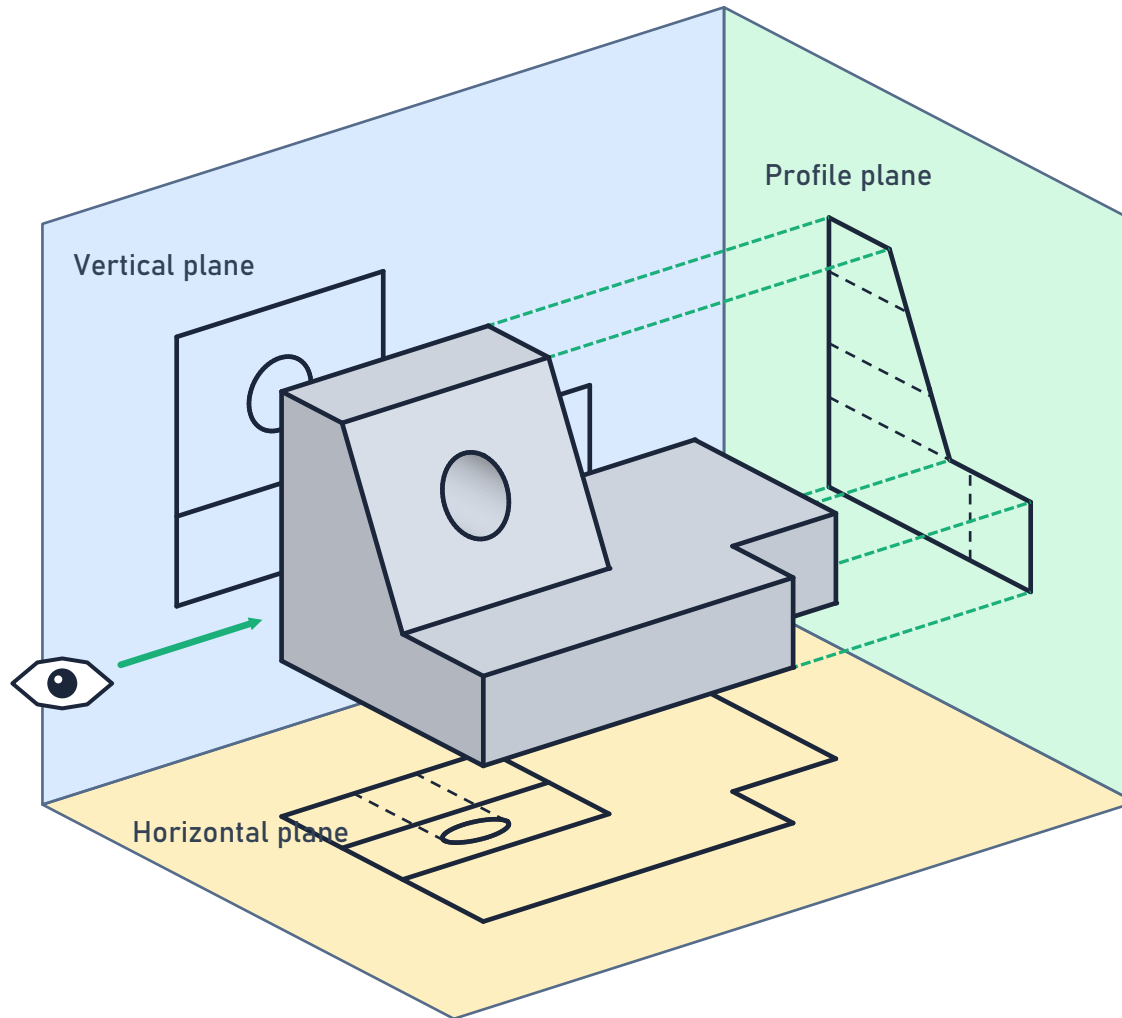


3 Top view

Look from above. The top view falls on the plane BELOW the object.



First-angle projection: the glass box

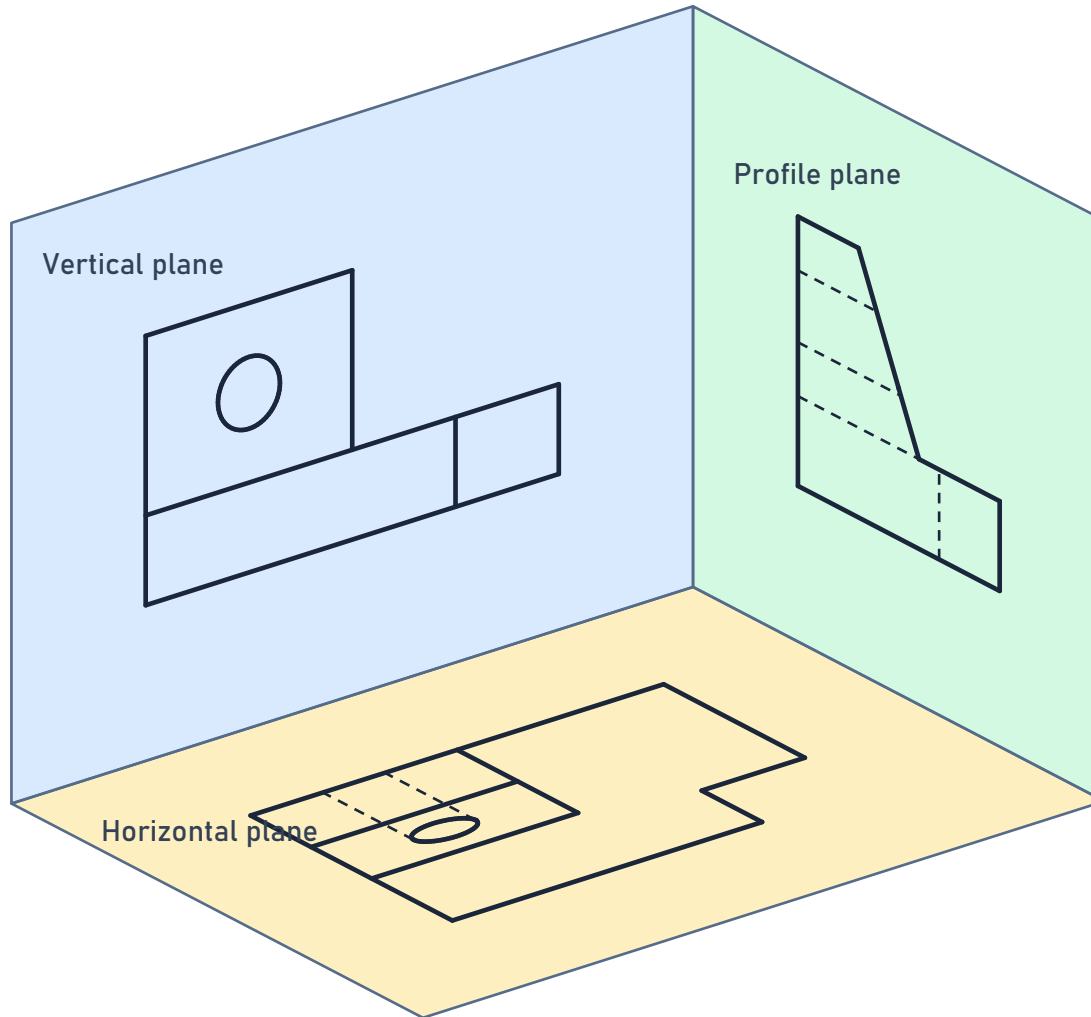


4 Left side view

Look from the left. The left side view falls on the plane on the RIGHT.



First-angle projection: the glass box

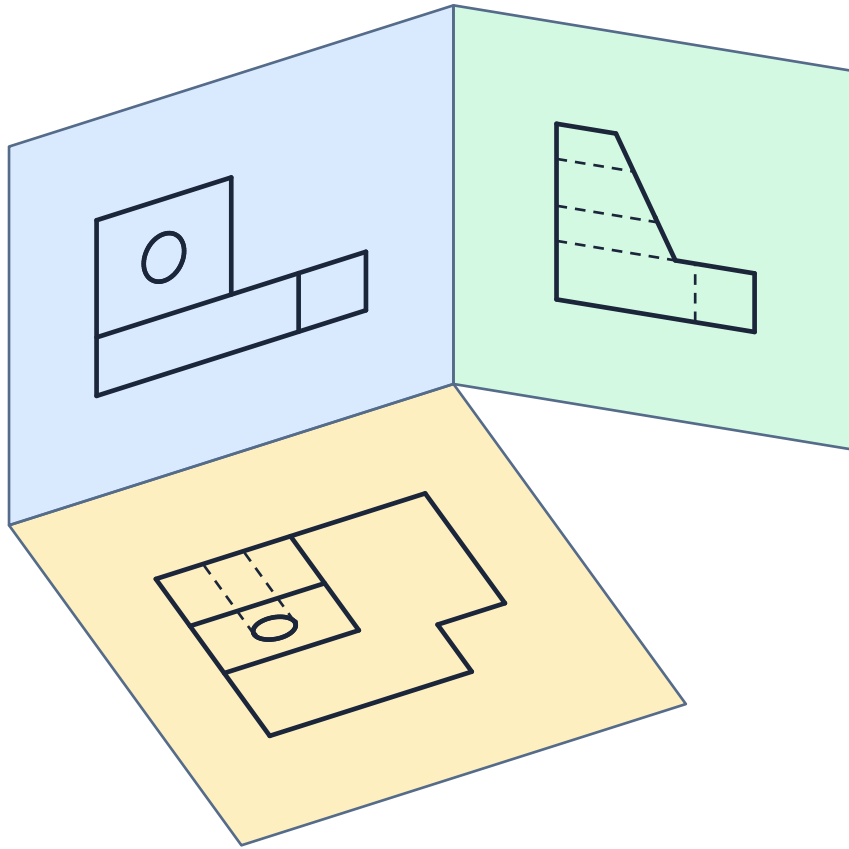


5 Remove the object

Three views remain, one on each plane.



First-angle projection: the glass box

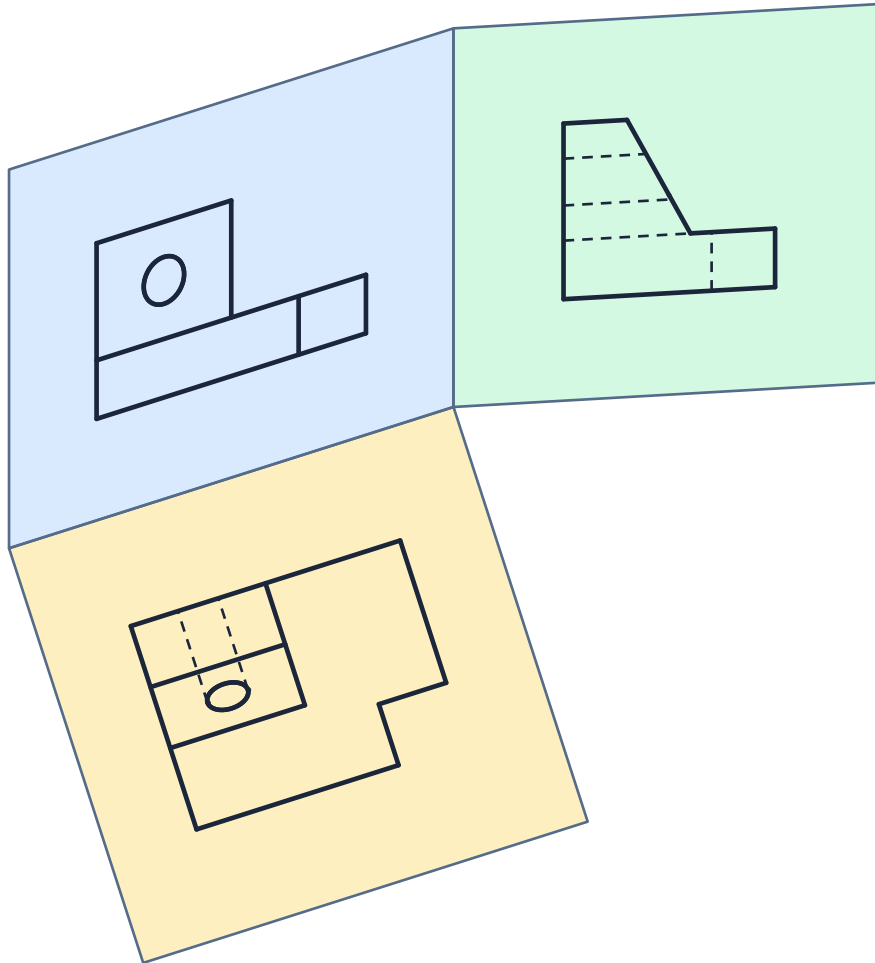


6 Open the box

The lower plane turns down; the right-hand plane turns to the right.



First-angle projection: the glass box

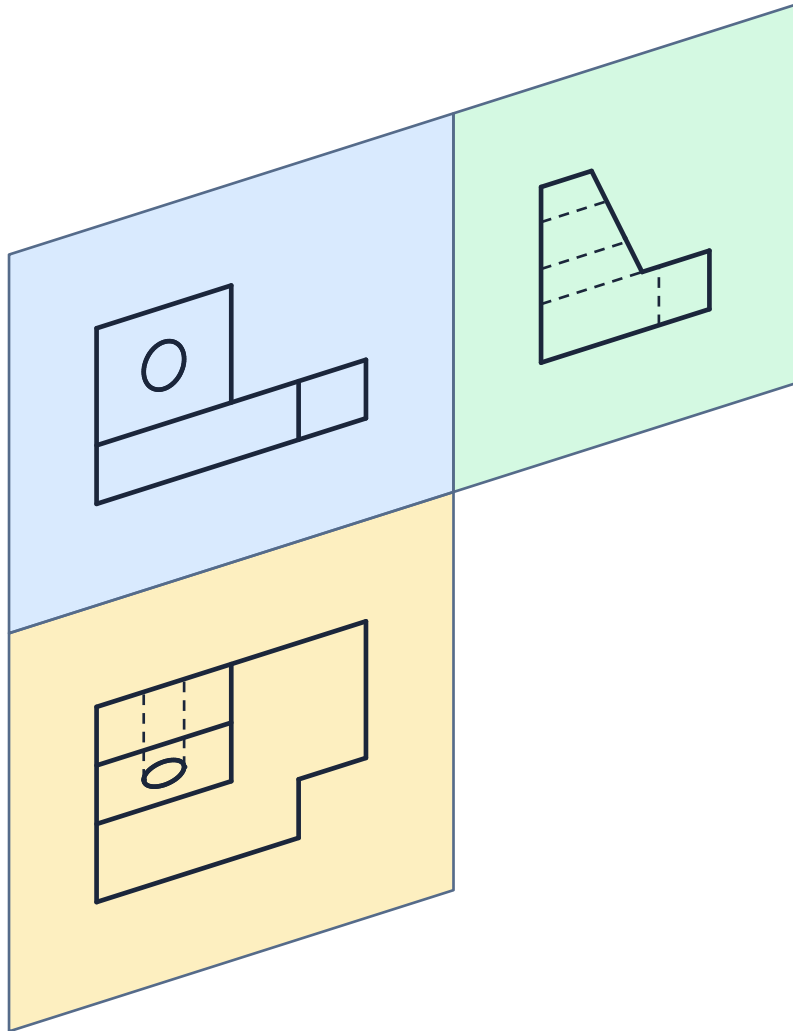


6 Open the box

The lower plane turns down; the right-hand plane turns to the right.



First-angle projection: the glass box

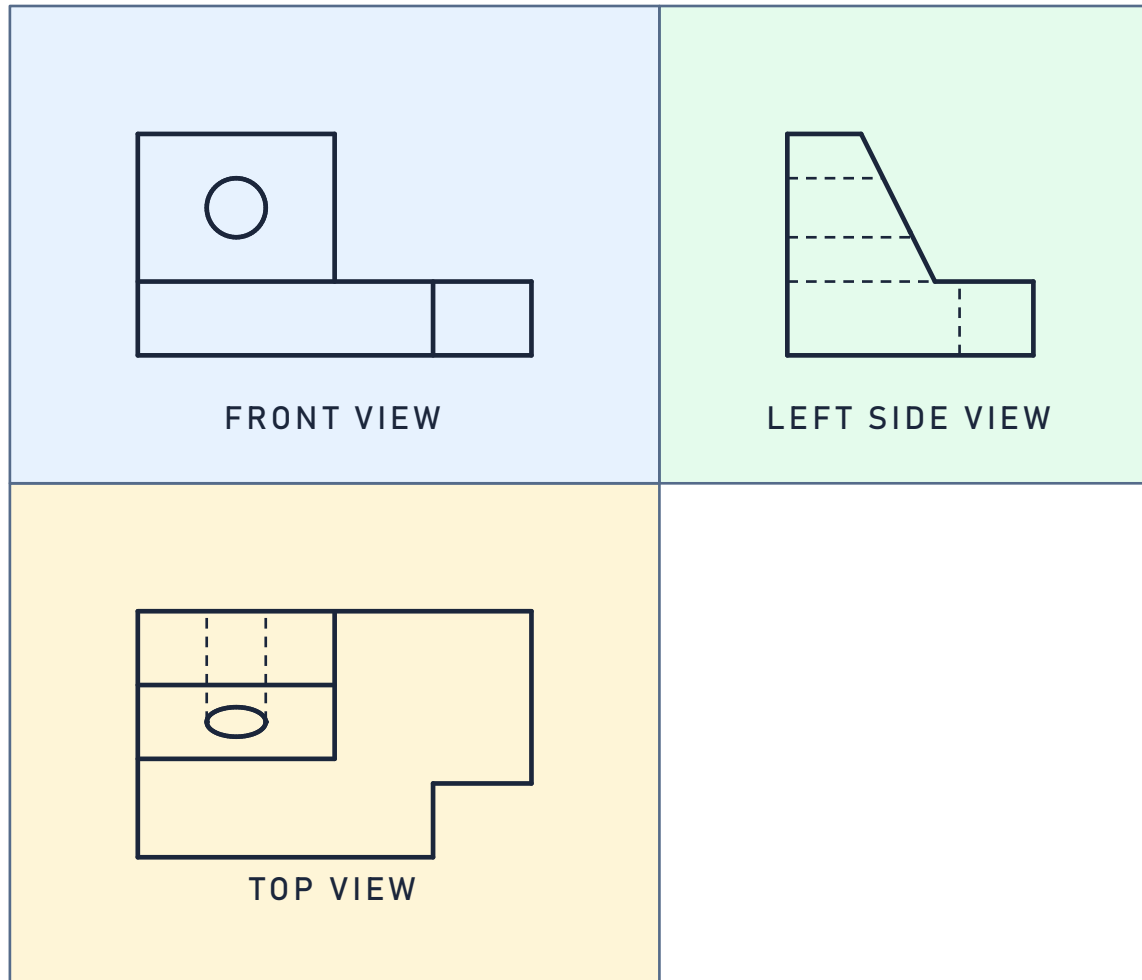


6 Open the box

All three planes now lie in one flat surface: the drawing sheet.



First-angle projection: the glass box

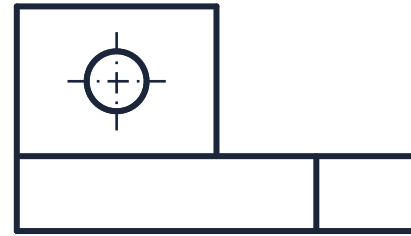
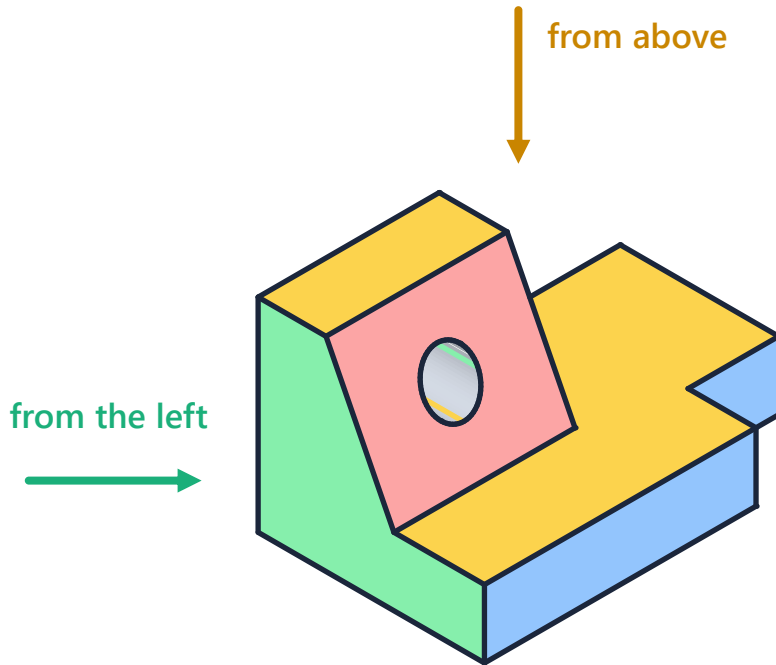


7 First-angle layout

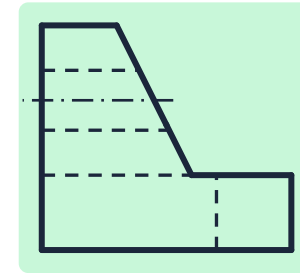
Top view BELOW the front view. Left side view on the RIGHT of the front view.

First angle: each view lies on the side opposite to where you look from.

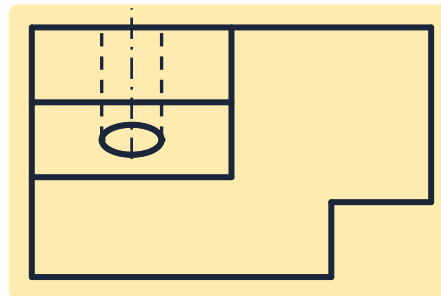
The first-angle rule



FRONT



LEFT SIDE



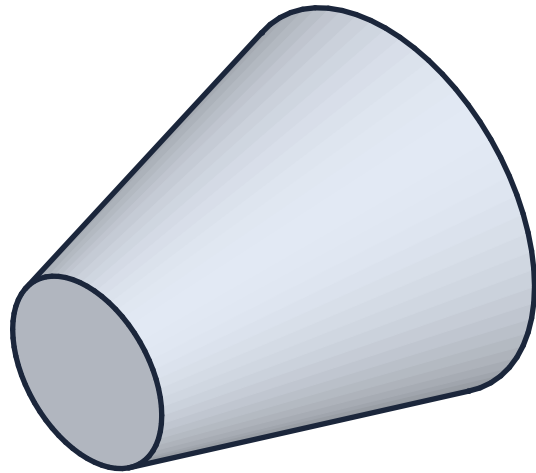
TOP

Seen from the LEFT → drawn on the RIGHT

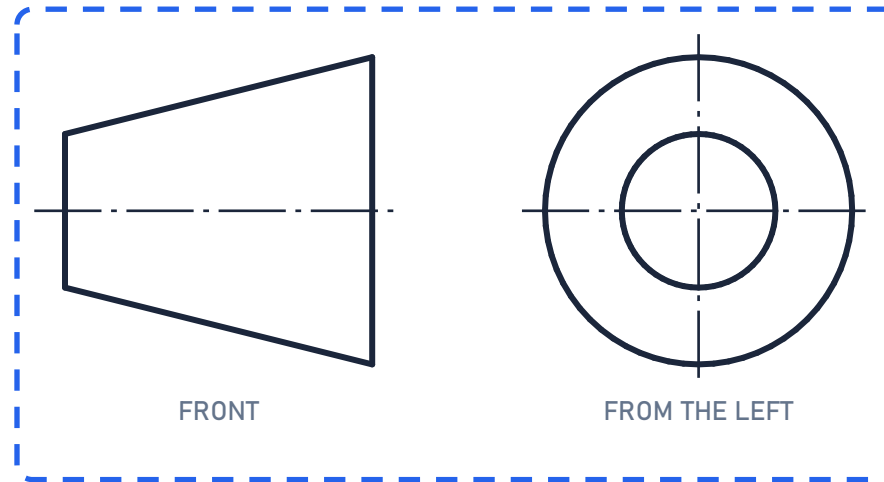
Seen from ABOVE → drawn BELOW

First-angle projection: every view goes to the side OPPOSITE to where you look from.

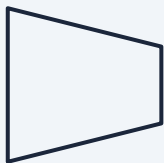
The first-angle symbol



A truncated cone



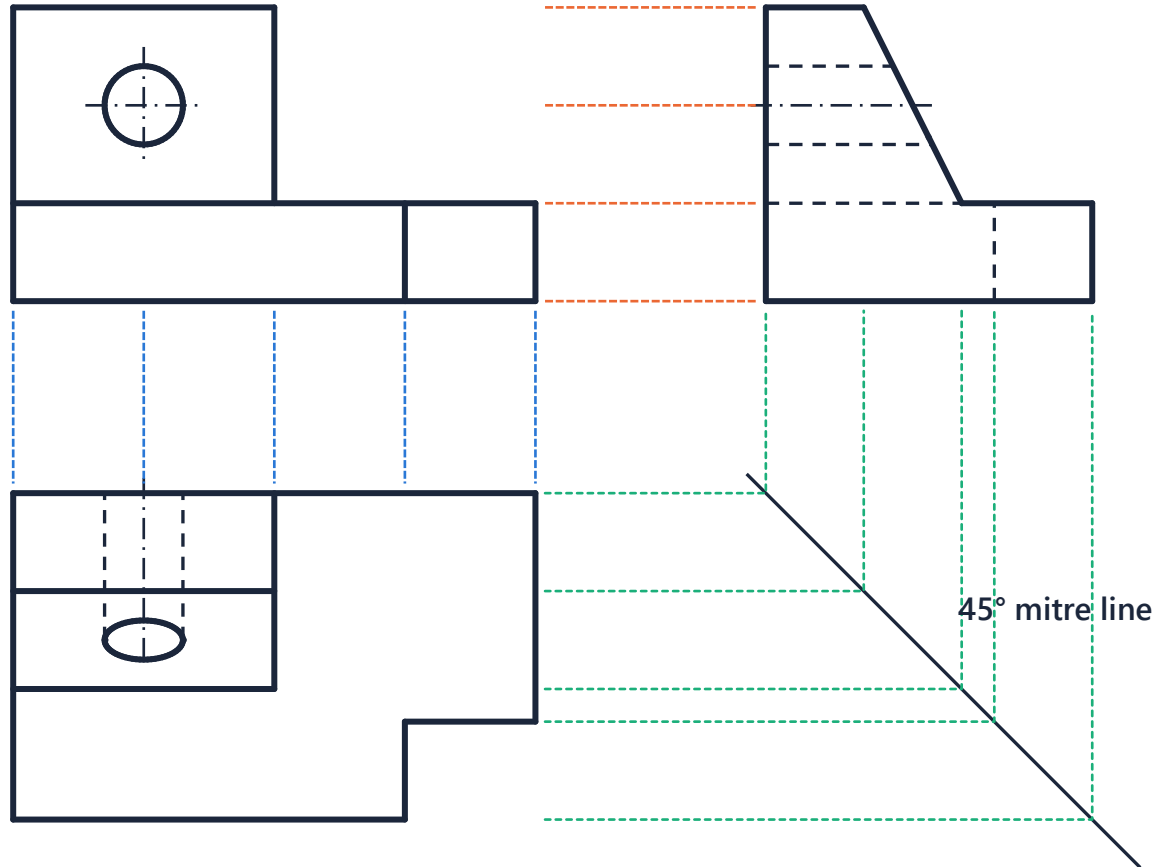
= the first-angle symbol



Third-angle projection

Used in the USA: the top view is drawn ABOVE, the left view on the LEFT. Always check the symbol in the title block.

The views are aligned



Width

Front and top views: the same width, one above the other.

Height

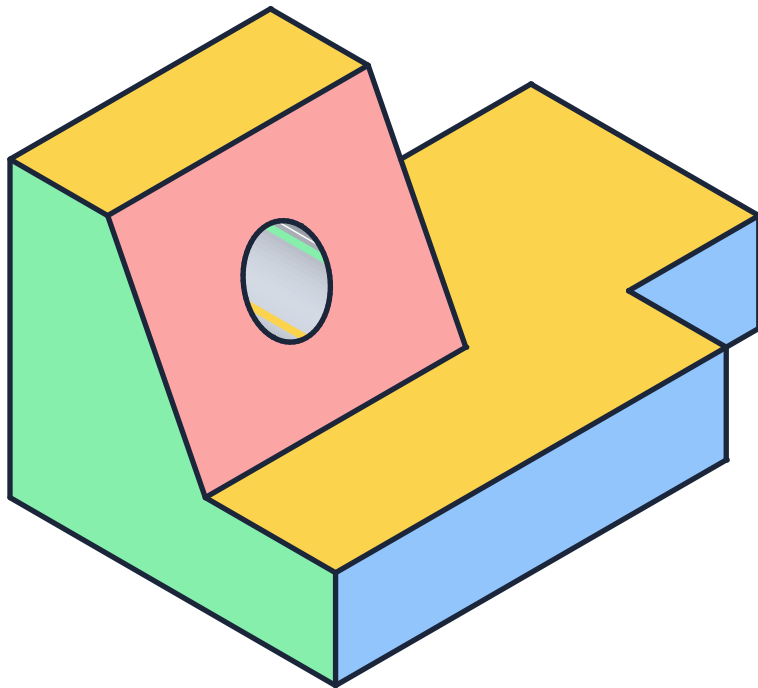
Front and side views: the same height, side by side.

Depth

Top and side views: the same depth, carried across by a 45° mitre line.

Use the alignment to draw a view, and to check it.

Same face, same colour

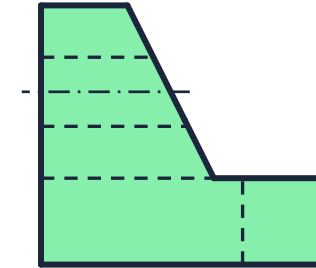
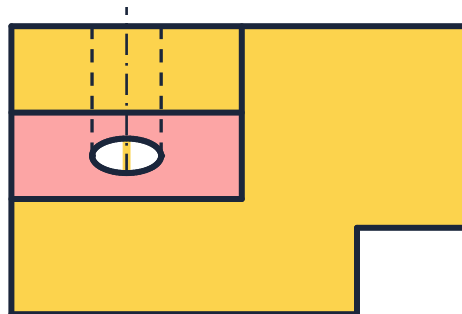
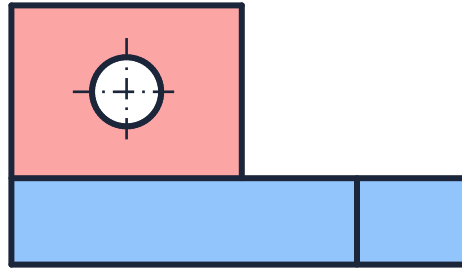


 **Blue:** faces seen from the front

 **Green:** faces seen from the left

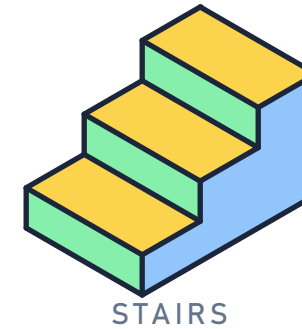
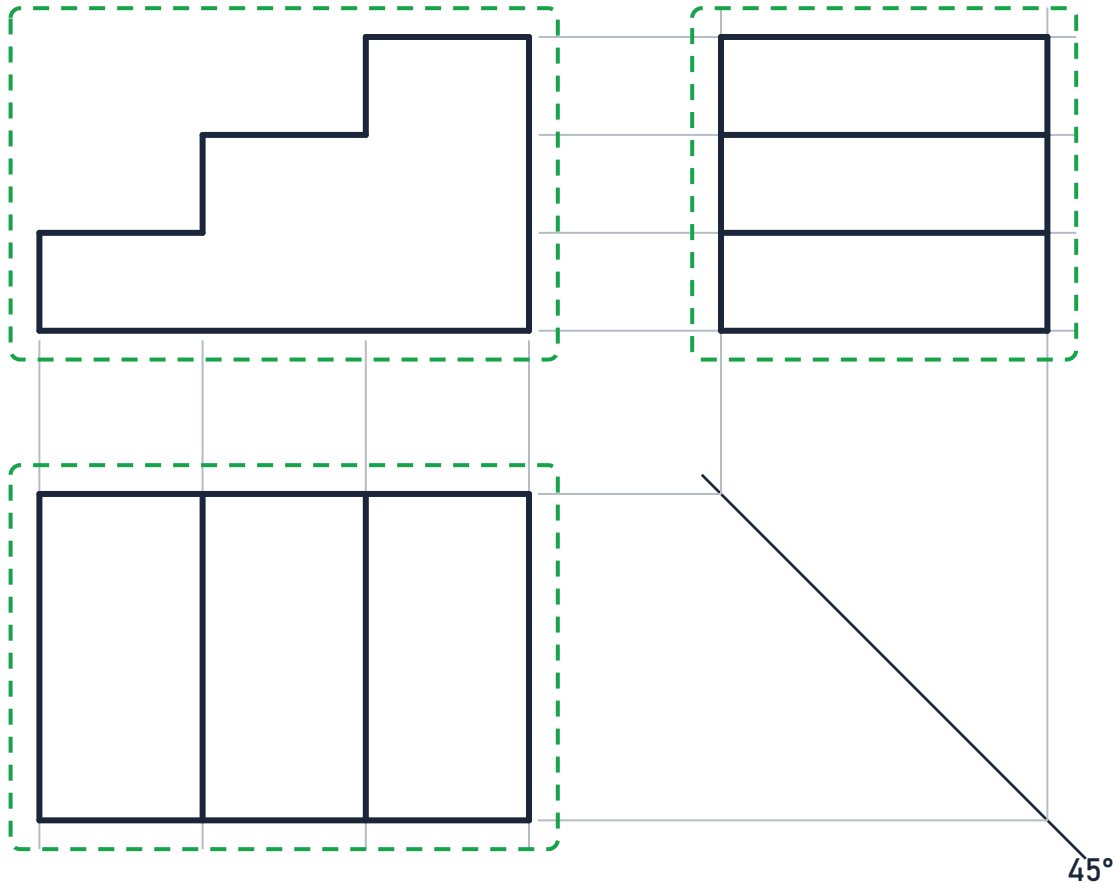
 **Yellow:** faces seen from above

 **Pink:** the inclined face



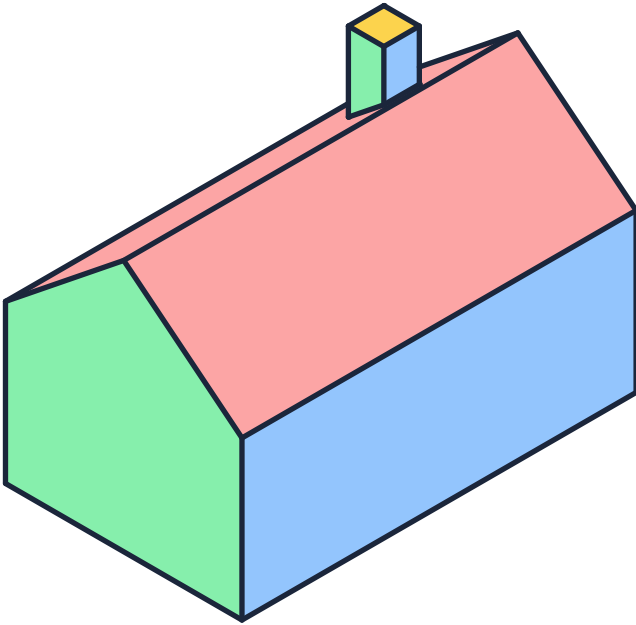
The pink inclined face is a LINE in the side view and a smaller, similar SHAPE in the front and top views.

Drawing three views, step by step



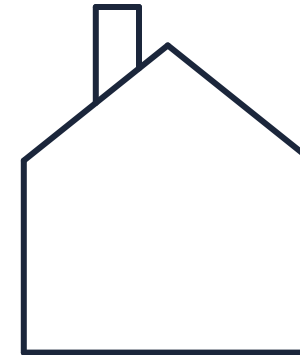
- 1 Draw the front view
- 2 Carry the widths down
- 3 Draw the top view (depth 50)
- 4 Carry the heights across
- 5 Draw the 45° mitre line
- 6 Carry the depths through the mitre
- 7 Draw the side view
- 8 Check, then darken the outlines

For buildings: plan and elevations



FRONT ELEVATION

front view



SIDE ELEVATION

left side view

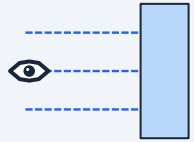


PLAN

top view

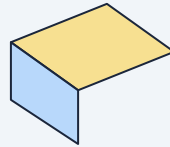
Same projection, building names: plan = top view, elevation = front or side view.

Key terms



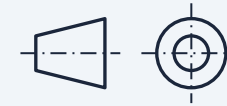
Projection

Carrying the edges of an object onto a plane with parallel lines of sight.



Projection plane

The plane a view is drawn on: vertical, horizontal or profile plane.



First-angle projection

ISO method: top view below the front view, left view on the right.



Third-angle projection

USA method: top view above the front view, left view on the left.



Mitre line

A 45° line that carries the depth between the top and side views.



Plan / elevation

Building names: plan = top view, elevation = front or side view.

Quick check

1 Which line shows a hidden edge?

a) Continuous wide

b) Continuous narrow

c) Dashed narrow

d) Dash-dot (chain)



2 First-angle: the top view is drawn ... the front view.

a) above

b) below

c) on the left of

d) on the right of



3 A wall is 5 m long. What do you write on a 1:100 plan?

a) 5

b) 50

c) 500

d) 5000



4 A line is 40 mm on a 1:5 drawing. Its real length is ...

a) 8 mm

b) 40 mm

c) 200 mm

d) 400 mm



Next: Part 3

1

Views of simple objects

Many objects, three views each, sketched freehand

2

Reading views

What each line and each area in a view means

3

The third view

Completing a missing view from two given views

Bring your kit and template sheets: the workshops start.