

Civil Engineering Drawing

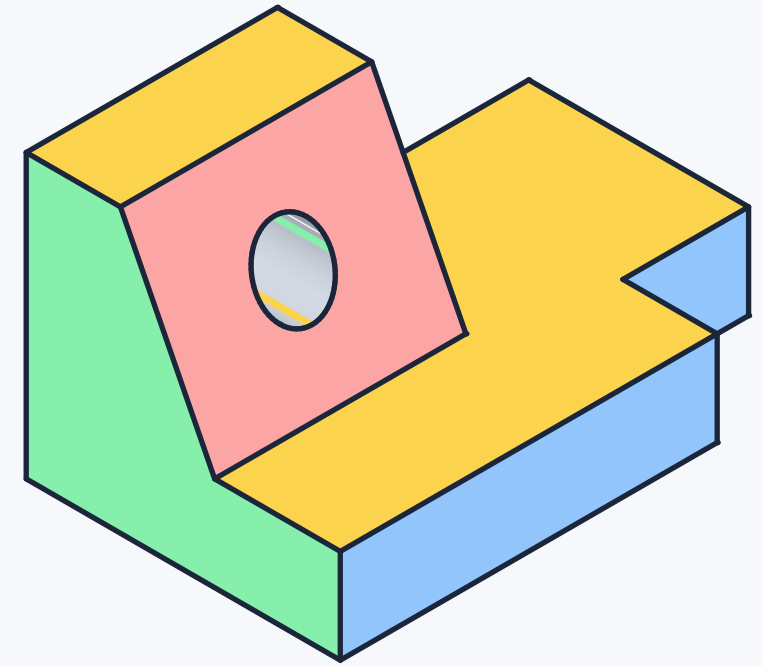
Part 1 · The Language of Engineers

Why engineers draw, how the course runs, and the tools we draw with.

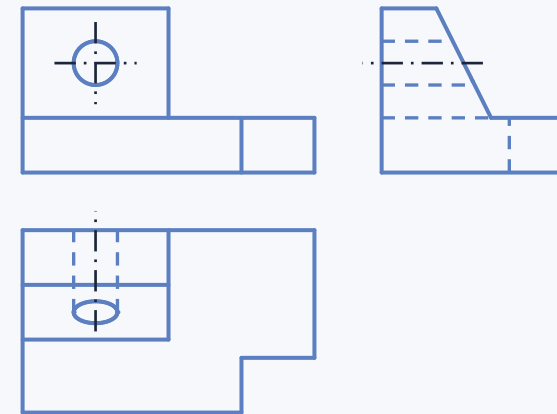
- Course overview
- Why engineers draw
- Kinds of drawing
- The drawing kit
- Drawing paper

Asst. Prof. Dr. Abdulhadi PALA

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



ISOMETRIC DRAWING · 3D



ORTHOGRAPHIC VIEWS · 2D

Today

1.1

Course overview

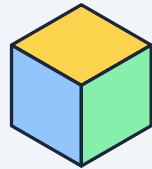
How the semester runs



1.2

Why engineers draw

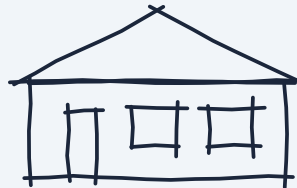
A drawing is a language



1.3

Kinds of drawing

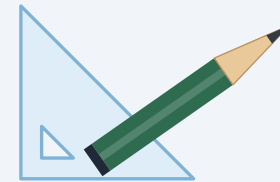
Isometric, orthographic, sketch, CAD



1.4

The drawing kit

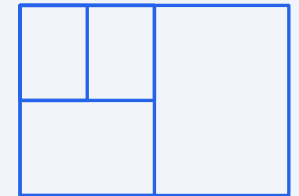
Twelve instruments



1.5

Drawing paper

A0 to A4



One semester, two tools

BY HAND · Weeks 1–7

W1 Intro, instruments, paper	W2 Sheet, lines, dimensions, scale, orthographic views	W3 Workshop: basics, orthographic views	W4 Workshop: orthographic views	W5 Isometric drawings	W6 Workshop: isometric drawings	W7 Midterm exam
--	--	--	---	------------------------------------	---	---------------------------

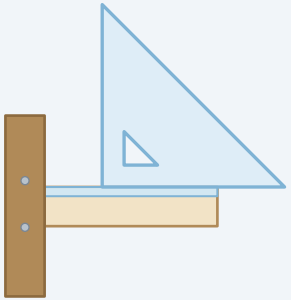
WITH CAD · Weeks 8–14

W8 CAD: basic commands	W9 CAD: modify	W10 CAD: layers, line types	W11 CAD: text, dimensions	W12 Section views, hatching	W13 CAD: layouts, plotting	W14 CAD practical exam	Final Final exam
-------------------------------------	--------------------------	--	--	--	---	-------------------------------------	----------------------------

 Lecture  Workshop (drawing in class)  CAD laboratory  Exam

By the end of the course you can ...

1



Use the drawing instruments and standard sheets

By hand

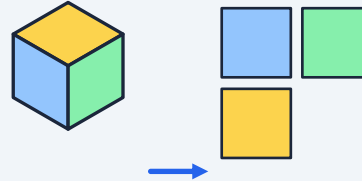
2



Apply line types, dimensions and scale

By hand

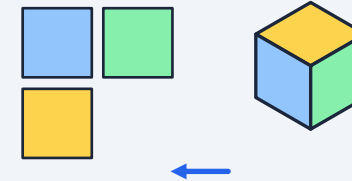
3



Draw orthographic views
3D → 2D

By hand

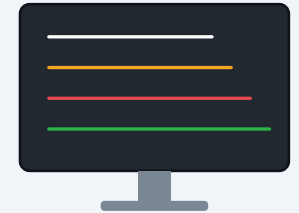
4



Draw isometric drawings
2D → 3D, and section views

By hand

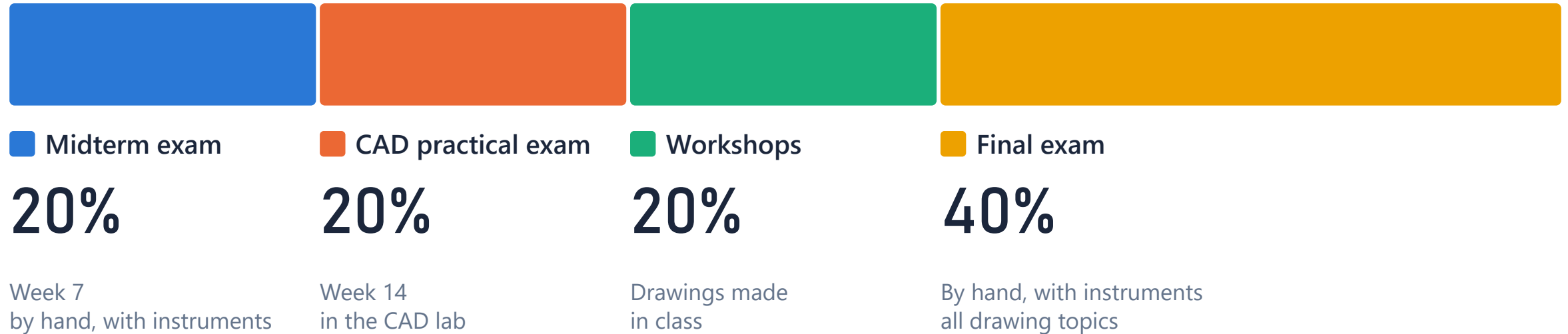
5



Draw, dimension and plot with CAD

With CAD

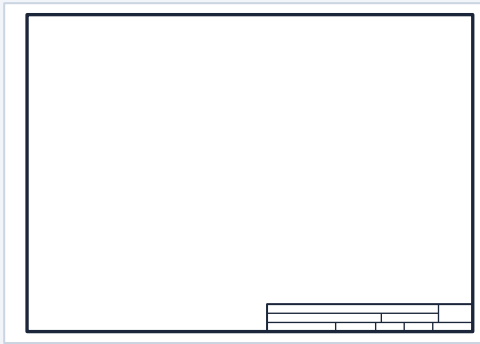
How you are graded



Attendance: at least 70% of the lectures. Otherwise the grade is NA and you cannot take the final exam.

Three rules for every drawing

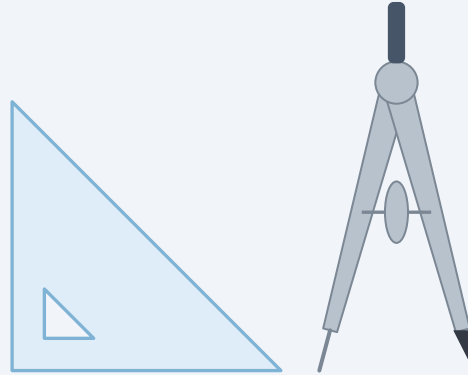
1



A3 or A4 sheet with frame and title block

Print the course template: the frame and title block are ready on it.

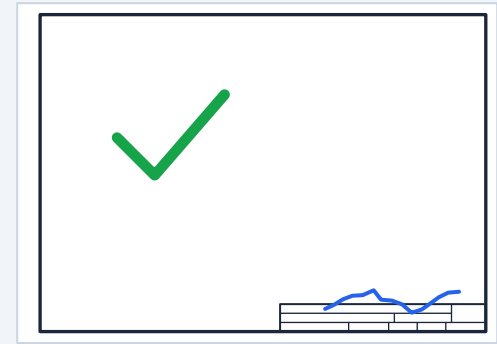
2



Bring your complete kit

To every workshop and to the midterm, from Week 3 on.

3



Your own work only

Copying drawings or CAD files is academic dishonesty.

Keep every sheet flat in your sheet folder for the whole semester.

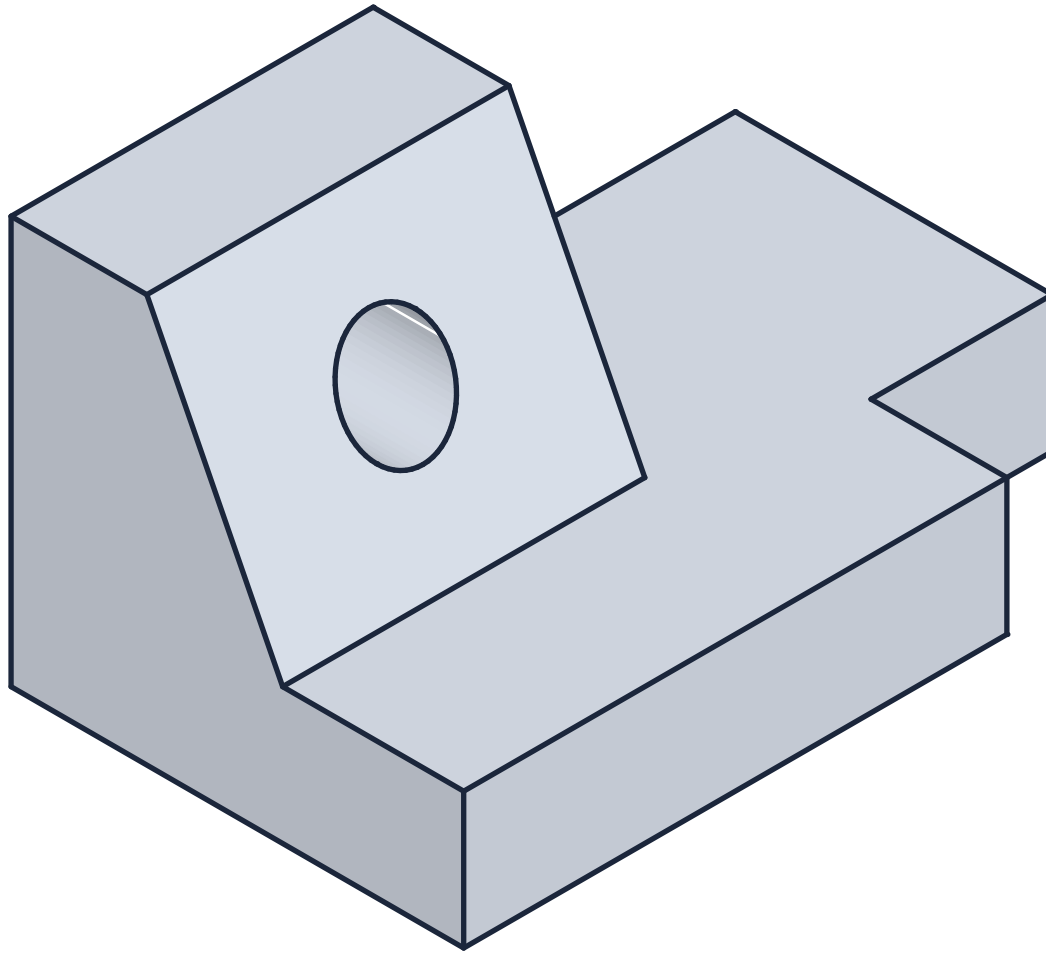
1.2

Why engineers draw

A drawing says what words cannot:
shape, size and hidden parts.



Try it: describe this object in words



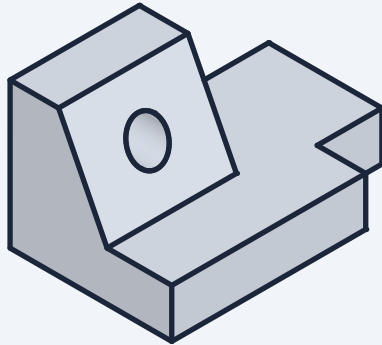
Write a description so that a friend could make **exactly** this object.

Words only: no sketches, no numbers on a picture.



2 minutes

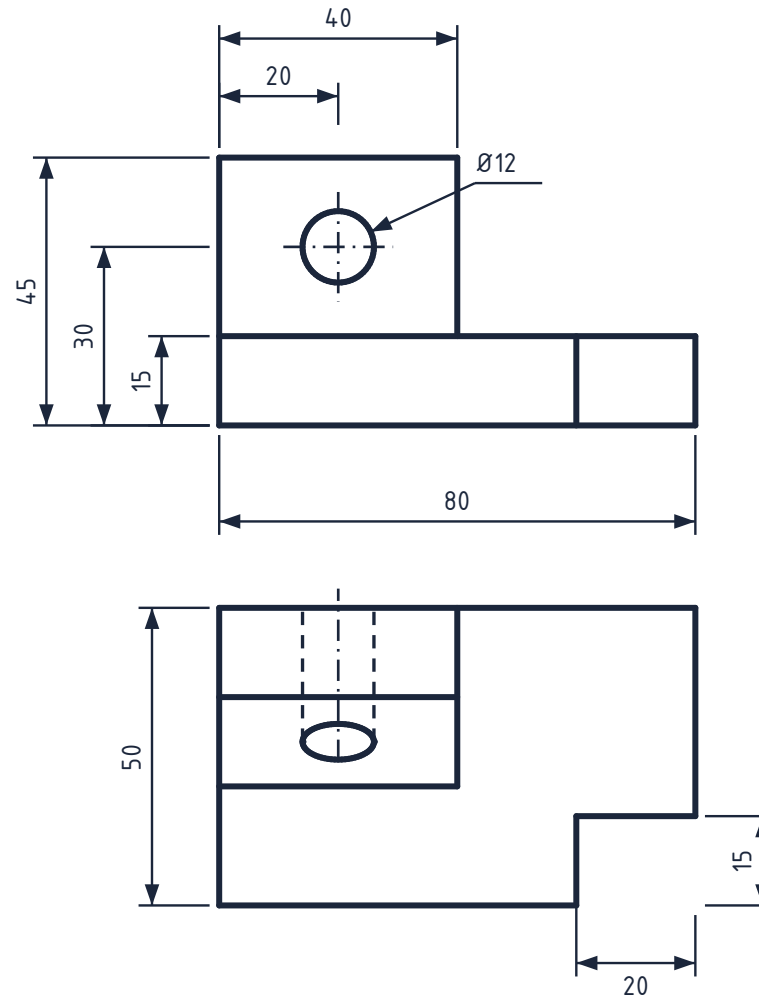
Now read the drawing



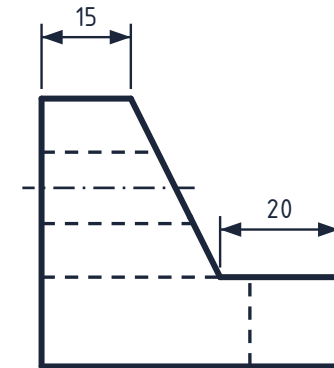
ISOMETRIC DRAWING · 3D

"A flat block, about 8 cm long. On the left a higher part with a sloping front and a round hole. One front corner is cut away ... I am not sure how deep."

Shape, sizes and hidden parts: nothing left to guess.



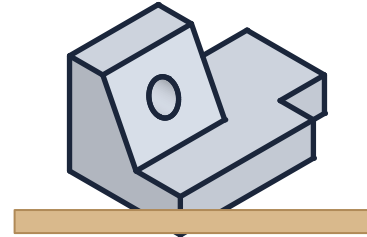
ORTHOGRAPHIC VIEWS · 2D



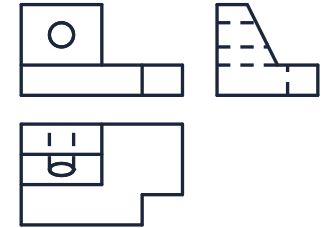
Photograph, model or drawing?



Photograph



Model



Drawing

Shows the exact sizes	✗	✗	✓
Shows hidden and inside parts	✗	✗	✓
Possible before the object exists	✗	✓	✓
Cheap to copy and send	✓	✗	✓

Only the drawing does all four.

A language without borders

duvar

Turkish

wall

English

Wand

German

mur

French

pared

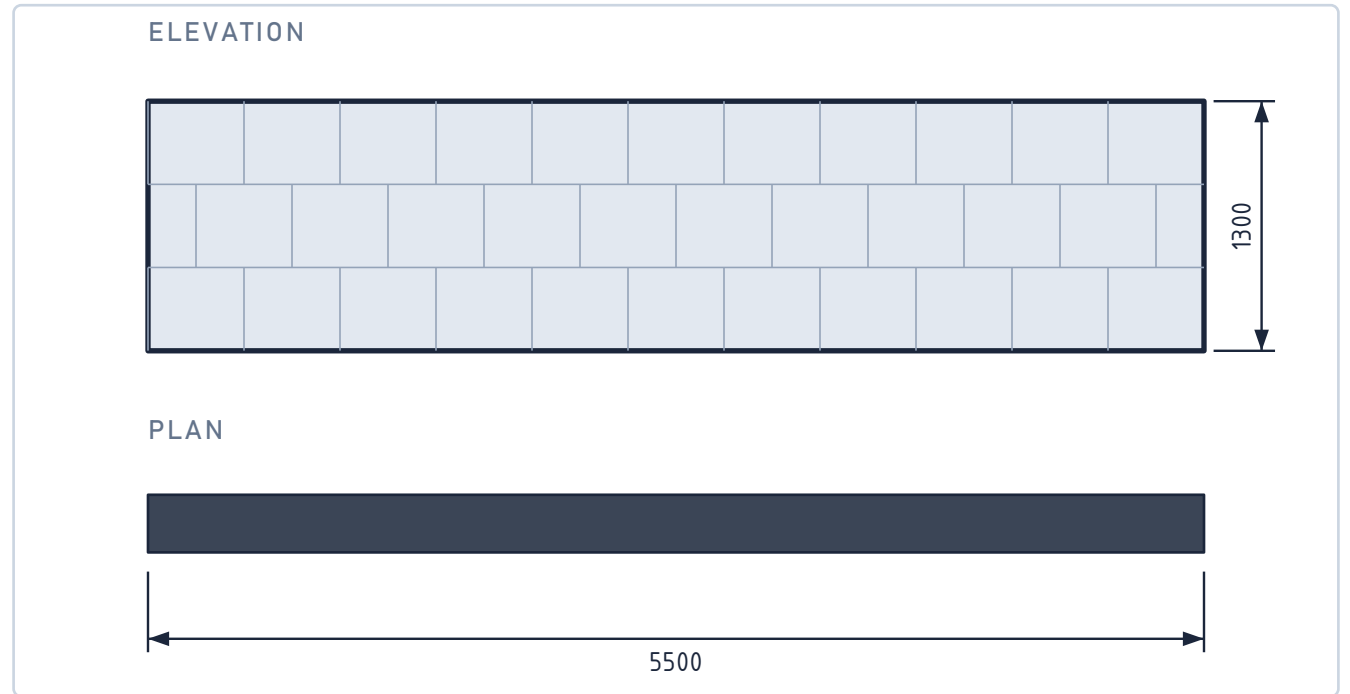
Spanish

стена

Russian

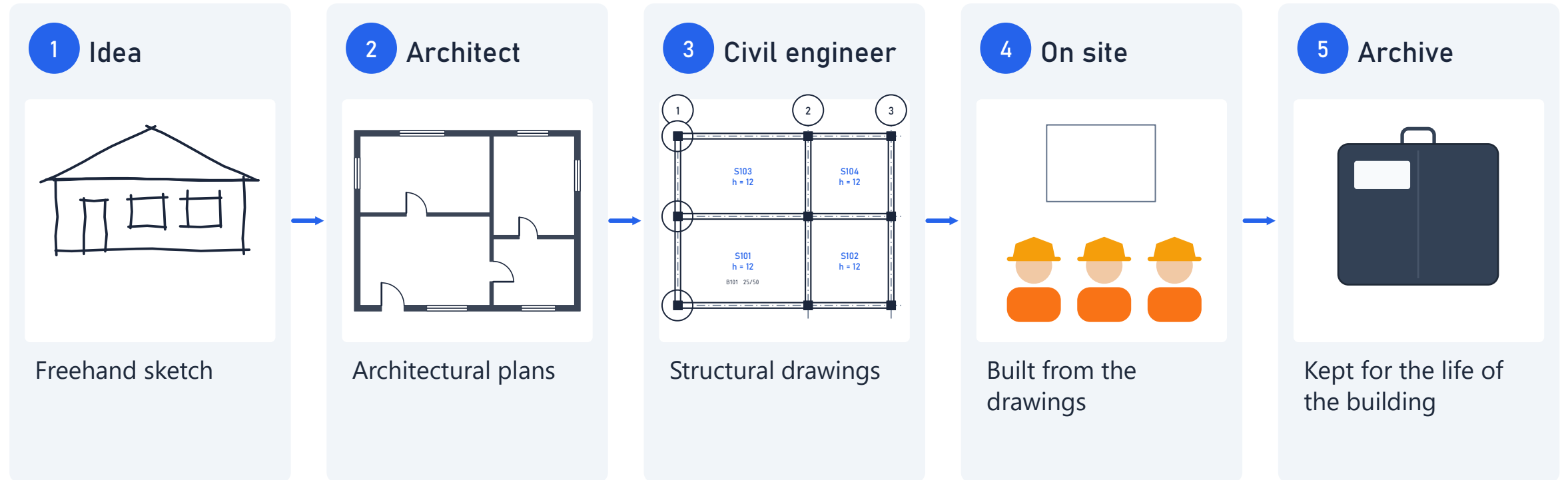
τοιχος

Greek



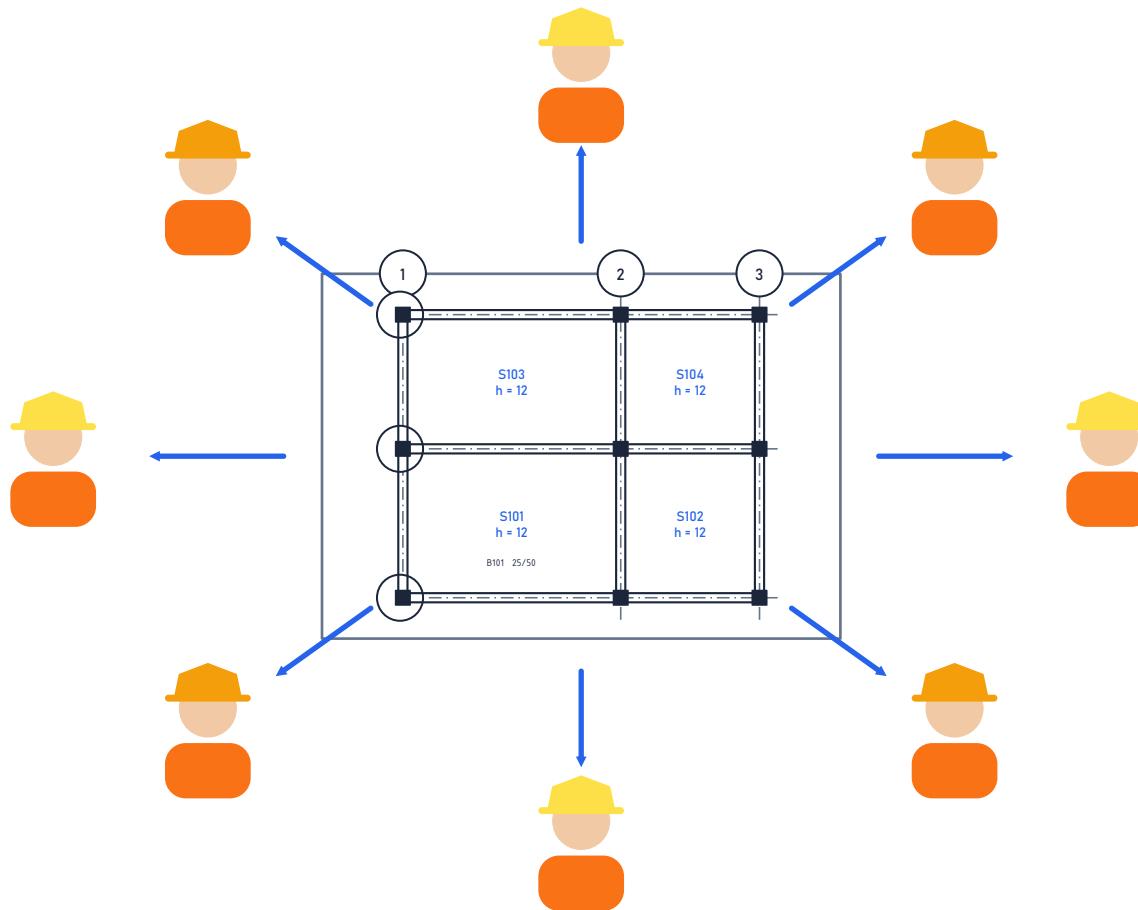
Its grammar is the standard: same lines, same symbols, same meaning everywhere.

From an idea to a building: drawings at every step



Every hand-over, from one person to the next, happens through drawings.

On site, the drawing decides



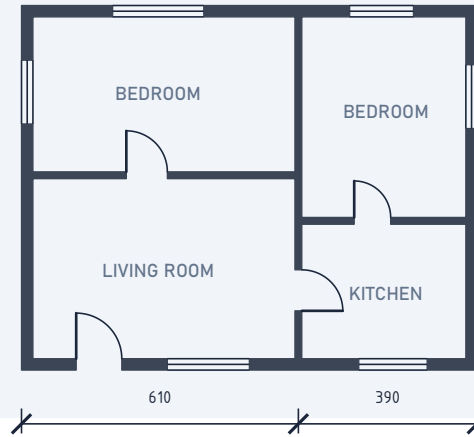
Hundreds of people, one drawing.

- Spoken instructions change from person to person.
- A drawing gives everyone the same wall, the same column, the same size.

Drawings a civil engineer reads every day

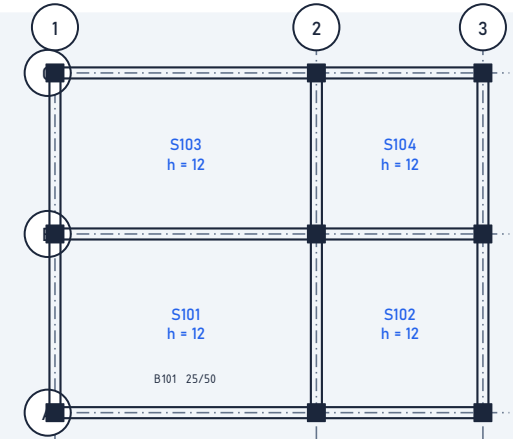
Floor plan

Scale 1:100



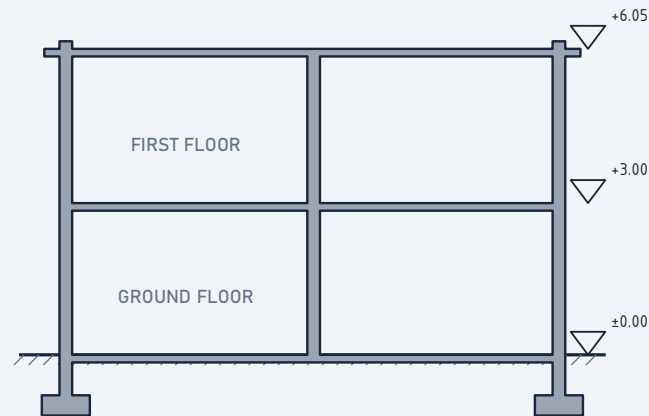
Structural
(formwork) plan

Scale 1:50



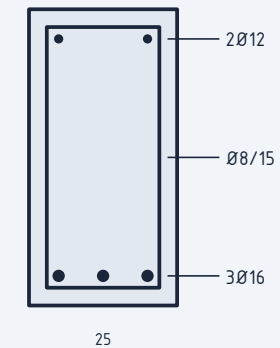
Building section

Scale 1:50

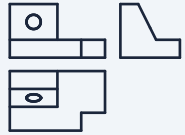


Reinforcement
detail

Scale 1:20

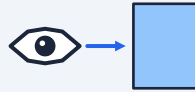


Key terms



Engineering drawing

A drawing that describes an object exactly (shape, sizes, details) so that it can be made.



View

What you see when you look at an object straight from one direction, drawn flat.



Dimension

A number on a drawing that gives a real size, in millimetres.



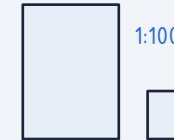
Hidden line

A dashed line: an edge that is there but cannot be seen from that direction.



Centre line

A thin chain line that marks the centre of a hole or an axis of symmetry.



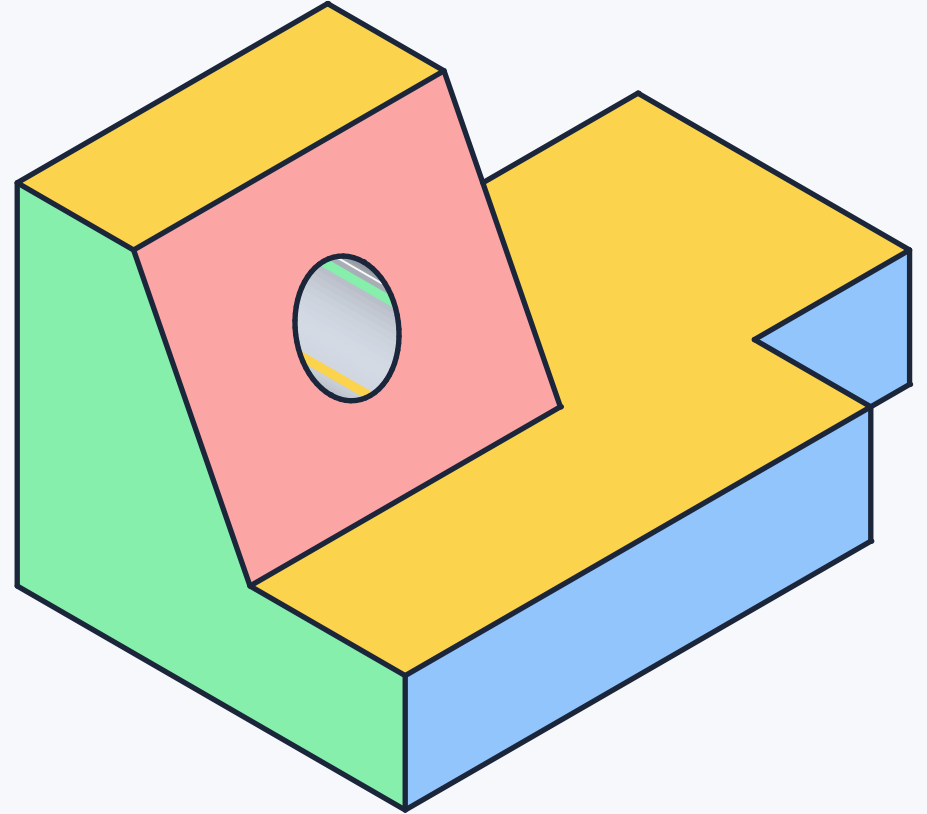
Scale

How much smaller or larger the drawing is than the object. 1:100 = 100 times smaller.

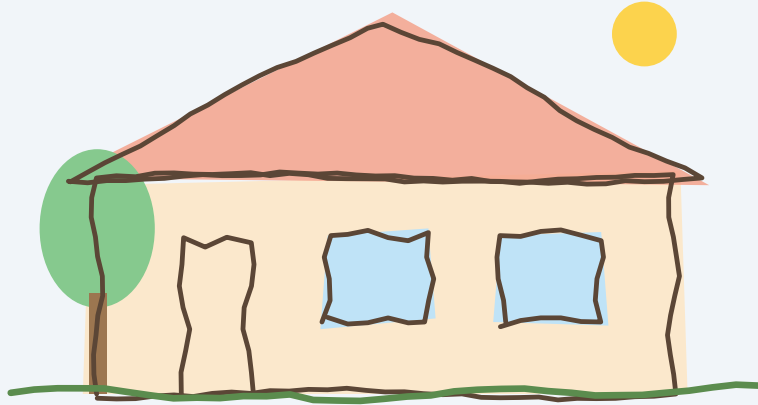
1.3

Kinds of drawing

Isometric drawings and orthographic views, sketch, instruments or CAD.

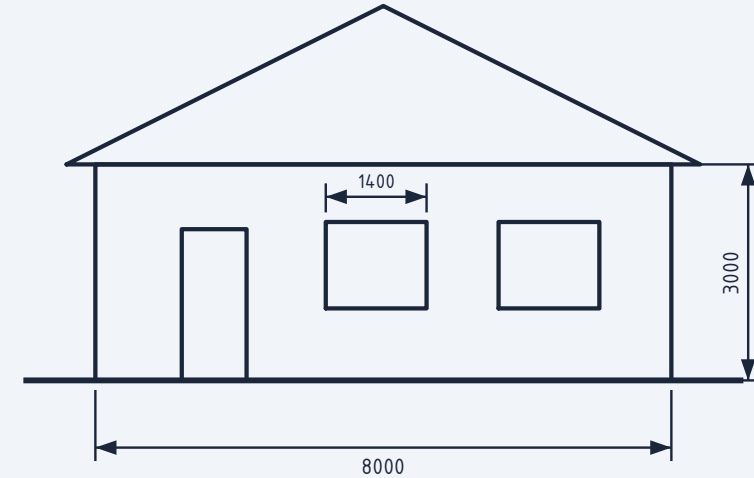


Artistic or technical?



Artistic drawing

- Expresses an idea or a feeling
- Free, personal style
- Each viewer may read it differently

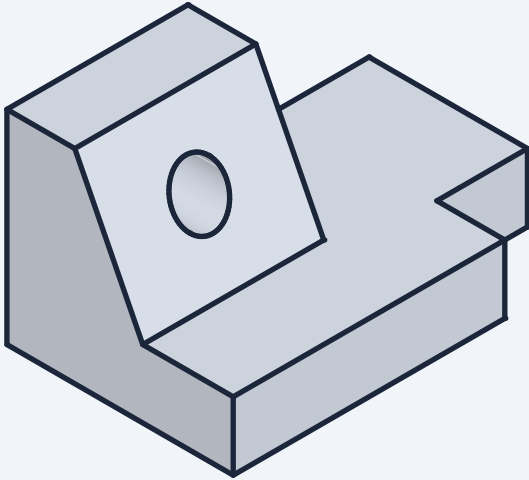


Technical drawing

- Describes an object exactly
- Follows standard rules
- One meaning for every reader

A technical drawing is judged by accuracy, not beauty: one wrong size makes it wrong.

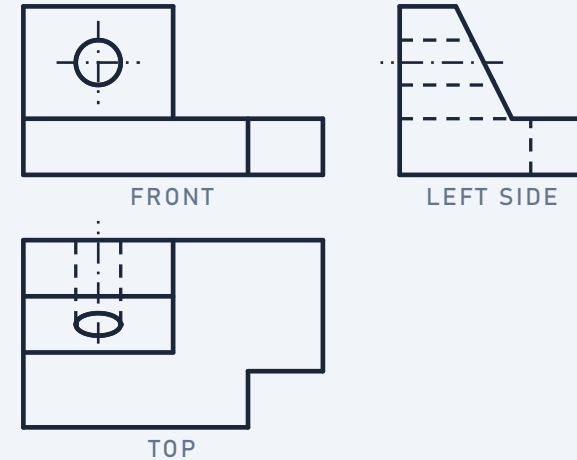
Isometric drawing or orthographic views?



Isometric drawing 3D picture

- Easy to understand at a glance
- Circles become ellipses, angles change
- Hidden parts are not shown

2D → 3D: isometric drawing

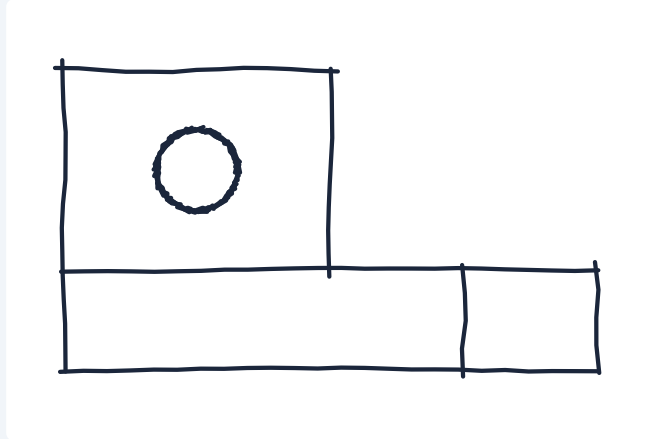


Orthographic views 2D views

- Exact shapes and true sizes
- Hidden parts shown with dashed lines
- Must be learned to be read

3D → 2D: orthographic views

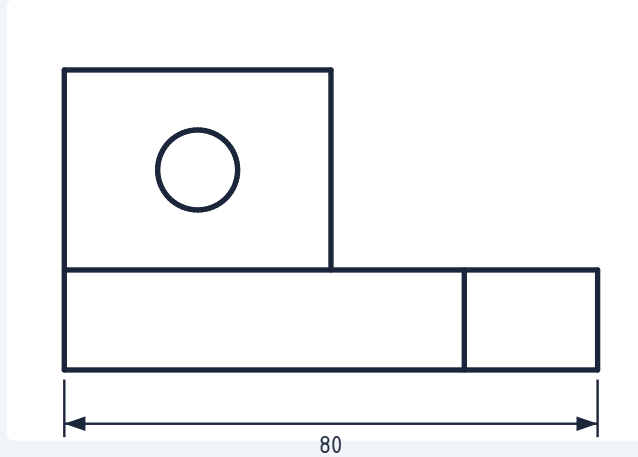
Three ways to make a technical drawing



Freehand sketch

Pencil only

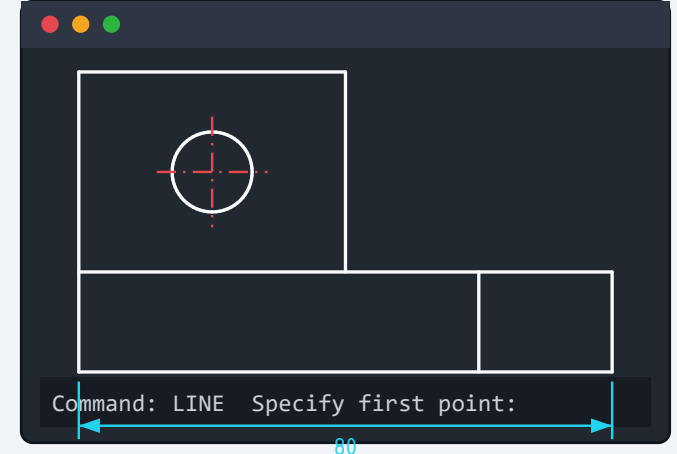
Fast: ideas, site notes



Instrument drawing

T-square, set squares, compass

Accurate: before the midterm



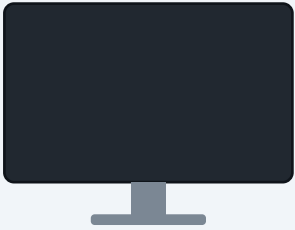
CAD drawing

Computer software

Accurate, easy to change and share: after the midterm

Different tools, the same rules.

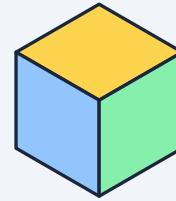
Why start by hand?



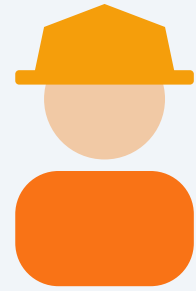
The computer draws.
You decide what to
draw.



The rules are learned
with the pencil.



It trains your
3D imagination.



On site, a sketch is
often all you have.

Same rules, two tools: by hand until the midterm, then CAD.

Standards: the grammar of drawing

A standard is a written rule that everyone follows, so a drawing has one meaning.

ISO 128

Line types

ISO 5457Sheet sizes and
frame**ISO 3098**

Lettering

ISO 129

Dimensions

ISO 5455

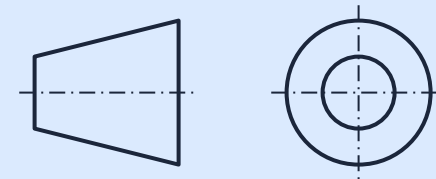
Scales

ISO 5456

Projection methods

In this course

- ISO standards
- Sizes in millimetres
- First-angle projection



The first-angle symbol, printed in the title block

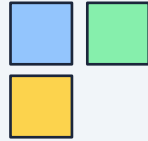
Turkish (TS) and European (EN) standards follow ISO.

Key terms



Isometric drawing

A 3D picture drawn on three axes 120° apart. We use it to go from 2D to 3D.



Orthographic views

Flat views (front, top, side), each looking straight at one side. 3D to 2D.



Freehand sketch

A quick drawing made with a pencil only, sizes kept in proportion by eye.



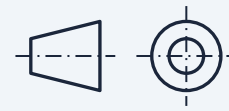
CAD

Computer-Aided Drafting: drawing with software, for example AutoCAD.

ISO

Standard (ISO)

A written rule everyone follows. ISO: International Organization for Standardization.



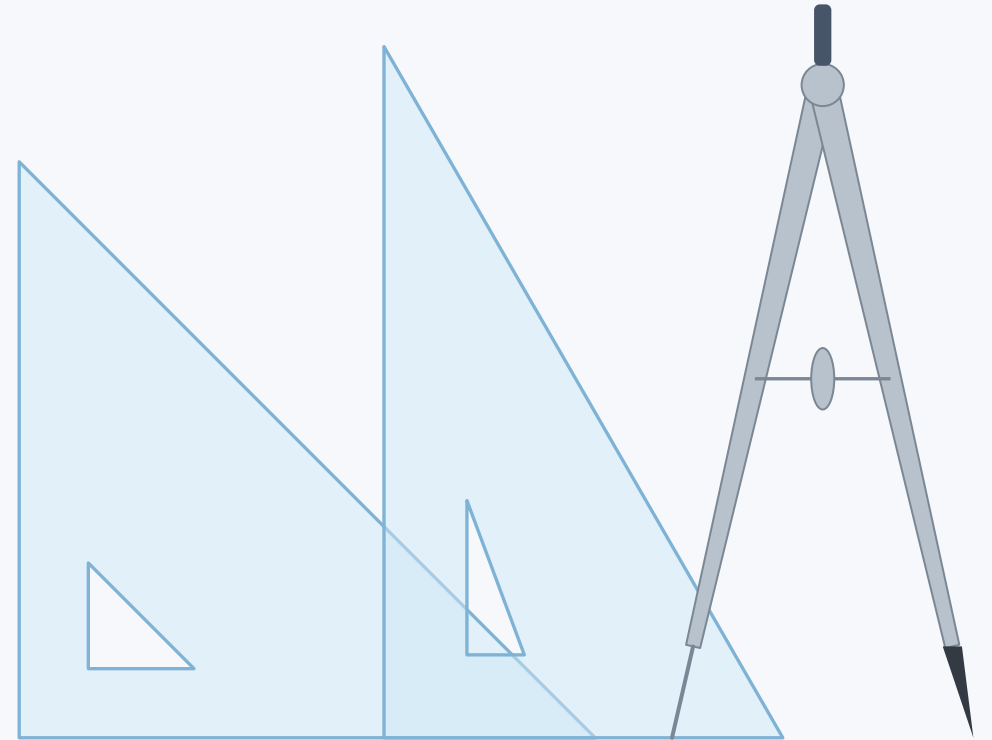
First-angle projection

The ISO way of placing the views on the sheet. Explained in detail later.

1.4

The drawing kit

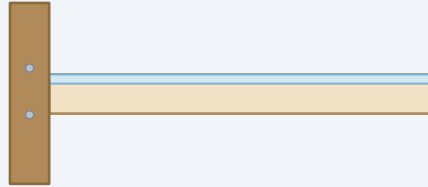
Twelve instruments, each with one job,
and how to use them well.



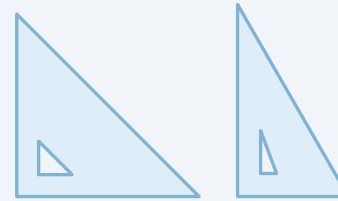
Your drawing kit: bring it from Week 3



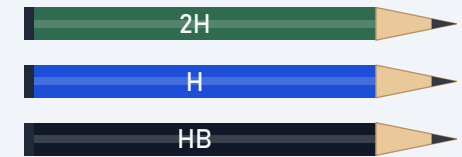
1 Drawing board



2 T-square



3 Set squares 45° and 30°/60°



4 Pencils 2H · H · HB



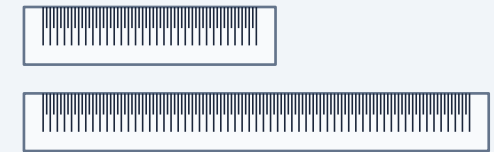
5 Sharpener



6 Eraser



7 Compass



8 Rulers 30 cm and 60 cm



9 Protractor



10 Drafting tape

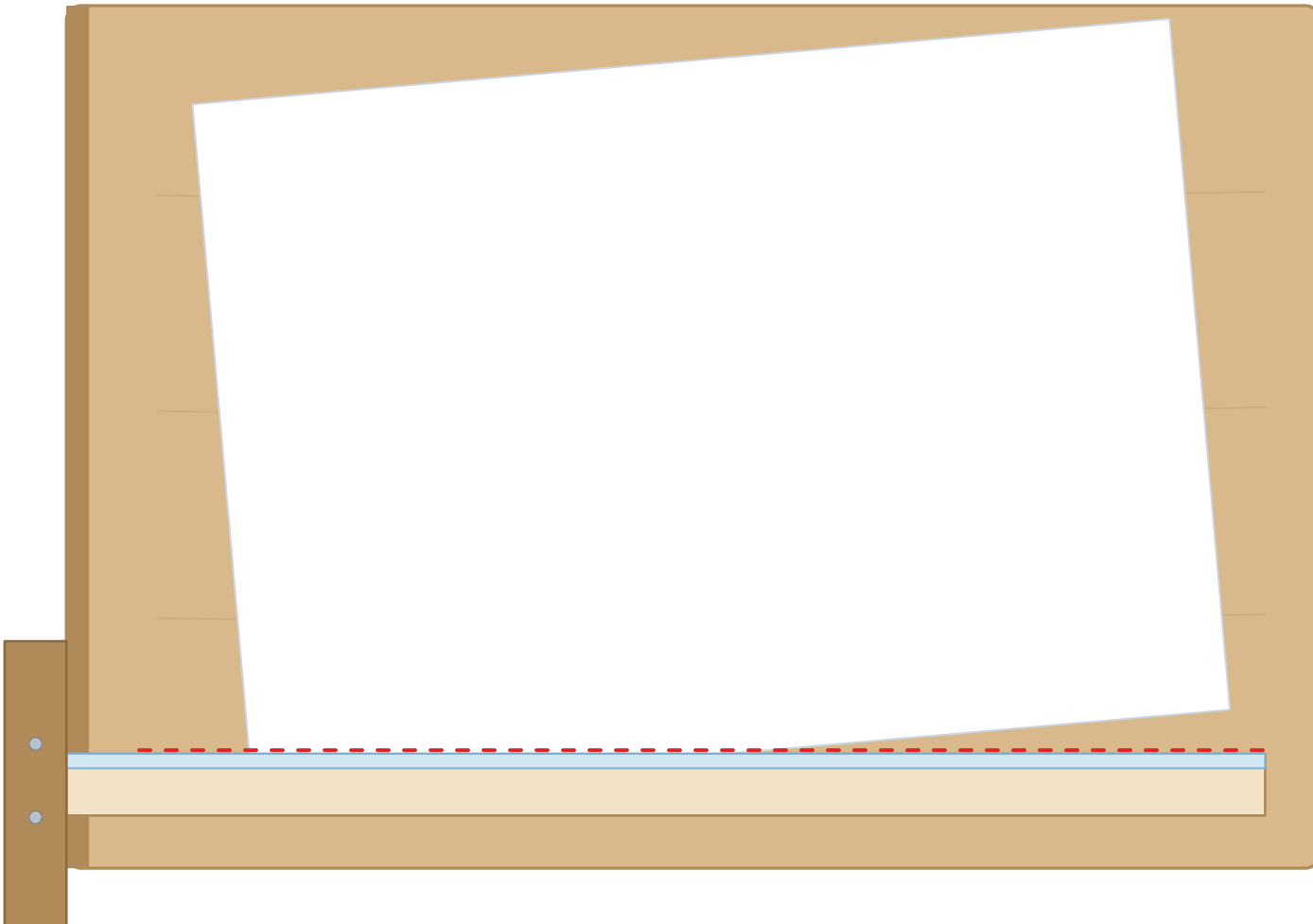


11 Drawing paper A3 · A4



12 Sheet folder

Fix the sheet to the board

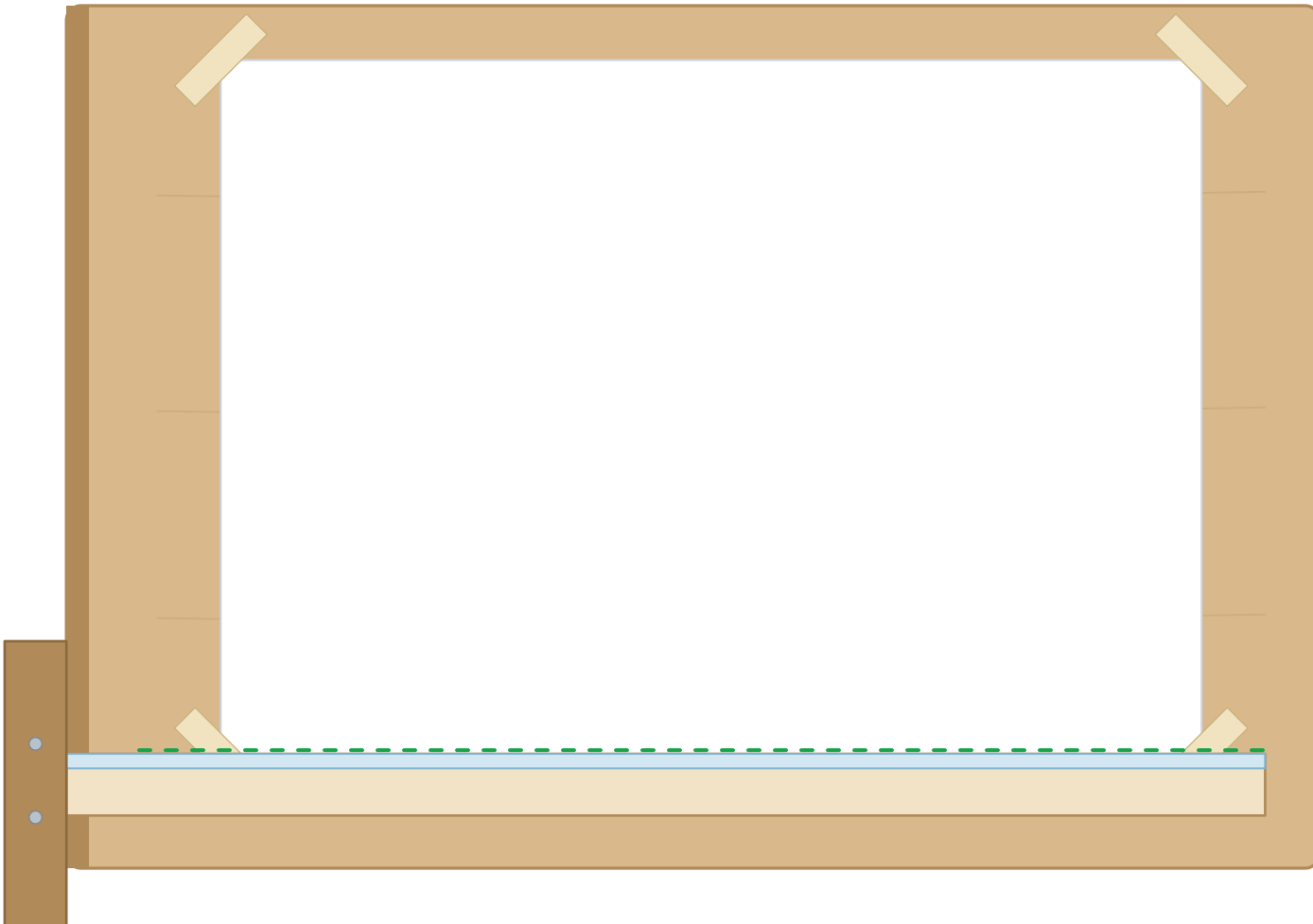


✗ Not aligned

The sheet is turned a little.

Every “horizontal” line will run across the sheet at an angle.

Fix the sheet to the board



✓ Aligned and taped

Slide the T-square up to the lower edge of the sheet.

Turn the sheet until its edge lies on the blade.

Tape the four corners, diagonally.

T-square: horizontal lines



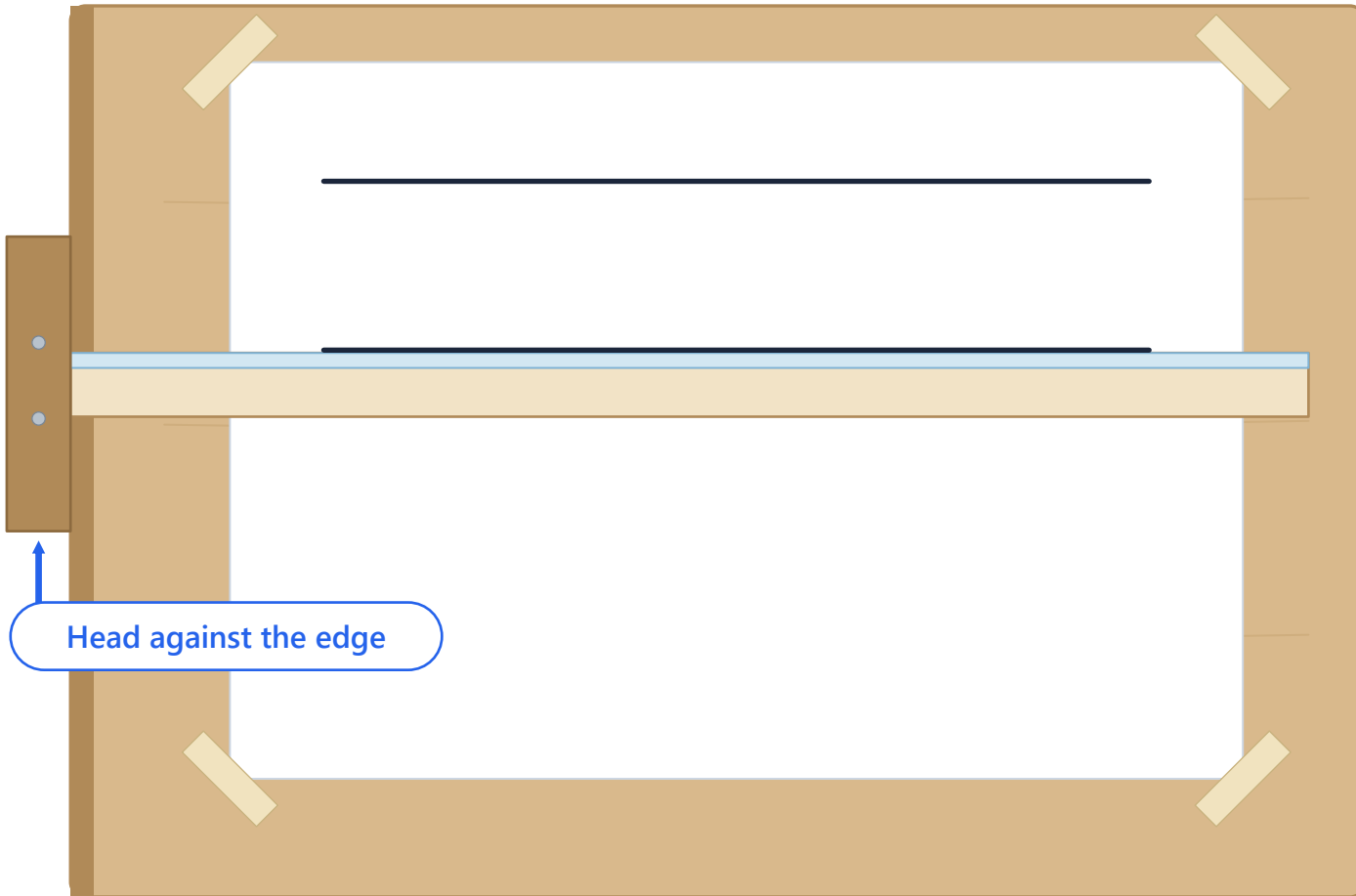
Horizontal lines

Press the head against the left edge of the board.

Draw along the upper edge of the blade, from left to right.

Slide the T-square for the next line: it stays parallel.

T-square: horizontal lines



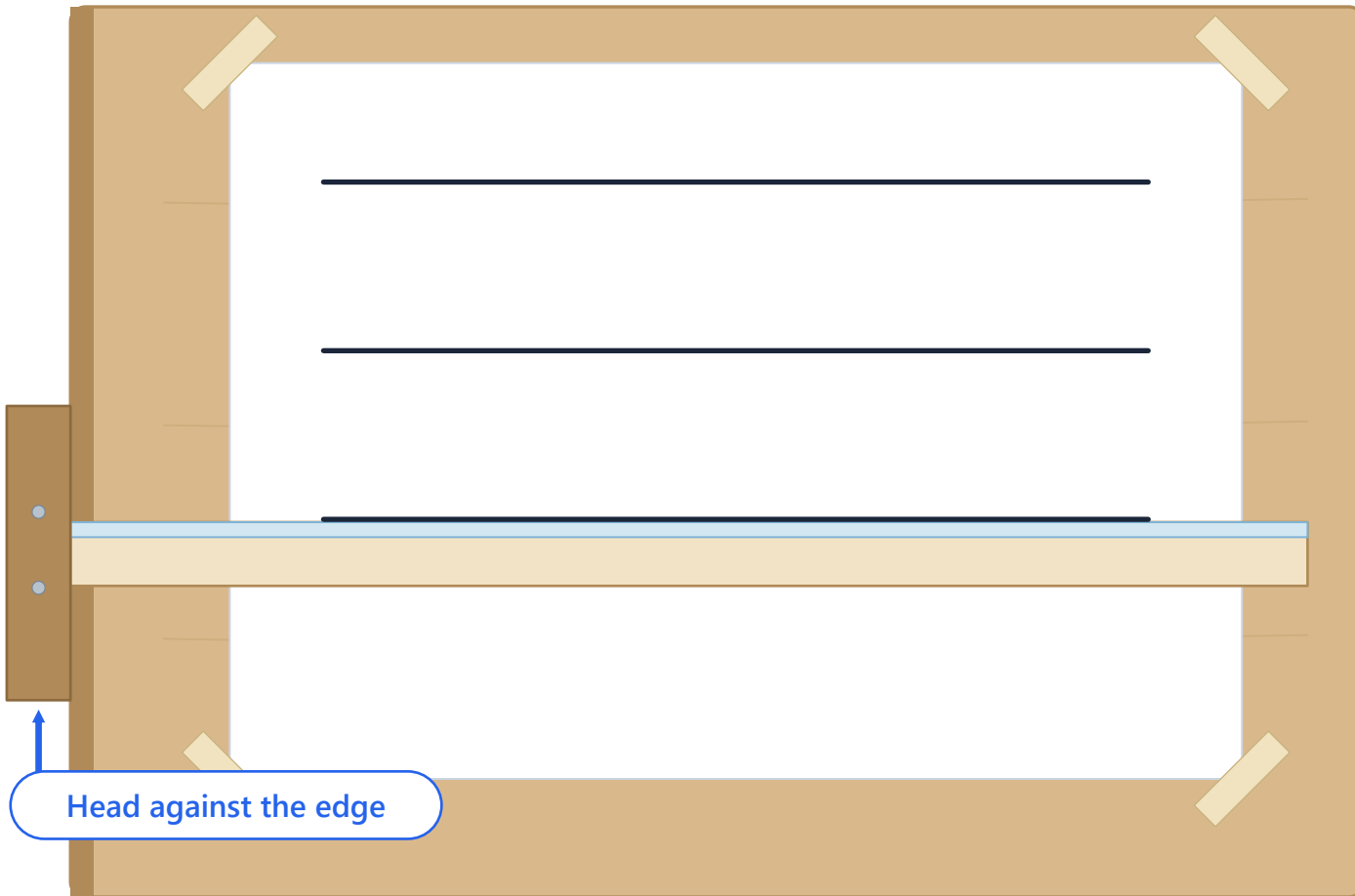
Horizontal lines

Press the head against the left edge of the board.

Draw along the upper edge of the blade, from left to right.

Slide the T-square for the next line: it stays parallel.

T-square: horizontal lines



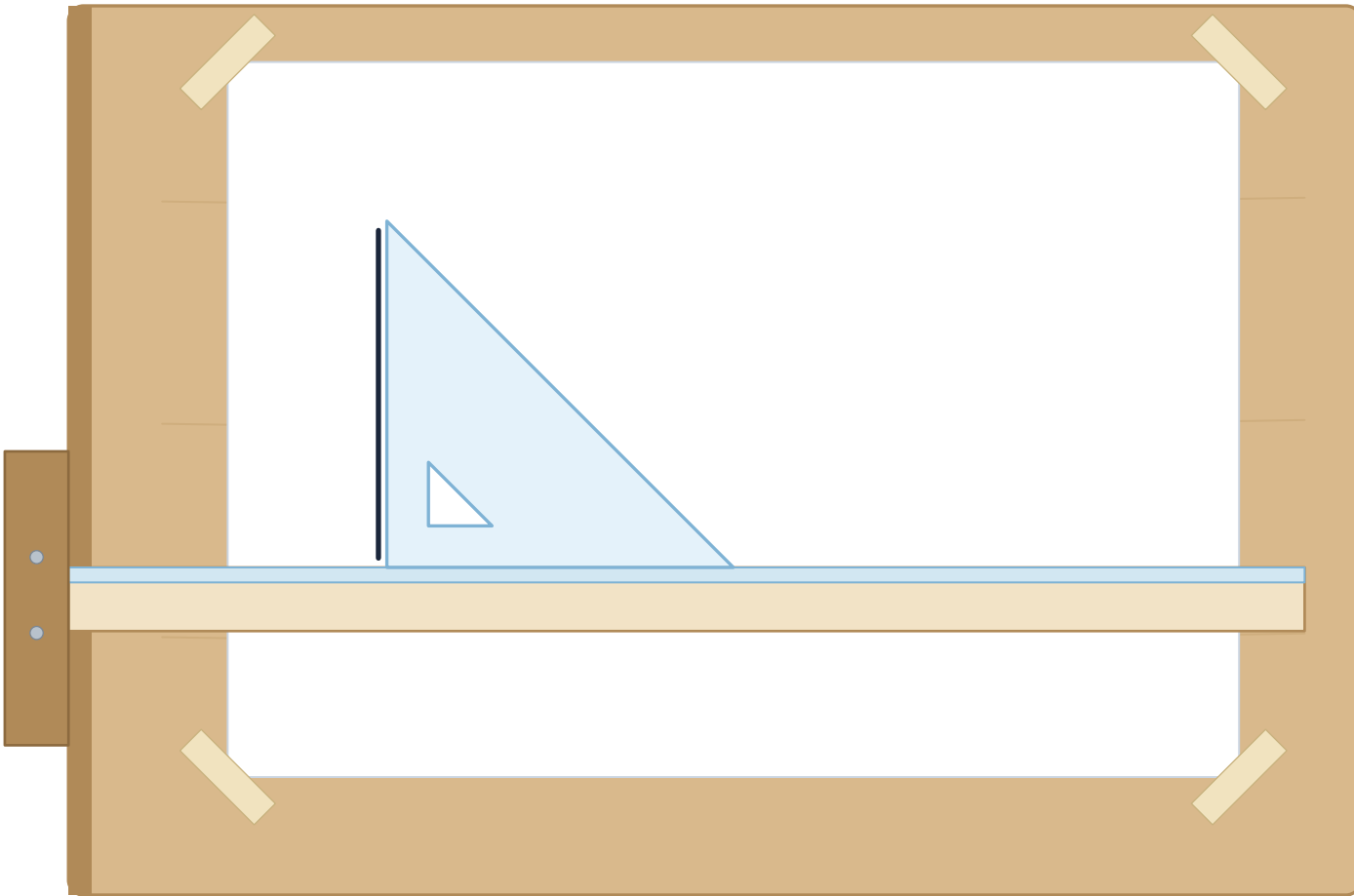
Horizontal lines

Press the head against the left edge of the board.

Draw along the upper edge of the blade, from left to right.

Slide the T-square for the next line: it stays parallel.

Set squares: vertical and angled lines

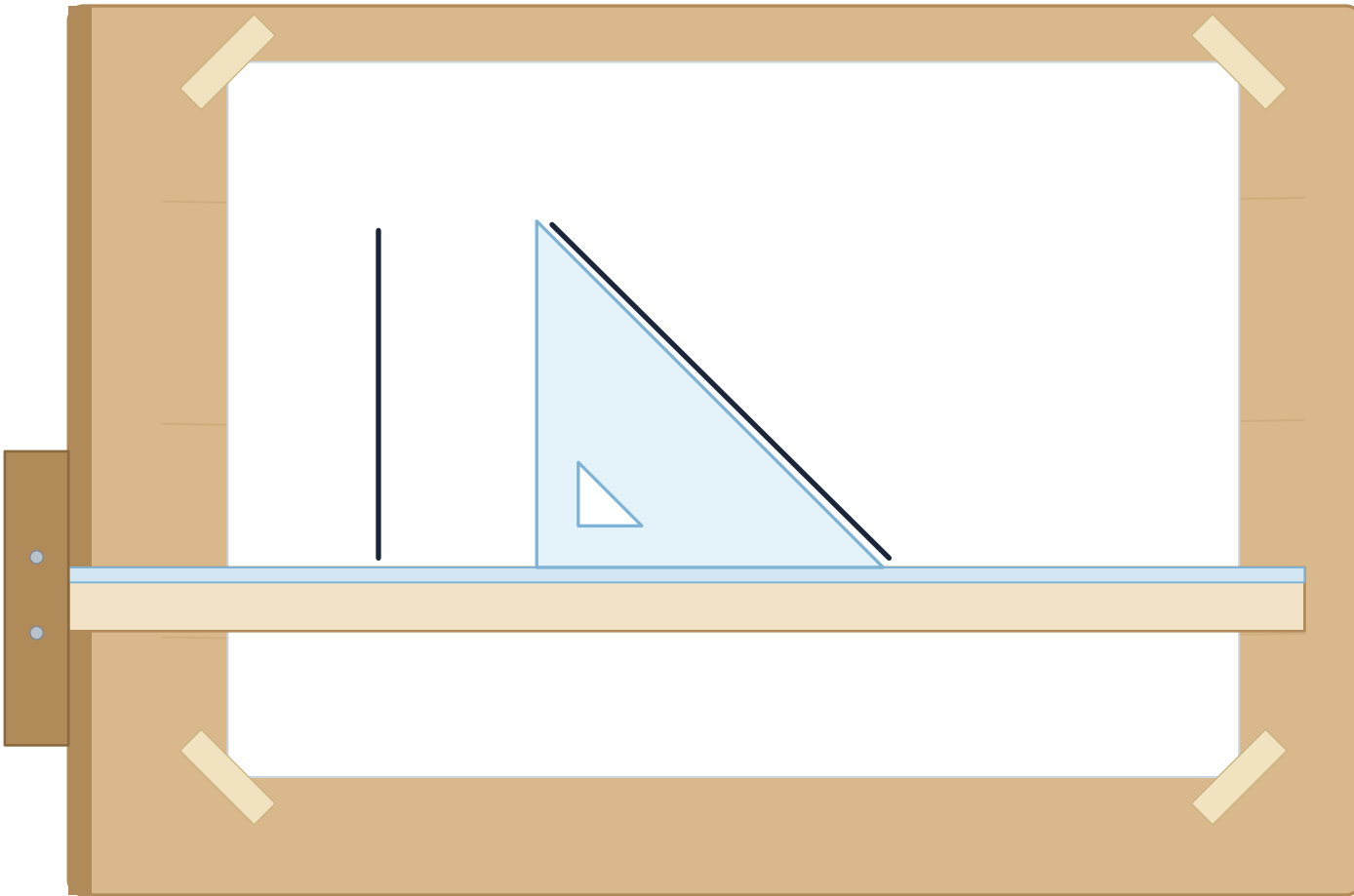


Vertical lines

Rest a set square on the blade.

Draw along its vertical edge, from bottom to top.

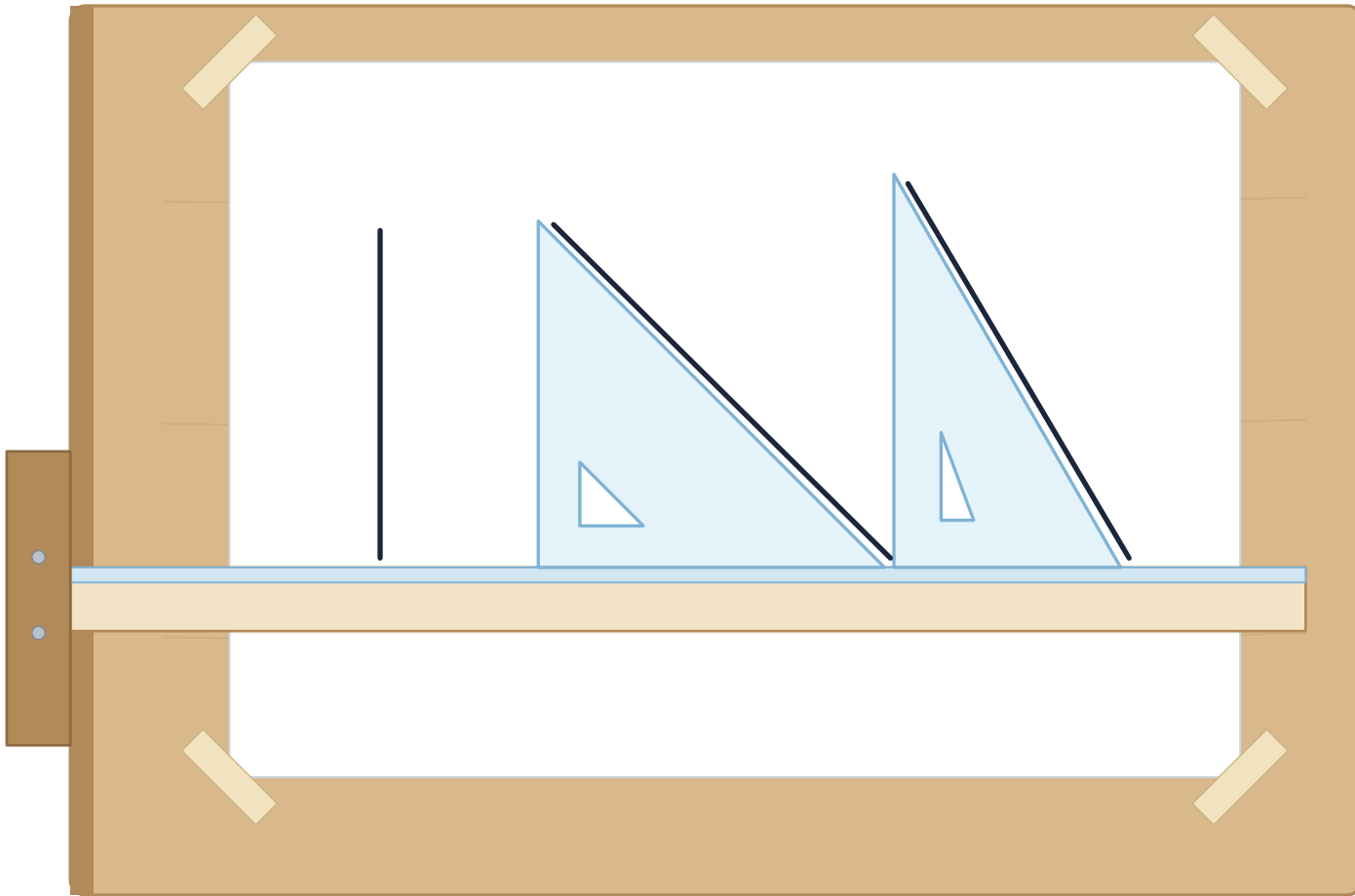
Set squares: vertical and angled lines



45° lines

The same 45° set square, along its long edge.

Set squares: vertical and angled lines

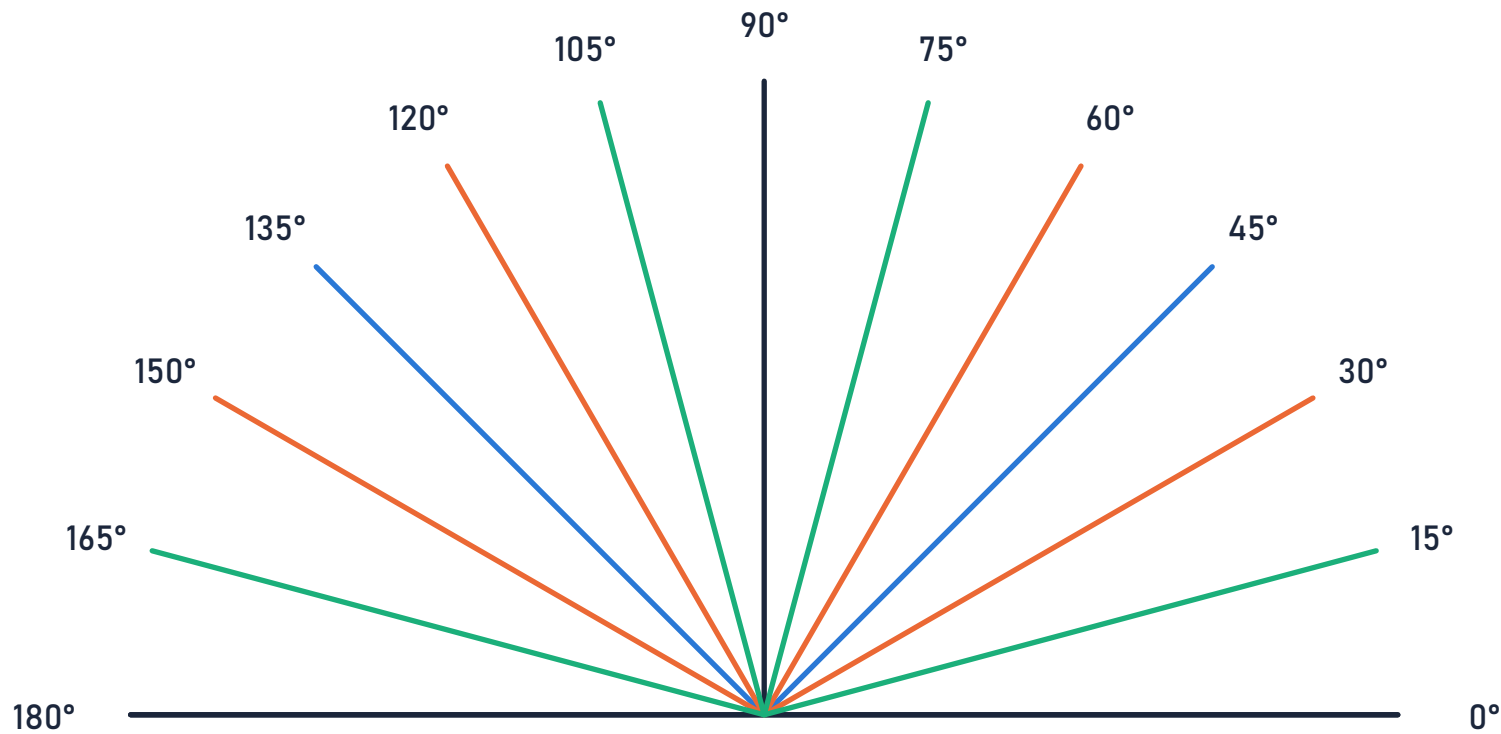


30° and 60° lines

The 30°/60° set square.

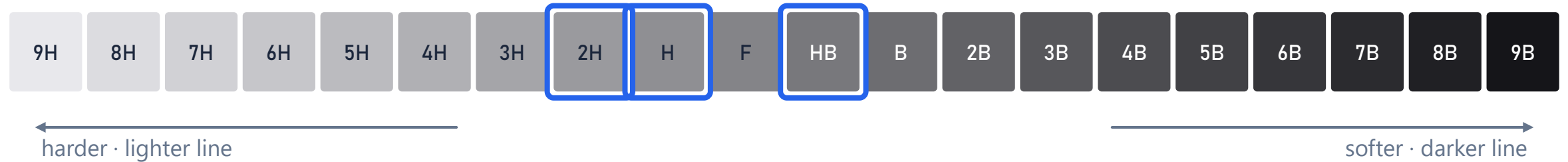
Keep the T-square still while the set square slides.

Two set squares: every 15°



- 0°, 180° T-square
- 90° vertical edge
- 45°, 135° 45° set square
- 30°, 60° ... 30°/60° set square
- 15° = 45° - 30°
- 75° = 45° + 30°
- Any other angle protractor

Pencils: hard or soft?



Construction lines: very light, drawn first

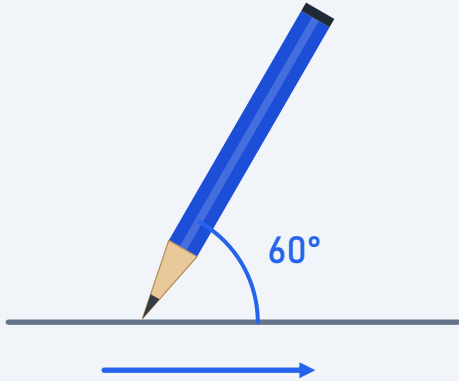


Thin lines: dimension, hidden and centre lines



Thick lines: visible outlines, lettering

How to draw a good line



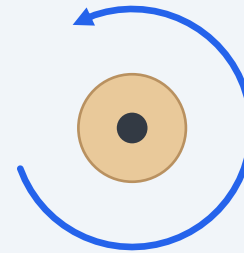
Lean the pencil

About 60° to the paper, leaning in the direction you draw.



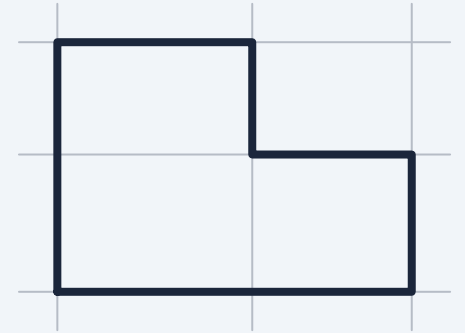
Pull, don't push

Left to right. Bottom to top. One steady stroke.



Turn the pencil

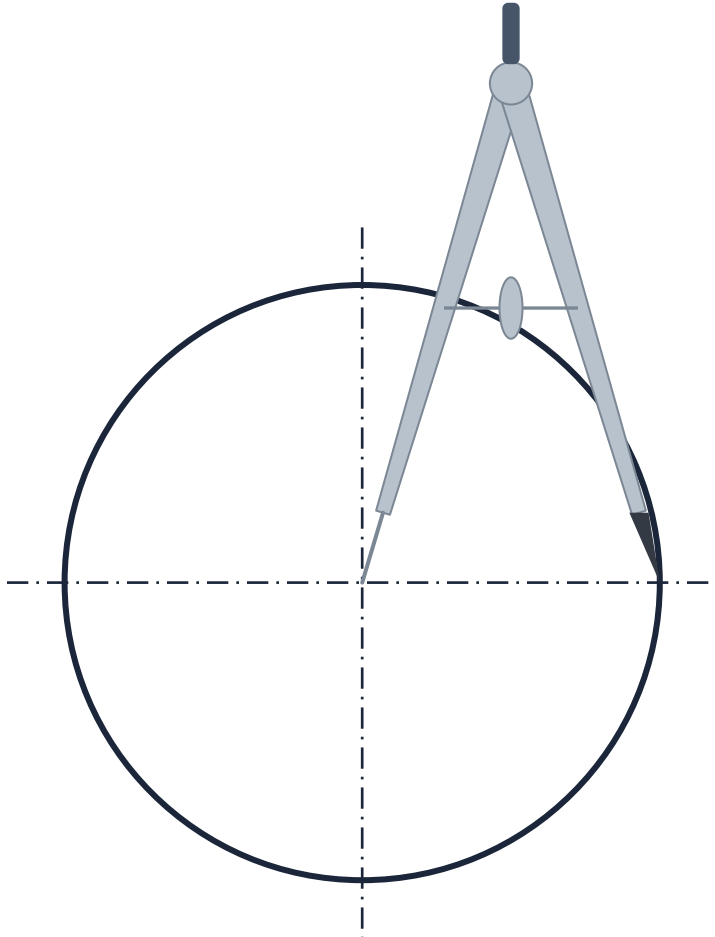
Rotate it slowly while drawing: the point stays sharp, the width stays even.



Light first, dark later

Lay out everything with light 2H lines. Darken only when it is correct.

Compass: circles and arcs



- 1 Set the radius on a ruler: needle on 0.
- 2 Needle a little longer than the lead.
- 3 Lead sharp, as dark as your pencil lines.
- 4 Hold the handle, lean slightly, turn in one direction.

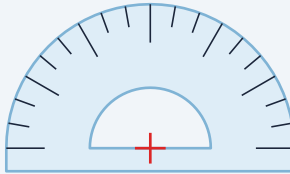
The rest of the kit



Rulers



Measure lengths.
Look straight down
at the mark.



Protractor

Only for angles the
set squares cannot
give, like 20°.



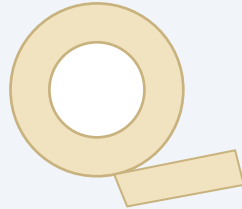
Eraser

Soft white eraser.
Erase gently; brush
the crumbs away.



Sharpener

Keep a long, sharp
point on every
pencil.



Drafting tape

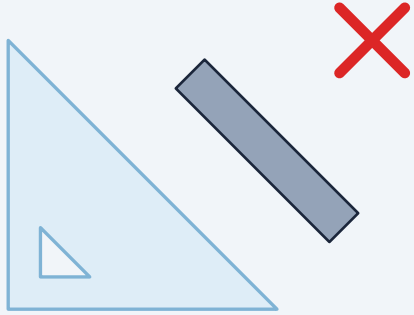
Holds the sheet
and peels off
without tearing it.



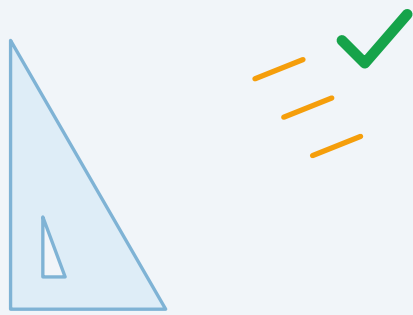
Sheet folder

Carry every sheet
flat. Never fold a
drawing.

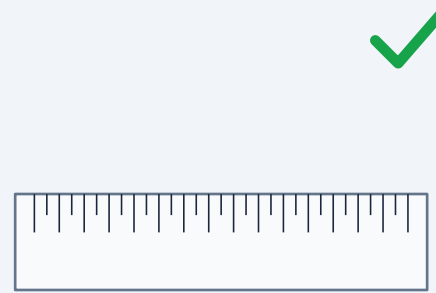
Look after your instruments



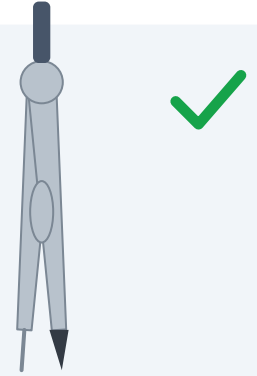
Never cut paper along the T-square or a set square.



Wipe graphite off the plastic edges.



Store rulers and set squares flat, away from heat.



Close the compass and protect the needle.

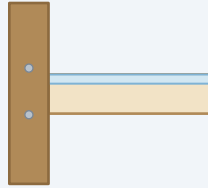
A nick in an edge repeats in every line you draw.

Key terms



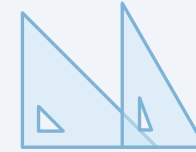
Working edge

The straight left edge of the drawing board. The T-square head slides along it.



T-square

A long straight blade with a head. It gives horizontal lines.



Set square

A plastic triangle, 45° or 30°/60°. On the T-square it gives vertical and angled lines.



Compass

An instrument with a needle and a lead that draws circles and arcs.



Pencil grade

The hardness of the lead: H = hard, light line; B = soft, dark line.



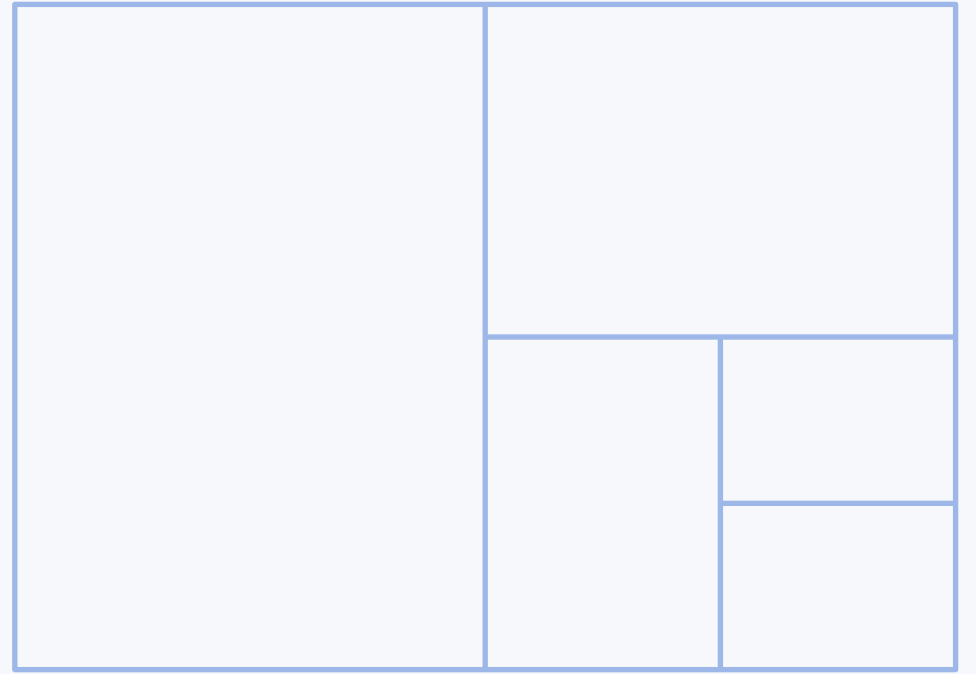
Construction line

A very light line used to lay out a drawing before it is darkened.

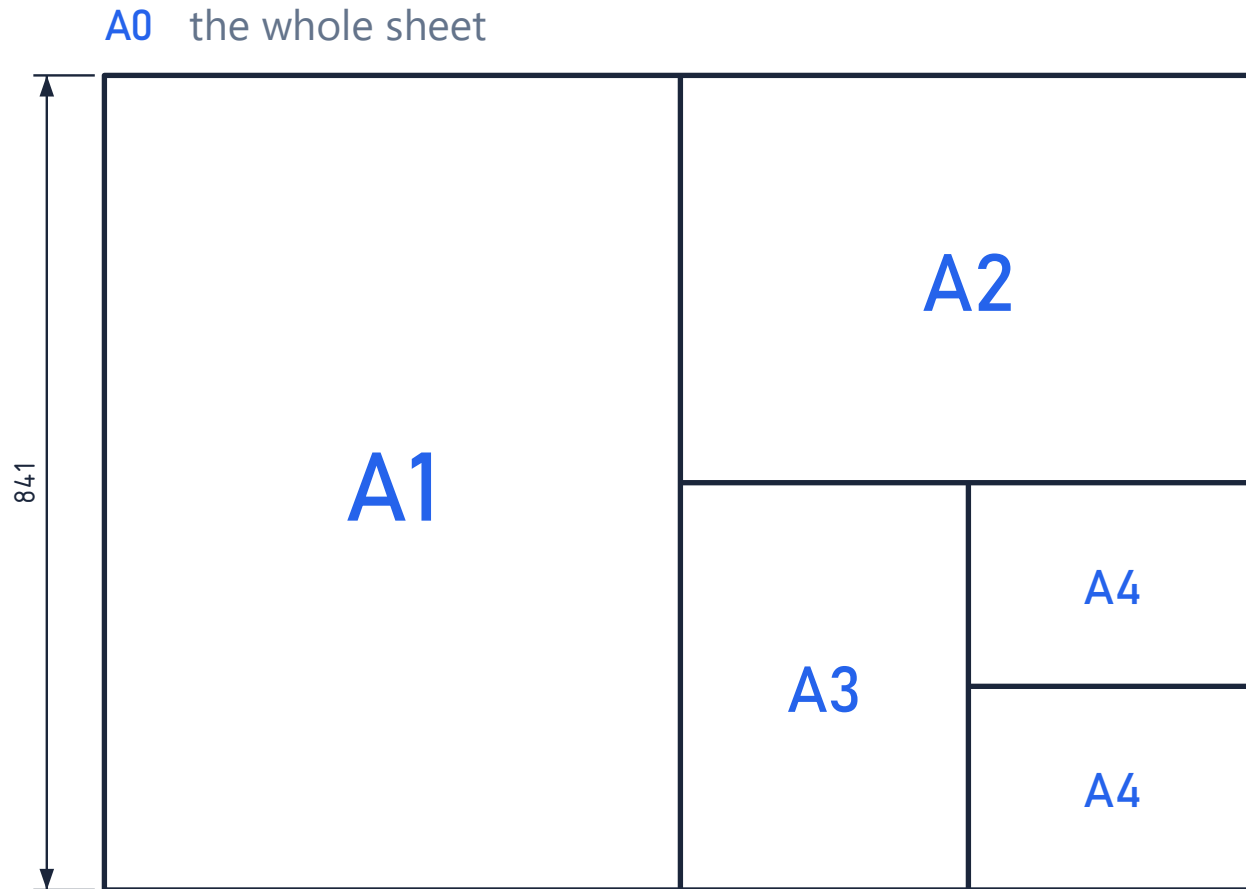
1.5

Drawing paper

The ISO A-series, and the template sheets we use in this course.



The A-series: always cut in half



A0	841 × 1189 mm	about 1 m ²
----	---------------	------------------------

A1	594 × 841 mm	½ A0
----	--------------	------

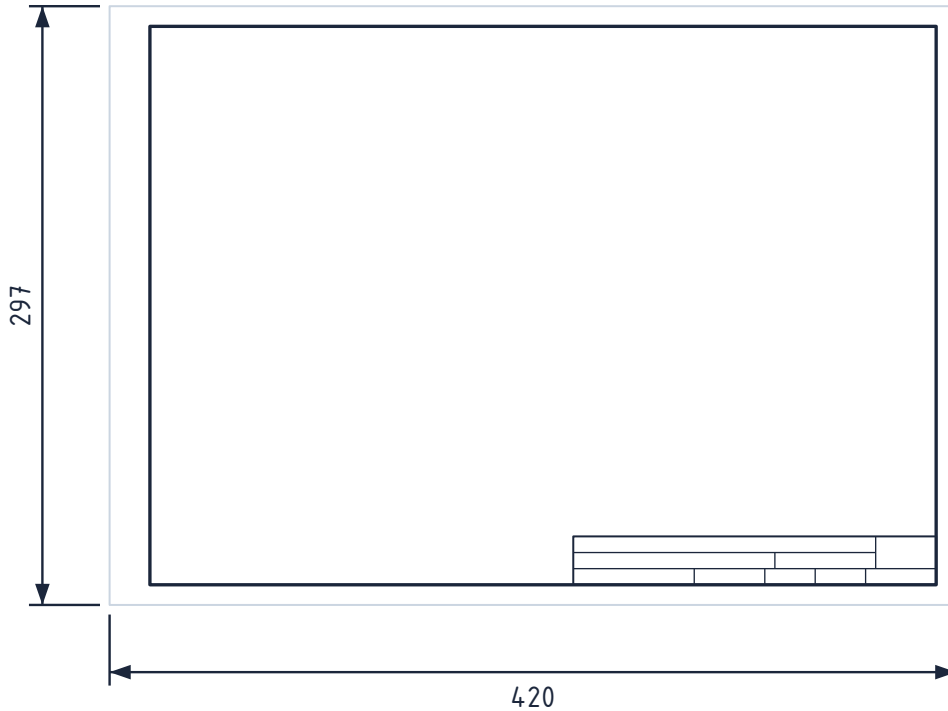
A2	420 × 594 mm	½ A1
----	--------------	------

A3	297 × 420 mm	½ A2
----	--------------	------

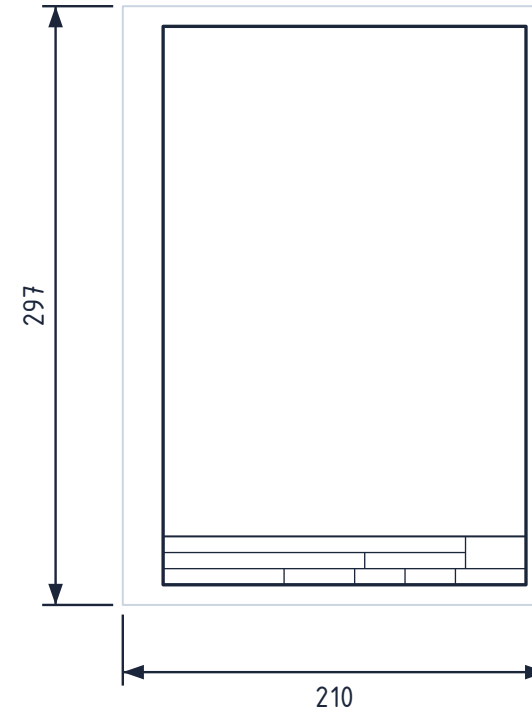
A4	210 × 297 mm	½ A3
----	--------------	------

Every size is half of the one before, and all have the same shape (sides 1 : $\sqrt{2}$).

In this course: A3 and A4 template sheets



A3 landscape



A4 portrait

Template sheets

Frame and title block are already printed.

We share the file; print it on drawing paper.

No need to draw the frame every time. How it is drawn: in Part 2.

Key terms



A-series

The ISO paper sizes A0, A1, A2, A3, A4: each one is half of the one before.



Landscape / portrait

Long side horizontal (landscape) or vertical (portrait).



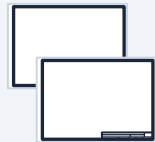
Frame

The thick border line inside the sheet edge. The drawing stays inside it.



Title block

The table at the bottom of the sheet: university, name, number, date, scale, signature.



Template sheet

A sheet with the frame and title block already printed on it.



Drawing paper

Thick paper that holds pencil lines and survives the eraser.

Quick check

1

From a 3D object to flat 2D views: what is this called?

a) Isometric drawing

b) Orthographic views

c) Freehand sketch

d) Scale

2

Which instrument gives a vertical line?

a) T-square

b) Compass

c) Set square

d) Protractor

3

Which pencil do you use for light construction lines?

a) 2H

b) H

c) HB

d) 2B

4

How many A4 sheets make one A3 sheet?

a) 1

b) 2

c) 4

d) 8

Before the next lecture

Get your kit (needed from Week 3)

- | | |
|--|---|
| ☐ Drawing board | ☐ Compass |
| ☐ T-square | ☐ Rulers 30 cm and 60 cm |
| ☐ Set squares 45° and 30°/60° | ☐ Protractor |
| ☐ Pencils 2H · H · HB | ☐ Drafting tape |
| ☐ Sharpener | ☐ Drawing paper A3 · A4 |
| ☐ Eraser | ☐ Sheet folder |

Next: Part 2

- Sheet: frame and title block
- Line types
- Dimensions
- Scale
- Orthographic views: 3D → 2D

