Visual Communication Design Units 3 & 4

Chapter 4 — Two-dimensional & technical drawing

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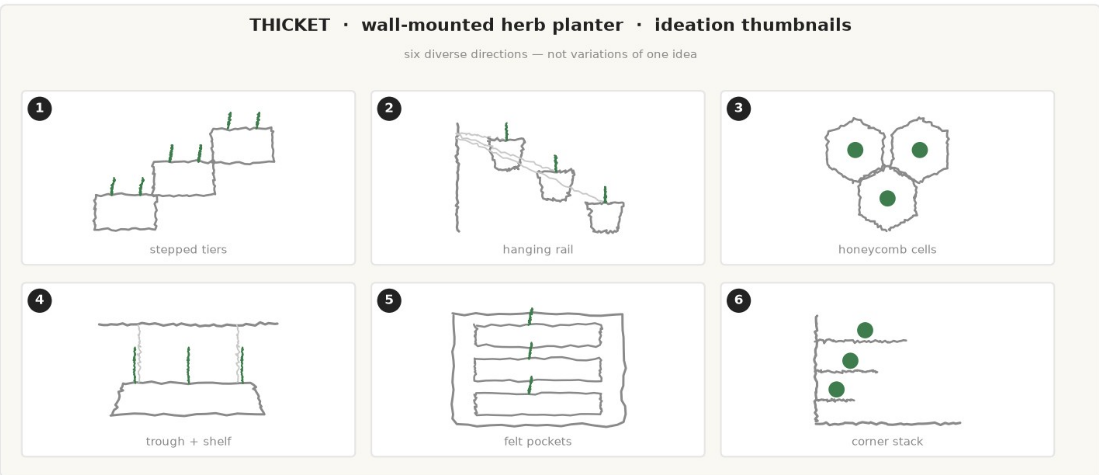
Theory

Development drawings are the drawings a designer makes to *visualise design ideas and concepts* so that they can be analysed, tested and evaluated. The Study Design places them in the **Develop** and **Deliver** stages of the VCD design process, where they help the designer *devise, document and communicate* concepts. They may incorporate **abstract, symbolic or realistic** representations, may be produced digitally or by hand, and may be **rendered** to suggest surface textures, materials and the direction of light, shade and shadow. The Study Design lists them as including, but not limited to, **schematic diagrams, ideation sketches, storyboards, mock-ups and illustrations**.

This subtopic is about *making* these drawings — the **rapid, informal and expressive** techniques used to generate ideas quickly, and the **annotation** that explains and evaluates them. It is a practical skill and it also underpins Section B of the examination, where you must generate diverse development drawings and annotate the design elements and principles you apply. The precise, ruled methods for **documentation drawings** — orthogonal projection and technical conventions (4B), and packaging nets, flats and plans (4C) — are taught later; here the goal is speed, breadth and clear design thinking, not measured accuracy.

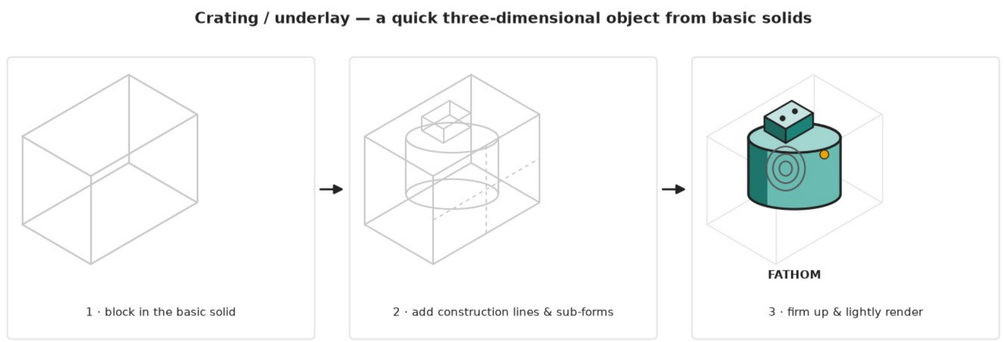
Purpose — visualise, explore and refine ideas rapidly. In the early *Develop* phase the designer uses **divergent thinking** to generate a broad range of imaginative options. Development drawings at this stage are *experimental, imaginative and rapidly generated* — the aim is to capture the *essence* of an emerging idea before judging it, while keeping the audience or users and the earlier research in mind. Later, in the *Deliver* phase, more refined development drawings are used to test and critique a chosen concept.

Ideation sketches and thumbnails. A **thumbnail** is a small, quick sketch. Working at thumbnail size lets the designer put down *many* options fast and compare whole directions at a glance. The key is that a strong set is **diverse** — each thumbnail explores a genuinely different direction (different form, layout or combination of design elements and principles), not a minor variation of the one idea.



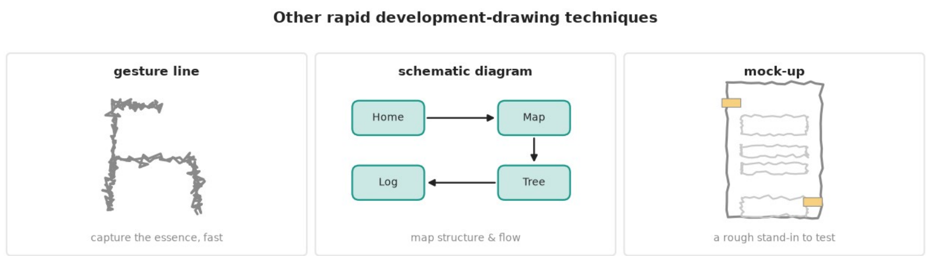
The set above responds to one brief — the *THICKET* wall-mounted herb planter for a small kitchen. Notice that the six thumbnails are **distinct directions** (stepped tiers, a hanging rail, honeycomb cells, a trough-and-shelf, felt pockets, a corner stack), not the same planter drawn six times.

Crating (underlay construction). To sketch a believable three-dimensional object quickly, designers **crate** it: they first block in the **basic solids** (a cuboid, cylinder or sphere) as a light construction "crate", add centre lines and sub-forms, then firm up the object inside that framework. The underlay keeps **proportion** and perspective consistent while the drawing stays rapid and freehand.

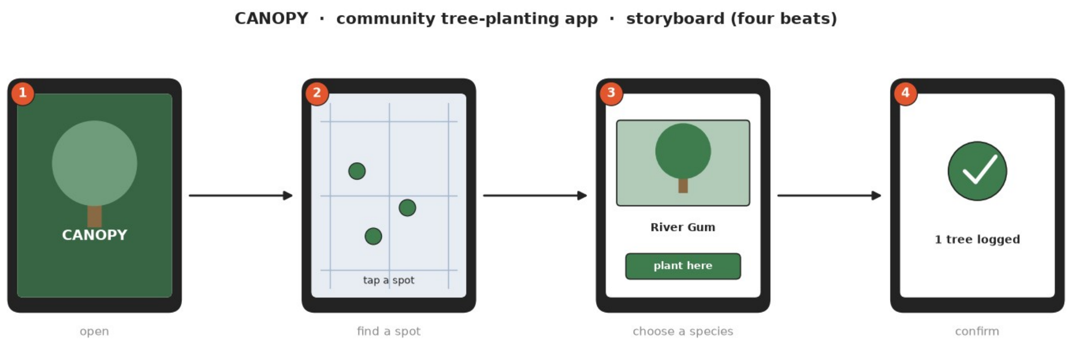


Above, the *FATHOM* portable speaker is crated in three stages: (1) block in the basic solid as a light box; (2) add construction and centre lines and locate the sub-forms; (3) firm up the object and lightly render it, letting the underlay fall away. This is a *quick* three-dimensional development drawing — it is not a ruled isometric or planometric drawing (that precise paraline construction is taught in Chapter 5).

Other rapid techniques — gesture, schematic diagrams and mock-ups. Not every development drawing is a picture of the object. A **gesture** sketch uses a few loose, expressive strokes to capture the essence or movement of a form fast. A **schematic diagram** is an *abstract or symbolic* drawing that maps the **structure, relationships or flow** of a design — for example the screens of an app or the zones of a layout — rather than its appearance. A **mock-up** is a rough, low-fidelity stand-in (folded card, a paper interface) made to *test* placement, scale and how a design is handled.



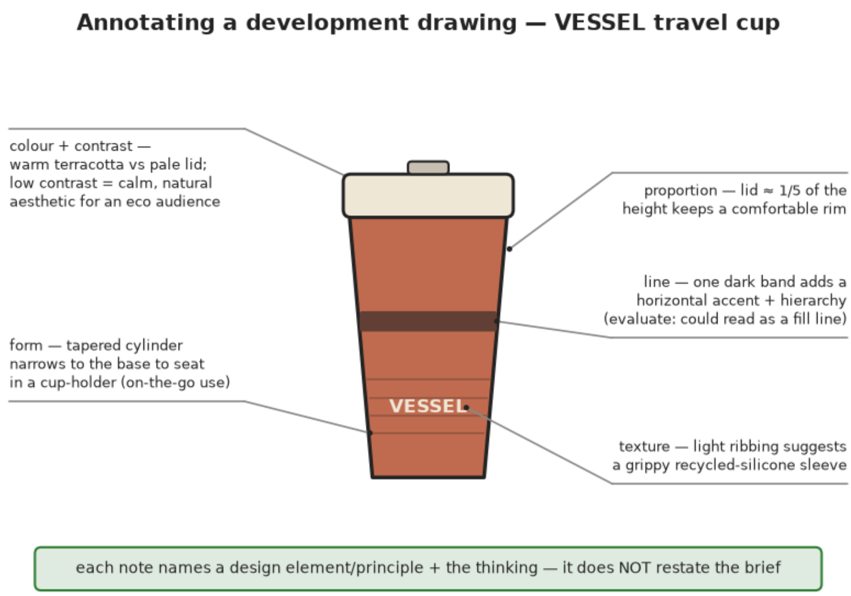
Storyboards. A **storyboard** is a sequence of frames that shows a design *experience across time* — one frame per key moment or beat. Its natural home is the field of **Interactive experiences**, where a user moves through an interface screen by screen; storyboards are also used in **Messages** work (the beats of an animated advertisement or title sequence) and in **Environments** work (the sets and worlds built for film and games). Keep the vocabulary exact: the four **fields of design practice** are only **Messages**, **Objects**, **Environments** and **Interactive experiences** — animation and film are kinds of work *within* those fields, never fields in their own right. A single sketch cannot show sequence; a storyboard can.



The storyboard above works through the opening flow of the *CANOPY* community tree-planting app — open, find a spot, choose a species, confirm — as four ordered frames.

Illustrations. The fifth type the Study Design names is the **illustration** — a drawn or digitally painted *pictorial* image made to depict something: an object in use, a scene, a character, a mood. As a *development* drawing an illustration is used when the thing being tested is how the design will **look and feel** — the organiser seen on a real hallway wall, the atmosphere of a space, the character on a pack. It is normally more resolved and more **realistic** than a thumbnail, and it is usually **rendered**, so it belongs to the later part of *Develop* and to *Deliver*, where a concept is tested, critiqued or presented rather than invented. (The same word appears in the Study Design's list of **presentation** drawings; what makes an illustration a *development* drawing is its purpose — exploring and testing an idea, not handing a resolved solution to a stakeholder.)

Annotation — the Section B skill. A development drawing earns most of its value from its **annotation**: short notes, run on **leader lines**, that use **design terminology** to *explain and evaluate* the design decisions. A strong annotation names the **design element** or **design principle** applied, states the **design thinking** behind the choice, and links it to the audience, purpose or design criteria — often with a brief **evaluation** ("this works because…", "a limitation is…"). A weak annotation merely labels what is visible ("this is blue") or **restates the brief** ("this is a herb planter"), which adds nothing.



The annotated *VESSEL* travel-cup concept shows the difference: each note names an element or principle (form, colour, proportion, line, texture) and explains the reasoning and its effect, rather than describing the obvious or repeating the brief.

Diversity now, two concepts later. Keep two Section B moves separate. During ideation you **diverge**: your development drawings must be *distinct directions*, not variations of one idea. Only after you **converge** and select the strongest idea do you develop that **one idea into two concepts** — and *those* two concepts are deliberate variations of the same idea, each annotated to show the different elements and principles applied.

> **Watch-out — diverse ≠ variations.** At ideation, development drawings must be genuinely **different directions**. Six versions of the same form with a tweaked handle is *one* idea, not six. Assessors penalise sets that are minor variations rather than diverse options.
>
> **Watch-out — the drawing is the answer, not the writing.** When a question asks you to generate ideas, **drawing** must be your primary method of idea generation. Assessors report that lower-scoring students "relied heavily on annotations rather than drawing", and that a number submitted **brainstorms or mind maps in place of drawings** — a thinking strategy, which "does not meet the requirement for developmental drawings" and limits the marks available. Brainstorm in your head or your workbook if you must; on the page, draw.
>
> **Watch-out — one idea → two concepts (not two ideas).** When you develop, take a **single** selected idea and resolve it into **two concepts**. Do not present two unrelated ideas and call them concepts.
>
> **Watch-out — annotate the design thinking, don't restate the brief.** An annotation must name the **design element/principle** and the **reasoning** (and, ideally, evaluate it). "This is a planter" or "this is green" earns nothing; "the low-contrast green supports a calm, natural aesthetic for an eco audience" does.

Watch-out — annotate elements and principles, not criteria and not Gestalt. Assessors report that annotations which listed the **design criteria** or used terms relating to **Gestalt** principles "did not address the requirements of the question". Every note must **name a design element or a design principle** first; only then link that choice to a criterion, the audience or the purpose — a criterion is never the annotation on its own. Keep the three vocabularies separate: *proximity, continuity, similarity, closure, common fate* and *focal point* are **Gestalt** principles (Chapter 2D) and do not belong in a Section B annotation about design elements and principles.

Watch-out — rapid is appropriate; finish comes later. Ideation drawings are meant to be quick, informal and expressive. Do not over-render a thumbnail — fidelity is *resemblance to the finished outcome*, not quality, and polishing too early wastes the divergent stage.

Watch-out — development ≠ documentation. Development drawings visualise and explore ideas; they do **not** carry the technical conventions (dimensions, scale, projection symbols) that define a documentation drawing. Those conventions are taught in 4B and 4C, and applied to three-dimensional documentation drawings in Chapter 5. Classify a drawing by its **purpose**.

Worked examples

Example 1 — scaffolded

Use crating to produce a quick three-dimensional development sketch of the FATHOM portable speaker, working from basic solids. Describe what you do at each stage. (4 marks)

Working	Comment
Stage 1 — crate. Lightly block in the overall bounding box of the speaker as a **basic solid** (a cuboid) drawn in three dimensions, keeping the lines faint.	Start from a basic solid, not the detail. The crate fixes the overall **proportion** and the 3D angle before any features are drawn.
Stage 2 — construct. Add **centre lines** to the faces and rough in the sub-forms — a **cylinder** for the rounded body and a smaller box for the control panel — still lightly.	Construction and centre lines locate features symmetrically and keep everything inside one consistent framework. Sub-forms are also basic solids.
Stage 3 — refine. Firm up the outline of the speaker inside the crate, add the circular grille and controls, and **lightly render** one side to suggest form; let the underlay fall away.	Only now do you commit the object line. A little tone (light, shade) reads as three-dimensional. Keep it rapid — this is a development sketch, not a ruled drawing.

Example 2 — scaffolded

Annotate the VESSEL travel-cup concept using appropriate design terminology to explain and evaluate two design decisions. (4 marks)

Working	Comment
Annotation 1 (form). "Tapered cylindrical **form** narrows toward the base so the cup seats in a car cup-holder — resolves the on-the-go use."	Name the **element** (form), state the design thinking, and link it to use. Do not just write "it is a cup".
Annotation 2 (colour + contrast). "Warm terracotta body against an off-white lid: low **contrast** builds a **calm, natural** aesthetic suited to an eco-minded audience."	Name an element (colour) *and* a principle (contrast), name the **specific aesthetic**, and tie it to the audience.
Evaluate one decision. "The single dark band adds **hierarchy** and a horizontal accent without clutter — effective, though at a glance it could read as a fill line."	An annotation that **evaluates** (strength + a limitation) earns more than one that only describes.
Keep every note in design language and off the brief.	The marks are for **design terminology + reasoning**, never for restating what the brief already said.

Example 3 — unscaffolded

Generate a set of at least six diverse ideation thumbnails for the THICKET wall-mounted herb planter, and explain what makes your set strong. (6 marks)

A strong response quickly puts down **six or more distinct directions** rather than one planter drawn six ways — for example stepped tiers, a hanging rail of pots, clustered honeycomb cells, a trough beneath a shelf, a felt pocket panel and a triangular corner stack (a model set is shown in the thumbnails figure above). Each thumbnail is small, rapid and informal, so judgement is suspended and *quantity and variety* come first; each explores a different combination of the design elements and principles (different **form**, **proportion** and arrangement) while keeping the small-kitchen audience and the mounting constraint in mind. The set is strong because it is genuinely **diverse** — it opens up the design space before the designer converges — rather than a set of minor variations *(6 marks: a diverse set of ≥6 directions + the reasoning that ideation is divergent, rapid and varied).*

Example 4 — unscaffolded

Produce a four-frame storyboard for the opening flow of the CANOPY tree-planting app, and annotate one design decision. (6 marks)

A four-frame storyboard shows the **experience across time**, one frame per beat: (1) a splash frame with the CANOPY mark; (2) a city map with tree-planting pins; (3) a species-detail card with a "plant here" action; (4) a confirmation frame acknowledging the logged tree (as shown in the storyboard figure above). The frames are ordered left to right with the user's action captioned beneath each. One decision is then annotated in design terminology — for example: "the green **colour** and rising **hierarchy** from map → card → confirmation reassure the user and signal progress through the task." The storyboard succeeds because a single sketch could not communicate the **sequence**, whereas the ordered frames make the flow and each key moment clear to the stakeholder *(6 marks: four ordered frames covering the flow + one annotation naming an element/principle and its reasoning + why sequence needs a storyboard).*

Practice questions

Scaffolded

Q1. Using the THICKET thumbnail set: (a) Name the type of development drawing shown. *(1 mark)* (b) State which type of thinking a designer uses to generate them. *(1 mark)* (c) Explain why the set should show diverse directions rather than variations of one idea. *(2 marks)*

Q2. Using the FATHOM crating sequence: (a) Name the basic solid used as the "crate" in stage 1. *(1 mark)* (b) State the purpose of the construction and centre lines added in stage 2. *(1 mark)* (c) Explain how crating helps a designer sketch a believable 3D object quickly. *(2 marks)*

Q3. Using the annotated VESSEL concept: (a) Identify one design **element** named in the annotations. *(1 mark)* (b) Identify one design **principle** named in the annotations. *(1 mark)* (c) Explain why an annotation must do more than restate the brief. *(2 marks)*

Q4. Using the CANOPY storyboard: (a) Name the type of development drawing shown. *(1 mark)* (b) Describe what a storyboard can communicate that a single sketch cannot. *(2 marks)* (c) Name one field of design practice a storyboard is well suited to. *(1 mark)*

Q5. A **schematic diagram** and a **storyboard** are both development drawings. (a) Define a schematic diagram. *(2 marks)* (b) Describe one way it differs from a storyboard. *(2 marks)*

Q6. A student annotates a concept: "This is a blue lid." (a) Explain why this is a weak annotation. *(1 mark)* (b) Rewrite it as a strong annotation that names a design element or principle and the design thinking. *(2 marks)*

Unscaffolded

Questions 7–17 use the following brief unless a question states otherwise.

SLATE — a wall-mounted organiser for a shared-house hallway that keeps keys, mail and reminders in one place. Design criteria: hold up to four sets of keys; include a slot for letters; provide a surface for notes; mount on a single wall stud; suit a busy, shared entryway. Field of practice: Objects.

Q7. Generate a set of at least **six diverse ideation thumbnails** for the SLATE organiser. *(6 marks)*

Q8. The Study Design lists **illustrations** among the types of development drawing. Explain what an illustration would contribute to the SLATE project that an ideation thumbnail could not, and describe **two** ways an illustration differs from a thumbnail. *(4 marks)*

Q9. Use **crating** to produce a quick three-dimensional development sketch of **one** of your SLATE ideas. Describe the basic solid you start from and the stages you follow. *(4 marks)*

Q10. Annotate one SLATE concept with **three** annotations that name design elements and/or principles and the design thinking, and **evaluate** one of your decisions against the criteria. *(6 marks)*

Q11. Produce a **schematic diagram** that maps the zones of the SLATE organiser (keys, mail, notes) and how a user moves between them. Explain why a schematic, rather than a rendered sketch, suits this task. *(4 marks)*

Q12. Produce a short **storyboard** (three to four frames) showing a resident arriving home and using the SLATE organiser. *(4 marks)*

Q13. Explain what a low-fidelity **mock-up** of the SLATE organiser would let the designer test, and why a mock-up is useful before resolving the concept. *(3 marks)*

Q14. Select **one** of your SLATE ideas and develop it into **two concepts**, annotating the different design elements and principles applied in each. Explain how this differs from generating two separate ideas. *(6 marks)*

Q15. Explain why development drawings at the ideation stage are produced using **rapid, informal and expressive** techniques, and why a high level of finish is not the goal at this stage. *(3 marks)*

Q16. The Study Design states that development drawings may incorporate **abstract, symbolic or realistic** representations. Give one example of each in the context of the SLATE project. *(3 marks)*

Q17. A development drawing may be **rendered** to suggest surface textures, materials and the direction of light, shade and shadow. Explain why a designer might render a development drawing, and at which stage of the process this is most likely. *(3 marks)*

Answers

Q1. (a) Ideation sketches / thumbnails. (b) Divergent thinking. (c) See solutions (diverse directions open the design space; variations explore only one idea). **Q2.** (a) A cuboid (basic solid / box). (b) To locate features symmetrically and keep the sub-forms within one consistent framework. (c) See solutions. **Q3.** (a) Any one of: form, colour, texture (element). (b) Any one of: contrast, proportion, hierarchy (principle). (c) See solutions. **Q4.** (a) A storyboard. (b) The sequence/experience across time — the ordered moments or beats. (c) Interactive experiences (also accept Messages or Environments — the answer must be one of the four fields). **Q5.** (a) An abstract or symbolic drawing that maps the structure, relationships or flow of a design. (b) A schematic is abstract/symbolic — nodes and links mapping structure and relationships; a storyboard is pictorial — drawn frames picturing each moment of the experience. **Q6.** (a) It only labels what is visible and adds no design reasoning. (b) See solutions (name element/principle + thinking). **Q7.** A diverse set of ≥6 distinct SLATE directions, rapid and informal. See solutions. **Q8.** An illustration pictures the organiser realistically in use/in place, so look-and-feel can be judged; it differs from a thumbnail in fidelity (resolved and rendered vs rapid and informal) and in purpose/number (one drawing to test or present vs many to generate options). See solutions. **Q9.** Start from a cuboid crate → construction/centre lines + sub-forms → firm up and lightly render. See solutions. **Q10.** Three annotations naming elements/principles + reasoning, plus one evaluation tied to a criterion. See solutions. **Q11.** A node-and-link schematic of the three zones and the movement between them; a schematic shows structure/flow, not appearance. See solutions. **Q12.** 3–4 ordered frames: arrive → hang keys → drop mail → read a note. See solutions. **Q13.** Tests placement, scale, reach and handling cheaply before committing to a resolved concept. See solutions. **Q14.** One idea → two concepts (variations of the same idea), each annotated; two ideas would be unrelated directions. See solutions. **Q15.** To generate many options quickly, suspend judgement and capture the essence; finish comes after selection. See solutions. **Q16.** Abstract = a schematic of zones; symbolic = an icon for the mail slot; realistic = a rendered sketch of the finished unit. See solutions. **Q17.** To communicate materials/surfaces and form (light, shade, shadow) when testing or presenting a refined concept — most likely in the Deliver stage. See solutions.

Fully-worked solutions

Q1. (a) They are **ideation sketches** (thumbnails). (b) **Divergent thinking**. (c) A diverse set explores genuinely different directions, so it opens up the whole design space and gives the designer real options to evaluate; a set of variations only reworks a single idea, so it narrows the exploration prematurely and risks missing a stronger direction *(2 marks: diverse opens options / variations explore one idea).*

Q2. (a) A **cuboid** (a basic solid / box). (b) They locate the features symmetrically on the faces and keep the sub-forms within one consistent 3D framework, so the object stays in proportion and on a single angle. (c) Crating starts from a basic solid that fixes the overall **proportion** and the three-dimensional angle before any detail is drawn; the object is then firmed up *inside* that framework. Because the hard decisions about size and viewpoint are made first with light lines, the designer can sketch a believable 3D object quickly and freehand, without measuring *(2 marks).*

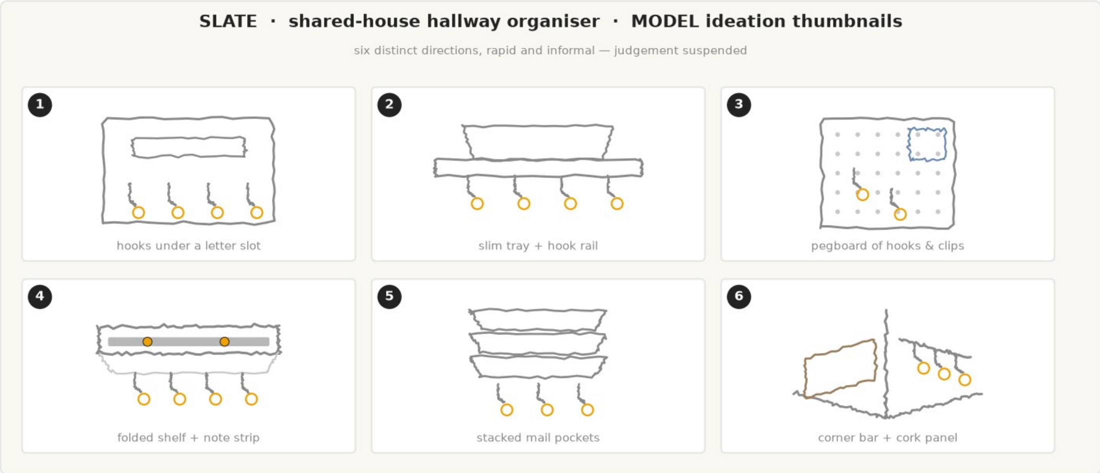
Q3. (a) An **element** such as **form**, **colour** or **texture**. (b) A **principle** such as **contrast**, **proportion** or **hierarchy**. (c) An annotation exists to communicate the **design thinking** — which element or principle was chosen and *why*, and how well it works. Restating the brief ("this is a travel cup") repeats information the reader already has and shows no reasoning, so it earns no marks; a strong annotation explains and evaluates the decision *(2 marks).*

Q4. (a) A **storyboard**. (b) A storyboard communicates the **experience across time** — the ordered sequence of key moments or beats a user passes through — which a single, static sketch cannot show *(2 marks).* (c) **Interactive experiences** — the field in which a user moves through an interface screen by screen. (**Messages** is equally creditable, for the beats of an animated advertisement, as is **Environments**, for the sets and worlds of film and games. The answer must name one of the four fields: "animation" and "film" are kinds of work *within* those fields, not fields of design practice, and a one-mark *Name* question is marked on your first answer.)

Q5. (a) A **schematic diagram** is an abstract or symbolic development drawing that maps the **structure, relationships or flow** of a design rather than its appearance *(2 marks).* (b) A schematic is **abstract or symbolic**: it reduces the design to nodes, zones and links so that the *structure and relationships* between the parts can be read at a glance, and it makes no attempt to show what anything looks like. A storyboard is **pictorial**: it draws the design as the user actually meets it, one frame per key moment, so it communicates the *experience across time*. Both can carry a sequence — a schematic can arrow one zone or screen to the next — but only the storyboard **pictures** each moment *(2 marks).*

Q6. (a) It only **labels what is visible** and gives no design reasoning — it neither names a principle nor explains a decision. (b) Model: “The cool blue **colour** of the lid **contrasts** with the warm body, lifting the lid to the top of the visual **hierarchy** so the user reads at a glance where the cup opens.” *(2 marks: names an element/principle + states the design thinking).*

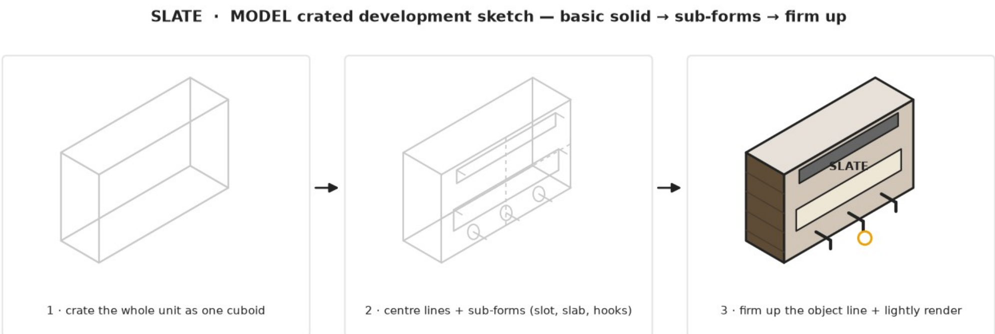
Q7. A model set of thumbnails is shown below.



A strong response rapidly generates **six or more distinct directions** for the SLATE organiser — for example: a row of key hooks under a letter slot; a slim tray-and-hook rail; a pegboard of movable hooks and clips; a folded-metal shelf with a magnetic note strip; a set of stacked pockets for mail with hooks below; and a corner unit combining a hook bar with a cork note panel. Each thumbnail is small, quick and informal, exploring a different **form**, **arrangement** and combination of elements and principles, while keeping the busy shared entryway and the single-stud mounting in mind. The set is strong because it is genuinely **diverse** rather than one idea repeated *(6 marks: ≥6 clearly different directions, rapid and informal, audience/constraint kept in view).*

Q8. An **illustration** is a drawn or digitally painted **pictorial** image of the design — for SLATE, a rendered image of the organiser mounted on a hallway wall with keys hanging, a letter in the slot and a note clipped to the surface. What it contributes that a thumbnail cannot is a **realistic** picture of the finished look and feel: the timber and steel read as materials, the light and shade describe the depth of the slot, and the unit is shown **in its context of use**, so the designer (and a housemate giving feedback) can judge whether it suits a busy shared entryway. A thumbnail is too small and too abstract to test that. Two differences: (1) **level of finish and fidelity** — a thumbnail is small, rapid and informal, while an illustration is resolved and usually **rendered** to show surface, material and light; (2) **purpose and number** — thumbnails are produced in quantity to *generate and compare* options during divergent ideation, whereas a single illustration is produced later to *test, critique or communicate* one chosen direction *(4 marks: what an illustration contributes — a realistic, in-context picture for testing look and feel; two clear differences from a thumbnail).*

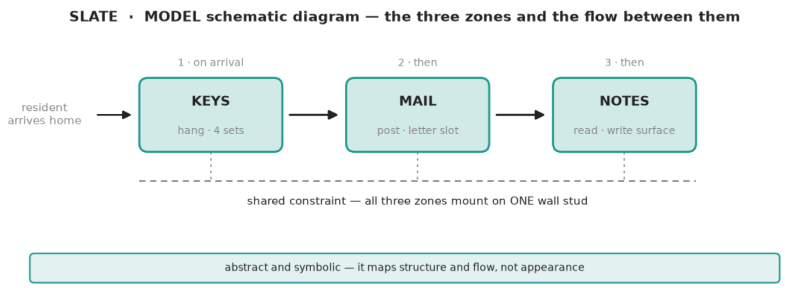
Q9. A model crated sketch is shown below.



Model method: start from a **cuboid** that bounds the whole organiser — this is the “crate” and it is drawn lightly in three dimensions to fix the proportion and viewing angle. Add **centre lines** to the front face and rough in the sub-forms as further basic solids — a shallow box for the letter slot, small cylinders for the key hooks, a thin slab for the note surface. Then **firm up** the object line inside the crate, add the openings and hooks, and **lightly render** one side to suggest depth and the metal or timber surface, letting the construction lines fall away. The result is a rapid, believable 3D development sketch — not a ruled paraline drawing *(4 marks: basic solid crate → construction/centre lines + sub-forms → firm up and lightly render).*

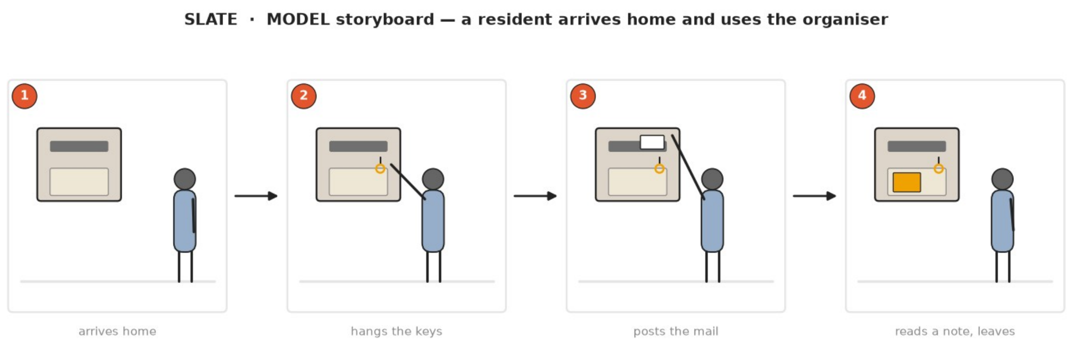
Q10. Model annotations on a SLATE concept: (1) "Horizontal **form** and a wide **proportion** let the unit span one wall stud and sit above head height — resolves the single-fixing criterion." (2) "A bright accent **colour** on the key hooks gives **contrast** against a neutral body, so keys are found fast in a busy, low-light entryway." (3) "The note surface is given the largest area, placing it at the top of the **hierarchy** because reminders are the most time-critical item." Evaluation: "Grouping four hooks in one row meets the 'four sets of keys' criterion and reads clearly, though it may crowd if the household grows — a limitation to test." Each note names an element or principle and the reasoning, and the evaluation is tied to a stated criterion *(6 marks: three valid design-terminology annotations + one criterion-linked evaluation).*

Q11. A model schematic is shown below.



The model schematic uses three linked nodes — **KEYS**, **MAIL** and **NOTES** — connected by arrows showing the order in which a resident uses them on arriving home (for example keys → mail → notes), with the "single-stud mount" marked as a shared constraint. A **schematic** suits this task because the question is about **structure and flow** — which zones exist and how the user moves between them — not about how the object looks. A rendered sketch would show appearance but obscure the relationships; the abstract diagram makes the organisation legible at a glance *(4 marks: a node-and-link map of the three zones + the reason a schematic communicates structure/flow better than a rendered image).*

Q12. A model storyboard is shown below.



The model storyboard uses four ordered frames: (1) a resident approaches the wall unit at the door; (2) they hang a set of keys on a hook; (3) they drop letters into the mail slot; (4) they glance at a reminder on the note surface and leave. The frames run left to right with the action captioned beneath each, showing the **sequence** of use over time. The storyboard is effective because it communicates the resident's experience of the organiser as an ordered flow, which a single sketch could not *(4 marks: 3–4 ordered frames covering the use sequence + evidence of a clear beat-by-beat flow).*

Q13. A low-fidelity **mock-up** — made quickly from cheap, readily available materials such as folded card and tape — lets the designer test **placement, scale, reach and handling**: whether the hooks sit at a comfortable height, whether the letter slot is wide enough, and how the unit feels in the hallway. Because it is cheap and fast, it can be tried and changed early, gathering feedback and critique *before* the designer commits time and resources to resolving the concept, reducing wasted effort *(3 marks: names what is tested — scale/placement/handling — + the value of testing cheaply and early).*

Q14. The designer first uses convergent thinking to **select one** SLATE idea with the most potential — say the folded-metal shelf with hooks. That single idea is then developed into **two concepts**: Concept A resolves it as a warm timber-fronted unit with a soft, natural aesthetic (colour and texture chosen for a homely entryway); Concept B resolves the same idea as a powder-coated steel unit with a bold accent hook rail and stronger **contrast** for a sharp, contemporary look. Each concept is annotated to show the different elements and principles applied. This differs from generating **two separate ideas** because both concepts share the *same underlying idea* and simply resolve it in different ways — they are variations of one direction, not two unrelated directions *(6 marks: one selected idea → two annotated concepts that vary the same idea + the distinction from two separate ideas).*

Q15. Ideation drawings are produced **rapidly, informally and expressively** so the designer can put down a **broad range of imaginative options** quickly, suspend judgement, and capture the *essence* of each emerging idea rather than labouring over one. A high level of finish is not the goal at this stage because the ideas are still being explored and most will be discarded; **fidelity is resemblance to the finished outcome, not quality**, so polishing a thumbnail wastes effort and can lock the designer into an idea before it has been evaluated. Finish is added later, once a concept has been selected *(3 marks: rapid = many options/suspend judgement/capture essence + finish is premature at ideation).*

Q16. In the SLATE project: an **abstract** representation could be a **schematic diagram** mapping the keys/mail/notes zones and their flow; a **symbolic** representation could be a simple **icon** standing for the mail slot or a key on a signage-style mark; a **realistic** representation could be a **rendered sketch** of the finished unit showing its material and form. Each is a legitimate development drawing chosen for a different job *(3 marks: one valid example of each of abstract, symbolic and realistic).*

Q17. A designer **renders** a development drawing — adding tone to show surface textures, materials and the direction of light, shade and shadow — so that the drawing communicates *what the object is made of and how it reads in three dimensions*, which helps in **testing and critiquing** a refined concept or presenting it for feedback. This is most likely in the **Deliver** stage, once a concept has been selected from the rapid, unrendered ideation sketches, because rendering takes time and is only worthwhile on an idea the designer intends to carry forward *(3 marks: renders to convey material/form via light and shade for testing/critique + most likely at the Deliver stage).*

Chapter 4 Two-dimensional and technical drawing — 4B Third-angle orthogonal projection and technical drawing conventions

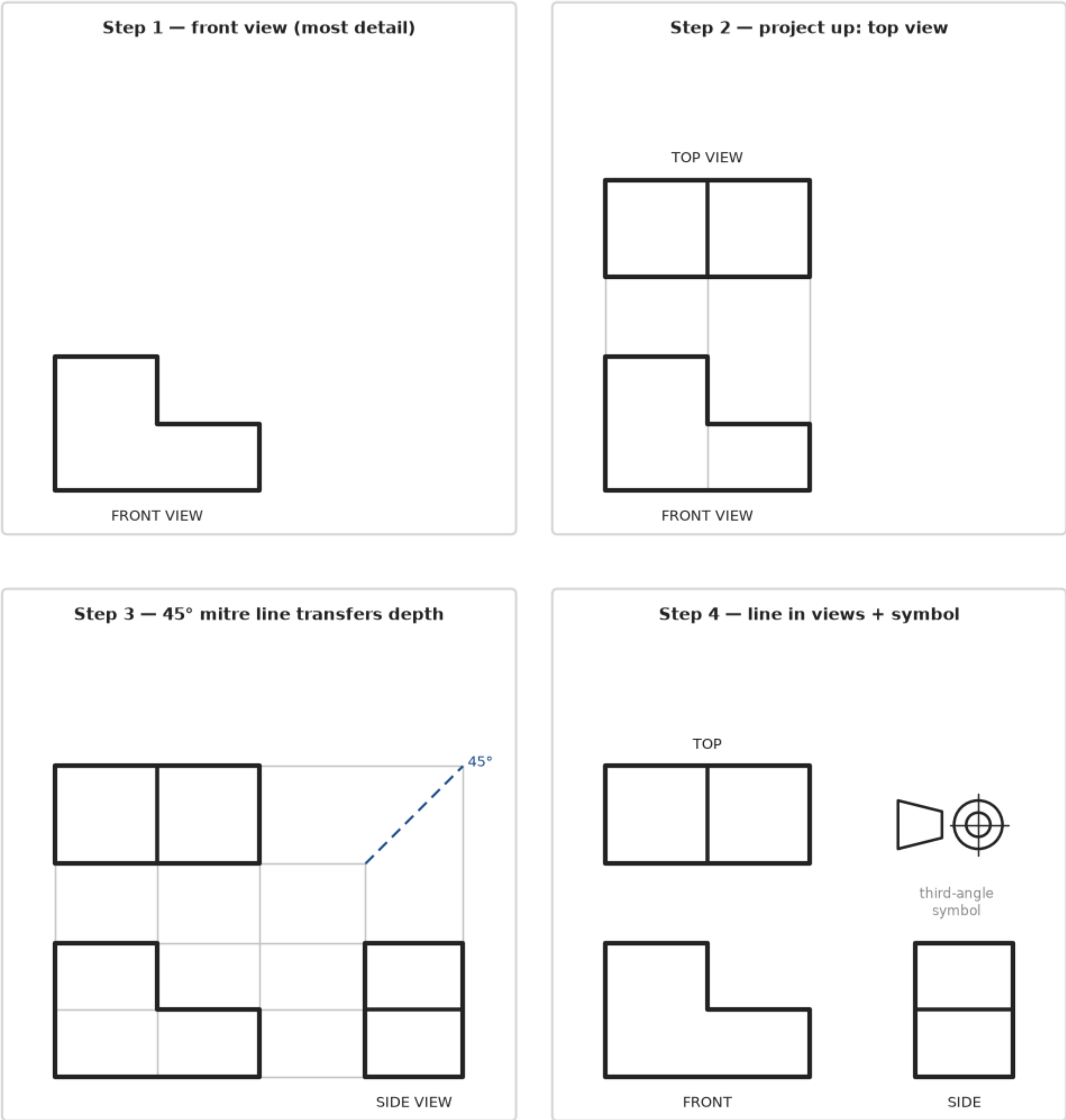
Theory

Documentation drawings define and record the technical specifications required for the assembly of three-dimensional objects and environments. They may represent a form in two dimensions — as **orthogonal drawings**, architectural plans and elevations, packaging nets or technical flats — or in three dimensions, as perspective and paraline (isometric and planometric) drawings. Whatever the type, documentation drawings carry **technical conventions**: **symbols, dimensions and scales**. This subtopic covers the most widely used two-dimensional documentation method, **third-angle orthogonal projection**, and the conventions that make such a drawing readable and buildable.

Orthogonal (orthographic) projection depicts an object through a set of two-dimensional views, each looking squarely at one face. Because the lines of sight (the *projectors*) are parallel to one another and strike each view at right angles, a view shows every face that is **parallel to it** in its **true shape and true size**, with no perspective distortion (a face that is *not* parallel to the view — a slope or a chamfer — comes out foreshortened, so it is set out by projecting its corners rather than measured). A single view cannot describe a three-dimensional object on its own, so the method uses **multiple views** — most commonly three: the **front view**, the **top view** (plan) and a **side view** (end elevation). Together they let a maker read every width, height and depth.

Third-angle projection — the arrangement of the views. Australian technical drawing follows the **third-angle** convention (Australian Standard AS 1100). Its rule is simple: **each view is placed on the same side of the front view as the direction from which it is seen.** So the **top view sits directly above the front view**, the **right-side view sits to the right of the front view** (a left-side view would go to the left, a bottom view below). The views are not scattered — they are locked together by projection:

- The front and top views share the object's **width**, so they are lined up **vertically** by projectors drawn straight up and down.
- The front and side views share the object's **height**, so they are lined up **horizontally** by projectors drawn straight across.
- The top and side views share the object's **depth**. Depth is the same in both, so it is transferred from one to the other with a **45° mitre line**: a depth run horizontally out of the top view meets the mitre line and turns down into the side view (and the reverse), guaranteeing the two views agree.



The staged drawing above sets out one object — a stepped block — the way you should work: draw the **front view** first (choose the face that shows the most detail with the fewest hidden edges); **project up** to build the top view; then **project across** and use the **45° mitre line** to carry the depths into the side view; finally **line in** the three finished views and add the projection symbol. Notice that the light **construction and projection lines** stay faint — they set the drawing out but are not part of the object.

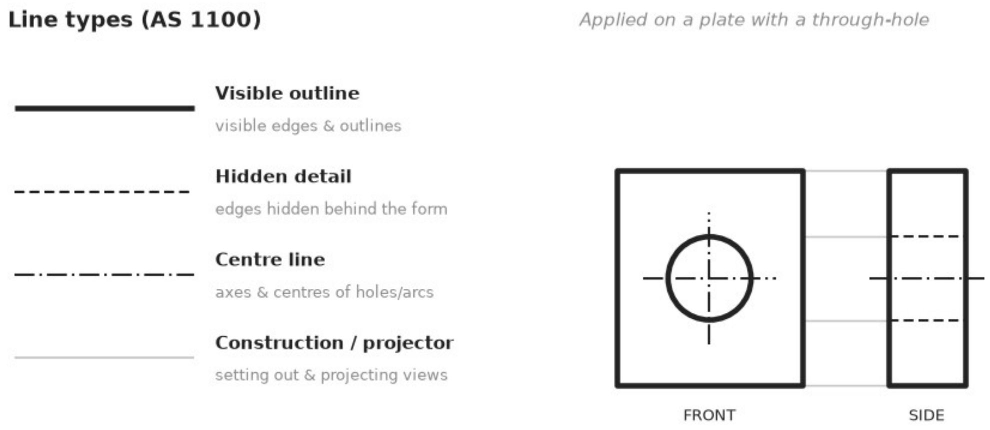
The third-angle projection symbol. So a reader knows which convention has been used, a documentation drawing carries the standard **third-angle symbol** near its title block: a small **truncated cone** drawn as a tapered profile beside its end view (two **concentric circles**), arranged in the third-angle relationship. If the two systems were confused, a builder could read the views mirror-reversed, so the symbol is not decoration — it tells the reader how to interpret the layout.

Scale. A **scale** states the ratio between a length on the drawing and the true length on the object, written *drawing : object*.

- **1:1** is **full size** — the drawing length equals the real length.
- **1:2, 1:5, 1:10, 1:20, 1:50, 1:100** are **reductions** — the drawing is smaller than the object (used for large objects and environments).
- **2:1, 5:1, 10:1** are **enlargements** — the drawing is larger than the object (used for small details).

The scale is noted near the title block, for example **SCALE 1:2**. Crucially, the **dimension figures always give the true size of the object**, never the shortened or enlarged length on the paper — you measure the object, not the drawing.

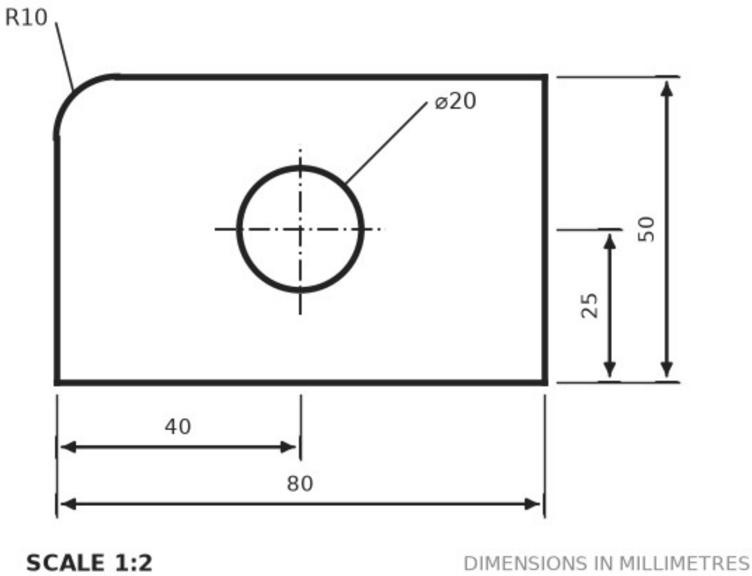
Line types. AS 1100 uses different line styles and weights so a reader can tell an edge from a hidden feature from a centre.



- **Visible outline** — a **thick continuous** line for all visible edges and outlines.
- **Hidden detail — a thin dashed** line for edges that are hidden behind the form (a hole or step you cannot see from that view). Hidden detail is *shown*, not left out.
- **Centre line —** a **thin chain** line (long dash–short dash) marking axes of symmetry and the centres of circles, holes and arcs.
- **Construction / projection line —** a **thin, light continuous** line used to set the drawing out and to project between views; it is kept faint so it does not compete with the object.

Dimensioning. Dimensions record the true measurements a maker needs. Each is built from:

- **Extension (projection) lines** — thin lines projecting from the feature being measured. They start with a **small gap** from the outline (so they are not mistaken for edges) and extend a little past the dimension line.
- A **dimension line** — a thin line parallel to the feature, ending in **arrowheads** that touch the extension lines.
- The **figure** (the measurement), placed centrally, clear of the dimension line, and readable from the bottom or the right of the sheet. Dimensions are in **millimetres** (noted once on the drawing).
- **Symbols**: the **diameter symbol Ø** is written before the size of a full circle or hole (for example Ø20); the **radius symbol R** is written before the size of an arc, round or fillet (for example R10).



Good dimensioning is disciplined: **dimension each feature once** (never duplicate a measurement); place dimensions **outside the view** where possible; dimension to **visible outlines**, not to hidden detail; put smaller dimensions nearer the view and overall dimensions further out; and always give the **true size**.

> **Watch-out — place the views the third-angle way.** In third angle the **top view goes above** the front view and the **right-side view goes to the right**. Placing them the opposite way is first-angle and will mislead the reader. Australia uses third angle (AS 1100) — show the symbol.
>
> **Watch-out — conventions are examined two ways: applied *and* discussed.** In a drawing task, the marks go to a drawing that *uses* the conventions correctly (right line types, dimensions, scale note, symbol). In a written task ("discuss the conventions you would consider when presenting your concept"), the marks go to **naming** established conventions that suit the field, using the study design's terminology, and **explaining how each helps the reader understand the concept** — linked to your own solution. The trap in the written task is not "writing about conventions"; it is **describing what you made or "pitching" the design** instead of discussing conventions. Do both jobs properly.
>
> **Watch-out — keep the views aligned and to one scale.** Line the views up with projectors and transfer depth with the **45° mitre line** so the top and side agree. Do not draw the three views at different sizes or out of alignment.
>
> **Watch-out — dimension the true size, once.** The figure against a feature is the object's real size, not the scaled length on the paper. Give each measurement **once**, to a visible outline, and keep it off the view.
>
> **Watch-out — use the right line for the job.** Visible outline is **thick**; hidden detail is **thin dashed**; a centre line is a **thin chain**; construction lines are **thin and light**. Drawing every line the same weight, or leaving hidden detail out, loses convention marks.
>
> **Watch-out — Ø is not R.** Use **Ø (diameter)** for a full hole or circle and **R (radius)** for an arc, round or fillet. They are not interchangeable.

Worked examples

Example 1 — scaffolded

*Set out the three principal views — front, top and right side — of the TENON stepped block in **third-angle orthogonal projection**. The block is 60 mm wide, 40 mm high and 30 mm deep; its right-hand half steps down to a height of 20 mm. Show your construction, including the projectors and a 45° mitre line. (6 marks)*

Working	Comment
Choose the **front view** as the face showing the most detail — the stepped profile — and draw it as an L-shape: 60 wide, 40 high on the left half, stepping down to 20 high on the right. Use **thick visible outline**.	The front view should carry the most information with the fewest hidden edges. Getting this choice right sets up the whole drawing.
Project up. Draw light **vertical projectors** up from every corner of the front view, and build the **top view directly above** it: a 60 × 30 rectangle (width × depth) with a visible line at the 30 mm mark where the step edge runs.	Third-angle places the top view **above** the front, sharing **width**. The projectors keep the two views in vertical alignment — draw them faint.
Project across with light **horizontal projectors** to the right, carrying the heights (0, 20 and 40 mm) into the side-view zone.	The front and side views share **height**, so horizontal projectors fix the vertical extents of the side view.
Draw a **45° mitre line** up and to the right, and transfer the **depth** (30 mm) from the top view: run each depth across to the mitre line and down into the side view.	Depth is the measurement the top and side views share; the mitre line guarantees they agree. This is the step weak drawings skip.
Line in the **right-side view** to the right of the front view: a 30 (depth) × 40 (height) rectangle with a visible line at 20 mm (the top of the step). Add the **third-angle symbol** near the title block.	Right-side view goes to the **right** in third angle. The symbol tells the reader the convention — include it to earn the conventions mark.

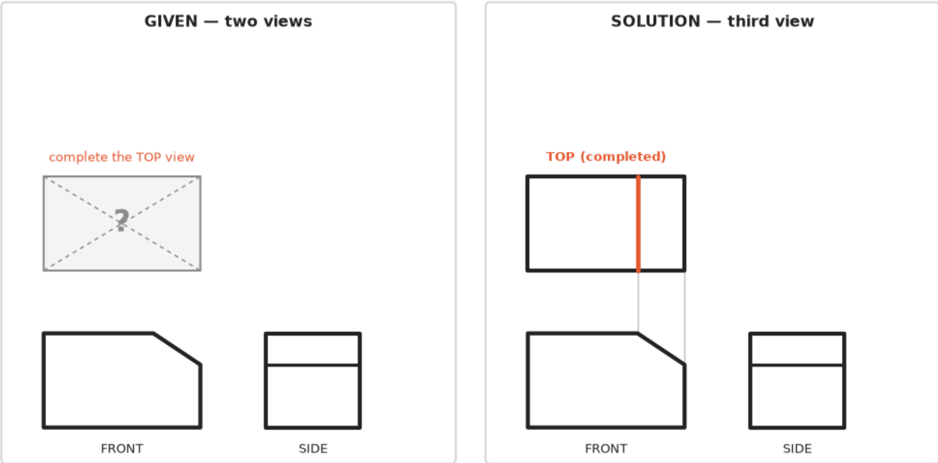
Example 2 — scaffolded

*Fully **dimension** the front view of the TENON cover plate using correct technical drawing conventions. The plate is 80 mm wide and 50 mm high, with a Ø20 mm hole centred 40 mm from the left edge and 25 mm from the bottom, and a 10 mm radius round on the top-left corner. The drawing is made at half size — add a scale note. (6 marks)*

Working	Comment
Draw **extension lines** projecting from the edges and the hole's centre lines, each starting with a **small gap** from the outline and running a little past where the dimension line will sit.	Extension lines must not touch the outline (the gap prevents them being read as edges). Dimension to **visible outlines**, not hidden detail.
Place the **overall dimensions** furthest out: **80** below the plate and **50** to the right, each on a **dimension line** with **arrowheads** touching the extension lines, the figure centred and clear.	Overall dimensions sit outermost; smaller ones nearer the view. Keep dimensions **off** the view.
Place the **hole-position dimensions** nearer the view: **40** from the left to the hole's centre line, and **25** from the bottom to the centre line.	Locate a hole from its **centre lines**. Give each position **once** — do not also dimension it from the far side (no duplication).
Dimension the hole as **Ø20** on a leader off the circle, and the corner as **R10** on a leader pointing toward the arc's centre.	**Ø** for the full hole (diameter); **R** for the round (radius). Using the wrong symbol loses the mark.
Note **SCALE 1:2** and **DIMENSIONS IN MILLIMETRES** near the title block. The figures stay the **true sizes** (80, 50, Ø20, R10) even though the plate is drawn 40 mm wide on the paper.	The scale note tells the reader the reduction; the dimensions still give the **real** object size, not the drawn length.

Example 3 — unscaffolded

*The **front view** and **right-side view** of a chamfered block are given below. Complete the **third view** (the top view) in third-angle orthogonal projection. (4 marks)*



Place the top view **directly above the front view** and project the widths up from it. The block is a plain rectangular prism apart from the chamfer, so the top view is a **rectangle** (the full width by the full depth). The chamfer is the key: because it runs straight through the full depth of the block, the sloping face is seen **edge-on in the front view**, where it appears as the **slope line** itself. In the top view the same face is seen at an angle, so it appears as a flat **strip of surface** — added to the drawing as a **single straight visible outline** where the flat top meets the chamfered face (at the 35 mm knuckle projected up from the front view) — **not** as another slope. The completed top view is therefore a rectangle with one straight line across it, aligned by projector with the change of slope in the front view. *(The common error is to redraw the chamfer as a slope in every view. An inclined face appears as a **sloping line** in the one view that sees it edge-on and as a **foreshortened surface** in the other two — shorter than it really is — so no principal view shows its true shape.)*

Example 4 — unscaffolded

*You have resolved a concept for the TENON flat-pack side table — a design in the **objects** field, 900 mm wide — and will present it to the client as a documentation drawing. **Discuss** the presentation conventions you would need to consider when presenting this concept. (4 marks)*

Because the resolved concept is an object that has to be manufactured, it is presented as a **third-angle orthogonal projection**, so the conventions to consider are the technical drawing conventions that belong to that method. **Scale** comes first: at 900 mm wide the table is drawn at a reduction such as **SCALE 1:10**, noted near the title block, so the client sees the whole table in proportion on one sheet. **Dimensioning** is then applied so the client and their maker can read every measurement — extension and dimension lines with arrowheads, each feature dimensioned **once**, figures in **millimetres**, and every figure the table's **true size** rather than its reduced length on the paper; this is what tells the client whether the top will clear their doorway. **Line types** separate what can be seen from what cannot: thick visible outlines for the frame, thin dashed hidden detail for the dowel holes concealed inside the leg joints and thin chain centre lines through them, so a hidden joint is not misread as a surface edge. Finally, the **arrangement of the views** is itself a convention — top view above the front view, right-side view to its right, signalled by the **third-angle symbol** near the title block — so the drawing reads the way the client's manufacturer expects. Together these conventions let the client understand the measurements, the proportions and the construction of the resolved concept. *(Marks here come from naming established conventions that suit the field and explaining how each helps the client read the drawing — describing what the table looks like, or "pitching" it, earns nothing.)*

Practice questions

Scaffolded

Q1. Third-angle arrangement: (a) Name the three principal views used to describe an object in orthogonal projection. *(1 mark)* (b) In third-angle projection, state where the **top view** and the **right-side view** are placed relative to the front view. *(2 marks)* (c) Which measurement do the top and side views share, and how is it transferred between them? *(2 marks)*

Q2. Using the line-types diagram: (a) Name the line type used for a **visible outline** and the line type used for **hidden detail**. *(2 marks)* (b) State what a **centre line** is used for. *(1 mark)* (c) State what **construction / projection lines** are used for, and how they should appear. *(2 marks)*

Q3. Scale: (a) State what a **scale** tells you on a drawing. *(1 mark)* (b) State whether each of **1:2**, **2:1** and **1:1** is a reduction, an enlargement or full size. *(3 marks)* (c) A shelf pin 24 mm long is drawn at **2:1**. How long is it on the paper, and what length figure is written against it? *(2 marks)*

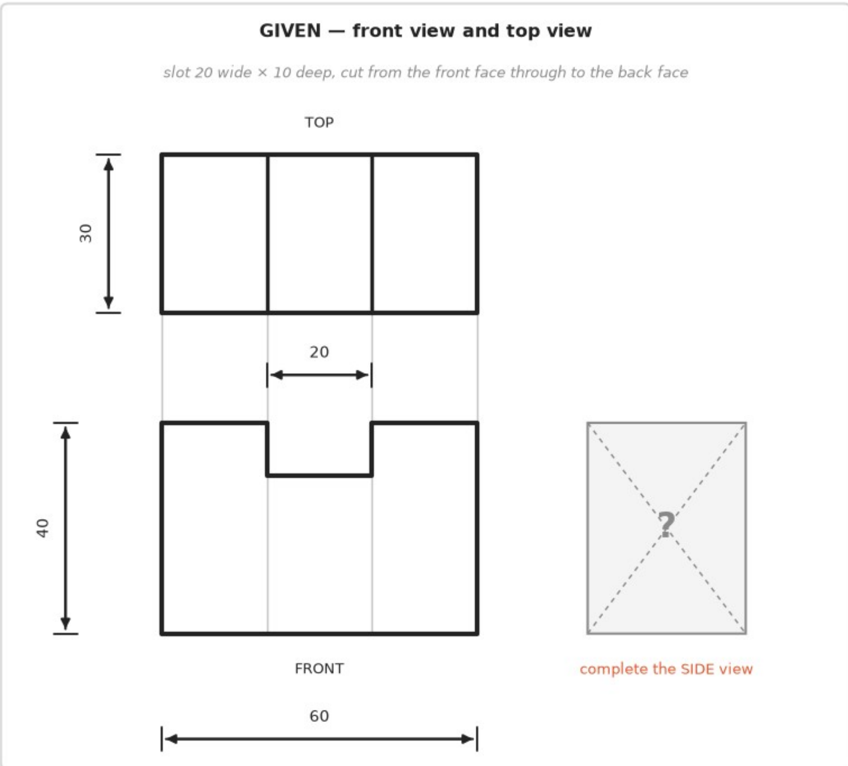
Q4. Using the dimensioned plate: (a) Name the two kinds of line used to place a dimension. *(2 marks)* (b) Describe how an **extension line** should start and finish. *(2 marks)* (c) State what **Ø** and **R** mean, and where each is used. *(2 marks)*

Q5. The projection symbol: (a) Which projection convention is standard in Australia (AS 1100)? *(1 mark)* (b) Describe the third-angle **symbol**. *(2 marks)* (c) Why is the symbol placed on a documentation drawing? *(1 mark)*

Q6. Setting out: (a) State one rule for choosing which face to draw as the **front view**. *(1 mark)* (b) How are edges that are **hidden** behind the form shown in a view? *(1 mark)* (c) Why must the three views be drawn to the **same scale** and kept in **alignment**? *(2 marks)*

Unscaffolded

Q7. The **front view** and **top view** of a block with a rectangular slot cut into its top face — the slot running from the front face straight through to the back face — are given below. Complete the **right-side view** in third-angle projection, and state how the slot appears in that view. *(4 marks)*



Q8. Set out the three principal views of an **L-shaped bracket** (50 mm wide, 50 mm high, 40 mm deep, made of 15 mm thick arms) in third-angle orthogonal projection, showing your projectors and a 45° mitre line. *(6 marks)*

Q9. A spacer plate is 60 mm × 40 mm with a single Ø12 mm hole centred 30 mm from the left and 20 mm from the bottom. **Dimension** its front view fully, using correct conventions, and add a scale note for a full-size drawing. *(4 marks)*

Q10. A student's documentation drawing has these faults: (i) the overall width is dimensioned twice; (ii) hidden detail is drawn as a thick continuous line; (iii) a hole is labelled "R20"; (iv) the top view is placed below the front view. **Identify and correct** each fault. *(4 marks)*

Q11. Explain, with reference to the **45° mitre line**, why the top and side views of an object must agree, and how **depth** is transferred between them. *(3 marks)*

Q12. An object is 250 mm long. (a) State a suitable **standard scale** to fit it comfortably on an A4 sheet. *(1 mark)* (b) Give its **drawn length** at that scale. *(1 mark)* (c) State the length **figure dimensioned** on the drawing. *(1 mark)*

Q13. On a small front view and side view of a plate with a central through-hole, **show and label** the four line types: visible outline, hidden detail, centre line, and construction / projection line. *(4 marks)*

Q14. Documentation drawings **define and record the technical specifications** needed to assemble an object. **Explain** how a third-angle orthogonal drawing does this, referring to **two** technical conventions it carries. *(3 marks)*

Q15. Distinguish between the **diameter symbol Ø** and the **radius symbol R**, stating when each is used, and show how you would dimension a 16 mm hole and a 6 mm rounded corner. *(3 marks)*

Q16. Produce a complete **third-angle documentation drawing** of a stepped object 70 mm wide, 40 mm high and 30 mm deep whose left-hand end is raised by a 20 mm × 20 mm × 30 mm block. Your drawing must show the three views correctly arranged and aligned, the correct **line types**, full **dimensions**, a **scale note** and the **projection symbol**. *(8 marks)*

Answers

Q1. (a) Front, top and side views. (b) Top view above the front view; right-side view to the right of the front view. (c) Depth; transferred with a 45° mitre line. **Q2.** (a) Visible outline = thick continuous; hidden detail = thin dashed. (b) Axes of symmetry and centres of holes/circles/arcs. (c) Setting out and projecting between views; thin and light (faint). **Q3.** (a) The ratio of a length on the drawing to the true length on the object (drawing:object). (b) 1:2 = reduction; 2:1 = enlargement; 1:1 = full size. (c) 48 mm on the paper; the figure written is **24** (the true size). **Q4.** (a) Extension (projection) lines and the dimension line. (b) Starts with a small gap from the outline and finishes a little past the dimension line. (c) Ø = diameter (a full hole/circle); R = radius (an arc/round/fillet). **Q5.** (a) Third-angle. (b) A truncated cone: a tapered profile beside two concentric circles. (c) So the reader knows which projection convention was used and reads the views correctly. **Q6.** (a) The face showing the most detail with the fewest hidden edges. (b) As thin dashed (hidden-detail) lines. (c) So the views describe one consistent object and can be read together (widths, heights and depths line up). See solutions. **Q7.** Right-side view = a full rectangle (depth × height) with the slot floor shown as a **hidden dashed line** at the height of the slot floor; the slot is hidden behind the solid rail beside it. See solutions. **Q8–Q16.** See fully-worked solutions.

Fully-worked solutions

Q1. (a) The **front view**, the **top view** (plan) and a **side view** (end elevation). (b) In third-angle projection the **top view is placed directly above** the front view, and the **right-side view is placed to the right** of the front view — each on the same side as it is viewed. (c) The top and side views share the object's **depth**; it is carried between them with a **45° mitre line**, so the two views always agree *(2 marks: depth named + mitre-line method).*

Q2. (a) A **visible outline** is a **thick continuous** line; **hidden detail** is a **thin dashed** line. (b) A **centre line** marks **axes of symmetry** and the **centres of circles, holes and arcs**. (c) **Construction / projection lines** are used to **set the drawing out and to project between the views**; they should be **thin and light (faint)** so they do not compete with the object outline *(2 marks: use + appearance).*

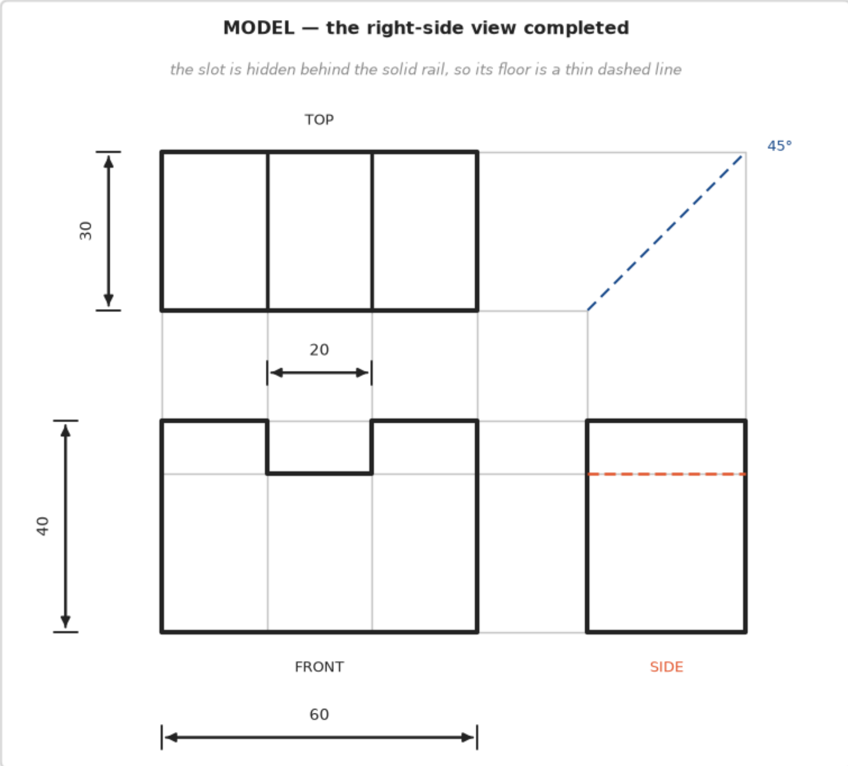
Q3. (a) A scale states the **ratio of a length on the drawing to the true length on the object**, written drawing:object. (b) **1:2** is a **reduction** (drawing smaller than the object); **2:1** is an **enlargement** (drawing larger than the object); **1:1** is **full size**. (c) At 2:1 the pin is drawn **twice** as long, so **48 mm** on the paper; the figure dimensioned against it is **24** — dimensions always give the object's **true size**, not the drawn length *(2 marks: 48 mm + true-size figure 24).*

Q4. (a) **Extension (projection) lines** and a **dimension line**. (b) An extension line **starts with a small gap** from the outline of the feature (so it is not read as an edge) and **finishes a little past** the dimension line. (c) **Ø** is the **diameter** symbol, written before the size of a **full circle or hole** (e.g. Ø20); **R** is the **radius** symbol, written before the size of an **arc, round or fillet** (e.g. R10) *(2 marks: both symbols + where each is used).*

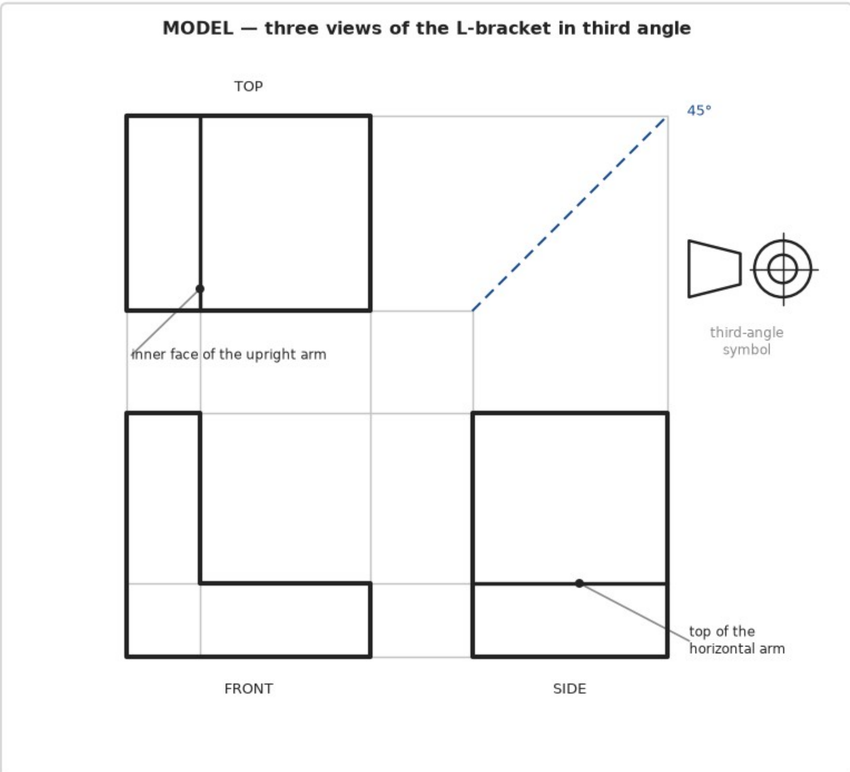
Q5. (a) **Third-angle** orthogonal projection (AS 1100). (b) The third-angle **symbol** is a small **truncated cone**, shown as a **tapered (trapezoidal) profile beside two concentric circles** (its end view), arranged in the third-angle relationship. (c) It is placed near the title block **so the reader knows which projection convention has been used** and does not read the views mirror-reversed *(1 mark).*

Q6. (a) Choose the face that shows the **most detail / most characteristic shape with the fewest hidden edges** as the front view. (b) Hidden edges are shown as **thin dashed (hidden-detail) lines**, not omitted. (c) The three views must be to the **same scale** and kept in **alignment** because they describe **one object**: their widths, heights and depths must correspond so a reader can move between the views (up for width, across for height, mitre for depth) and reconstruct the form. Different sizes or misaligned views cannot be read together *(2 marks: same object/corresponding measurements + readable together).*

Q7. Placed to the **right of the front view**, the right-side view is a **full rectangle** whose width is the block's **depth** (30) and whose height is the block's **height** (40) — because the solid rail beside the slot is nearest the viewer and fills the whole outline. The slot runs **the full depth** of the block, front face to back face, so from the side it is **hidden behind that rail**: its floor is shown as a **thin hidden (dashed) line** across the view at the **height** of the slot floor (10 mm down from the top), and the outline stays a complete rectangle. So the answer is a rectangle (depth × height) with a single **dashed line** for the slot floor — its heights carried across by projector from the front view and its depth carried from the top view by the **45° mitre line** *(4 marks: correct outline + slot shown as hidden dashed detail + placed to the right in third angle).*

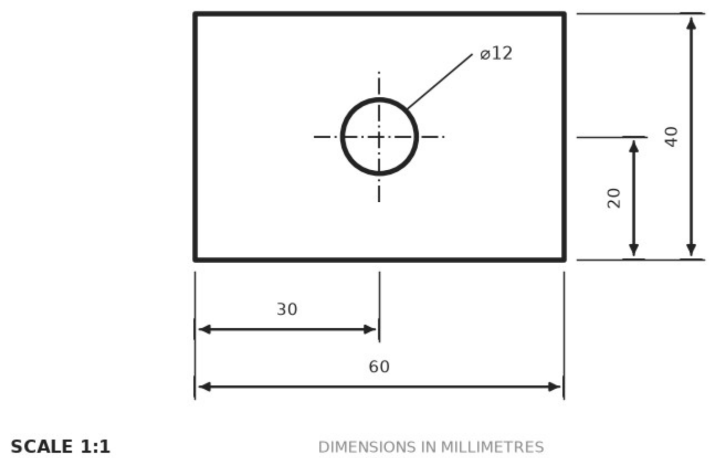


Q8. Draw the **front view** as an **L-shape** (50 wide × 50 high, arms 15 thick) in thick visible outline — the face with the most detail. **Project up** with light vertical projectors to the **top view** directly above: a **50 × 40 rectangle** (width × depth) with a visible line at the 15 mm mark — the **inner face of the upright arm** (the vertical face that looks along the horizontal arm), seen edge-on from above. **Project across** with horizontal projectors to carry the heights, draw a **45° mitre line**, and **transfer the 40 mm depth** from the top view into the **right-side view** to the right: a **40 × 50 rectangle** with a visible line at the 15 mm mark (the top face of the horizontal arm). Keep all three views aligned, line them in, and add the **third-angle symbol** *(6 marks: correct front L, top view above with the step edge, side view to the right built via mitre, alignment + symbol).*



Q9. Draw **extension lines** with a small gap from each edge and from the hole's centre lines. Place the **overall dimensions** outermost — **60** below the plate and **40** to the right — on dimension lines with **arrowheads**. Nearer the view, dimension the hole's position from its centre lines: **30** from the left and **20** from the bottom, each given **once**. Label the hole **Ø12** on a leader off the circle, with **centre lines** (thin chain) through it. Because the drawing is full size, note **SCALE 1:1** and **DIMENSIONS IN MILLIMETRES** near the title block; the figures are the object's true sizes *(4 marks: overall dims + hole position from centre lines with no duplication + Ø on the hole + scale note).*

MODEL — the spacer plate fully dimensioned



Q10. (i) **Remove the duplicate width** — a feature is **dimensioned once only**, so keep a single overall-width dimension. (ii) **Redraw the hidden detail as a thin dashed line** — hidden edges use the hidden-detail line, not a thick continuous outline. (iii) **Relabel the hole Ø20** — a full hole is a **diameter** (Ø), not a radius (R). (iv) **Move the top view above the front view** — third-angle projection places the top view **above**, not below *(1 mark each correction).*

Q11. The top and side views of an object must **agree on its depth**, because both describe the same solid: the depth seen from above must equal the depth seen from the side. The **45° mitre line** enforces this. A depth measured in the **top view** is run **horizontally** out to the mitre line, where the 45° turn converts it into an equal **vertical** run **down** into the **side view** (and the reverse for depths taken from the side). Because the mitre line makes every horizontal depth equal to its vertical counterpart, the two views are transferred from each other rather than measured independently, so they cannot disagree *(3 marks: views share depth + the mitre converts horizontal↔vertical + this keeps the views consistent).*

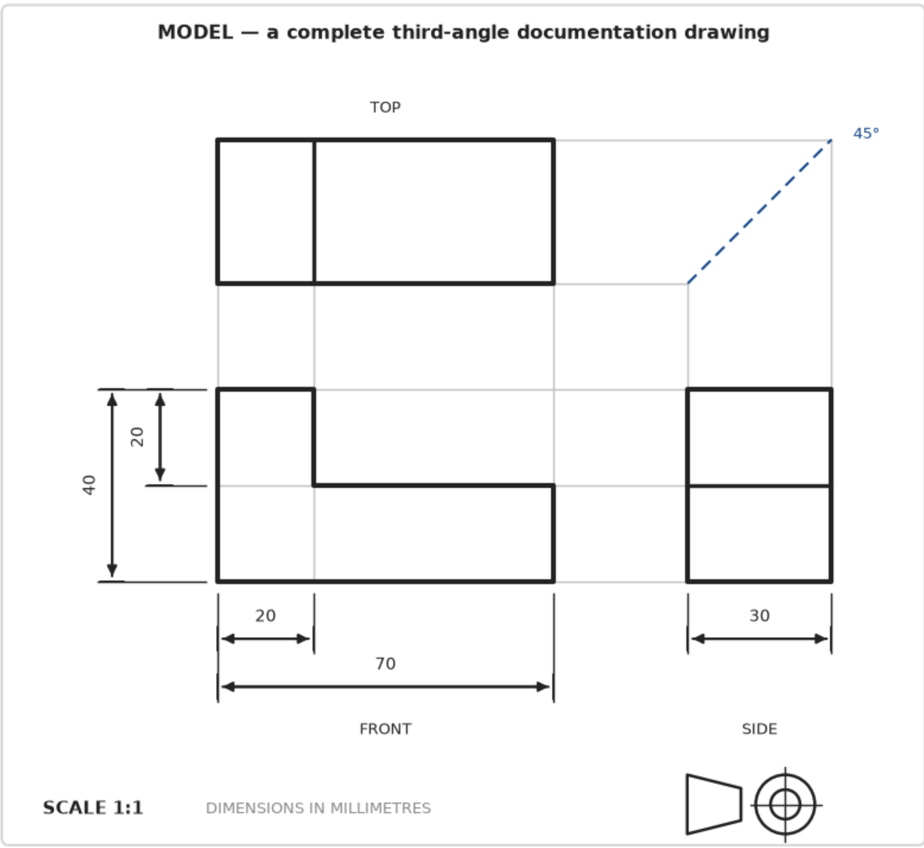
Q12. (a) A suitable standard **reduction** such as **1:2** (or 1:5) — 1:2 draws the 250 mm object 125 mm long, which fits comfortably on A4. (b) At **1:2** the **drawn length is 125 mm**. (c) The **figure dimensioned is 250** — the dimension gives the object's **true size**, regardless of the scale *(1 mark each; accept 1:5 → 50 mm drawn, still dimensioned 250).*

Q13. The model drawing labels each line type in context: the plate's edges and the circle of the hole are drawn as **thick continuous visible outlines**; in the side view the through-hole cannot be seen, so it is drawn as **two thin dashed hidden-detail lines** — one at the top of the hole and one at the bottom, each running the full thickness of the plate and lining up by projector with the circle in the front view; a **thin chain centre line** runs through the hole in both views to mark its axis; and faint **thin construction / projection lines** link the two views to show they were projected from one another. Each line is labelled with its name *(4 marks: one for each line type, correctly used and labelled; see the line-types figure for the model).*

Q14. A documentation drawing must carry enough information for someone who has never seen the object to build it, so a third-angle orthogonal drawing records the form as a set of **aligned views** rather than as a picture: the front, top and right-side views, arranged the third-angle way and locked together by projectors and the **45° mitre line**, between them fix every **width, height and depth** of the object — that set of measurements *is* the technical specification. Two conventions make the record unambiguous. **Dimensioning** gives the object's **true sizes** in millimetres, each feature dimensioned **once** and to a visible outline, so the maker cuts to the figure on the drawing and never measures the paper. **Line types** tell the maker what each line means: a **thick continuous** line is a visible edge, a **thin dashed** line is a feature hidden inside the form (a hole or a slot) that must still be cut, and a **thin chain** line is a centre or axis to set out from. Because the conventions are standard (AS 1100), any maker reads the drawing the same way *(3 marks: aligned views record every measurement of one object as the specification + two conventions named and explained; accept the scale note, the Ø / R symbols or the projection symbol as either convention).*

Q15. The **diameter symbol Ø** is used to dimension a **complete circle or hole**, written before the size (e.g. **Ø16** on a leader from the hole, with centre lines through it). The **radius symbol R** is used to dimension an **arc, round or fillet** — anything less than a full circle — written before the size (e.g. **R6** on a leader pointing toward the arc's centre). The difference matters because a hole is fully defined by its diameter, whereas a corner round is defined by its radius; using the wrong symbol would tell the maker to cut the wrong size *(3 marks: Ø for the full hole + R for the round + a correct example of each).*

Q16. *(Model.)* Draw the **front view** first — a stepped profile 70 wide and 40 high, with the left-hand end raised as a 20 × 20 block — in **thick visible outline**, choosing this face because it shows the step most clearly. **Project up** with faint vertical projectors to the **top view** directly above (a 70 × 30 rectangle with a visible line at the 20 mm mark, the edge view of the raised block's right-hand face), and **project across**, using a **45° mitre line** to carry the 30 mm depth into the **right-side view** to the right (a 30 × 40 rectangle with a visible line at 20 mm, where the top of the base meets the raised block). Keep the three views **aligned** and to **one scale**. **Dimension** the overalls (70, 40, 30) outermost and the step sizes (20, 20) nearer the views, each given **once**, to visible outlines, with extension lines, arrowheads and figures in millimetres. Note the **scale** (e.g. SCALE 1:1) and draw the **third-angle projection symbol** near the title block *(8 marks: three correctly arranged + aligned views built by projection and mitre; correct line types; complete, non-duplicated dimensions; scale note; projection symbol).*



Theory

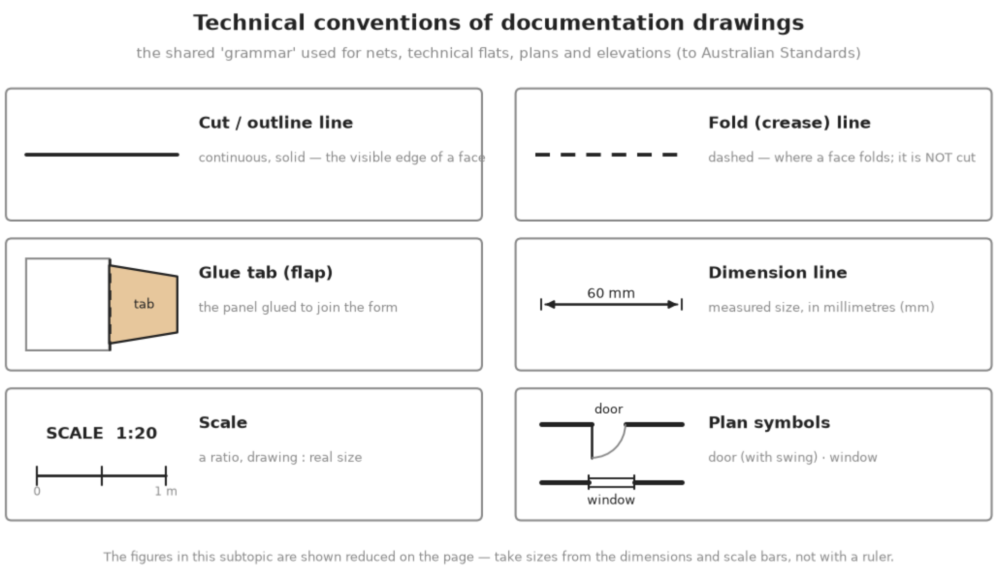
In the Study Design, **documentation drawings** *define and record the technical specifications required for the assembly of three-dimensional objects and environments*. They are one of the three drawing purposes: **development** drawings visualise and test ideas (Chapter 4A), **presentation** drawings *convey resolved design concepts to stakeholders for consideration*, and **documentation** drawings record exactly how something is made. Documentation drawings *may represent forms in two dimensions, such as orthogonal drawings, architectural plans and elevations, packaging nets and technical flats*, and they *include technical conventions, such as symbols, dimensions and scales*. When a resolved solution is documented, those conventions are expected to comply with **Australian Standards**.

This subtopic teaches three two-dimensional documentation methods:

1. **Packaging nets** — the unfolded, flat development of a three-dimensional package.
2. **Technical flats** — flat, un-rendered drawings of a product or garment, front and back.
3. **Plans and elevations** — the top-down and straight-on views used to document a structure.

(The related two-dimensional method, third-angle **orthogonal projection**, is covered in 4B; the three-dimensional paraline and perspective methods are covered in Chapter 5.)

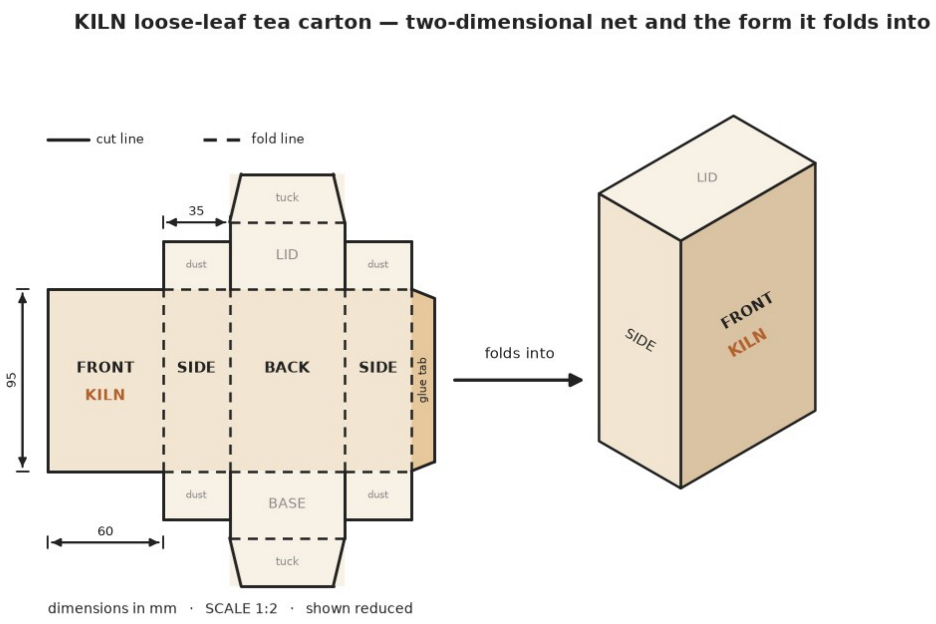
The shared grammar: technical conventions. All three methods speak the same visual language of line types, symbols, dimensions and scale. Learning this grammar once lets you read and draw any of them.



- A **cut / outline line** is a *continuous, solid* line — it shows the visible edge of a face, the line a blade would cut.
- A **fold (crease) line** is *dashed* — it shows where a flat face folds up; it is not cut. Keeping the two apart is the whole point of the convention: a drawing in which every line looks the same cannot tell a maker where to cut and where to crease.
- A **glue tab (flap)** is the narrow extra panel that is folded and glued to join a net into a form.
- A **dimension line** is a light, double-ended line giving a measured size, stated in **millimetres (mm)**.
- A **scale** is a ratio of *drawing size : real size* — written as, for example, **1:20** (the drawing is one-twentieth of real size). A documentation drawing without a stated scale and dimensions is incomplete. (The drawings printed in this subtopic are **shown reduced** on the page, so the scale each one states is the scale of the original sheet. Read sizes from the dimensions and the scale bar, never with a ruler.)

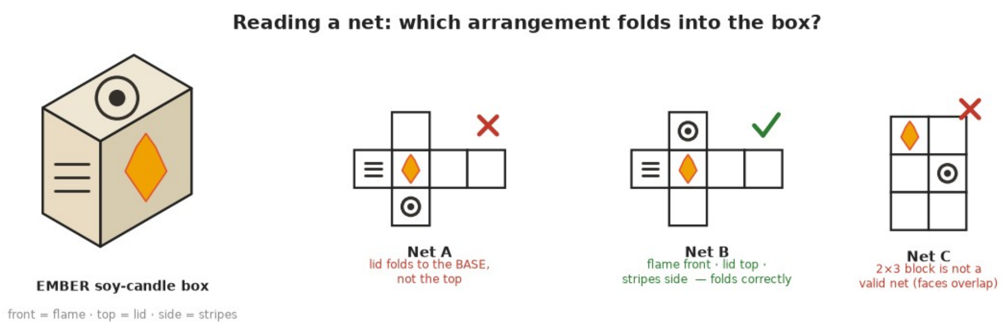
- **Symbols** stand in for real features — for example, the plan symbols for a door (a break in the wall with a leaf line and a quarter-circle **swing arc**, both drawn the *same length as the opening*) and a window (a break in the wall with a double glazing line).

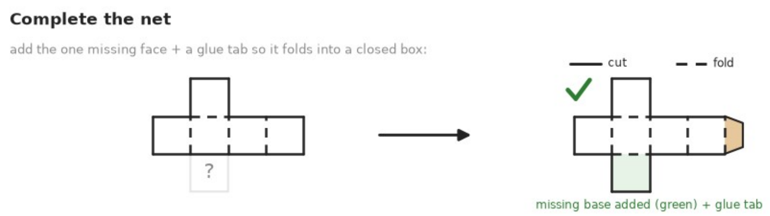
Method 1 — Packaging nets. A **net** is the two-dimensional development of a three-dimensional package: every face of the box unfolded and laid flat as one connected shape, so it can be printed, cut, creased and assembled. A net for a rectangular box (a cuboid) has **six faces** — front, back, two sides, a lid (top) and a base — plus **closure flaps** (tuck and dust flaps) and at least one **glue tab**. Fold lines are drawn dashed, cut edges solid, and the tab is placed on a fold so it can be glued to the opposite panel.



Above, the original *KILN* loose-leaf tea carton is drawn as a flat net (left) and as the folded form it makes (right). The six body faces sit in one connected strip; the dashed fold lines let it wrap into a box; the shaded glue tab joins the last side to the front; and the lid, base and dust flaps close the top and bottom. The net is dimensioned in millimetres and drawn to scale (1:2).

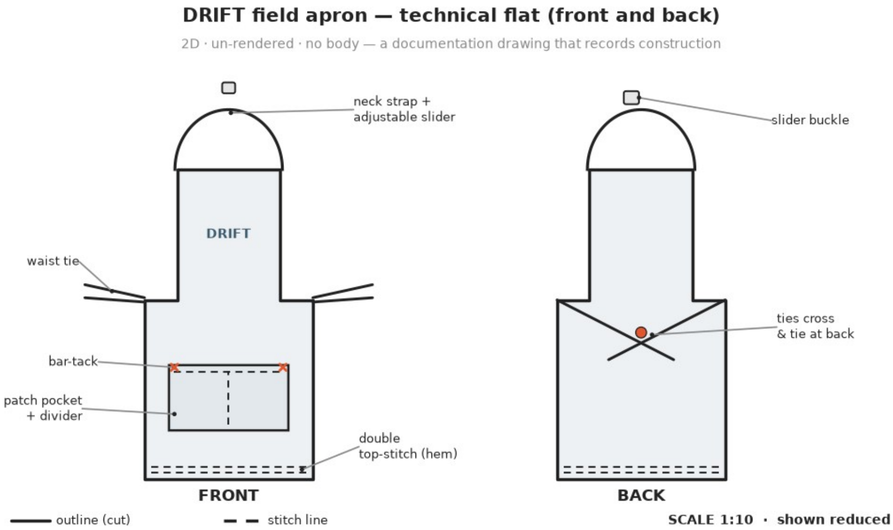
Reading a net. Because folding rearranges the faces, not every arrangement of six squares makes a box. A valid net must (i) fold up without any faces overlapping, and (ii) place the marked faces where they belong on the finished form. Checking a net means mentally folding it.





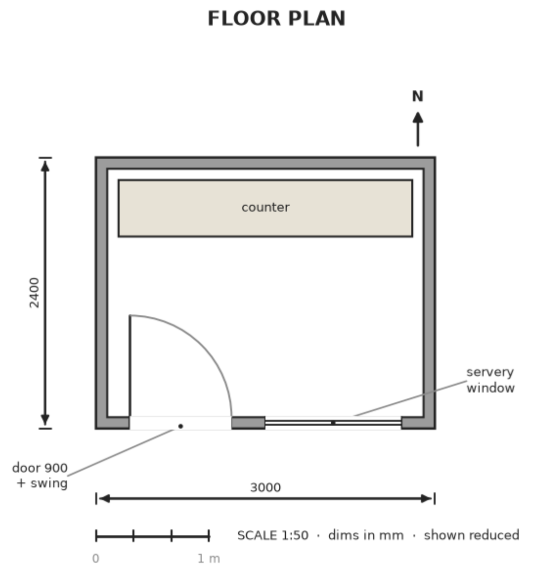
Here the *EMBER* candle box carries a flame on the front, a lid ring on top and stripes on its **left-hand side** — and *which* side matters, because folding sends a square to one particular face. Only **Net B** folds so those three faces land in the right places: in Net A the lid folds onto the *base*, and Net C is a 2 × 3 block whose faces would overlap, so it is not a valid net at all. The lower task shows a net with one face missing — adding the base panel and a glue tab completes a closed box.

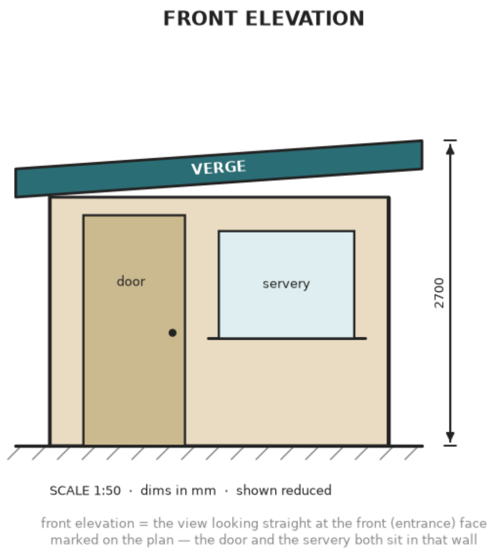
Method 2 — Technical flats. A **technical flat** is a flat, two-dimensional drawing of a product or garment — most often shown **front and back** — that records its construction *without* a body, a pose or any rendering. It uses a solid outline for the edges and **dashed lines for stitching and detail**, and it labels the features that tell a maker how the item is put together. Because it documents construction, a flat is very different from a *fashion illustration* or a presentation rendering, which show the item styled on a figure.



The original *DRIFT* field apron above is drawn as a technical flat. The solid outline gives the silhouette of the bib and skirt; dashed stitch lines show the top-stitched hem and pocket; and leaders label the neck strap and adjustable slider, the waist ties, the patch pocket with its divider, the double top-stitching and the bar-tacks at the stress points. The **back** view records the slider buckle and the crossed ties. There is no shading and no wearer — only the information needed to make it.

Method 3 — Plans and elevations. A **plan** is a drawing of a structure as seen *looking straight down from above* (a horizontal slice, like a bird's-eye view). An **elevation** is a drawing of one *vertical face* of the structure seen *straight on* — the front, side or rear elevation. Both are drawn to scale, use standard symbols (walls, doors, windows) and carry dimensions; a plan also shows orientation with a **north point**. Together they document a structure fully: the plan gives the layout and footprint, the elevations give the heights and the appearance of each face.





The original *VERGE* market kiosk is documented above as a floor plan and a matching front elevation. The plan shows the walls in a heavier line (poché), the door and the servery **window** as breaks in the front wall — the door with a **swing arc**, the window with a double glazing line — plus the internal counter, a north point and overall dimensions at 1:50. The **front elevation** shows the same kiosk looking straight at its entrance face — the awning roof, the servery opening, the door and the ground line — with a height dimension, again at 1:50.

Read the two together. An elevation shows exactly *one* vertical face, so an opening only appears in the elevation of the wall it sits in. On the VERGE plan both the door and the servery window are set in the **front wall**, which is why both appear again — at the same set-out along the wall — in the front elevation. A window in the right-hand wall would not appear here at all; it would be documented in the **right side elevation**. Plan and elevations must always agree.

> **Watch-out — cut lines and fold lines are different.** Draw a *continuous solid* line for a cut/outline edge and a *dashed* line for a fold/crease. Drawing every line the same weight loses marks: applying technical drawing conventions to a documentation drawing is an examined key skill.
>
> **Watch-out — a net needs glue tabs and closure flaps.** A development of six bare faces cannot be assembled. Add the glue tab (on a fold line) and the tuck/dust flaps that close the top and base, or the net will not make a closed box.
>
> **Watch-out — always state the scale and dimension in millimetres.** A documentation drawing is a specification: write the scale as a ratio (e.g. 1:50) and dimension the drawing in mm. “Scale” is a ratio of *drawing : real size*, not a vague word for “big” or “small”.
>
> **Watch-out — a plan is not an elevation.** A **plan** looks straight *down* (the layout); an **elevation** looks straight *at* a vertical face (the appearance and heights). Name an elevation by the face it shows — front, side or rear — not “the outside”.
>
> **Watch-out — a technical flat is 2D and un-rendered.** It shows construction with outline and stitch lines, front and back — no body, no pose, no shading. That is what makes it a *documentation* drawing and not a presentation illustration.

Worked examples

Example 1 — scaffolded

Construct the two-dimensional net for the KILN tea carton, a straight-tuck box measuring 60 × 35 × 95 mm. Show the fold and cut lines with the correct conventions, add the glue tab and closure flaps, label the faces, and state the scale. (6 marks)

Working	Comment
Set out the four body faces in one connected strip, in assembly order: FRONT (60 wide) · SIDE (35) · BACK	A net is every face unfolded as one connected piece; keeping them in wrap-around order is what lets it fold

Working	Comment
(60) · SIDE (35), each 95 high, drawn at a chosen scale (1:2).	into a tube.
Draw the shared edges between the faces as *dashed fold lines*, and the free outer edges as *continuous solid cut lines*.	The line convention is examined — a cut edge (solid) is not a fold edge (dashed).
Add the top closure: a LID panel plus a tuck flap hinged to the BACK, and a dust flap on each SIDE; mirror this for the BASE.	The flaps are what close the top and bottom of the box; without them it is an open tube.
Add a narrow glue tab to the last SIDE, joined to it by a fold line.	Without a glue tab the net cannot be joined into a form — a commonly forgotten panel.
Label the faces (front / side / back / side / lid / base), dimension the drawing in mm (95, 60, 35) and note “SCALE 1:2”.	A documentation drawing must carry its dimensions (in mm) and scale.

A model net and the form it folds into are shown in Figure 2 (the KILN carton).

Example 2 — scaffolded

Draw a technical flat of the DRIFT field apron showing the front and the back, using the correct line conventions and labelling three construction details. (5 marks)

Working	Comment
Draw the FRONT silhouette — bib and skirt — as a single continuous *solid outline*, with no body inside it.	A technical flat is 2D and un-rendered; the outline is a solid cut/outline line and there is no figure or pose.
Show the stitching as *dashed* lines: the double top-stitched hem and the pocket edges.	Dashed stitch lines are how a flat records construction; keeping them distinct from the solid outline is the convention.
Label the construction detail with leaders: neck strap and adjustable slider, waist ties, and the patch pocket with its divider (add bar-tacks at the stress points).	“Label three construction details” — a flat exists to tell a maker how the item is built.
Repeat the silhouette for the BACK, recording the slider buckle and the crossed ties; title each view FRONT and BACK.	A flat documents multiple views (front and back) of the same item — still flat, still un-rendered.

A model flat is shown in Figure 4 (the DRIFT apron).

Example 3 — unscaffolded

Draw a scaled floor plan of the VERGE market kiosk (a 3.0 m × 2.4 m footprint) at 1:50, using the correct plan symbols for a door and a servery window, an internal counter, overall dimensions and a north point. (6 marks)

The plan is drawn looking straight down on the kiosk. The 3000 × 2400 mm footprint is set out at 1:50, and the walls are drawn as a heavier double line (poché) so they read as solid. The door is shown in the front wall as a break in the wall with a straight door-leaf line and a quarter-circle **swing arc** indicating the direction it opens; the leaf line and the swing radius are drawn the same length as the opening, and it is noted as a 900 mm door. The servery **window** is shown in the same front wall, clear of the door swing, as a break spanned by a double glazing line. The internal **counter** is drawn as a rectangle against the back wall and labelled. A **north point** is added to fix the orientation, and the overall sizes (3000 and 2400) are dimensioned in millimetres. The drawing is titled “FLOOR PLAN” and noted “SCALE 1:50”. A model plan is shown on the left of Figure 5 *(6 marks: scaled footprint; correct door and window symbols; counter; north point; dimensions in mm; stated scale).*

Example 4 — unscaffolded

Draw the front elevation of the VERGE kiosk at 1:50, showing the awning roof, the servery and the ground line, and explain how an elevation differs from a plan. (5 marks)

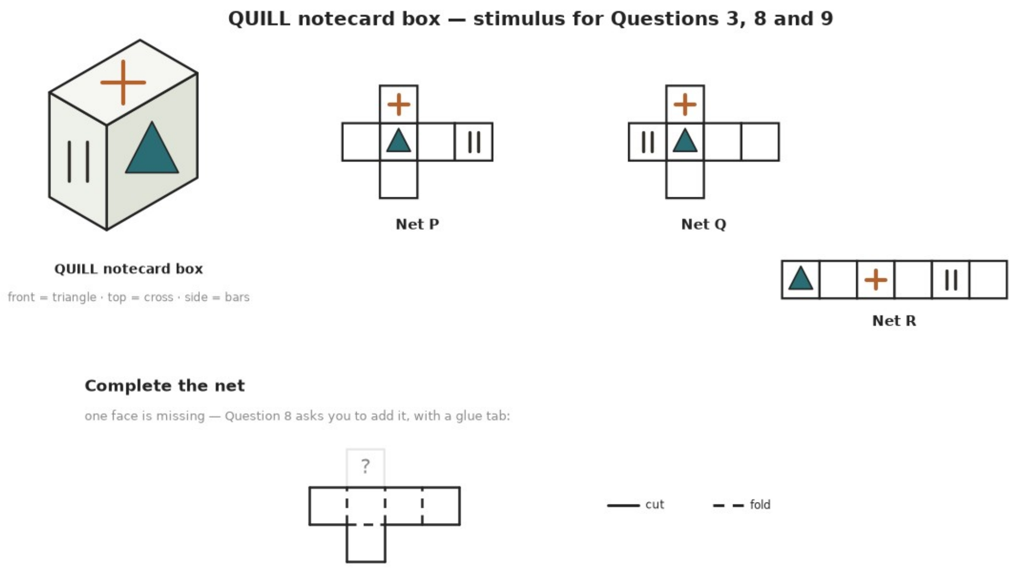
The front elevation is the kiosk seen straight on from the front, so it records the appearance and heights of the entrance face rather than the layout. It is drawn at 1:50 on a solid **ground line** (hatched below to read as ground), with the two posts and the front wall face, the mono-pitch **awning roof** over the top, the **servery** opening with its shelf, and the door. Both openings are set out along the wall at exactly the positions the plan gives them, because both sit in the front wall. The overall height (2700 mm) is dimensioned and the drawing is titled “FRONT ELEVATION · SCALE 1:50”. It **differs from a plan** because a plan is the view looking straight *down* — it shows the footprint, the wall layout and where openings sit in plan — whereas an elevation looks straight *at* one vertical face and shows its heights and appearance. Both are needed to document the kiosk fully. A model elevation is shown on the right of Figure 5 *(5 marks: scaled elevation on a ground line, roof, servery and door shown, height dimension and scale, and a correct plan-versus-elevation distinction).*

Practice questions

Scaffolded

Q1. Using the conventions figure (Figure 1): (a) State the line type used for a cut/outline line and the line type used for a fold line. *(2 marks)* (b) What is the purpose of a glue tab on a packaging net? *(1 mark)* (c) A scale is written 1:20. State what “1:20” means and whether the drawing or the real object is larger. *(2 marks)*

Q2. Using the KILN net (Figure 2): (a) State how many faces the net of a closed rectangular box has, and name them. *(2 marks)* (b) The FRONT panel of the KILN net has a solid line down its left-hand edge but a dashed line down its right-hand edge. Explain why one panel carries both line types. *(2 marks)* (c) Where is the glue tab placed, and why is it drawn on a fold line? *(2 marks)*



Questions 3, 8 and 9 refer to the QUILL notecard box stimulus above (Figure 6).

Q3. Using the QUILL stimulus (Figure 6): (a) State which of Nets P, Q and R folds correctly into the QUILL box. *(1 mark)* (b) Explain why Net P does not fold to match the box. *(2 marks)* (c) State one test you can apply to decide whether an arrangement of six squares is a valid net. *(1 mark)*

Q4. Using the DRIFT flat (Figure 4): (a) Define what a technical flat is. *(2 marks)* (b) Name two construction details that a technical flat of a garment should record. *(2 marks)* (c) Give one difference between a technical flat and a fashion (presentation) illustration. *(1 mark)*

Q5. Using the VERGE plan (Figure 5): (a) What viewpoint does a floor plan show? *(1 mark)* (b) Describe the plan symbol for a door and the plan symbol for a window. *(2 marks)* (c) On the 1:50 plan a wall measures 60 mm long. How long is the real wall, in metres? *(2 marks)*

Q6. Using the VERGE elevation (Figure 5): (a) Define what an elevation is. *(1 mark)* (b) The door and the servery window both appear in the front elevation. Explain what that tells you about where the two openings sit on the plan. *(2 marks)* (c) Name the elevation that would document a window set in the kiosk’s right-hand side wall. *(1 mark)*

Unscaffolded

Q7. Construct the two-dimensional net for a closed rectangular gift box measuring 80 × 80 × 120 mm. Show fold lines and cut lines with the correct conventions, add a glue tab and the closure flaps, label the faces, and state a suitable scale. *(6 marks)*

Q8. A net is shown with one face missing (the “complete the net” task in Figure 6). Redraw it and add the single missing face and a glue tab so that it folds into a closed cube, using the correct line conventions. *(4 marks)*

Q9. On a cross-shaped six-square net like those in Figure 6, the centre square is the FRONT face. A designer needs a logo on the FRONT and a barcode on the BASE. Explain how folding decides which faces finish opposite one another, and identify which square of the cross must carry the barcode. *(4 marks)*

Q10. Draw a technical flat of an original tote bag, showing the front and the back and labelling three construction details (for example, handles, a pocket, top-stitching). Use the correct line conventions. *(6 marks)*

Q11. Explain, with reference to line conventions, how you would show a fold line, a cut line and a line of stitching differently on a documentation drawing. *(3 marks)*

Q12. Draw a scaled floor plan of a small artist’s studio with a 4.0 m × 3.0 m footprint and one door and two windows, all set in the front wall, at 1:50. Use the correct plan symbols, add overall dimensions in millimetres, a north point and the scale. *(6 marks)*

Q13. Draw the front elevation of the studio in Q12, showing the door, the windows and the ground line, and add the overall height dimension and the scale. *(5 marks)*

Q14. A student has drawn a box net in which every line is the same solid weight and there are no glue tabs. Identify two convention errors and describe how to correct each. *(4 marks)*

Q15. Explain the difference between a documentation drawing (such as a plan or a net) and a presentation drawing, and state why documentation drawings must include technical conventions such as dimensions and scale. *(4 marks)*

Q16. A studio must document three resolved designs: a folding carton for a bar of soap, a cotton work shirt, and a pop-up market stall. Name the documentation drawing you would produce for each and justify each choice by stating what that drawing records, then name one technical convention all three drawings must carry. *(4 marks)*

Answers

Q1. (a) Cut/outline = continuous solid; fold = dashed. (b) To join the net into a closed form (it is glued to the opposite panel). (c) 1:20 = the drawing is one-twentieth of real size; the real object is larger. **Q2.** (a) Six: front, back, two sides, lid (top), base. (b) The right-hand edge is shared with the SIDE panel, so it is a fold (dashed); the left-hand edge is a free outer edge that is cut (solid). (c) On the last side panel, on a fold line, so it can fold over and glue to the front panel. **Q3.** (a) Net Q. (b) Its bars sit two squares along the row, and that square folds round to become the back, so the bars would land on the back and the side would be blank. (c) Mentally fold it — a valid net folds up with no overlapping faces (and lands the marked faces correctly). **Q4.** (a) A flat, 2D, un-rendered drawing of a product/garment, usually front and back, recording construction. (b) Any two: seams/stitching, pockets, straps/ties, fastenings, hems, bar-tacks. (c) A flat is 2D and un-rendered with no body; a fashion illustration styles the item on a figure. **Q5.** (a) Looking straight down from above (a horizontal slice / bird's-eye view). (b) Door = a break in the wall with a leaf line and a swing arc; window = a break in the wall with a double glazing line. (c) 60 mm × 50 = 3000 mm = 3.0 m. **Q6.** (a) A straight-on view of one vertical face of a structure. (b) Both openings must sit in the front wall on the plan — an elevation shows only the one face it is named for. (c) The right side elevation. **Q7–Q16.** See fully-worked solutions.

Fully-worked solutions

Q1. (a) A **cut / outline line** is a *continuous, solid* line; a **fold (crease) line** is a *dashed* line *(1 mark each).* (b) The **glue tab** is the panel that is folded and glued to the opposite face to **join the net into a closed form** *(1 mark).* (c) **1:20** means the drawing is drawn at *one-twentieth of real size* — one unit on the drawing represents twenty units in reality — so the **real object is larger** than the drawing *(2 marks: meaning of the ratio + which is larger).*

Q2. (a) **Six** faces: **front, back, two sides, a lid (top)** and a **base** *(2 marks).* (b) The two edges do different jobs. The FRONT panel's **right-hand edge is shared with the SIDE panel** — the card is not cut there, it **creases and folds**, so it is drawn **dashed**. Its **left-hand edge is a free outer edge** of the flat blank, the line the blade actually **cuts**, so it is drawn **solid**. Every panel in a net is bounded by both kinds of edge, and the line type is what tells the maker which is which *(2 marks: shared edge = dashed fold + free edge = solid cut, each explained).* (c) The glue tab is placed on the **last side panel** and joined to it by a **fold line**, so that it can be folded over and glued to the front panel, closing the net into a tube — drawing it on a fold line (not a cut line) shows that it bends rather than being cut off *(2 marks).*

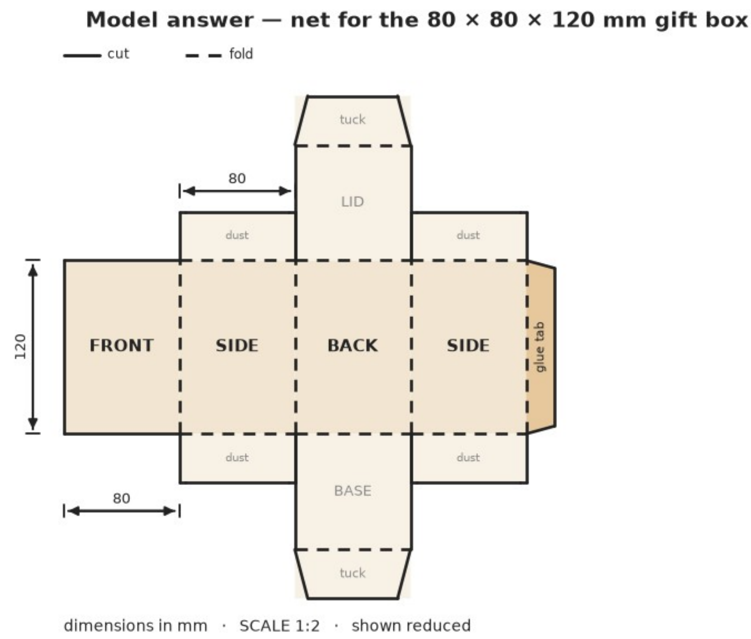
Q3. (a) **Net Q** *(1 mark).* (b) In **Net P** the bars are placed **two squares along the row** from the centre. Folding the row wraps it right around the box, so that square does not become a side at all — it folds round to become the **back** face. The finished box would carry the bars on the back and have a **blank side**, which does not match the QUILL box *(2 marks: identifies the mis-placed face + the consequence when folded).* (c) **Mentally fold the net**: a valid net folds up so that **no two faces overlap** and all six faces meet to enclose the box (and the marked faces land in the right places) *(1 mark).*

Q4. (a) A **technical flat** is a *flat, two-dimensional, un-rendered* drawing of a product or garment — usually shown **front and back** — that records its **construction** using an outline and stitch/detail lines, with no body, pose or shading *(2 marks).* (b) Any **two** construction details, e.g. **stitching (top-stitched hem), a pocket, straps or ties, a fastening (buckle/slider)** or **bar-tacks** *(2 marks).* (c) A technical flat is **2D and un-rendered and shows no wearer**, existing to document construction, whereas a **fashion (presentation) illustration** styles the garment on a figure to convey its look and appeal *(1 mark).*

Q5. (a) A floor plan shows the structure as seen **looking straight down from above** — a horizontal slice, or bird's-eye view *(1 mark).* (b) A **door** is shown as a **break in the wall** with a straight **door-leaf line** and a quarter-circle **swing arc** — both the same length as the opening — showing the direction it opens; a **window** is shown as a **break in the wall spanned by a double (glazing) line** between the jambs *(2 marks: one each).* (c) At **1:50**, real size = drawing size × 50 = 60 mm × 50 = **3000 mm = 3.0 m** *(2 marks: method + answer).*

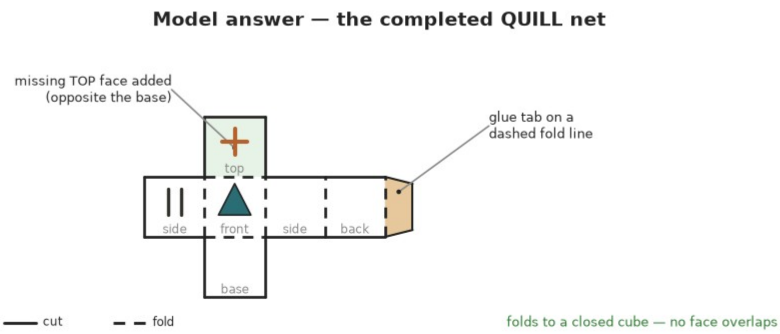
Q6. (a) An **elevation** is a drawing of one **vertical face** of a structure seen **straight on** (front, side or rear) *(1 mark).* (b) An elevation shows **only the one face it is named for**, so an opening can appear in it only if that opening is set in **that** wall. Because the door and the servery window both appear in the **front** elevation, both must be drawn in the **front wall** on the plan — and at the same set-out along the wall, so the two drawings agree *(2 marks: an elevation shows a single face + therefore both openings are in the front wall on the plan).* (c) The **right side elevation** *(1 mark).*

Q7. A model net is shown below.



A correct response is a single connected net for the 80 × 80 × 120 mm box, drawn to a stated scale (for example 1:2), showing: four body panels in a wrap-around strip (two 80-wide faces and two 80-wide sides, each 120 high, with the top/base faces 80 × 80), the shared edges as **dashed fold lines** and the free outer edges as **solid cut lines**, a **lid and base** with **tuck and dust flaps** to close the top and bottom, and a **glue tab** on the last side panel (on a fold line). The faces are **labelled** (front / side / back / side / lid / base), the drawing is **dimensioned in mm** (80, 80, 120) and the **scale** is stated *(6 marks: connected net; correct dashed-fold / solid-cut lines; closure flaps; glue tab; labelled faces; dimensions + scale).*

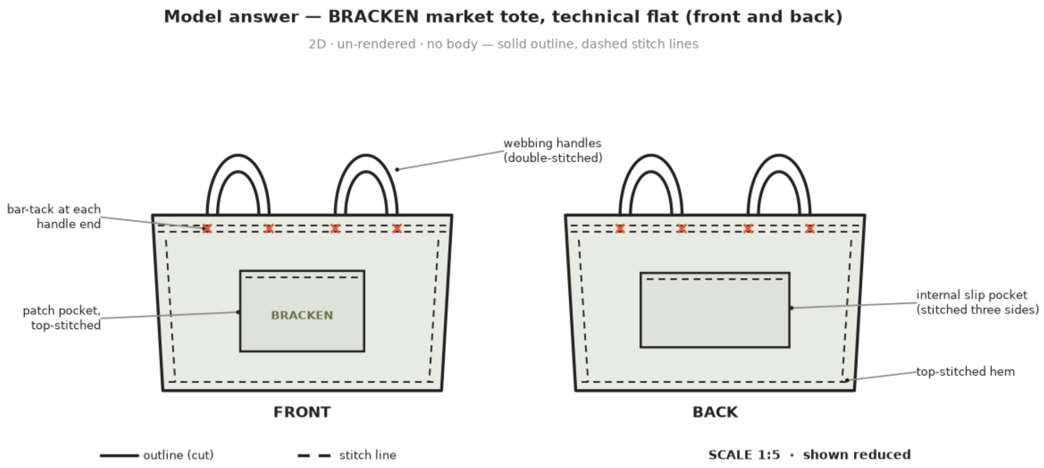
Q8. The completed net is shown below.



The completed net adds the **single missing face** — the **top** panel — to the vacant arm of the cross, directly above the front square and therefore opposite the base. It is drawn with **solid cut edges** on its three free sides and a **dashed fold line** where it hinges to the front panel, and a **glue tab** is added on the far edge of the back panel, again hinged on a **dashed fold line** so it bends rather than being cut off. Checking by mental folding confirms the six faces now enclose a cube with no overlap *(4 marks: correct missing face in the right position; correct fold/cut conventions; a glue tab added; result folds to a closed cube).*

Q9. When a net folds up, the six faces pair off into **three opposite pairs**: front–back, top–base and left–right. Folding rearranges the flat squares, so a face and its opposite are **not adjacent** on the net — each ends up on the far side of the box from its partner. On the cross with the **centre square as the FRONT**, the back is the far square along the row (two cells across), the left and right are the side arms, and the **top and base are the two arms above and below the centre**. Because the barcode goes on the **base**, and the base is the face opposite the top, it must be placed on the square **directly below the front** (the lower arm of the cross) — folding that square down closes the underside of the box. So: logo on the centre (front), barcode on the square immediately beneath it (base) *(4 marks: explains that folding makes three opposite pairs so opposites are non-adjacent + identifies the lower-arm square as the base).*

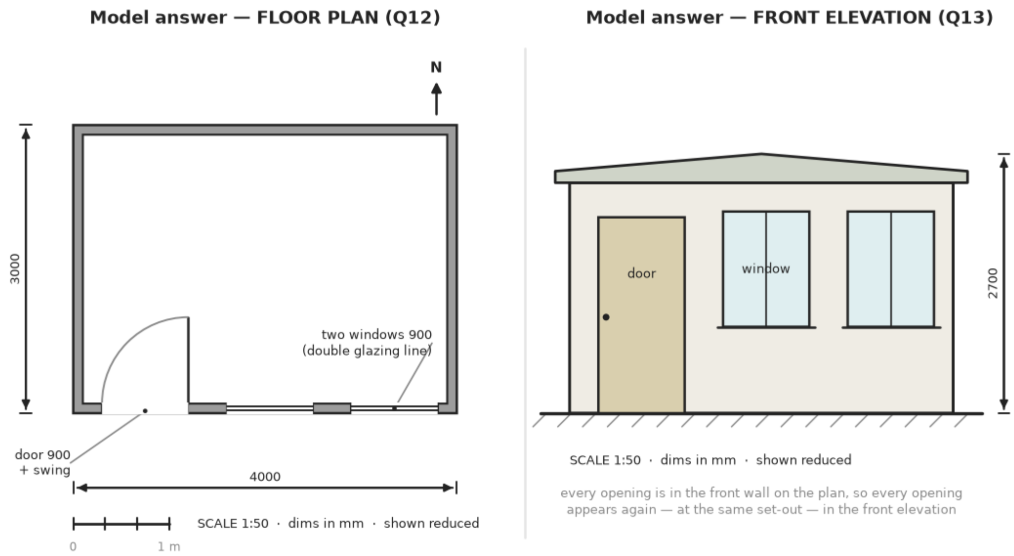
Q10. A model flat is shown below.



A correct response is a technical flat of an original tote bag showing **front and back**, drawn 2D and **un-rendered** with a **solid outline** and **dashed stitch lines**, and **three construction details labelled** with leaders — for example the **handles** (and where they are stitched down with a bar-tack or a box-stitch), a **patch or internal pocket** (top edge top-stitched), and the **top-stitched hem or side seams**. There is no body or styling *(6 marks: front and back; un-rendered 2D; solid outline vs dashed stitch lines; three construction details correctly labelled).*

Q11. On a documentation drawing the three are shown by **different line types**. A **cut/outline line** is drawn as a **continuous solid** line, showing a visible cut edge of a face. A **fold (crease) line** is drawn **dashed**, showing where the material bends rather than is cut. A **line of stitching** is also drawn **dashed** (a fine broken line of short even dashes), placed just inside the edge to record where the item is sewn — kept lighter/finer than a fold line and clearly separate from the solid outline. Using distinct line types lets the drawing be read unambiguously by whoever makes the item *(3 marks: solid cut line + dashed fold line + dashed/broken stitch line, each correctly described).*

Q12. A model plan and the matching elevation for Q13 are shown below.



A correct response is a **1:50** floor plan of the 4000 × 3000 mm studio drawn **looking straight down**: the walls drawn as a heavier double line (poché); **one door** shown as a break in the front wall with a **leaf line and swing arc** (both the same length as the opening); **two windows** each shown as a break spanned by a **double glazing line**; **overall dimensions** (4000 and 3000) given in **millimetres**; a **north point** to fix orientation; and the drawing titled and noted **"SCALE 1:50"** *(6 marks: scaled footprint; walls; correct door symbol; two correct window symbols; dimensions in mm + north point; stated scale).*

Q13. A correct response is the **front elevation** of the same studio at **1:50**, drawn **straight on** to the front face and sitting on a **solid ground line**: the wall face with the **door** and the **windows** shown in elevation (as rectangles in their correct positions), the roof/top edge, an **overall height dimension** in millimetres, and the drawing titled and noted **"SCALE 1:50"**. It shows heights and appearance rather than layout. Because all three openings are set in the front wall on the plan, all three must reappear here — **at the same set-out along the wall** as the plan gives them, which is what makes the two drawings a consistent set (see the model above) *(5 marks: scaled elevation on a ground line; door and windows shown in elevation; height dimension; stated scale; consistent with the plan).*

Q14. The two convention errors are: (1) **every line is the same solid weight**, so cut edges and fold edges cannot be told apart — this is corrected by drawing the **fold (crease) lines dashed** and keeping only the **cut/outline edges solid**; and (2) **there are no glue tabs**, so the net cannot be joined into a closed form — this is corrected by adding a **glue tab** (and the tuck/dust closure flaps), each placed on a **fold line** so it folds over and glues to the adjoining panel. With the fold lines dashed and the tabs added, the net both reads correctly and can actually be assembled *(4 marks: identifies each error + gives the correct fix for each).*

Q15. A **documentation drawing** *defines and records the technical specifications for assembling* an object or environment — a net, a technical flat, a plan or an elevation — and is precise, measured and drawn with technical conventions. A **presentation drawing** *conveys a resolved design concept to stakeholders for consideration* — a rendered impression or styled illustration — to communicate how the design looks and feels. The purpose differs: documentation is *for making*, presentation is *for considering*. Documentation drawings **must include technical conventions such as dimensions and scale** because they are read as a **specification**: a maker or manufacturer needs the exact sizes (in mm) and the scale to build the object at the correct proportions and dimensions — without them the drawing cannot be reliably assembled *(4 marks: documentation vs presentation purpose distinguished + why conventions/dimensions/scale are essential to a specification).*

Q16. The **soap carton** is documented as a **packaging net** — the unfolded development of every face of the box laid flat as one connected shape, with its fold and cut lines, closure flaps and glue tab, so the carton can be printed, cut, creased and assembled. The **work shirt** is documented as a **technical flat** — a flat, un-rendered front-and-back drawing that records the construction (seams, stitching, pockets, fastenings) without a body or a pose, so a maker can sew it. The **pop-up market stall** is an environment, so it is documented as a **plan** (the layout and footprint, looking straight down) together with **elevations** of each face (the heights and appearance of the built form). The convention **all three** must carry is a **stated scale** written as a ratio — and with it, **dimensions in millimetres** — because each drawing is read as a specification and is useless without the real sizes it stands for *(4 marks: correct method named and justified for each of the three designs + one convention common to all three).*