# Ellwand

User guide. Draft the way you would on paper, with a ruler, a curve and a tape measure, except every line remembers the measurement it came from. Change the size and the whole draft redraws itself.

This guide covers the desktop app, on the Mac and on Windows; the same app runs in a web browser while it is being developed. Where a shortcut says ⌘, read Ctrl on Windows; where it says the Finder, read File Explorer.

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## Beta

While Ellwand is being tested, every copy is the beta edition. A few things to know:

- This is a pre-release copy of Ellwand, for your own testing. Please don't pass it on.
- It may change or stop working at any time, and it stops on 31 January 2027. The app says so on its home screen for the last fortnight; afterwards it shows a thank-you screen instead, with a button to the folder your files are in.
- Your patterns are yours. They stay on your computer as ordinary files, in Documents › Ellwand or a folder you choose.
- Anything you send as feedback may be used to improve the app.
- When it opens, the app tells ellwand.app its version, your system's version (macOS or Windows) and a random number for this computer, so Sam can see which copies are in use and show you any reply to your feedback. Nothing about your patterns is sent unless you include one with feedback. On first launch it also asks, optionally, for the email you applied with, so your copy can be matched to your application; it is sent once and not kept. What is kept, and why, is set out at **ellwand.app/privacy**.

After the agreement, the app asks where to keep your patterns. **Keep them in Documents** is the recommended answer and the one most people should give; **Choose another folder…** is for keeping the library somewhere else, such as a folder that iCloud Drive or Dropbox backs up. You can move it later from the home screen (see The files).

A key from Sam turns one computer into the full edition, with no end date: enter it under **More › Enter a key** on the home screen.

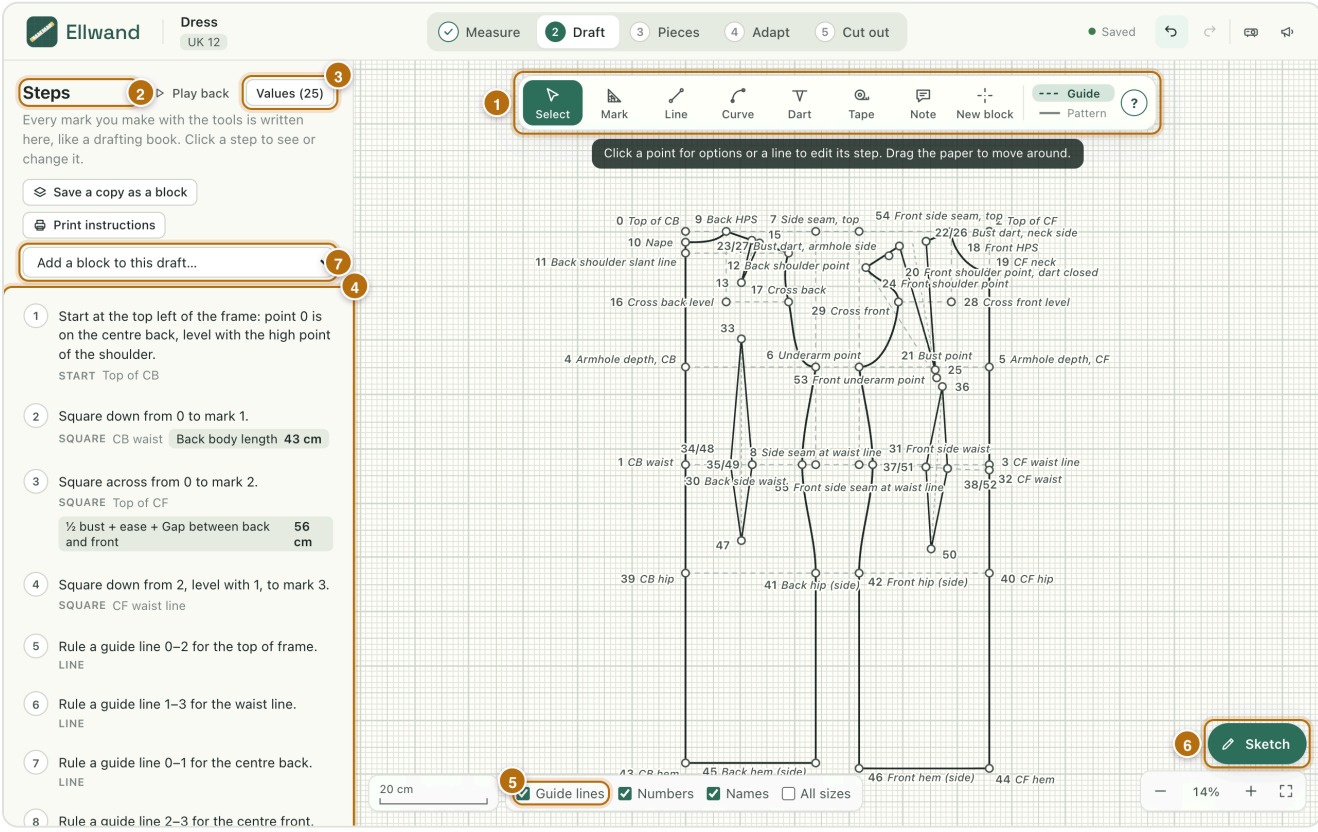
## 1. How the app is laid out

A pattern goes through five stages, shown across the top of the window. You can go back and forth between them at any time; nothing is lost. The sketch pad, for drawing the design as a flat, pops up over any of them from the pencil button in the bottom corner.

1. **Measure**
   Pick a size or a client, and set the ease and style choices.
2. **Draft**
   Draw the block with the tools. Every mark becomes a written step.
3. **Pieces**
   Trace the pattern pieces off the draft. Seam allowance and notches are added.
4. **Adapt**
   Slash and spread the pieces into new designs: flare, gathers, moved darts.
5. **Cut out**
   Project onto the cutting mat, or print.

The panel on the left belongs to the current stage. The big area on the right is the paper. Drag it to move around, pinch or scroll to zoom, and use the buttons in the bottom corner to zoom, show real size (100%) or fit everything on screen.

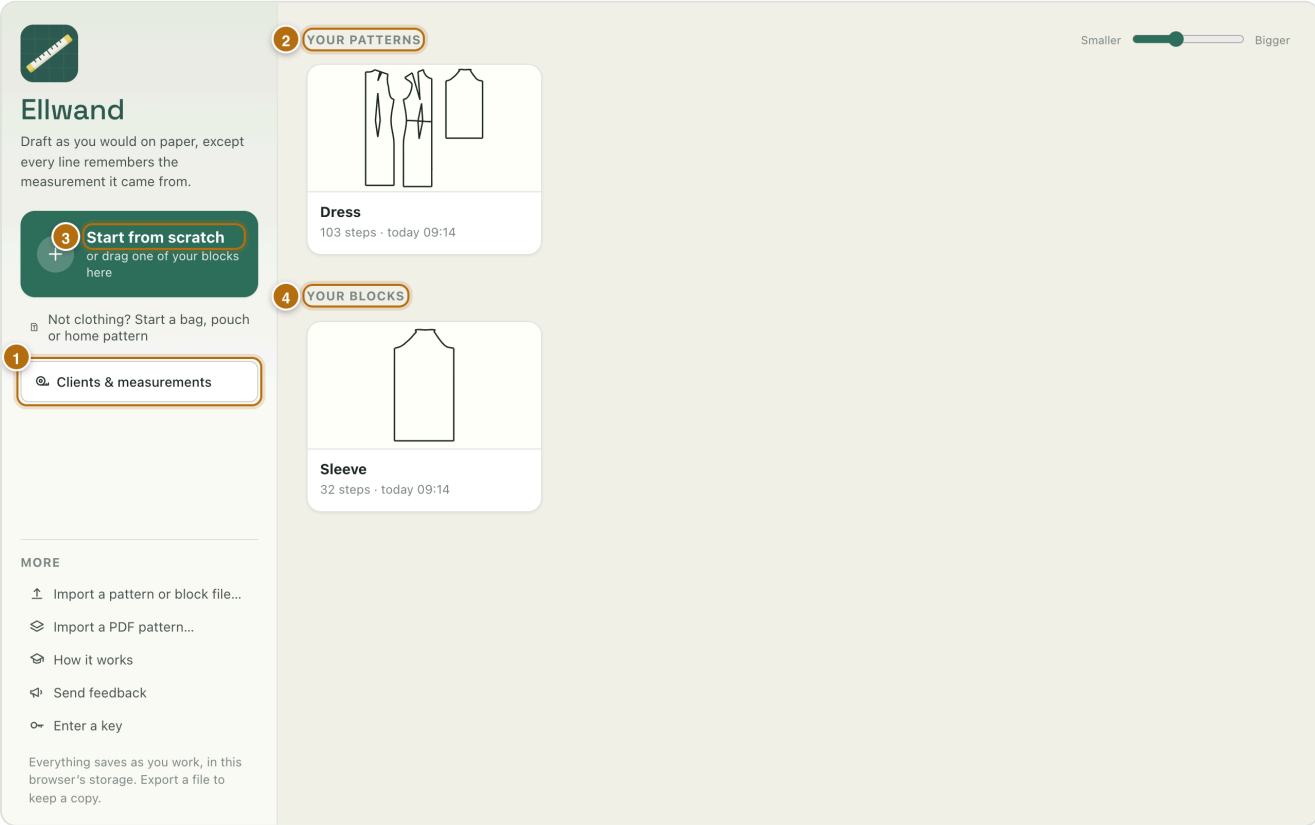
The pattern's name is at the top left; click it to rename. Next to it is the size or client it is drafted for; click that to change it. **Undo** and **redo** are at the top right ( ⌘Z and ⇧⌘Z ).




**The Draft stage.** (1) The tool palette: Select, Mark, Line, Curve, Dart, Tape and New block, with the guide / pattern line choice. (2) The steps: everything you draw is written here, like a drafting book. (3) Values: ease, style choices and worked-out numbers, to use in any formula. (4) Click a step to see it on the paper and change its formulas. (5) Under the paper: guide lines, point numbers and all sizes at once. (6) The sketch pad pops up from here, over any stage. (7) Add one of your blocks to this draft as a draft block of its own.

> **Everything is parametric.** Nothing you draw is a fixed number unless you want it to be. A line that was "half the hip plus 2" stays that when the hip changes. This is what makes one draft work for every size, and for every client.

# 2. Home: your library




**Home.** 1 Clients & measurements: a measurement sheet for each client, shared by every pattern. 2 Your patterns: every pattern saves itself here as you work, the most recent first. 3 Start from scratch: a blank sheet and your own method, or drop one of your blocks on it. 4 Your blocks: drafts you start new patterns from.

The home screen is your library. Everything in it saves itself as you work; there is no Save button to remember. While a pattern is open, **Saved** in the top bar (beside Undo) says so, and reads **Saving…** for the moment after each change. Click it to turn **Save as I work** off if you would rather save by hand: the pattern then reads **Unsaved changes** until you press `⌘S` or **Save now**, and you are asked before anything unsaved would be lost. The panel down the left side is for starting things; your patterns and blocks fill the rest of the window.

- **Start from scratch** gives a blank sheet with one point on it. To start a pattern from one of your blocks instead, drag the block onto it and let go.
- **Your patterns**: the patterns you are making, the most recent first. Click a pattern to carry on with it. When there are more than fit in two rows, **Show all** lists the rest. The **Smaller / Bigger** slider sets how big the cards are.
- **Your blocks**: the drafts you start patterns from, such as your own bodice block or a client's. Click a block to edit the block itself (a **Block** tag shows at the top while you do). To make a pattern from it, drag it onto Start from scratch, or use its menu.
- **More**, at the bottom of the panel: **Import a pattern or block file…**, **Show the library folder**, **Library folder…** and **Connect to Claude** (in the desktop app, full edition only: beta copies show **Enter a key** instead), **How it works**, the five stages in brief, and **Send feedback**.

- **Send feedback** (under More, and the megaphone button at the top right while a pattern is open) is for telling us what went wrong or what you would like. Write your note, say whether it is a problem, an idea or something else, and click **Send**: it goes straight to Sam with the app's version, your system's version, the screen size and the stage you were on added for you. Tick **Include this pattern** to send the open pattern's file with it, so Sam can open the very pattern you were working on. If it can't be sent (no internet, say), **Send by email** opens it in your email app instead, and **Copy instead** puts the whole message on the clipboard to paste into one. When Sam replies, the reply appears at the top of the home screen the next time the app opens; click **OK** to clear it.

The app doesn't come with ready-made blocks: you draft your own. Start from scratch, draft the block from your book or class, check it on a toile, then use **Save a copy as a block** in the Draft stage to keep it in Your blocks. A block someone sends you comes in with **Import a pattern or block file…**, or drop the file anywhere on the window.

Hover over a pattern or block and click the ··· button for **Rename**, **Duplicate**, **Export file…** and **Delete** (and, on a block, **New pattern from this block**). From the Draft stage, **Save a copy as a block** puts a copy of the open draft into Your blocks.

### The files

In the desktop app, every pattern and block is an ordinary file in your **library folder**: a **Patterns** folder and a **Blocks** folder, one `.ellwand` file each, named after the pattern, with your clients' measurement sheets in `Clients.json` beside them. The library folder is **Documents › Ellwand** unless you chose another when the app first opened. **Show the library folder** (under More on the home screen) opens it in the Finder. You can rename, copy, back up (iCloud, a memory stick) or send these files like any other; the app reads the folders each time it opens. **Import a pattern or block file…** brings a file someone has sent you into the library. In the web browser version there are no files: the library lives in the browser's own storage, so export a file to keep a copy.

**Library folder…** (under More) says where the library is and lets you move it. **Choose another folder…** opens the system's folder dialog; the library goes in an **Ellwand** folder inside the folder you pick, unless that folder is already an Ellwand library. Then either **Move my files there**, which takes your patterns, blocks and clients with it (across to another disk if need be), or **Switch without moving**, which points the app at a library already kept in that folder. **Back to Documents › Ellwand** undoes the choice. The app remembers the folder on this Mac, in a small file at `~/Library/Application Support/Ellwand/library.json`, and the Claude connection reads the same file, so Claude finds the library wherever it is. Documents › Ellwand is still the recommended place: it is backed up with the rest of your Documents, and nothing has to be remembered.

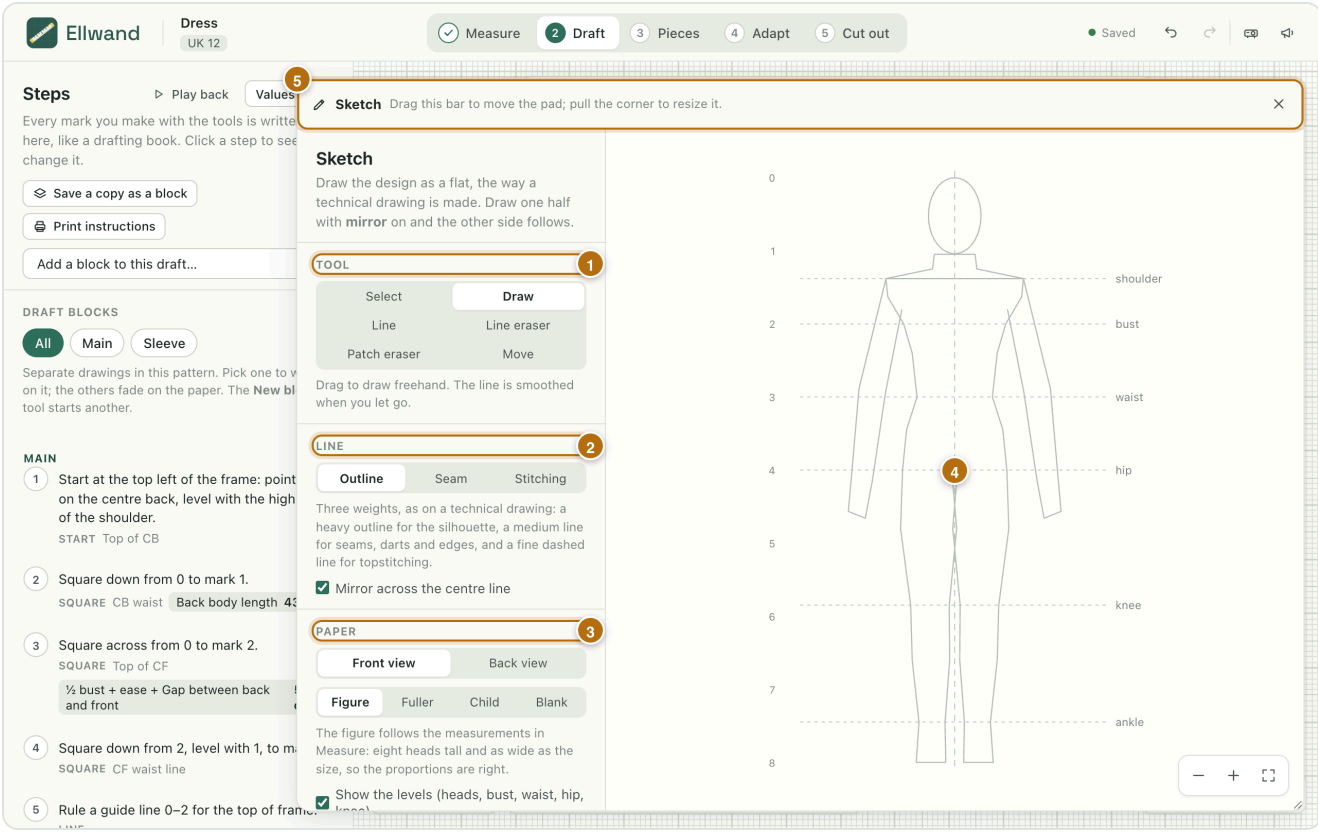
## 2a. The sketch pad

A design starts as a drawing. The **Sketch** button in the bottom corner of the paper opens the sketch pad over whatever stage you are on; drag it by its title bar, pull its corner to resize it, and close it with the cross or Esc. It gives you a figure to draw over, the way a technical drawing (a flat) is made, or blank paper. Under **Paper**: **Figure** is the size you are working on, eight heads tall (a little longer in the leg than life, as fashion drawings are) and as wide as its measurements, so the proportions are right; **Fuller** is the

same size rounded out; **Child** is a child of about six, drawn six heads tall (a children's block is always drawn on a child); **Blank** is plain paper. Front and back views.

- **Draw** freehand (the line is smoothed when you let go), **Line** for straight lines, **Line eraser** to remove a whole line with a click, **Patch eraser** to rub out just the part of a line you drag over (with Mirror on, the other side goes too), **Move** to pan (or hold the space bar).
- **Three line weights**, as on a technical drawing: a heavy **outline** for the silhouette, a medium line for **seams**, darts and edges, and a fine dashed line for **stitching**.
- **Mirror**: draw one half and the other side follows across the centre line, so the flat is symmetrical. Turn it off for asymmetric details.
- **Select** a line to move it (drag it) or reshape it (drag one of its handles; the neighbours ease along). Change its weight or mirroring in the panel, or press Backspace to delete it.
- **Details** drop standard shapes onto the figure, drawn to the measurements of the size: whole silhouettes (fitted top, T-shirt, shirt, A-line, pencil and full skirts, straight and wide trousers, shift and fit-and-flare dresses, jacket), necklines, collars, sleeves, cuffs and hems, pockets, fastenings, seams and darts. Drop one, then move or reshape it. This is the "speed designing" of the Flats book: start from a shape and change it.
- The figure's **levels** (head units, shoulder, bust, waist, hip, knee, ankle) can be hidden. **Save sketch as SVG** exports the drawing, with the figure if one is showing.

Keep flats to the essentials: draw only what is needed for the pattern cutter, no wrinkles or flourishes. The sketch is saved with the pattern.

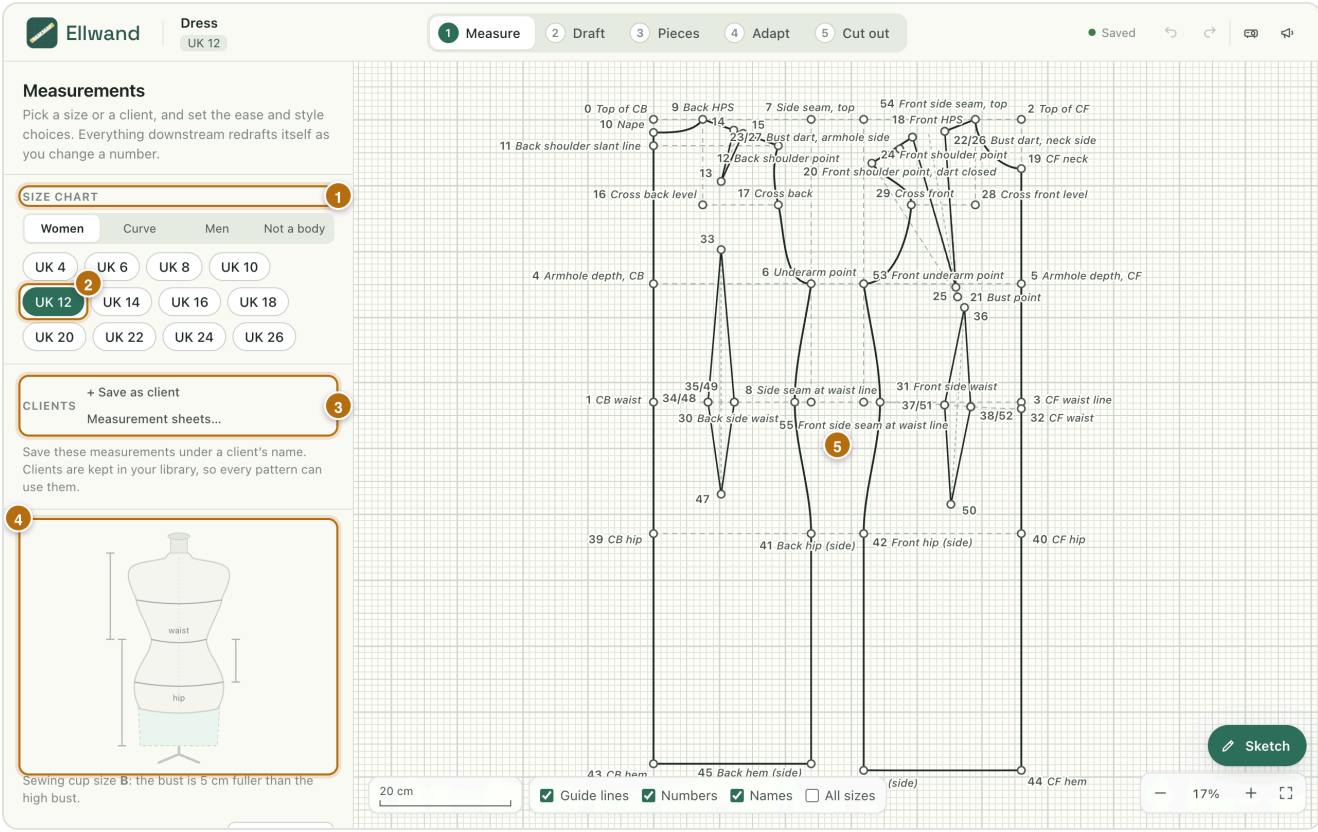



**The sketch pad.** 1 The tools, including the line and patch erasers. 2 Line weights: outline, seam, stitching; and mirroring. 3 Paper: the figure for this size, a fuller figure, a child, or blank; below it, the details library. 4 The figure, eight heads tall and as wide as the measurements. 5 Drag the title bar to move the pad; pull the corner to resize it; the cross or Esc closes it.

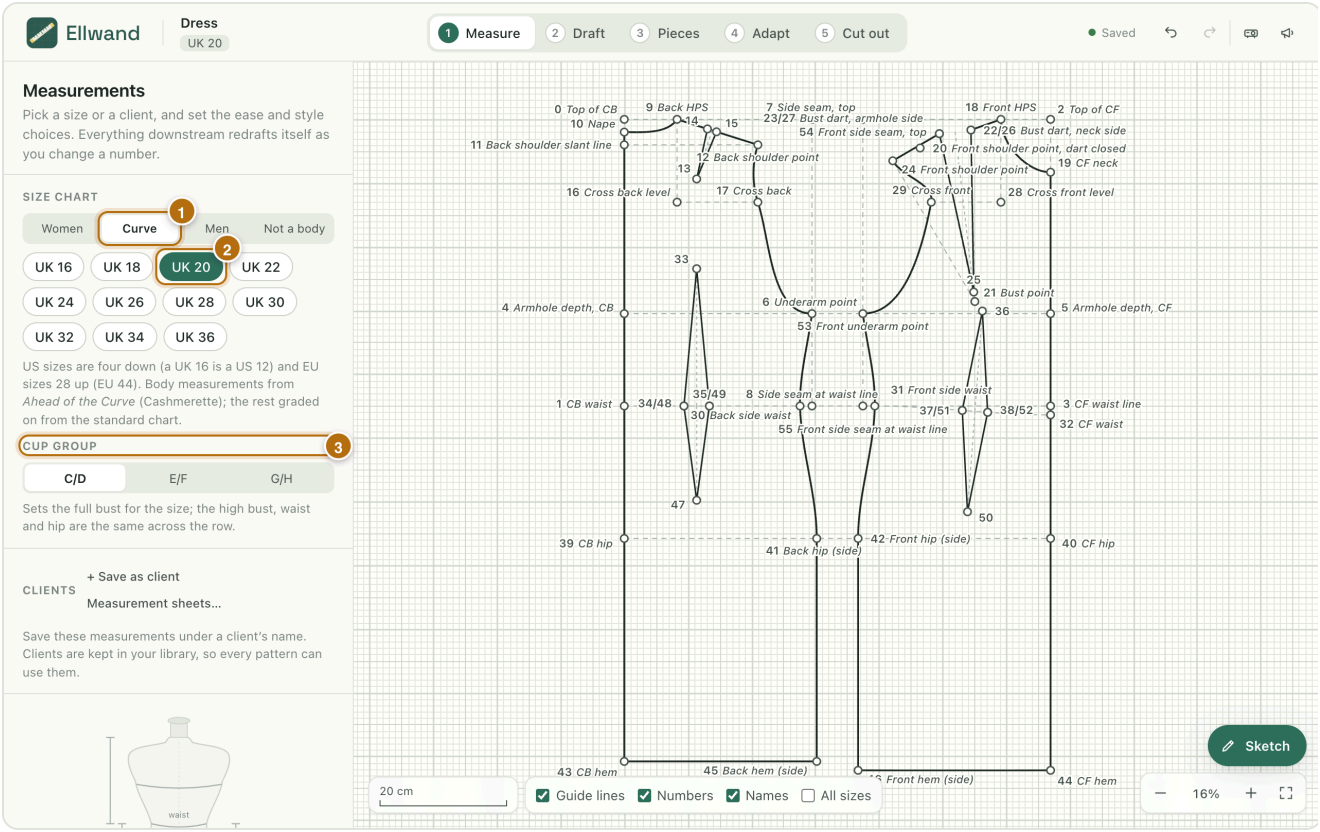
# 3. Measure

## Sizes

Pick a size from a chart. The women's blocks can be drafted to the **standard** chart (UK 4 to 26, our grading from the size 12 in Lo's *Pattern Making*) or the **curve** chart (UK 16 to 36, with the US and EU sizes alongside: a UK 16 is a US 12 and an EU 44). The curve chart's body measurements come from Jenny Rushmore's *Ahead of the Curve* (Cashmerette), with the full bust given for three **cup groups**, C/D, E/F and G/H; the smaller measurements carry on the standard grading. The **men's** chart runs by chest size, 88 to 124 cm (a chest 100 is about a 40 in), graded after Aldrich's *Metric Pattern Cutting for Menswear*; pick a men's size and the measurements read as a tailor names them (chest, seat), and a pattern started from scratch becomes a men's pattern. The children's block uses the children's chart, age 2 to 14. For something that isn't clothing at all, a bag, a pouch or a cushion, choose **Not a body**: there is no size chart, and the pattern is drafted from measurements you add yourself (a bag's width, a strap length). The home screen's **Not clothing?** link starts one, and the PDF importer can mark an import that way. The measurements fill in below. Change any number and the size chip changes to **Custom**; the whole draft redraws as you type.



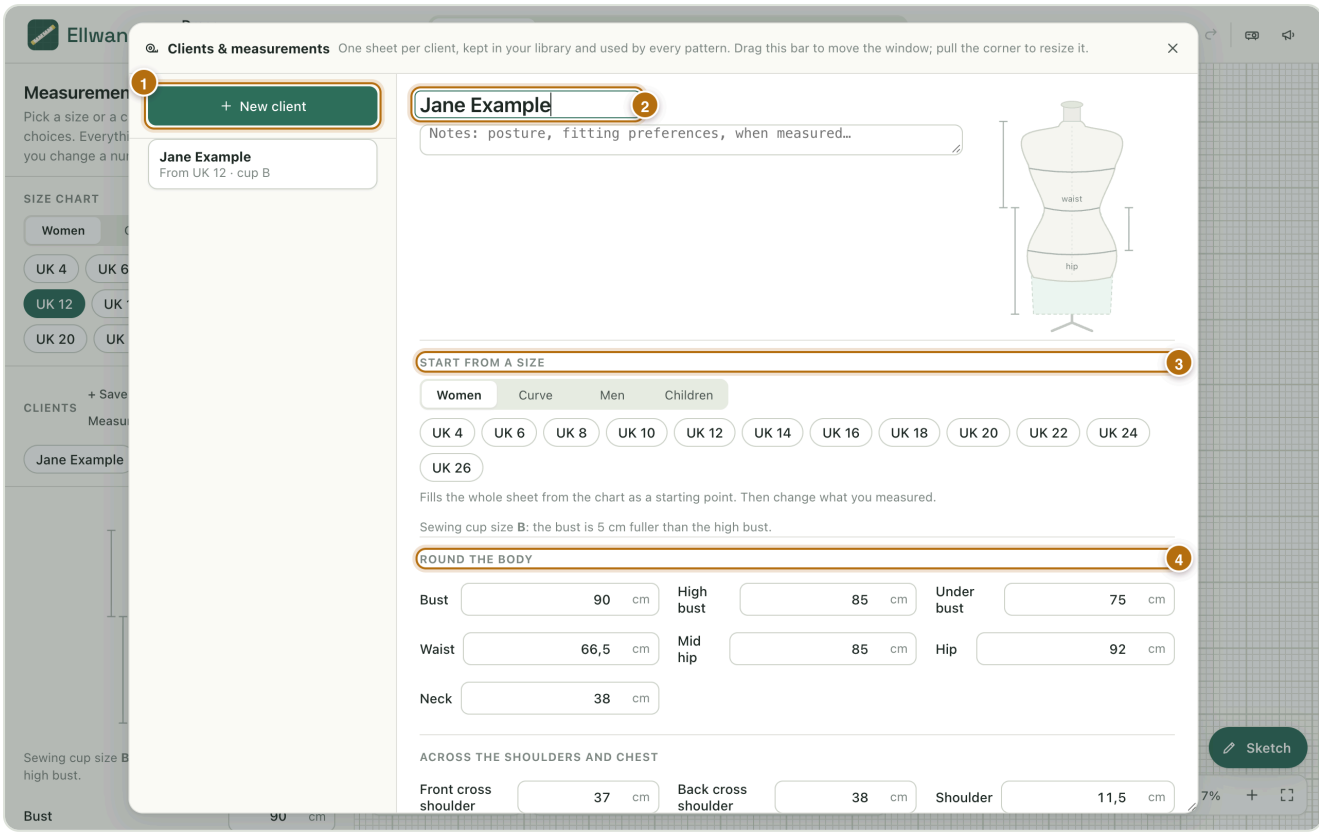

**The Measure stage.** 1 Which chart: standard or curve. 2 The sizes; hover a curve size for its US and EU numbers. 3 Clients: save these measurements under a name, or open the measurement sheets. 4 The figure shows where a measurement is taken; click into a box for the instructions. Below it, the ease (each shown as body + ease = the working measurement) and the style choices. 5 The draft redraws on the paper as the numbers change.




**The curve chart.** (1) Curve UK 16–36. (2) A size; the row's high bust, waist and hip are the same for every cup group. (3) The cup group sets the full bust. The sewing cup size is shown under the figure.

## Clients

A client's measurements are kept as a **measurement sheet** in your library, shared by every pattern, the way a pattern maker keeps one sheet per client. In Measure, **Save as client** keeps the current measurements under a name; the client then appears as a chip in every pattern. While a client is picked, changing a measurement updates their sheet for all their patterns. **Measurement sheets…** (or **Clients & measurements** on the home screen) opens the clients window: every measurement in the library for each client, with the figure, filled in from a chart size to start with. In the Mac app the sheets live in `Clients.json` in the library folder.




**The clients window.** 1 New client: a sheet starts from a UK 12 until you fill it in from another size or type in what you measured. 2 The client's name, and notes such as posture or when they were measured. 3 Start from a size: standard, curve (with a cup group) or children. 4 Every measurement in the library, in the order it is taken; hover one to see it on the figure. 5 With a pattern open, use this client for it.

## Measurements

Hover over a measurement to see where it is taken on the figure; click into its box for the instructions. Measurements the draft does not use can be removed with the small cross. **Add a measurement** offers everything in the library, which is the pattern maker's standard set: round the body (bust, high bust, under bust, waist, mid hip, hip, neck), across the shoulders and chest (front and back cross shoulder, shoulder, cross front, cross back), down the body (nape to waist, front and back body length, armhole depth, shoulder to bust point, hip length, skirt length, waist to knee, outseam, inseam, crotch depth, height), the arms (armhole, bicep, elbow, wrist, shoulder to elbow, sleeve length) and the legs (top of thigh, thigh, knee, calf, ankle, foot girth). Or type your own, such as "Dart to dart".

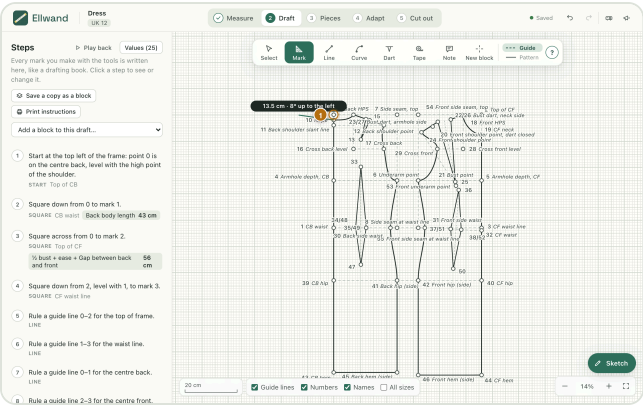
## Ease and style

Below the measurements are the block's **ease** values (how much room it has over the body) and its **style** choices: lengths, hem widths, waist drop, leg-hole height, fullness and so on, depending on the block. These are ordinary numbers or formulas; change one and the draft follows. Ease can also be a percentage of its measurement: type `5%` in the hip ease for 5% of the hip, or `−5%` for the negative ease of a stretch fabric; it reads back as "5% of Hip". They can also be edited in Draft, under **Values**, where the worked-out values are shown too.

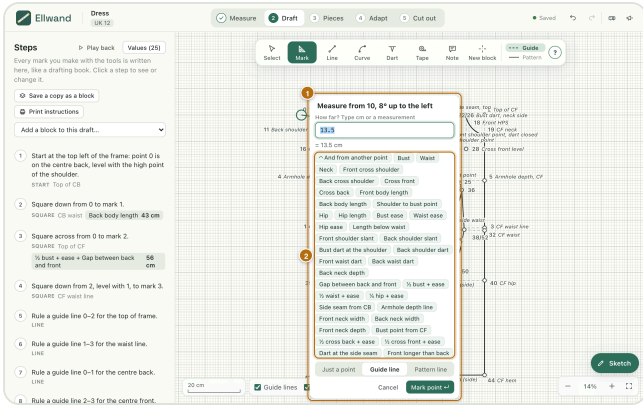
# 4. Draft

The Draft stage is where a block is drawn. Pick a tool from the palette at the top of the paper, or press its key. A tip appears for a few seconds when you pick a tool; click **?** to see it again.

| TOOL | KEY | WHAT IT DOES |
|---|---|---|
| **Select** | V | Click a point for a menu of things to do from it, or click a line, curve or dart to open its step. Drag the paper to move around. |
| **Mark** | M | Marks a new point. Drag out from any point with the ruler: it snaps square (up, down, left, right), to 45°, towards another point, or square off a line the point sits on, such as the shoulder slope. Drag along a curve the point is on to measure along it (8 cm down the armhole, say), or out to another line to swing the measure until it touches it (the sleeve slant down to the bicep line). Let go and type how far: `12`, `Skirt length` or `½ hip + 2`. Tick a guide line or pattern line to rule it as you go. Where two lines cross, a small × appears: click it to mark the crossing (straight lines count as extended). |
| **Line** | L | Click two points to join them, as a guide line (dashed) or a pattern line, chosen on the right of the palette. |
| **Curve** | C | Click the points the curve goes through. With just two, move the mouse to bend it like a hip curve, then click. With more (shoulder, guide point, underarm) it is a smooth curve through them; click empty paper or press Enter to finish. Drag the round handles of a selected curve to reshape it: round to change the angle it leaves or arrives at, further out for a fuller curve. |
| **Dart** | D | Drag from a point on the edge to the bust point (or the other way round), or click one and then the other: the dart runs between them, and you give its width and how far short of the bust point it stops. The edge end can also be any spot on a line or curve. Click a line or curve on its own for a dart square to it (it snaps to halfway), or click a point on a line twice for a square dart there. In its step, sliders change the width, length and position, and it can be switched between running to its point and having a length of its own. Where a guide line and a pattern line lie on top of each other, the pattern line is picked. |
| **Tape** | T | Click two points to measure between them. Or click along lines and curves to walk a seam, then walk a second one to compare them, e.g. the sleeve head against the armhole. |
| **Note** | A | Write on the paper. Click a point, or the paper near one, and type the note: *Bust point*, *Cut 2*, *Ease in here*. The note belongs to that point, so it moves with the draft when the size changes, and it can be dragged about with the Select tool. Its words and position are in its step. |
| **New block** | N | Click empty paper to start a new draft block there (see below): a separate drawing in the same pattern, with a fresh point that nothing else is measured from. Its distance across and down from point 0 is in its step, to change later. Then mark out from it as usual. |




**Marking a point.** 1 Drag out from a point with the Mark tool: the ruler snaps square, to 45°, or towards another point.




**Then let go.** 1 The box asks how far: a number, a measurement by name, or a formula. 2 Click a chip to put a measurement or value into the formula.

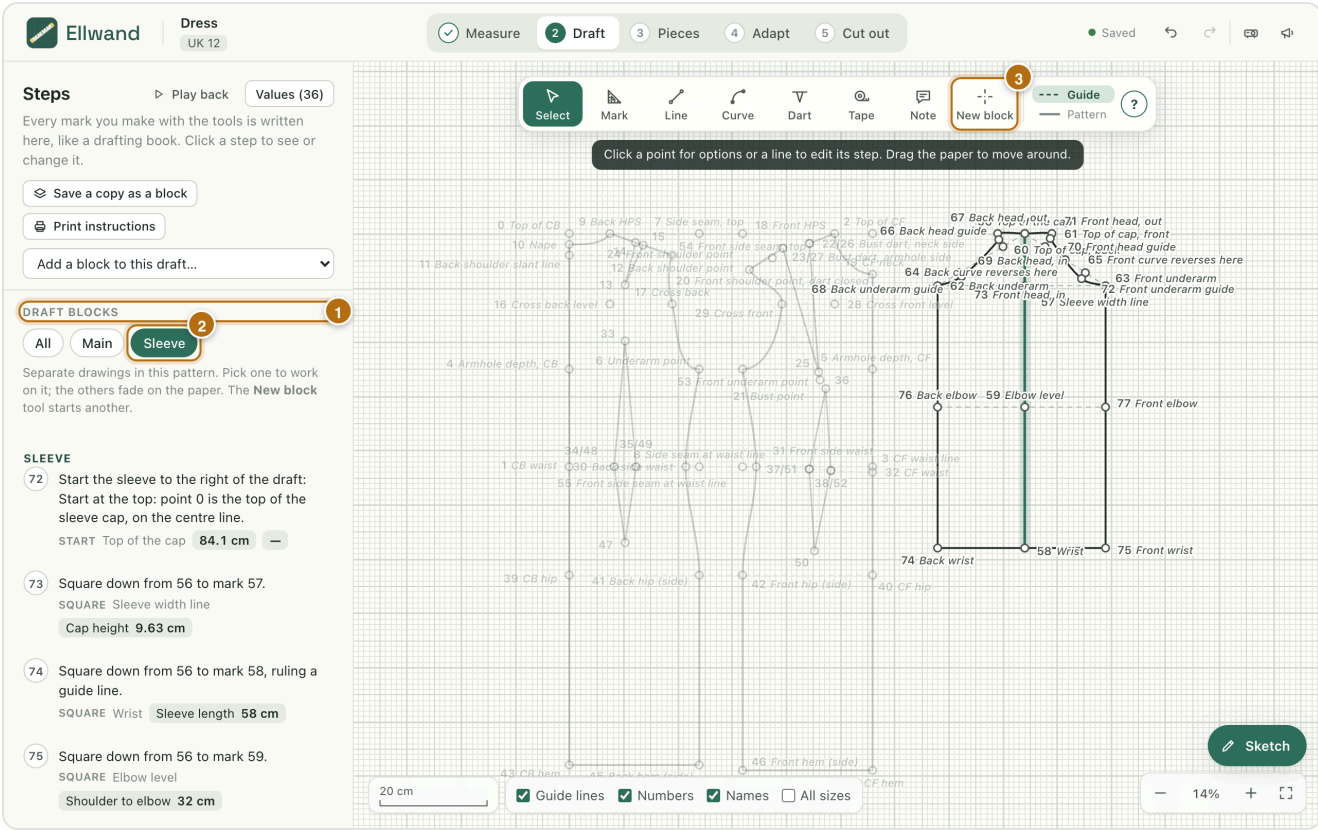
## The steps

Every mark you make is written into the list on the left, like a drafting book: "Square down from 0 to mark 1: Skirt length = 60 cm". Click a step to see it on the paper and change its numbers or formulas, by typing or with the slider under each one (on a formula such as ½ Hip + 2 the slider changes the + 2, so it still follows the size); give it a name ("CF waist", "Side seam") so later steps and the pieces read well. A line step can be divided into 2 to 6 equal parts. A step that other steps build on cannot be deleted until they are.

**Values** opens the named numbers: ease, style choices and worked-out values such as "Back hip = ½ hip ÷ 2 – 1". Name a number once and use it in any step. **Play back** replays the draft step by step, for a class. **Print instructions** makes a handout with the measurements, the numbered steps and the finished draft. **Save a copy as a block** keeps the draft in Your blocks, to start new patterns from.

## Draft blocks

One pattern can hold several drawings, called **draft blocks**: a bodice, its sleeve, its collar, each with its own starting point. **Add a block to this draft…** brings one of your blocks in as a draft block of its own, to the right of what is drawn, with its points renumbered to carry on from yours; the **New block** tool starts an empty one wherever you click. A block can measure from anything drawn before it, so a sleeve can be drafted from the bodice's armhole, and pieces can be traced across blocks. When there is more than one, chips at the top of the steps pick the block to work on: its steps are listed and the other blocks fade on the paper. A block's first step names it and can delete the whole block, provided nothing later builds on it.




**Draft blocks.** 1 The blocks in this pattern; All shows every step. 2 The sleeve block picked: its steps are listed and the dress fades. 3 New block starts another drawing where you click.

### Naming and marking points

Any point can be given a name, such as *Bust point* or *CF waist*, and drawn with a mark instead of a dot: a cross, a plus, a circle, a drill hole (a circled cross), a square or a triangle. Click the point with the Select tool and use **Name and mark** at the bottom of its menu, or open its step. The name is written under the point's number on the paper and in the printed instructions; the mark is drawn on the draft, in the instructions, and on any pattern piece the point falls inside (so the bust point's cross comes through onto the front bodice piece, with its name). A dart's points are named by the dart, but the dart point can still be given a mark.

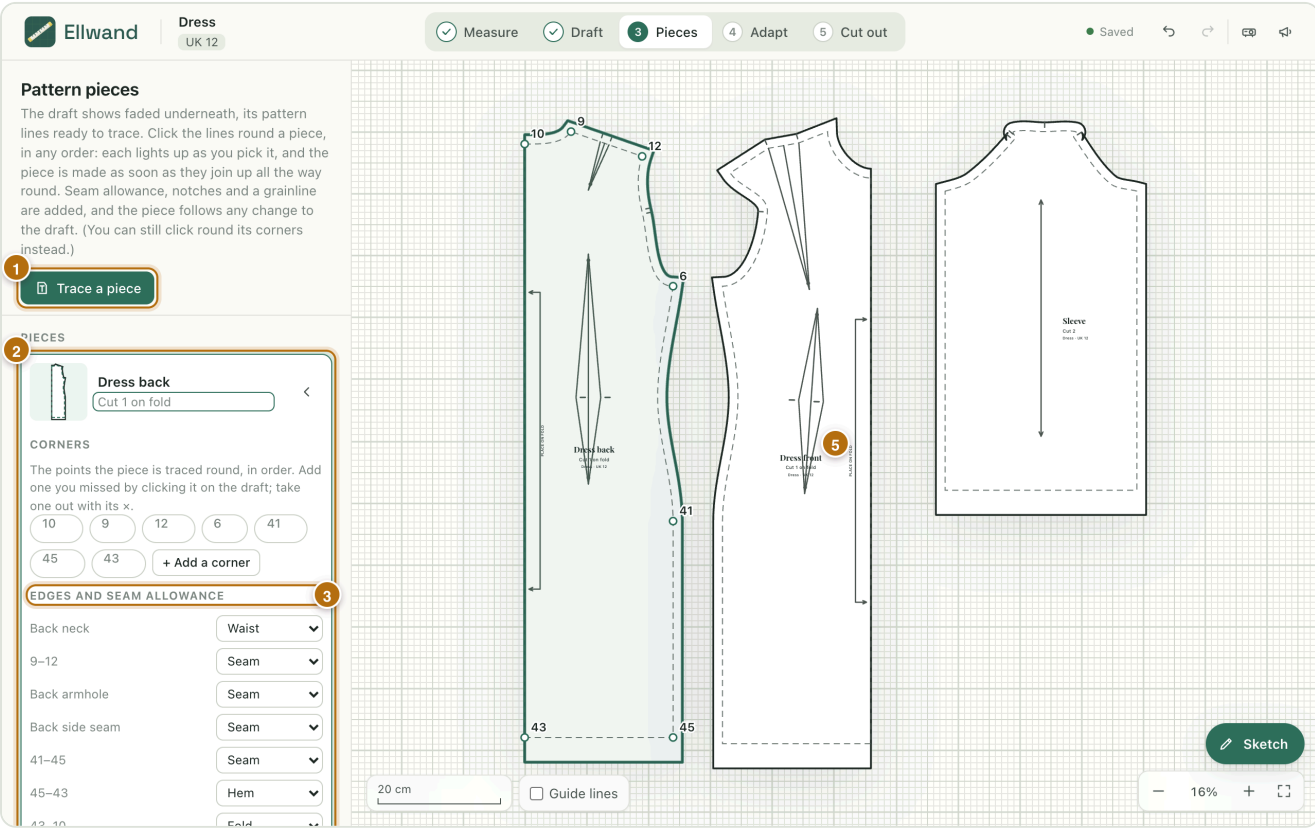
### Seeing the draft

Under the paper: **Guide lines** hides the dashed construction lines, **Numbers** hides the point numbers, **Names** hides the points' names, and **All sizes** drafts every size in the chart at once, nested, to check the grading.

## 5. Pieces

The draft shows faded under the paper, with its points. Outline a piece by clicking its corners in order, all the way round, like running a tracing wheel round it (or click **Trace a piece** first). Click the first point again, or press Enter, to close it. Between each pair of corners the app follows the pattern curve that joins them, or a straight line if there is none, and any dart sitting on the way is picked up. The piece appears where it was traced, with its seam allowance; a piece whose cutting line would touch another is nudged clear. Laying pieces out for paper happens in **Cut out**.

Click a piece on the paper, or its card, to open it; it is highlighted on the paper. The card has its name and the cutting instruction ("Cut 2", "Cut 1 on fold"), its **corners** in order (add one you missed by clicking it on the draft, or take one out with its ×), each edge set to **seam**, **waist**, **hem** or **fold** (that decides its seam allowance, which is set for the whole pattern under **Seam allowance**) or given its own width, the **grainline** (straight, cross, bias, or along a line of the draft such as a sleeve's centre line), and a **notch** choice at each corner and at any point measured along an edge: none, one, two or three, to match it to the piece it joins. Notches at the darts, a grainline (the straight one steps aside from any dart) and a "place on fold" bracket are added for you. **Include in Cut out** is the same tick as in Cut out. Under **Markings** you can hide the stitching line, notches, grainlines or labels on screen and in print.



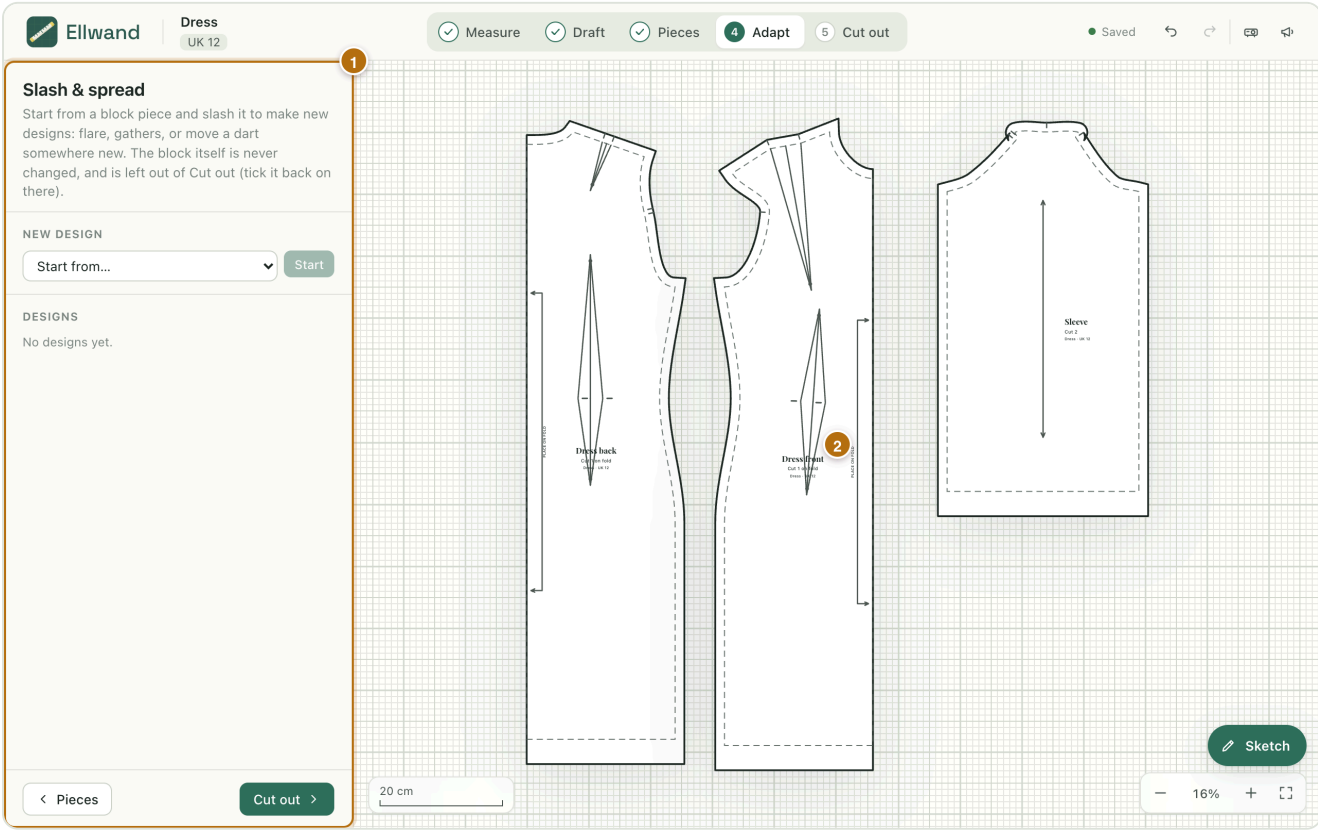

**The Pieces stage.** 1 Trace a piece, or simply click a corner on the draft to start. 2 The open piece, highlighted on the paper. 3 Its edges: seam, waist, hem or fold. 4 Notches at its corners. 5 The pieces sit where they were traced, over the faded draft.

> **Pieces follow the draft.** Change a measurement, a size or a step and every piece is retraced. Which pieces are printed or projected is chosen in **Cut out**.

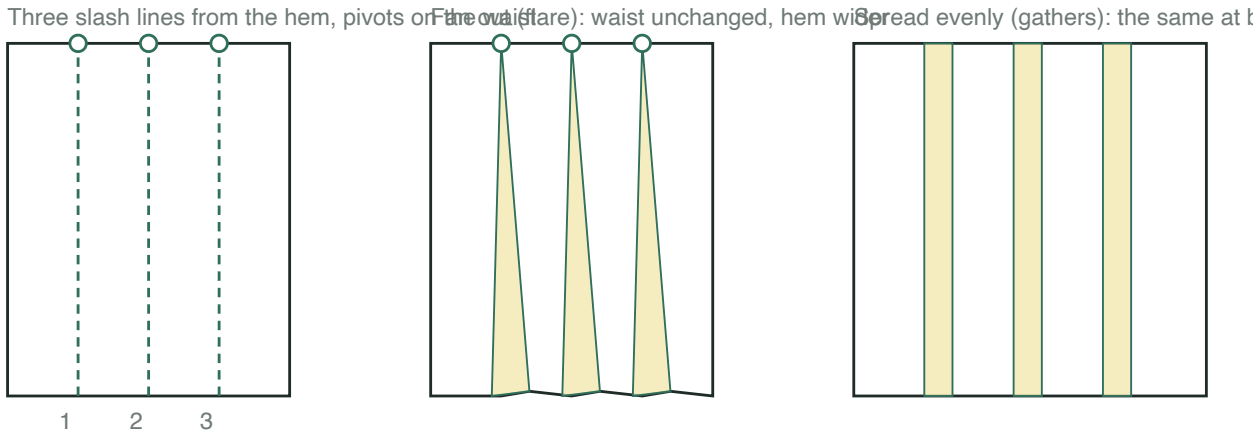
# 6. Adapt: slash and spread

Slash and spread turns a block into a new design before you get anywhere near the fabric. You cut (slash) a pattern piece into sections, then spread the sections apart to add fullness, or close them up to take it away. The app does it the same way as on paper, and the block itself is never changed.

Choose a block piece under **New design** and click **Start**. The design is traced from the block and appears on the paper; the block is shown dashed underneath (untick **Show the block underneath** to hide it) and leaves the Cut out list, so you cut the design and not the block.




**The Adapt stage.** 1 The designs and the slash-and-spread tools. 2 The piece being adapted, with its slashes and the paper added.




Slash lines are drawn parallel to the grain and spaced evenly, like the lines on a worksheet. Each is opened by the same amount: "10 mm at each of 3 lines."

### Add slash lines

1. Click **Add slash lines**, then click the edge where the fullness goes: the hem for flare or gathers, the top of a sleeve for a puff. As you hover, the lines are previewed.
2. Say **how many lines** (they are spaced evenly along that edge) and how much to **open each line by**, in centimetres or a formula such as `Hip / 10`. The total is shown.
3. Choose **Fan out (flare)** to cut up to a pivot and swing each piece open, so the fullness is only at this edge; or **Spread evenly** to cut right through and move the pieces apart by the same amount at both ends, for gathers.
4. **Slash up to** says how far the lines go: **the far edge** (a skirt flared from the waist), **a line on the draft** such as the knee line, elbow line, hip line or bicep line (a leg flared from the knee, a bell sleeve from the elbow), or **a distance** in centimetres. When the lines stop part way, the piece is cut across through the pivots and only the part below moves, exactly as for a bell sleeve: the outline above is untouched, and the side seams step out a little at the cut, to be blended smooth.

The slashes are numbered on the paper, the pivots are circled and the paper added is shaded. Every number can be changed afterwards on the design's card, and slashes can be removed.

### Close a dart

Click **Close a dart**, click the dart, then click where the slash runs from the dart point: the hem for **dart into flare** (an A-line), or another seam to **move the dart**, where it becomes a new dart. Closing part of the dart (say 50%) leaves a smaller dart behind. A moved dart keeps the same shaping in its new place; its point is set back from the bust point (**New dart stops short of the old point by**, 1.5–2.5 cm, a little more for a fuller bust) so that it doesn't end in a sharp point on the body. The opening needn't be sewn as a dart: gather, pleat or tuck it instead, which is how a plain bodice gets gathers at the neckline or the shoulder.

### Add a seam

**Add a seam** cuts the piece in two along a new seam. Click where it starts and where it ends: a spot on the outline, or a dart. A dart the seam runs through is taken into the seam, each side keeping one leg, which is how a princess line or a yoke does away with darts: start at the shoulder dart, end at the waist dart, and both vanish into the seam. By default a second design is made for the other side, so you get both pieces; untick that to keep one.

### Extend an edge

**Extend an edge** moves an edge outwards by a distance, the corners sliding along the neighbouring edges: 1.5–2 cm on the centre front for a button stand (then set that edge to a seam in Pieces; the buttons sit on the old centre front), a few centimetres on a hem, or extra ease on a seam.

### Pleats and tucks

Slash lines spread evenly are pleats waiting to happen: tick **Mark the openings as pleats** and the two fold lines of each opening are drawn on the piece, joined at the ends. The amount opened is the pleat depth doubled.

### The classics, in one click

A new design offers **Flared**, **Gathered** and **Dart into flare** buttons that set up the usual three lines with usual amounts. Adjust the numbers from there.

### Slash through a point: fitting adjustments

**Slash through a point** is for the adjustments that cut to a point inside the piece: a full or small bust adjustment on a bodice front, a full seat on a skirt or trouser back, a full stomach on a front. Click the point (the bust point for the bust; the waist dart's point for a seat or stomach), then where the slash starts (up through the waist dart for the bust; squared across from the centre front or back for a seat or stomach), then where it carries on to, leaving a hinge (the armhole for the bust; straight on to the side seam for a seat or stomach), and, if you want one, where a second slash comes in to the point: the side seam for the bust, which opens into a new side dart, or the waist dart for a seat or stomach, which grows. Then say how far the slash opens at the point; less than 0 overlaps, for a small bust. **Lower the centre to match, keeping the edge level** drops the piece on the other side of the first slash so the waist stays level, and the new dart stops short of the point as above.

Work the amount out before you cut, and set it at the point, not at the hem: the gap gets wider below the point, which is right. It is the extra that one pattern piece needs, so an amount measured round the body is shared between front and back and halved again for the piece, while a length goes on in full. For a bust it is half the extra the front needs: the full bust less the high bust, less the cup the pattern was drafted for (about 5 cm for a B cup). Afterwards, walk the side seam against the back with the Tape in Draft: it should still match once the new side dart is folded.

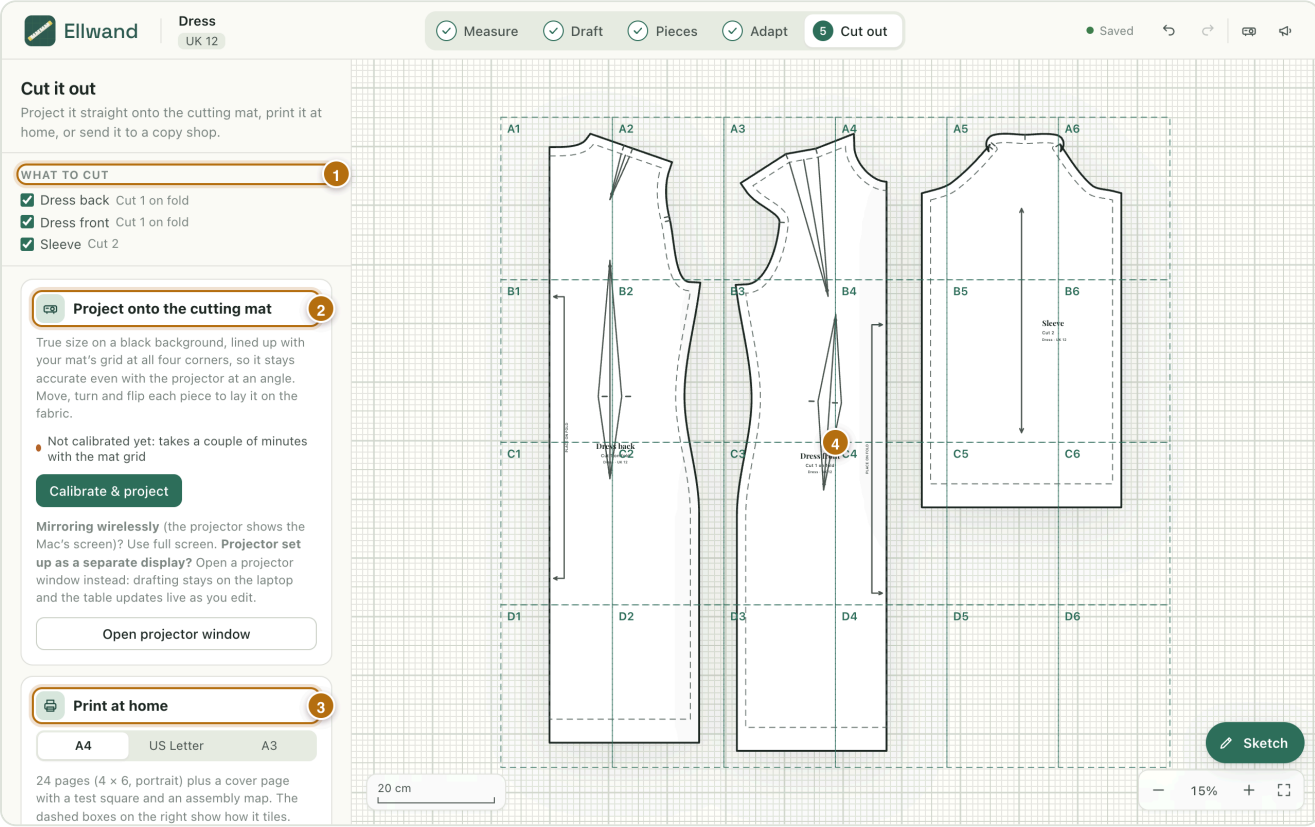
### Anything else

**Slash between two spots** makes a single cut from any spot on the outline to any other, fanned or spread, for the adjustments that do not follow a worksheet. **Save diagram for portfolio** saves the design as a drawing with the block dashed underneath and the added paper shaded.

> **Measure the hem.** After spreading, use the Tape in Draft, or check the piece in Cut out, to see what the new hem or waist measures.

# 7. Cut out

**What to cut** lists every piece in the pattern, blocks and designs alike; untick any you do not want printed or projected (a block you have made a design from is unticked for you).




**The Cut out stage.** 1 What to cut: untick a piece to leave it out. 2 Project onto the cutting mat, calibrated to its grid. 3 Print at home on A4, Letter or A3, tiled with a test square; below, a full-size PDF or 1:1 SVG, and the pattern file. 4 The pieces laid out side by side, with the page tiles.

## Project onto the cutting mat

With a projector over the cutting table, **Calibrate & project** shows a grid: line it up with the grid printed on the mat at all four corners (in cm or inches), which makes it accurate even with the projector at an angle. Calibration is kept for this screen. Then **Project full screen** shows the pieces at true size on a black background. Move, turn (90° or 45°) and flip each piece to lay it on the fabric.

If the projector is set up as a separate display, **Open projector window** instead: drafting stays on the laptop and the table updates live as you edit.

## Print at home

Choose A4, Letter or A3. The dashed boxes on the paper show how it tiles; the PDF has a cover page with a test square and an assembly map.

## Copy shop or plotter

**Full-size PDF** is one large page; **1:1 SVG** is for plotters and other software.

### Pattern file

The pattern already saves itself to the library. **Export a copy…** writes it to an `.ellwand` file to send to someone or keep elsewhere, and **Open a file…** adds a file to the library and opens it.

## 8. Formulas

Anywhere a number goes, a formula goes. Type it as you would say it: measurements and values by name, fractions as `½` or `/2`, and the usual arithmetic.

| WRITE | MEANING |
|---|---|
| `½ hip + 2` | Half the hip, plus 2 cm. |
| `Skirt length` | A measurement by name. Capital letters and spaces don't matter. |
| `Back hip – Back waist` | Values from the Values list. |
| `dist(2, 6) / 3` | A third of the distance between points 2 and 6. |
| `angle(9, 10) + 90` | Square to the line from 9 to 10 (angles: 0 is to the right, 90 is down). |
| `len(waistF)` | The length of a curve. |
| `5%`, `–5% of Hip` | In an ease field, a share of its measurement; anywhere, a share of a named measurement. |
| `radius of Waist` | The radius of a circle the waist goes round (waist ÷ 2π), as for a circle skirt. Also `diameter of` a circumference, and `circumference of` a radius. `π` (or `pi`) can be used directly. |
| `sqrt(…)`, `min(…)`, `max(…)`, `abs(…)`, `round(…)` | The functions available. |

## 9. Keys and gestures

| DO THIS | TO |
|---|---|
| V M L C D T N | Pick a tool: select, mark, line, curve, dart, tape, new piece. |
| Esc | Cancel what you are doing; then clear the selection; then back to Select. |
| Enter | Finish a curve, a piece, or the box you are typing in. |
| ↑ ↓ | Step through the drafting steps. |
| ⌘Z / ⇧⌘Z | Undo / redo. |
| Drag the paper, or hold Space and drag | Move around. |
| Pinch, or ⌘ + scroll | Zoom. Two-finger scroll pans. |
| Drag a box by its title | Move anything that pops up on the paper out of the way: a point's menu, the slash & spread box, the walkthrough card, the seam-walk card. |
| The 100% button | Show the draft at real size on screen. |

Ellwand · the user guide is kept in the app's repository as docs/user-guide.html and rebuilt with `npm run guide`.