

# HOW TO MASTER APPAREL SIZING AND MEASURING



BY

TECHPACKER

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Over 15,000 companies of all sizes in 86 countries have chosen Techpacker to organize their collections, work seamlessly with manufacturers and showcase their design specs accurately and beautifully. Why? Because it's intuitive, fun and incredibly easy to use. [www.techpacker.com](http://www.techpacker.com)

On the Techpacker blog we regularly share top industry knowledge about the most important topics in garment product development, which include insights from industry experts, essential guides, industry news and Techpacker updates. <http://www.techpacker.com/blog>

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Our mission is to create a world where creating fashion products is effortless. By making the most complicated supply-chain tasks simple and personal, Techpacker is reimagining product development, production and quality control for modern companies.

# C O N T E N T S

Introduction.....	5
-------------------	---

## PART ONE:

Understanding why measuring is important  
in the apparel business.

<a href="#">1.1</a> Why is measuring important in manufacturing?.....	8
<a href="#">1.2</a> Why is measuring important in retail?.....	9
<a href="#">1.3</a> Sizing of the future.....	10

## PART TWO:

What are body measurements and how to take them.

<a href="#">2.1</a> What are body measurements?.....	13
<a href="#">2.2</a> How to take body measurements?.....	14
<a href="#">2.3</a> What are the most important body measurements in apparel?.....	16
<a href="#">2.4</a> How to take secondary body measurements?.....	18

## PART THREE:

How to determine points of measurement  
and add them to the tech pack.

<a href="#">3.1</a> How to determine points of measurement and their specs?.....	22
<a href="#">3.2</a> How to create a measurements table?.....	24
<a href="#">3.3</a> How to reuse points of measurement as templates?.....	27

## PART FOUR:

What are grade specs and how to use them  
in the tech pack?

<a href="#">4.1</a> What are grade specs?.....	29
<a href="#">4.2</a> How to create grade specs?.....	30

# C O N T E N T S

## PART FIVE:

The fundamentals of pattern making in the apparel industry.

<a href="#">5.1</a> What is pattern-making in the apparel industry?.....	33
<a href="#">5.2</a> What is a basic pattern?.....	35
<a href="#">5.3</a> What is garment ease and why is it important?.....	36

## PART SIX:

A step-by-step pattern-making tutorial.

<a href="#">6.1</a> How to draft a flat pattern?.....	38
<a href="#">6.2</a> How to create a production-ready pattern?.....	42
<a href="#">6.3</a> Methods of pattern grading.....	59

# INTRODUCTION

Size matters in the apparel and shoe industries! These critical measuring numbers will not only be an important component of your [tech pack](#), but they may also define your brand.

Let's go back in time to learn more about [how measuring began](#).

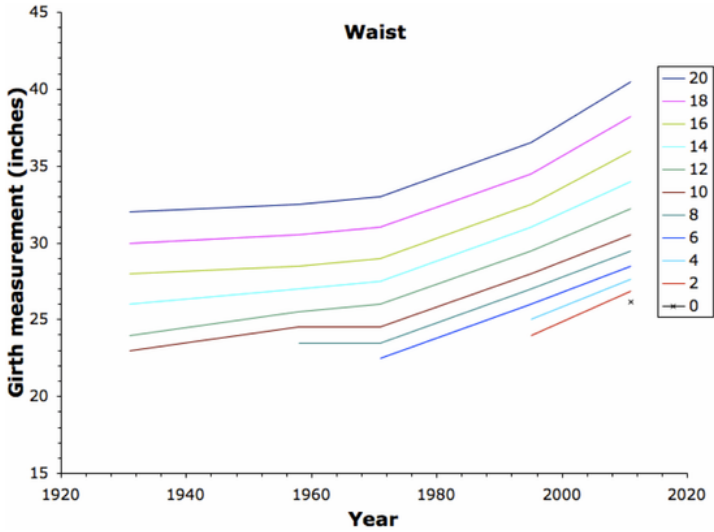
Before the industrial revolution, clothes were mostly made to measure, either by tailors or at home, despite the fact that ready-made garments had existed for centuries.

Then with machines everywhere, mass ready-to-wear production boomed in the 1800s with military uniforms for men. But true sizing standards didn't develop until the middle of the 20th century.



Sizing has a long and fascinating history that has seen many changes over time.

Vanity sizing is a term used to describe the practice of reducing the perceived (or labeled) size so that people believe they are purchasing a smaller size or the same size as before. A size 8 dress today is roughly equivalent to a size 16 dress in 1958!



## PART 1:

UNDERSTANDING WHY  
MEASURING IS IMPORTANT  
IN THE APPAREL BUSINESS.



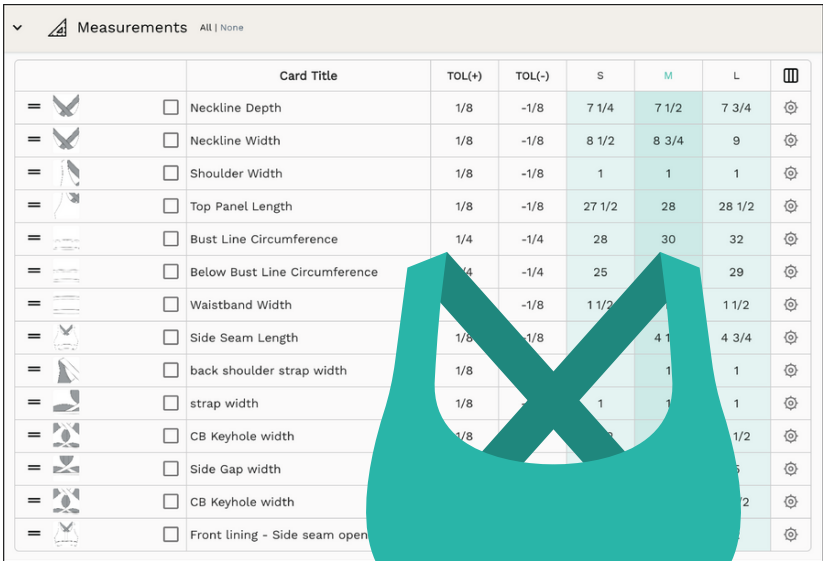
# 1.1

## WHY IS MEASURING IMPORTANT IN MANUFACTURING?

Measurements are an important part of your design spec sheets (or [Tech Packs](#)).

You must provide accurate measurements for each of your garment sizes so that they can be constructed correctly and fit properly.

This also allows manufacturers and suppliers to estimate how much fabric and materials you will require, among other things.



The screenshot shows a table titled 'Measurements' with columns for 'Card Title', 'TOL(+)', 'TOL(-)', and sizes 'S', 'M', and 'L'. Each row includes a measurement icon, a checkbox, and a gear icon. A teal tank top illustration is overlaid on the table.

	Card Title	TOL(+)	TOL(-)	S	M	L	
	<input type="checkbox"/> Neckline Depth	1/8	-1/8	7 1/4	7 1/2	7 3/4	
	<input type="checkbox"/> Neckline Width	1/8	-1/8	8 1/2	8 3/4	9	
	<input type="checkbox"/> Shoulder Width	1/8	-1/8	1	1	1	
	<input type="checkbox"/> Top Panel Length	1/8	-1/8	27 1/2	28	28 1/2	
	<input type="checkbox"/> Bust Line Circumference	1/4	-1/4	28	30	32	
	<input type="checkbox"/> Below Bust Line Circumference	1/4	-1/4	25		29	
	<input type="checkbox"/> Waistband Width		-1/8	1 1/2		1 1/2	
	<input type="checkbox"/> Side Seam Length	1/8	-1/8		4 1/2	4 3/4	
	<input type="checkbox"/> back shoulder strap width	1/8			1	1	
	<input type="checkbox"/> strap width	1/8		1	1	1	
	<input type="checkbox"/> CB Keyhole width	1/8				1 1/2	
	<input type="checkbox"/> Side Gap width					5	
	<input type="checkbox"/> CB Keyhole width					2	
	<input type="checkbox"/> Front lining - Side seam open						

## 1.2

# WHY IS MEASURING IMPORTANT IN RETAIL?

According to Shopify, 80% of returns are due to fit issues.

It is crucial to correctly measure your garments according to standard sizes. Your customers don't want to guess if your size M or 6 will fit, and at the same time, you don't want those costly returns if they guess incorrectly.

If your clothing comes in small, medium, and large, for example, provide comparable numerical sizes, such as sizes 8 to 10 for medium.

And add the measurements for each size so the customers have an idea. You can also include common measurements, such as length in inches, or centimeters.

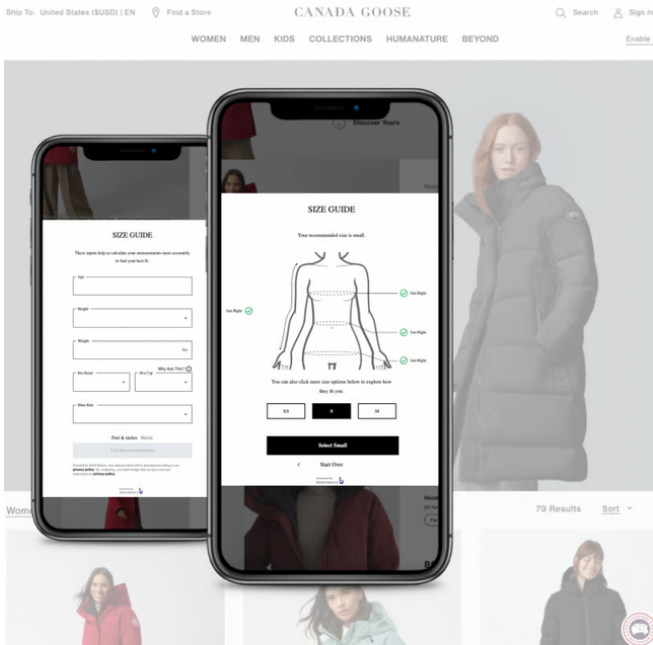


# 1.3

## SIZING OF THE FUTURE

The future ahead is promising and exciting. Maybe sooner than we imagine, we'll be throwing those measuring tapes away thanks to Artificial Intelligence machine learning.

For example, [Bold Metrics Inc](#) is using an AI-Powered Engine to match apparel fit to actual customers.



Meanwhile, others like [House of Holland and Tesco's F&F clothing range](#) have worked with a 3D technology system that allows shoppers to create a 'MeModel' avatar, which can digitally 'try on' clothes.

**Clothing at Tesco > F&F Fitting Room by Metal**  
Retail and consumer merchandise

**F&F** Clothing 13900 | Help & Info | Logged in as: Vikki Chorney

**Fitting Room**

Garments | Hairstyles | Backgrounds

**Dresses**  
Tops  
Knitwear  
Skirts  
Trousers  
Shoes  
Coats & Jackets

£15.00 info | £25.00 info

**LOW STOCK**

£25.00 info | £16.00 info

£22.00 info | £25.00 info

CLICK ON A GARMENT TO TRY IT ON!

ROTATE

Enter my look to win £50

Share with your friends!

EDIT BODY | EDIT FACE | TIPS | SURVEY

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- Wall
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## PART 2:

# WHAT ARE BODY MEASUREMENTS AND HOW TO TAKE THEM?



## 2.1

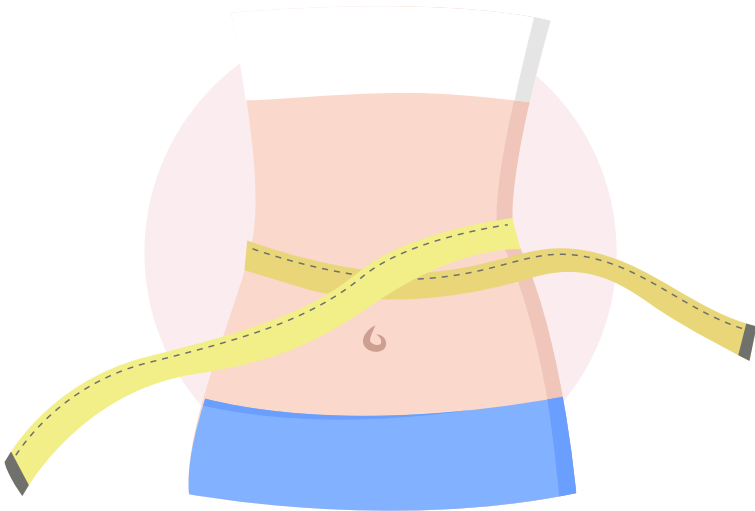
# WHAT ARE BODY MEASUREMENTS?

Body measurements refer to measuring the actual person (or people) who will wear a garment.

These are different from garment measurements and can be taken manually or purchased from different body data services.

Many body measurements are important to building a balanced, well-fitting garment.

Some of these measurements are more important - we'll call them "Key" or "Primary" measurements, while others - called "Secondary" measurements, are still a factor in pattern creation, but are less essential to the fit of the garment.



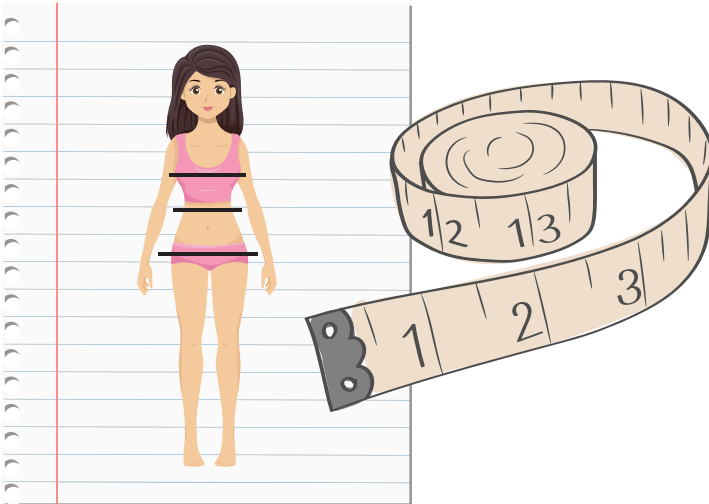
## 2.2

# HOW TO TAKE BODY MEASUREMENTS?

Even if you are purchasing existing body data in order to create your patterns, you'll likely still be fitting on fit models, so it's important to know how to manually take measurements.

To start with, you'll need to make sure you have the right tools.

- Flexible measuring tape (the longer the better - especially if working in tall or plus sizes).
- A second flexible measuring tape with a hook and eyes or snaps or a string or ribbon to mark the natural waist.
- A digital or physical copy of a measurement sheet like this one to track and notate the measurements.



You'll also want to make sure that the person you're measuring is either wearing well-fitting undergarments or for the comfort of the wearer, they can wear a light, non-compressive pair of leggings and a light, non-compressive tank top.

If you're measuring for a custom garment for a special occasion (such as a formal gown, wedding dress, tux, etc.) you will want to ensure your model is wearing the same shoes and undergarments they will be wearing with the garment as these things can affect the fit.



You want your model to stand up straight, with shoulders and hips parallel to the ground and feet about shoulder-width apart.

For circumference measurements, you'll want to pull the measuring tape snugly, so there is no slack, but not so tight that it distorts the body measurement by pushing or reshaping tissue.

## 2.3

# WHAT ARE THE MOST IMPORTANT BODY MEASUREMENTS IN APPAREL?

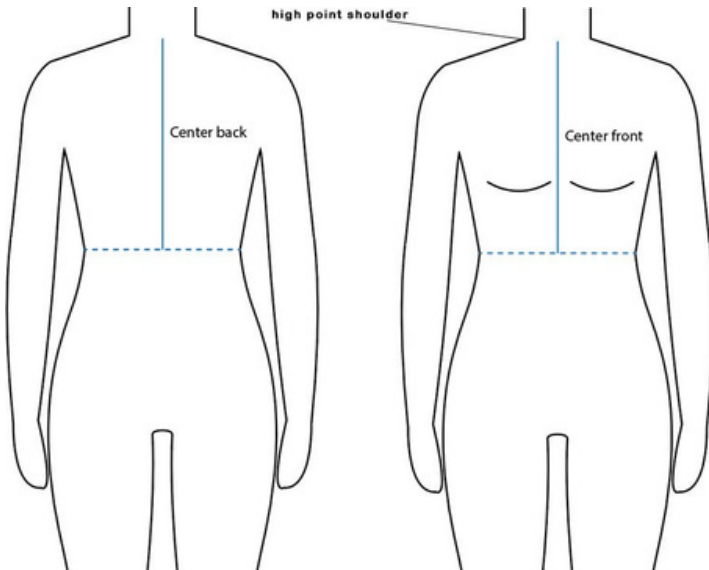
Our key measurements are different depending on the type of garment you're planning to make.

Before we can talk about them, let's get some common acronyms out of the way.

CB - Center Back: refers to the center back of a garment or body, along the spine.

CF - Center Front: refers to the center front of a garment or body from the hollow at the bottom of the neck straight down.

HPS - High Point Shoulder: refers to the top point of the shoulder on either side of the neck.



Let's go through and define the key measurements and how they relate to pattern-making for specific garment types. Later on, we'll discuss how to take each of these measurements on the body.

### Tops and dresses:

- Full Bust/Chest
- Full Hip
- Across Shoulder
- HPS to Apex
- CB Neck to Waist
- CF Neck to Waist
- Waist to Hip Length
- Additional measurements for dresses only:
  - CB neck to floor
  - CF neck to floor

### Bottoms:

- Full Hip
- High Hip
- Waist
- Total Rise
- Thigh
- Inseam

### One-piece swimsuits, rompers, and other one-piece garments:

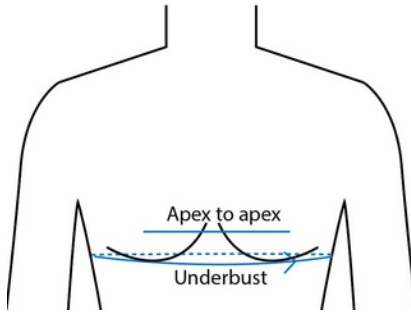
- Full Bust/Chest
- Full Hip
- Across Shoulder
- HPS to Apex
- CB Neck to Waist
- CF Neck to Waist
- Waist to Hip Length
- Vertical Trunk

## 2.4

# HOW TO TAKE SECONDARY BODY MEASUREMENTS?

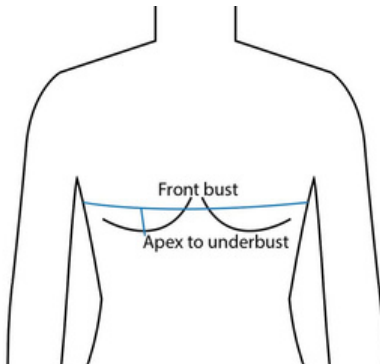
Underbust - full circumference measured around the rib cage just under the breast fold.

Apex to Apex - measured from apex point to apex point with measuring tape parallel to the floor.



Front Bust - measured from the natural side of the body, around the apex points to the other side of the body.

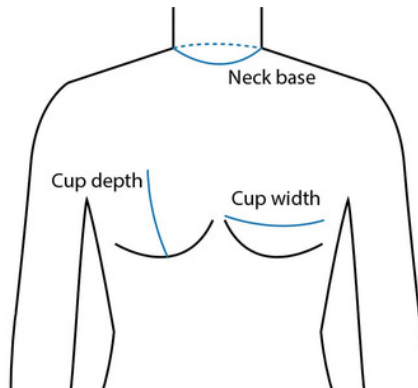
Apex to Underbust - measured from the apex point to the breast fold.



Cup width - measured from outside of the breast to inside of the breast along the apex.

Cup Depth - measured from the top of the breast to the breast fold, along the apex.

Neck Base - circumference of neck measured along the lower part of the neck.



Shoulder Length - measure from HPS to shoulder socket.

Arm Length from CB Neck to Wrist - measured from CB neck (C7 vertebrae) around the shoulder, down the outer edge of the arm, to wrist. The arms should be slightly bent.

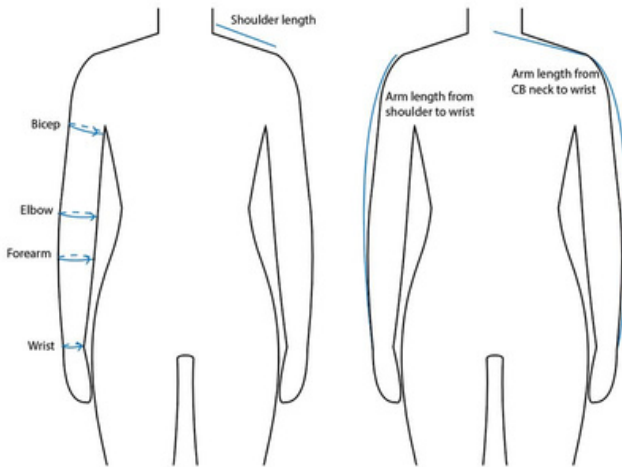
Arm Length from Shoulder Point to Wrist - measured from the shoulder socket, down the outer edge of arm, to the wrist. The arms should be slightly bent.

Bicep Circumference - measured at the fullest part of the bicep.

Elbow Circumference - measured at the elbow point.

Forearm Circumference - measured at the fullest part of the forearm.

Wrist Circumference - measured at the bony wrist protrusion.

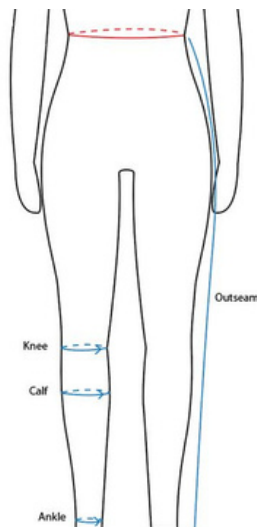


Knee Circumference - measured around the knee cap.

Calf Circumference - measured at the fullest part of the calf.

Ankle Circumference - measured at the bony protrusion at the ankle.

Outseam - measured from natural waist to floor at the side of body.



## PART 3:

HOW TO DETERMINE POINTS OF MEASUREMENT AND ADD THEM TO THE TECH PACK?



## 3.1

# HOW TO DETERMINE POINTS OF MEASUREMENT AND THEIR SPECS?

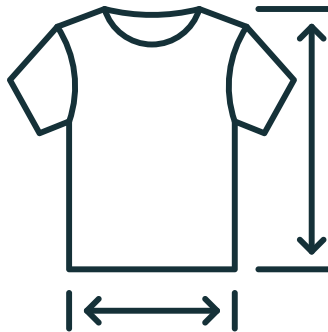
Points of measure (POM) are descriptions of each measurement point for the garment within the specification sheet (spec sheet).

The description of each POM must be precise, standardized, and easily understood by technical, production, and manufacturing teams.

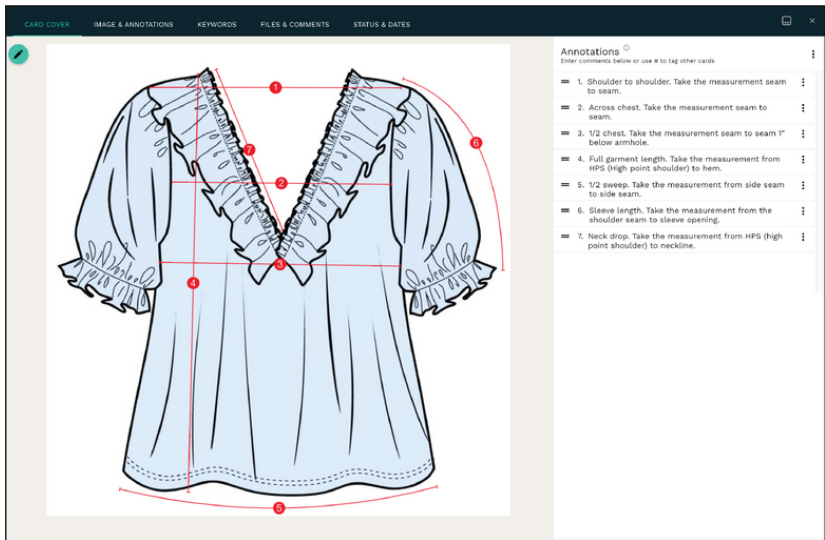
A how-to-measure guide is usually included with the spec sheet. It is a visual guide that explains each point of measurement and how to measure it with the garment sketch or photo.

Some of these measurements will be taken directly from the body data, while others will be added to the garment to determine the amount of ease.

Points of measurement are taken when the garment is laid flat on a flat surface. These measurements will serve your manufacturer as a guide to make precise patterns for your garments.



To explain how to create garment points of measurement let's take a look at this example of this blouse:



Using [Techpacker's annotation tool](#), we created a diagram showing the factory measurements of our blouse when it is laid flat. In addition to that, we included the guidelines on how to take these measurements. For example, to take the 1/2 chest measurement, the pattern maker will need to measure the width of the garment seam to seam 1" below the armhole.








Once we add our points of measurement, we create a Measurement Table based on it.

## 3.2

# HOW TO CREATE A MEASUREMENTS TABLE?

Once we have our points of measurement in the tech pack, we can start creating a measurement table.

[A measurement table](#) or a garment specification (spec) sheet is a technical document that contains all measurements of the sample garment and the entire size range. Spec sheets are used by manufacturers to make patterns for garments.

Measurements		All   None					
	Card Title	S	M	L	TOL(+)	TOL(-)	
	<input type="checkbox"/> Collar Width	1 3/4	1 3/4	1 3/4	0.125	-0.125	
	Neckline Circumference	15	15 1/2	16	0.125	-0.125	
	Placket Width	1 1/2	1 1/2	1 1/2	0.125	-0.125	
	<input type="checkbox"/> Shoulder Width	6	6 1/4	6 1/2	0.25	-0.25	
	Chest Circumference	46	48	50	0.25	-0.25	
	Waist Circumference	45	47	49	0.25	-0.25	
	Hip Circumference	44	46	48	0.25	-0.25	
	Total Length of Garment	26	26 1/2	27	0.25	-0.25	
<input type="checkbox"/> Sleeve Slit	5	5	5	0.125	-0.125		
<input type="checkbox"/> 	Pocket width	4 1/2	4 1/2	4 3/4	0.125	-0.125	
	Pocket length	5 1/2	5 1/2	5 1/2	0.125	-0.125	
	Pocket Flap Length	1 3/4	1 3/4	1 3/4	0.125	-0.125	

Our measurements will vary depending on the garment we are making. But the most important measurements for every garment are:









- Total length of the garment.
- Width of the chest/waist/hips.
- Sleeve length for tops and inseam for bottoms.
- Measurements of small design details like pockets, collars, etc.

Another important thing to keep in mind when creating your specs is the tolerance needed in production. Tolerance is the amount over or under (often expressed as +/-) the spec that is acceptable for a garment to pass quality control.

There are several things in the sewing and construction process that can cause small variances in the final garment measurements, so these need to be considered in the specs.

Typically, the larger body measurements like chest or hip areas have a tolerance of +/- 1/2" while the smaller areas like a sleeve width or neck drop will have much smaller tolerance amounts.

Measurements All | None

	Card Title	S	M	L	TOL(+)	TOL(-)	
<input type="checkbox"/> 	Collar Width	1 3/4	1 3/4	1 3/4	0.125	-0.125	
	Neckline Circumference	15	15 1/2	16	0.125	-0.125	
	Placket Width	1 1/2	1 1/2	1 1/2	0.125	-0.125	
<input type="checkbox"/> 	Shoulder Width	6	6 1/4	6 1/2	0.25	-0.25	
	Chest Circumference	46	48	50	0.25	-0.25	
	Waist Circumference	45	47	49	0.25	-0.25	
	Hip Circumference	44	46	48	0.25	-0.25	
	Total Length of Garment	26	26 1/2	27	0.25	-0.25	
<input type="checkbox"/> 	Sleeve Slit	5	5	5	0.125	-0.125	
<input type="checkbox"/> 	Pocket width	4 1/2	4 1/2	4 3/4	0.125	-0.125	
	Pocket length	5 1/2	5 1/2	5 1/2	0.125	-0.125	
	Pocket Flap Length	1 3/4	1 3/4	1 3/4	0.125	-0.125	

One thing to watch for in determining your tolerance amounts is to make them large enough to account for necessary variation in production, but small enough that you won't get any overlap between sizes.

For example, if your size S has an 18" half chest and your size M has a 19.5" half chest, you wouldn't want a 1" tolerance because that means that in production you could have a size S with a 19" half chest and a size M with an 18.5" half chest.

This causes confusion and inconsistency for your consumer. By limiting the tolerance to  $\pm 0.5$ " you ensure that your largest S is 18.5" and your smallest M is 19", ensuring there is no crossover.

### 3.3

## HOW TO REUSE MEASUREMENTS TABLE AS TEMPLATES?

Creating a measurement table might seem like a lot of work. However, many points of measurement can be reused across multiple tech packs. Without any need to draft them from scratch all over again.

Measurements like collar width, neck drop, sleeve length, cuff width, pocket measurements, etc. [can be easily repeated and reused](#) in seasonal collections, as well as utilized in new projects.

Having those on hand and ready to use will save you a ton of time when building new tech packs.

With [Techpacker](#) you can create templates for future re-use in your measurement tables. At any time, you and your team can reuse these saved templates on any tech pack in just a few clicks. This feature will save you time and keep your measurements consistent across all your tech packs.

The screenshot displays the Techpacker software interface. The main window shows a table of measurements for a 'Menswear Jacket'. The table has columns for 'Card Title', 'S', 'M', 'L', 'TOL(+)', and 'TOL(-)'. A sidebar menu on the right lists various measurement categories, with 'Outerwear measurements' highlighted and a hand icon pointing to it. Below the menu, there are visual representations of measurement points like 'Pocket width', 'Collar Width', and 'Armhole Circumf'.

Card Title	S	M	L	TOL(+)	TOL(-)
Collar Width	1.75	1.75	1.75	0.125	-0.125
Neckline Circumference	15	15.5	16	0.125	-0.125
Placket Width	1.5	1.5	1.5	0.125	-0.125
Shoulder Width	6	6.25	6.5	0.25	-0.25
Chest Circumference	46	48	50	0.25	-0.25
Waist Circumference	45	47	49	0.25	-0.25
Hip Circumference	44	46	48	0.25	-0.25
Total Length of Garment	26	26.5	27	0.25	-0.25
Sleeve Slit	5	5	5	0.125	-0.125
Pocket width	4.5	4.5	4.75	0.125	-0.125
Pocket length	5.5	5.5	5.5	0.125	-0.125
Pocket Flap Length	1.75	1.75	1.75	0.125	-0.125

## PART 4:

# WHAT ARE GRADE SPECS AND HOW TO USE THEM IN THE TECH PACK?



# 4.1

## WHAT ARE GRADE SPECS?

Grading specifications or grading specs are the measurements that indicate how much you want each size to change, by becoming larger or smaller. They are essentially providing the factory with the same information as your grading rules.

However, this is delivered in a different format and with more information included. Take a look at the following example:

	Card Title	TOL(+)	TOL(-)	S	M	L	
	<input type="checkbox"/> Neckline Depth	1/8	-1/8	7 1/4	7 1/2	7 3/4	
	<input type="checkbox"/> Neckline Width	1/8	-1/8	8 1/2	8 3/4	9	
	<input type="checkbox"/> Shoulder Width	1/8	-1/8	1	1	1	
	<input type="checkbox"/> Top Panel Length	1/8	-1/8	27 1/2	28	28 1/2	
	<input type="checkbox"/> Bust Line Circumference	1/4	-1/4	28	30	32	
	<input type="checkbox"/> Below Bust Line Circumference	1/4	-1/4	25	27	29	
	<input type="checkbox"/> Waistband Width	1/8	-1/8	1 1/2	1 1/2	1 1/2	
	<input type="checkbox"/> Side Seam Length	1/8	-1/8	4 1/4	4 1/2	4 3/4	
	<input type="checkbox"/> back shoulder strap width	1/8	-1/8	1	1	1	
	<input type="checkbox"/> strap width	1/8	-1/8	1	1	1	
	<input type="checkbox"/> CB Keyhole width	1/8	-1/8	1 1/2	2	2 1/2	
	<input type="checkbox"/> Side Gap width	1/8	-1/8	4 1/2	4 3/4	5	
	<input type="checkbox"/> CB Keyhole width	1/8	-1/8	1 1/2	1 1/2	1 1/2	
	<input type="checkbox"/> Front lining - Side seam opening length	1/8	-1/8	2	2	2	

We added the sample size measurements (size M) to our table along with the grading specs (highlighted in dark green). Techpacker [automatically calculated](#) the other sizes, S and L based on our grading specs.

Automating the grading like this saves a lot of time during the sample-making process and production. Because if any measurement of your samples size changes, without auto grading you would need to edit all sizes manually.

## 4.2

# HOW TO CREATE GRADE SPECS?

When designing clothing for mass production a bespoke grading rule system is used.

The main factors that are taken into consideration are age range, style preferences, and garment usage. In addition, the desired position of the brand in the current market is also taken into account, as are the demographics of the brand's customers.

Using the bespoke grading rule system maximizes exposure across the sizing spectrum, as well as aligning the brand with the sizes of its competitors. Customers get used to standard sizes and fit, which potentially reduces the number of returns for brands.

However, with the rising popularity of custom-made clothing, creating a 'unique to your business' grading rules system is a thing to consider.

Your grade rule will mainly depend on the style they are creating. If you are designing sportswear the size pattern should contain enough allowances for ease of movement. For a boxy garment, each size will need to include extra room for an oversize fit.

Here, for example, we are setting the grading rules for a wrap dress:

Measurements		All	None						
	Card Title	OS	OM	OL	TOL(+)	TOL(-)			
	<input type="checkbox"/> Chest 1" or 25mm Below Armhole	-2 <small>05</small>	0 <small>07</small>	2 <small>09</small>	+0.25	-0.25	⊗		
<input type="checkbox"/>	Front Body Length from HPS to bottom edge	-1 <small>02</small>	0 <small>03</small>	1 <small>04</small>	+0.25	-0.25	⊗		
<input type="checkbox"/>	Waist Circumference	-2 <small>08</small>	0 <small>00</small>	2 <small>12</small>	+0.25	-0.25	⊗		
<input type="checkbox"/>	Hip Circumference	-2 <small>04</small>	0 <small>05</small>	2 <small>06</small>	+0.25	-0.25	⊗		
<input type="checkbox"/>	Armhole	-1/2 <small>0.50</small>	0 <small>0.50</small>	1/2 <small>0.50</small>	+0.125	-0.125	⊗		



## PART 5:

# THE PATTERN-MAKING GUIDE IN THE APPREL INDUSTRY



## 5.1

# WHAT IS PATTERN-MAKING IN THE APPAREL INDUSTRY?

Pattern making is the process of creating a blueprint of your garment. A pattern is used as a template to cut out fabric that matches the required specifications to sew a garment. It factors in the type of fabric, the intended fit on the wearer, and any trims that will be used. The pattern is used to make 2D fabric sit properly on a 3D body.

The most common methods of pattern-making are draping and flat pattern. Each method requires slightly different tools to get the job done.

Draping is done by manually manipulating the fabric on a dress form so that it looks the way you want.



To get started, you'll need a dress form, fabric (this can be your actual fabric or a less expensive fabric with similar weight and drape qualities), pins, pattern paper, a French curve, and a straight ruler.

The fabric is wrapped around the form until it is the desired shape, and then it is marked while still on the form. After that, the fabric is removed and spread flat. A French curve and ruler are used to clean up the lines. After that, the patterns are transferred from the fabric to pattern paper. After that, you would add seam allowance, notches, or any other necessary markings, and true your patterns. We'll go over what all of that means later.

While draping is a lot of fun, and can occasionally be necessary for very complex folds, it is not as efficient, nor as exact, as a flat pattern.

The flat pattern is done on the flat, as the name implies. Pattern paper, a French curve, a straight ruler, and a pencil are used to create manual flat patterns. CAD software is used to create digital flat patterns. The drafting methods for creating flat patterns are the same whether you do it digitally or by hand.

Nowadays in the fashion industry, digital pattern-making is becoming more popular than drafting paper patterns by hand. It is more precise and less time-consuming and it also allows you to preview the final design on the digital model, which can save up to 30% of sample-making costs.

Fashion design software like [Tukatech](#) provides its customers with a [large library of templates](#) of 2D and 3D fashion patterns. This is a great learning opportunity for those fashion designers that are new to 3D design, as you won't have to create patterns from scratch.

## 5.2

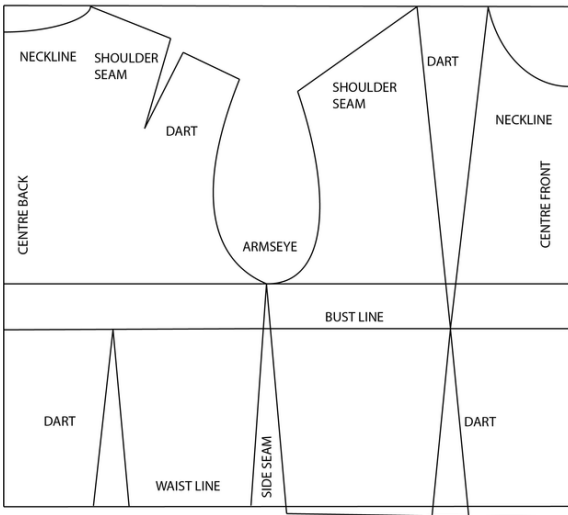
# WHAT IS A BASIC PATTERN?

A basic pattern, also known as a block pattern, corresponds directly to body measurements and has no wearing ease.

Basic patterns are critical for achieving fit consistency across a brand. Consistency in fit means that your customer can buy their size with confidence each time they buy a product from you, knowing that it will fit. Using a basic pattern library as a starting point for all of your style patterns is the best way to develop this confidence.

A solid basic pattern library will provide you with patterns that only have the necessary seams required for fit and the necessary amount of wearing ease required for the type of fabrics they are intended for. Design ease, additional design lines, and other design features can be added later on at a style level.

BODICE BLOCK



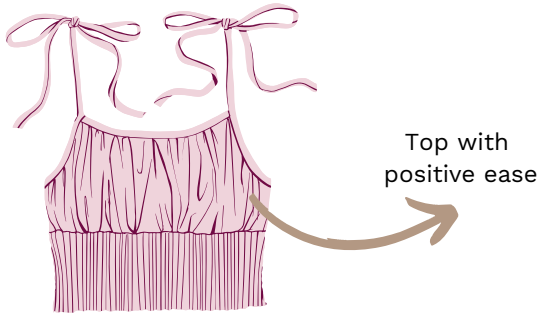
THE FOLD LINE

## 5.3

# WHAT IS GARMENT EASE AND WHY IS IT IMPORTANT?

You need to determine your garment ease now that you have your body measurements. The amount of difference between the body measurements and the garment measurements is referred to as garment ease.

The garment's ease determines how the garment fits against the body. A loose garment is more comfortable than a fitted garment. Some garments, such as athletic leggings, have negative ease, which means the garment measurements are smaller than the body measurements. Stretch fabrics are the only ones that allow for negative ease.



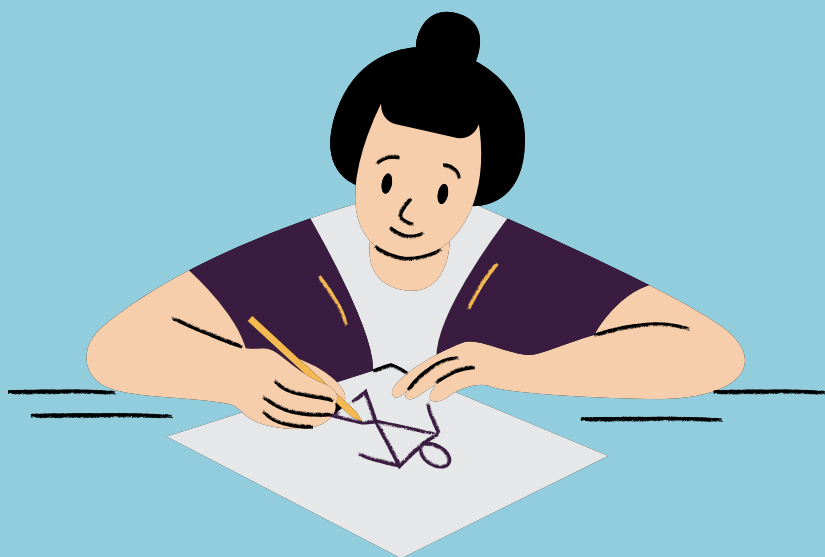
The garment ease is made up of two parts – wearing ease and design ease. Wearing ease is the amount of ease necessary to move in the garment.

For example, a woven garment typically requires 3-4” of wearing ease at the bustline to appear and feel fitted on the body, while a cotton knit, may only require 1” of ease and a cotton/elastane blend knit can use negative ease at the bustline.

Design ease is any additional ease on top of the necessary wearing ease to achieve the desired design. For example, if you want a loose woven garment, you would add additional ease on top of the needed wearing ease.

PART 6:

A STEP-BY-STEP PATTERN-  
MAKING TUTORIAL.



## 6.1

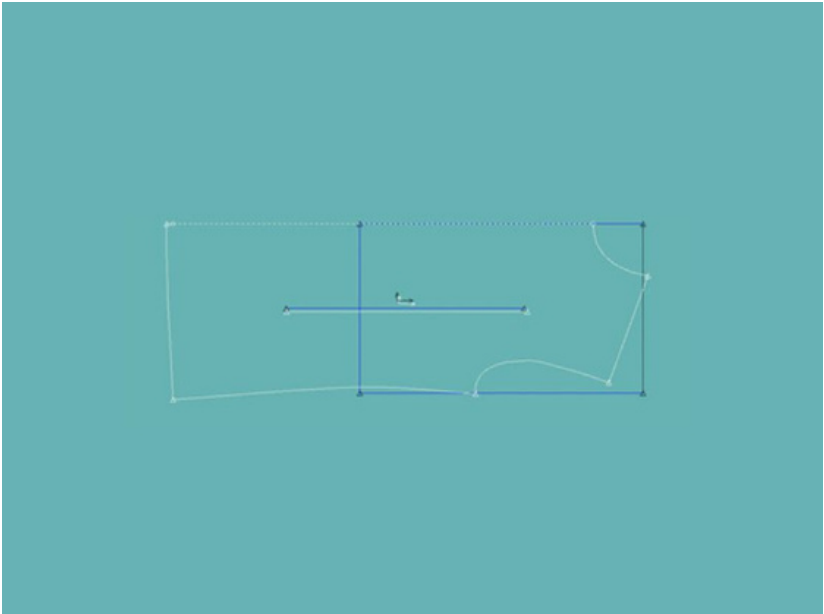
# HOW TO DRAFT A FLAT PATTERN?

There are a couple of different ways to draft your flat pattern – drafting the basic pattern is done entirely from measurements, while drafting a style pattern often comes from taking your existing basic pattern and manipulating it to match your garment specs and design.

Let's start with the basic top pattern!

Using either your pattern paper and straight ruler, or your CAD program, create a rectangle that matches the total length of your top from center back (CB) neck to waist. This measurement should be taken directly from your body data.

The width of the rectangle should be equal to  $\frac{1}{4}$  of the total garment chest width. You will use this rectangle as a starting place to draft your bodice pieces.



Once you have your basic patterns, you can create an endless amount of style patterns.

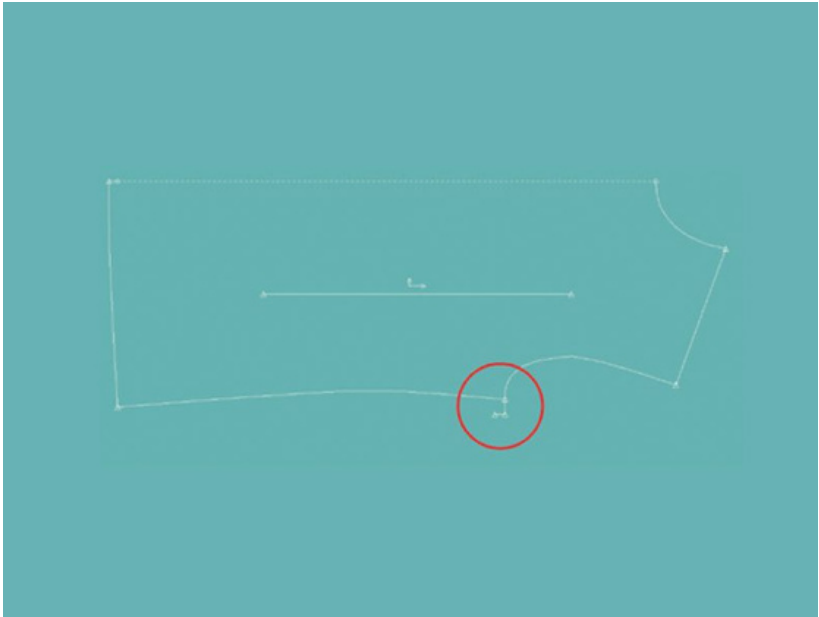
For our example, we'll reference the same bell sleeve top that we looked at earlier. If our basic pattern has a chest width of 37" and we want the full chest width to be 40" then we know we need to add 3" to our basic pattern.

When we're using a front or back bodice piece which is on the fold, we're dealing with  $\frac{1}{4}$  of the total body width measurement, so that means we need to add  $\frac{3}{4}$ " to the chest.

We'll start by drawing a line straight over  $\frac{3}{4}$ " from the underarm point.



Because another big factor in how loose a garment feels is the fit around the armhole, we will also want to drop the underarm point a bit to create a wider armhole and therefore be able to accommodate a wider sleeve. We will draw another line  $\frac{1}{2}$ " down from the line we just drew.

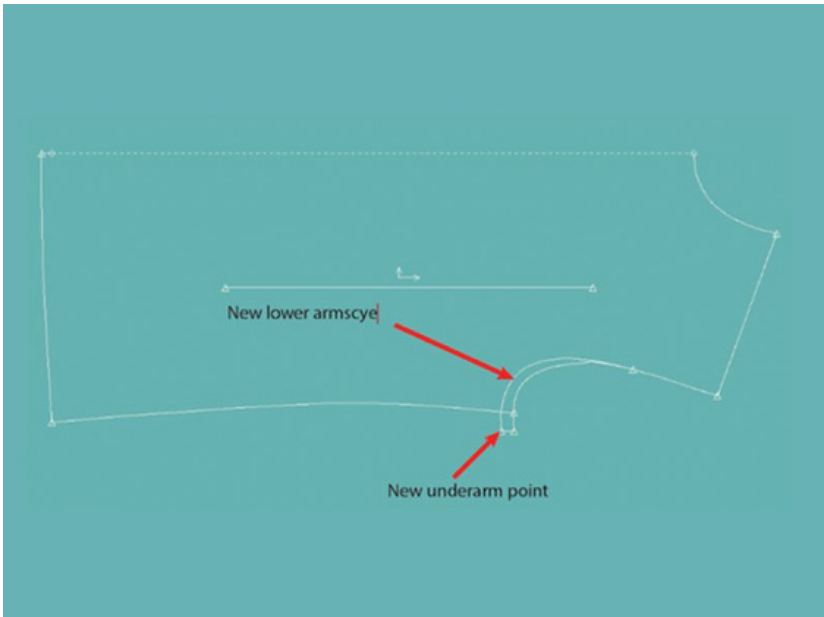


We can see in the sketch of our garment that the top of the armhole appears to be sitting right at the shoulder point of the body, so we will keep the shoulder the same as our basic pattern.

Now it's a matter of playing connect the dots for our new front armhole. We want to keep the upper 1/3-1/2 of our armhole curve the same as the basic pattern and then change the shape of the lower portion to meet the new underarm point we created.

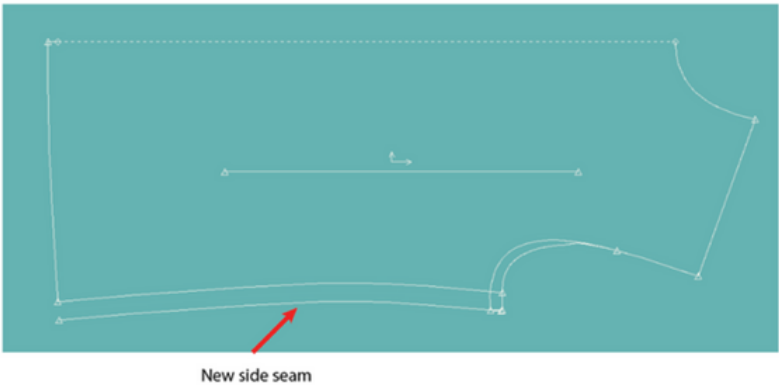
If you are doing your pattern manually, you'll use your French curve to create a smooth line.

You'll repeat this to add additional width to your waist and hem, based on your garment measurements, to create your new side seam.



You'll follow similar methods to make any additional adjustments, such as neckline shape and depth, body length, etc.

Until all of your basic pattern pieces have been adjusted to match your garment specs and design sketch. Any unnecessary lines, like your old underarm or old side seam, can be deleted from the style pattern.



## 6.2

# HOW TO CREATE A PRODUCTION-READY PATTERN

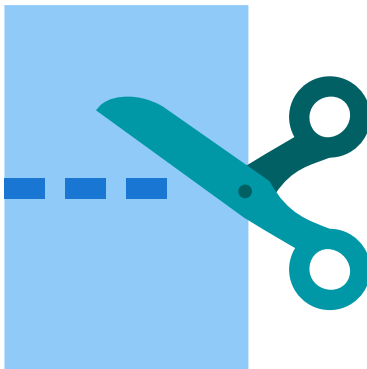
Production readiness checklist:

- Trueing your pattern.
- Adding notches, marks, and drill holes.
- Grainline.
- Adding seam allowance.
- Creating a marker.

The first step to finalizing your pattern is called trueing your pattern. This means making sure that the seamlines on each piece match the length of the seamlines on the piece they will be sewn to and that there are no strange angles at the top or bottom of the seams.

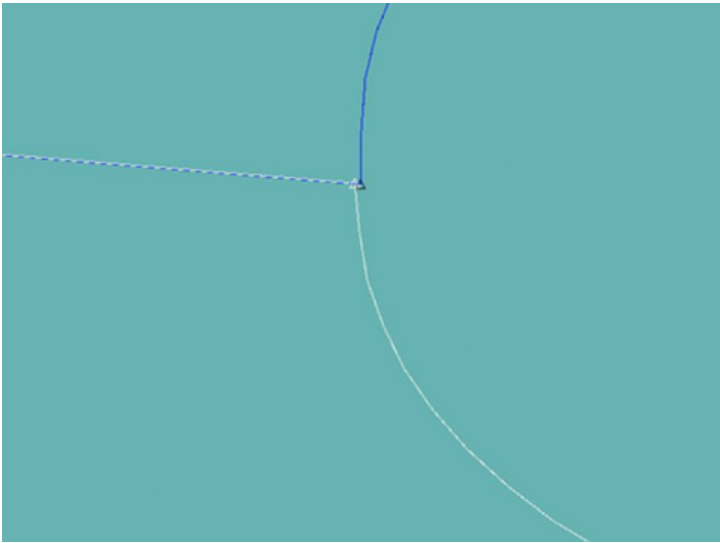
For most portions of the garment, you'll want these seam lengths to match exactly, but we'll go over the exceptions to this later.

You will do what is called “walking” the pieces together to determine that the lengths match and that you aren't getting any odd angles. You'll start with two pieces aligned at one end of a seam – here you'll see the side seams aligned at the bottom.

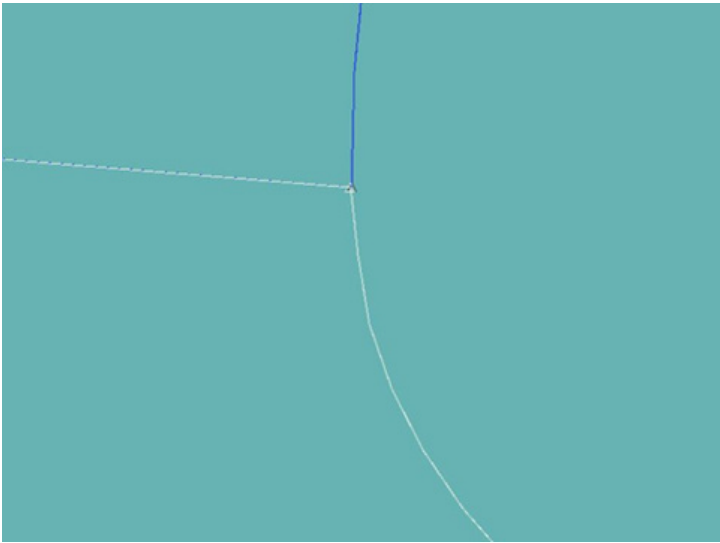




If we zoom in, we can see that the side seams aren't quite the same length and that the curve shapes aren't matching nicely.



We will make a small pattern adjustment to correct this and make sure our pattern is nice and trued.



Walk each seam of the garment to ensure that all of your seams are trued and everything will go together nicely.

Exceptions to the rule:

As with any good rule, there are always some exceptions. If you have pleats or darts on your garment, the edge of the pattern piece with the darts/pleats will be longer than the one without.

You want to close the darts/pleats as they would be once sewn, and then walk the pieces to ensure that the seams are trued.

Another exception is the shoulder cap on sleeves. Typically, a shoulder cap is slightly longer than the armhole you are sewing it to in order to ensure proper mobility and shoulder rotation for the wearer. This means that the shoulder cap will need to be eased into place while sewing.

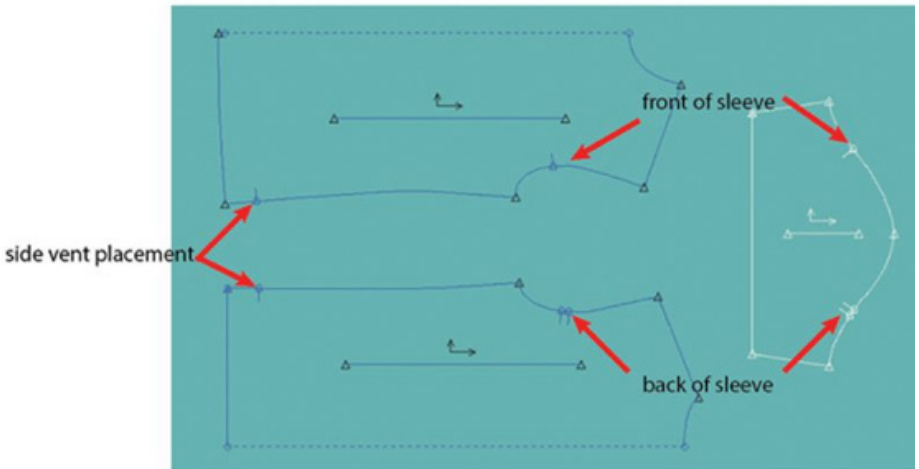
Things like gathers, very curved design lines, etc. may also have a difference in the pattern edge lengths as part of the nature of the design.

# ADDING NOTCHES, MARKS, AND DRILL HOLES

Notches, marks, and drill holes are used during the sample-making and manufacturing process to show several different things.

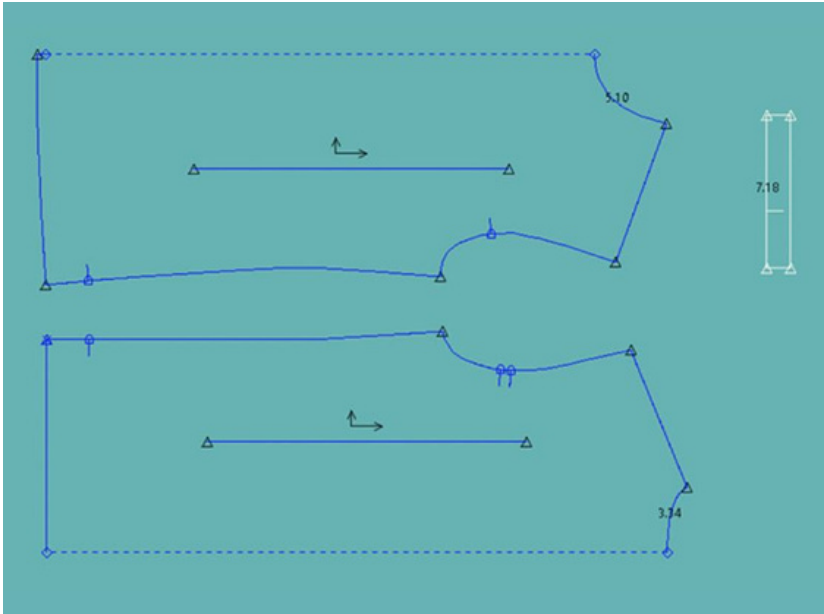
Notches are cut into the fabric and used to line up specific portions of your seam lines or indicate where two things should be matched.

In the image below, you can see that there are notches used to show where the top of a side seam vent might be placed, as well as a single notch on the front armscye and front sleeve and a double notch on the back armscye and back sleeve. These are all there to help during the sewing process.



Notches are also used to align things like rib collars, which are cut smaller than the neckline they sew to, so that the garment can be stitched evenly.

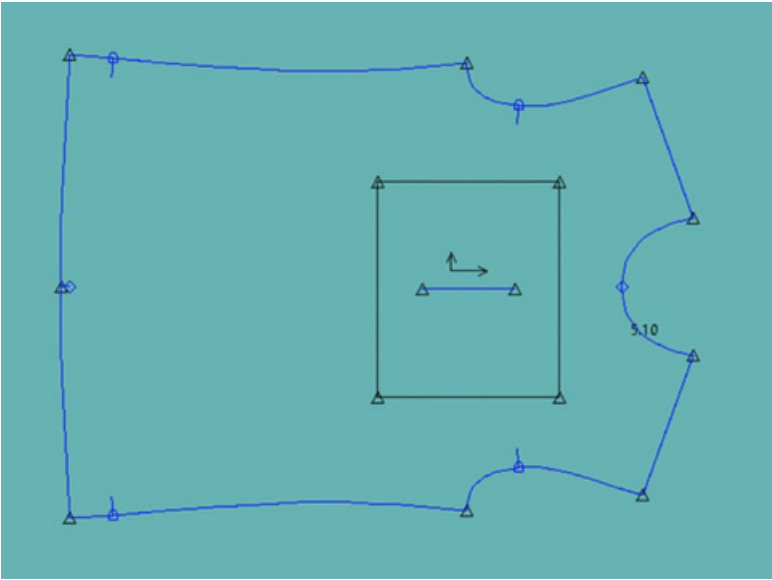
You can see here that the collar length is only about 85% of the length of the neckline. The notch indicated where to align the shoulder seam so that the collar is stretched the same amount and front and back.



Marks encompass a lot of different things within pattern-making.

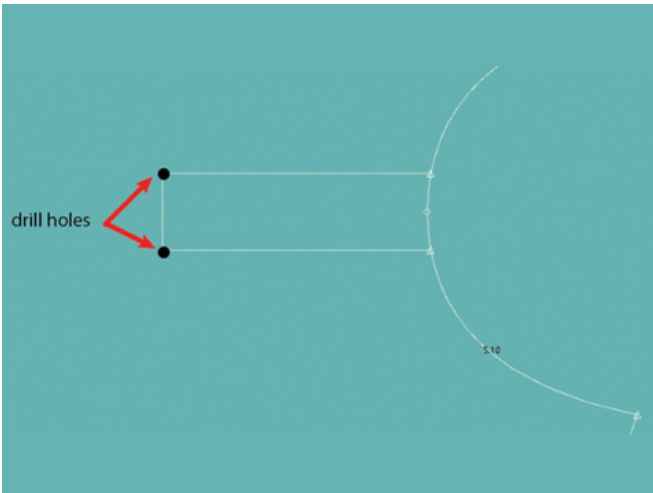
You can have marks that indicate button or snap placement, marks that indicate a graphic or logo placement, pocket placement for a patch pocket, etc. Marks are literally marked on the fabric, but NOT cut.

The rectangular mark shown here is for screen print placement, to ensure that the garment is aligned properly before printing.



Drill holes are another important indicator of patterns. They are small holes created to show things like the corners of a placket.

When cutting out the pattern piece for a Henley collared shirt, for example, the Henley placket would be marked on the pattern with the corners drilled as holes. Later in the process of creating the placket, you could cut the holes.

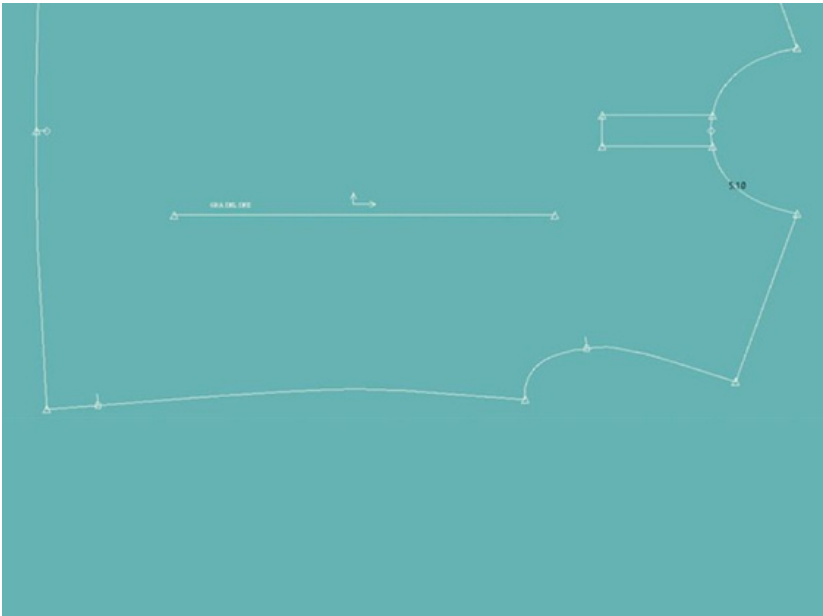


# GRAINLINES

Grainlines indicate the direction in which the pattern will be laid on the fabric to cut.

It is important to have this clearly marked on the pattern, so the fabric gets cut correctly. The grain affects the way a fabric drapes and stretches, as well as how a print or nap will execute when the fabric is cut.

Typically, grainlines are indicated as a straight line along the pattern piece. For digital patterns, the grainline controls how the piece will be put into a marker (don't worry, we'll cover markers later on). If your pattern is a paper pattern, the line should be annotated with the word "grainline".



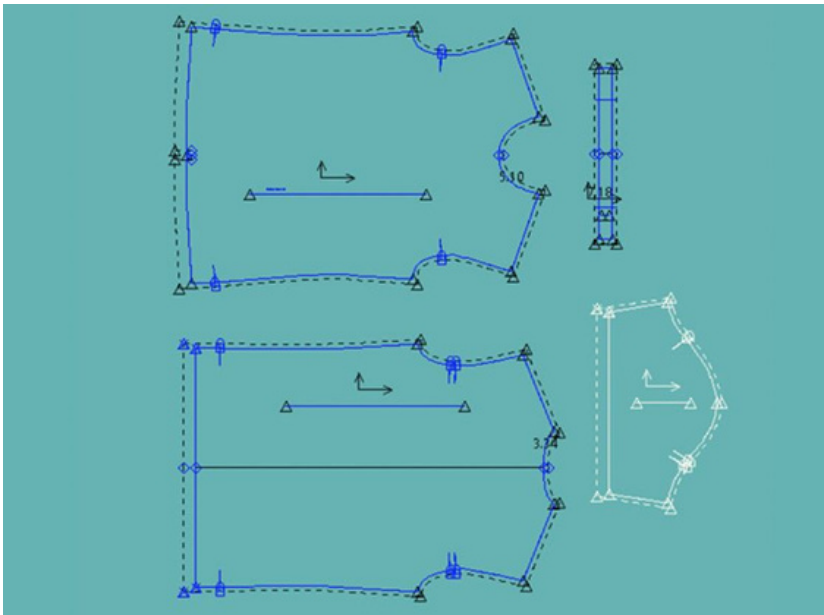
# ADDING SEAM ALLOWANCE

Now that our pattern is trued, marked, and notched, we need to add seam allowance (often abbreviated as SA) to the pattern. The seam allowance is the fabric that will be used to sew the garment together.

The amount of seam allowance used varies depending on the type of seam, the type of stitching that will be used, if a seam will be bonded instead of sewn, etc.

Most serged seams will be 3/8" or 1cm, while a hem is typically 1" or 2.5" allowance. Flatlock seam allowance is usually much smaller and will depend on the stitch width of the flatlock itself.

For this pattern, I have simply added a standard 3/8" to all serged seams and 1" to the hem and sleeve openings. The dotted lines indicate where the fabric will be cut, while the solid lines indicate the stitching lines.

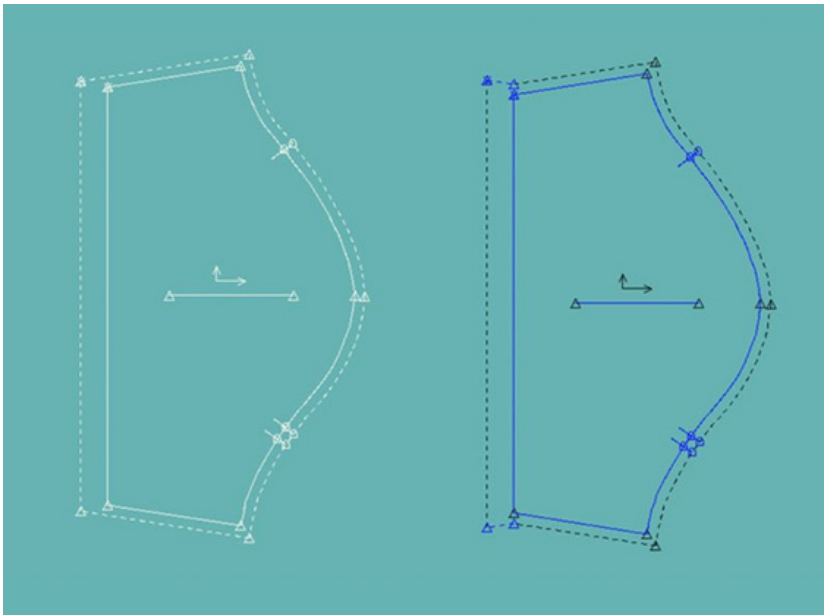


Depending on the shape of your pattern piece, you may need to manipulate the seam allowance at the corners to ensure that your pattern remains true.

One example of this is a turnback hem. You can see in the sleeve on the left that the seam allowance continues down, becoming narrower at the hem.

When you try to fold this hem allowance up and sew it to the hem, you would end up with puckering due to the fact that the cut edge is shorter than the sleeve width at the fold.

On the sleeve on the right, you can see the turnback hem has been applied so the cut seam is a mirror of where it will stitch to.



There are several other types of corners that can be applied to seam allowances to keep them true. Another very common type is a mitered corner, which is helpful for pieces that end in a very small, narrow point.

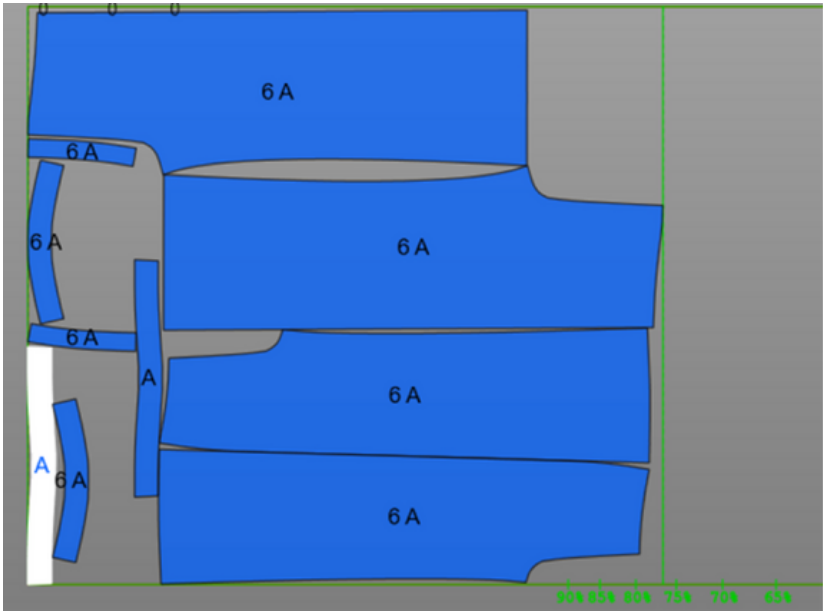
# CREATING A MARKER

We're not talking about a drawing instrument here. In apparel pattern making, the marker is a term for the layout of a pattern for cutting.

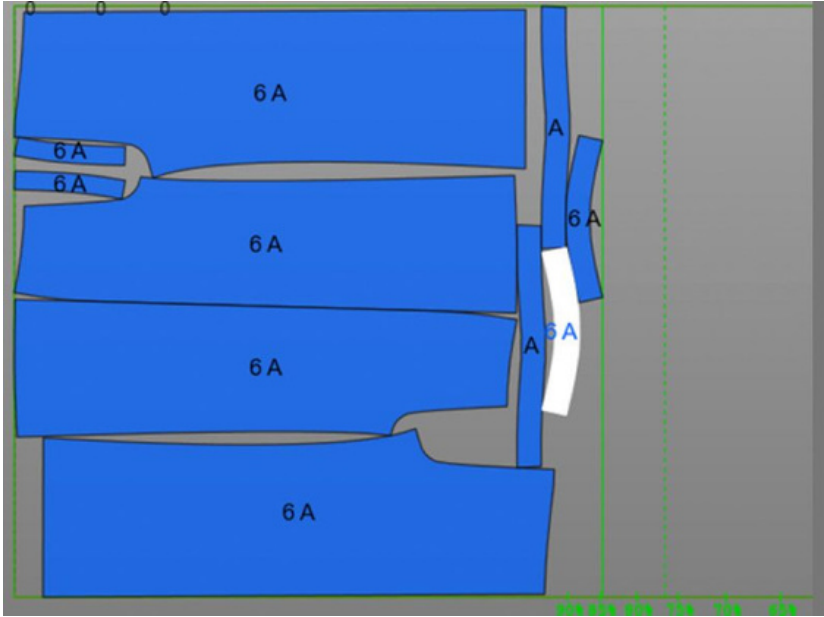
Within a marker, you want the pieces aligned along the grainline, you want a small buffer of space between pieces to ensure that one piece doesn't end up overcut into another, and you want to do the best you can to optimize how the pieces are laid together

for the best material yield and lowest material waste possible. I like to think of marker-making as the ultimate game of grown-up Tetris. The better you stack the pieces, the lower your cost and the lower your material waste.

You can see in the marker here, that we're only utilizing about 77% of our fabric, with the rest going to waste.



However, by rearranging the pieces in a more optimal layout, we can increase our usage to nearly 85%, saving money on fabric costs and keeping more of our fabric out of landfills.



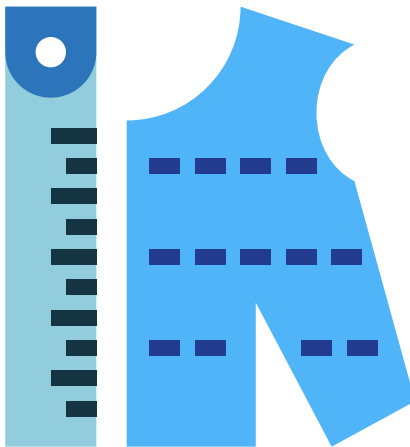
## PERFECTING THE FIT

Once you've created your pattern and sewn up your first sample, you'll have a fitting.

You may need to make some fit adjustments. Many things can factor into the pattern of not being perfect the first time. Things like the way the fabric drapes, any shrinkage that may occur during the production of the sample, variance in measurements of the wearer to the drafted body, etc.

The most commonly made adjustments are bust adjustments – especially on woven garments – to make darts hit in the proper location. Other common fit adjustments are shoulder slope, rise shape, and neckline adjustments.

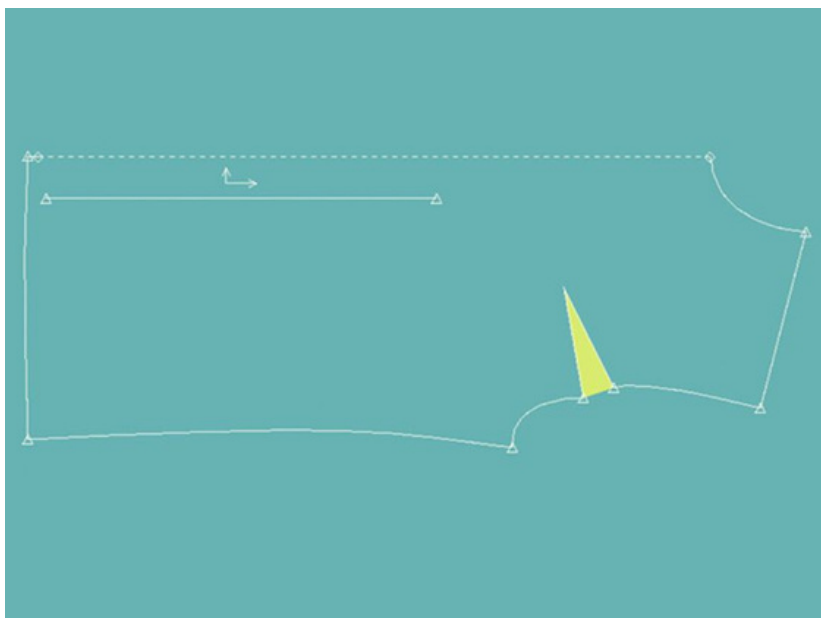
These are all part of the normal pattern-making process and can be adjusted on your patterns after fitting.



## DARTING, PLEATS, AND OTHER FULLNESS

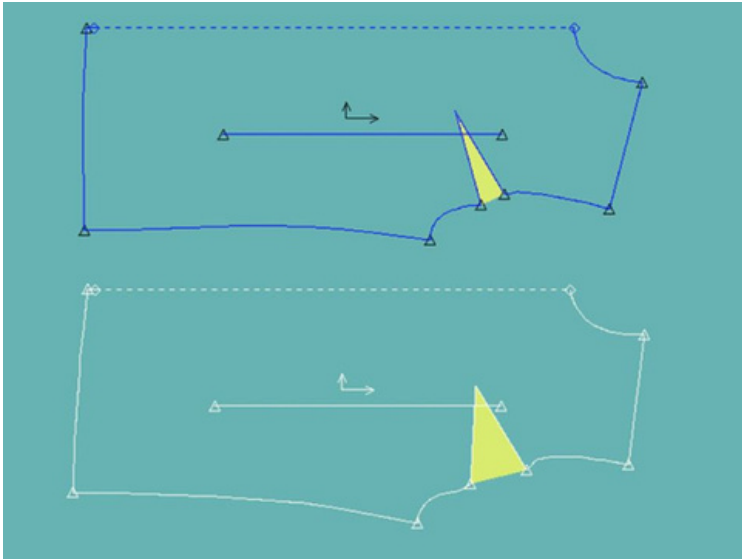
Creating a perfectly tailored garment, especially when using a woven fabric, often requires the use of darts, which add fullness to a specific location in a garment.

Bust darts are commonly used in women's wear to create fullness at the apex of the chest while keeping the armhole closely fitted to the body to avoid gaping.



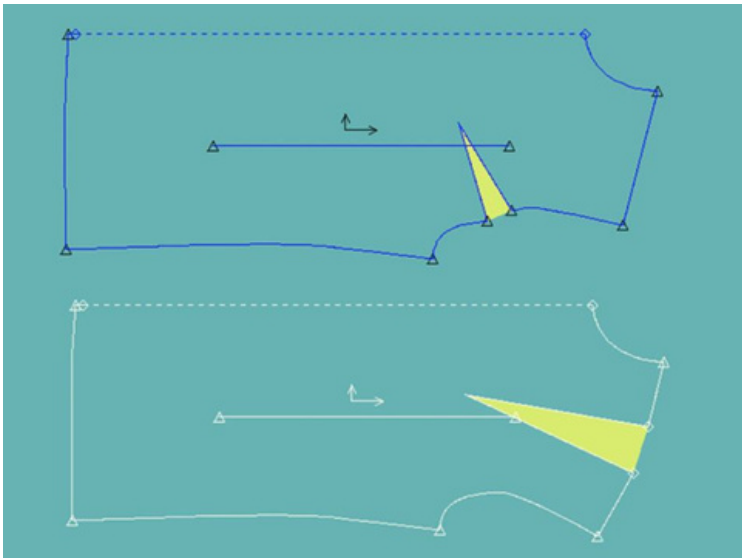
But let's say you're starting with a pattern that was drafted for a B cup and you'd like to make a version for a D cup instead.

Rather than starting completely over from scratch, you can add to the fullness of the chest and then use a larger dart to maintain your original armhole length.



You can also rotate darts to different places to keep the overall fit intact but change the design.

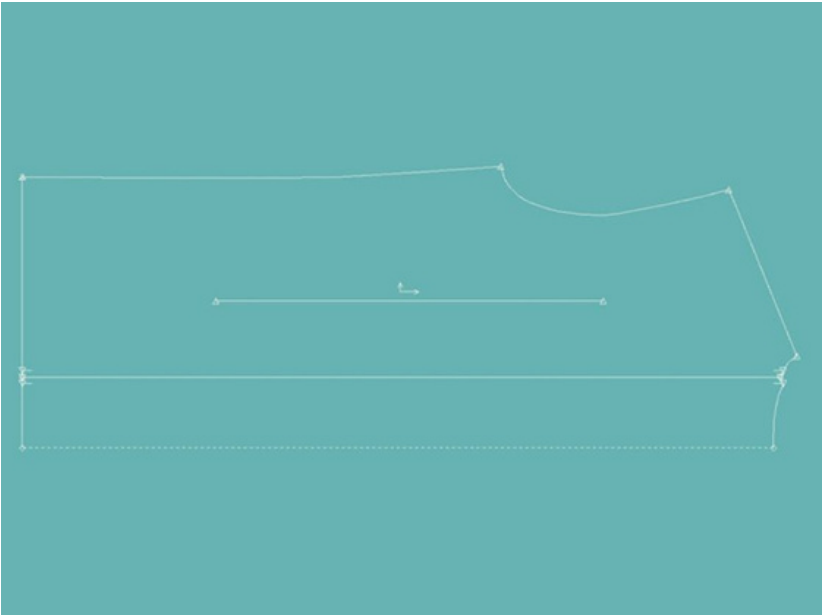
By maintaining the dart tip location at the apex point and rotating it to the shoulder, I'm able to keep fit but have the aesthetic of a shoulder dart rather than a bust dart.



Pleats are another common way to add both fullness and design detail to your garments.

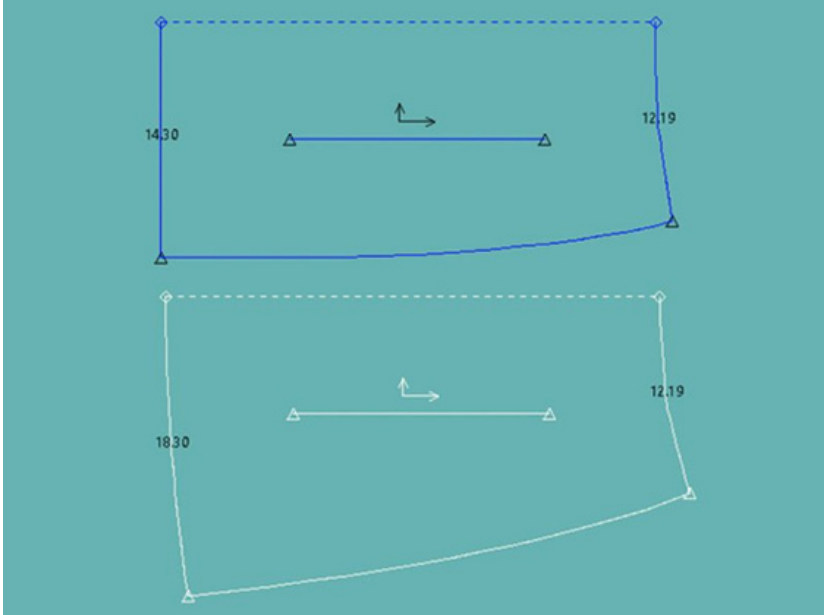
There are several different types of pleats, and they are added to your pattern in slightly different ways.

Although the way you add fullness to your pattern will vary depending on if you are using a knife pleat, a box pleat, or a tapered pleat, you should indicate the pleat with notches to show where the fabric will join together and a fold line to show where the pleat will be folded.



This will allow you to spread the pieces apart, without changing the length of the edge that you didn't quite cut through, adding fullness to the other end.

By using the slash and spread method on my skirt, I've maintained my waistline length, but added fullness to the hem going from a more sheath shape to a more A-line shape.



## 6.3

# METHODS OF PATTERN GRADING

There are 3 basic methods of pattern grading:

### Cut and spread

This is considered the easiest method. It is performed by cutting the pattern and spreading the pieces by a certain amount, to grade up or down. The only tools needed are a pencil, ruler, scissors, and measuring tape.

