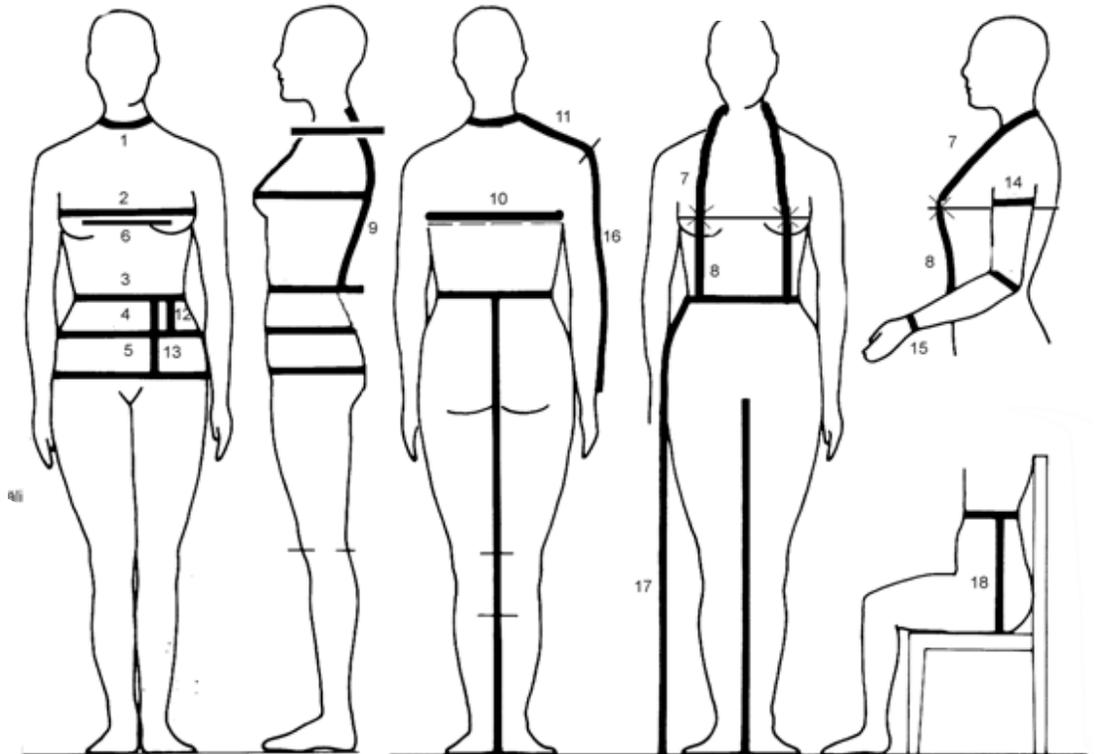# PatternMaker Software
Measuring for Women's Macros

1. neck circumference
2. bust circumference
3. waist circumference
4. abdomen circumference
5. hip circumference
6. bust span
7. bust height
8. waist height
9. back length
10. back width
11. shoulder
12. waist-abdomen
13. waist-hip
14. biceps
15. wrist circumference
16. overarm
17. outside seam
18. crotch depth

Measure bust height (7) and waist height (8) around neck (double) and divide by 2.

Following are the instructions on how to measure for PatternMaker women's macros.

Don't try to take the measurements yourself. Ask someone else to take them. Stand straight but relaxed when you are being measured. You will receive the best results if the measurements are taken over underwear.

Place 1-inch wide elastic bands around your waist and hip. Search carefully for the correct places of these elastic bands. Keep these elastic bands on their places during the whole measuring process. Hip elastic is fastened on the level where hip circumference is maximum. Examine whether it is on your buttocks (7-8 inches/18-20 cm below the waist) or on top of your thighs (10-12 inches/25-30 cm below the waist). Measurements are taken from the bottoms of the bands.

Except for pants' cuff circumference and skirt/dress length, all measurements are body measurements. DO NOT ADD ANY EASE to the measurements. The program does it for you.

DO NOT TIGHTEN MEASURING TAPE.
Please, refer to the picture related to this measuring form.

BE ESPECIALLY CAREFUL WHEN TAKING THE **MEASUREMENTS WRITTEN IN CAPITAL LETTERS**.
They are crucial for good fitting patterns. After having taken all the measurements, take these important measurements once again.

You can use either centimeters or inches. Give inches in fractions.

PatternMaker Software
Women's Measuring Chart

Name: _____   **Date:** _____

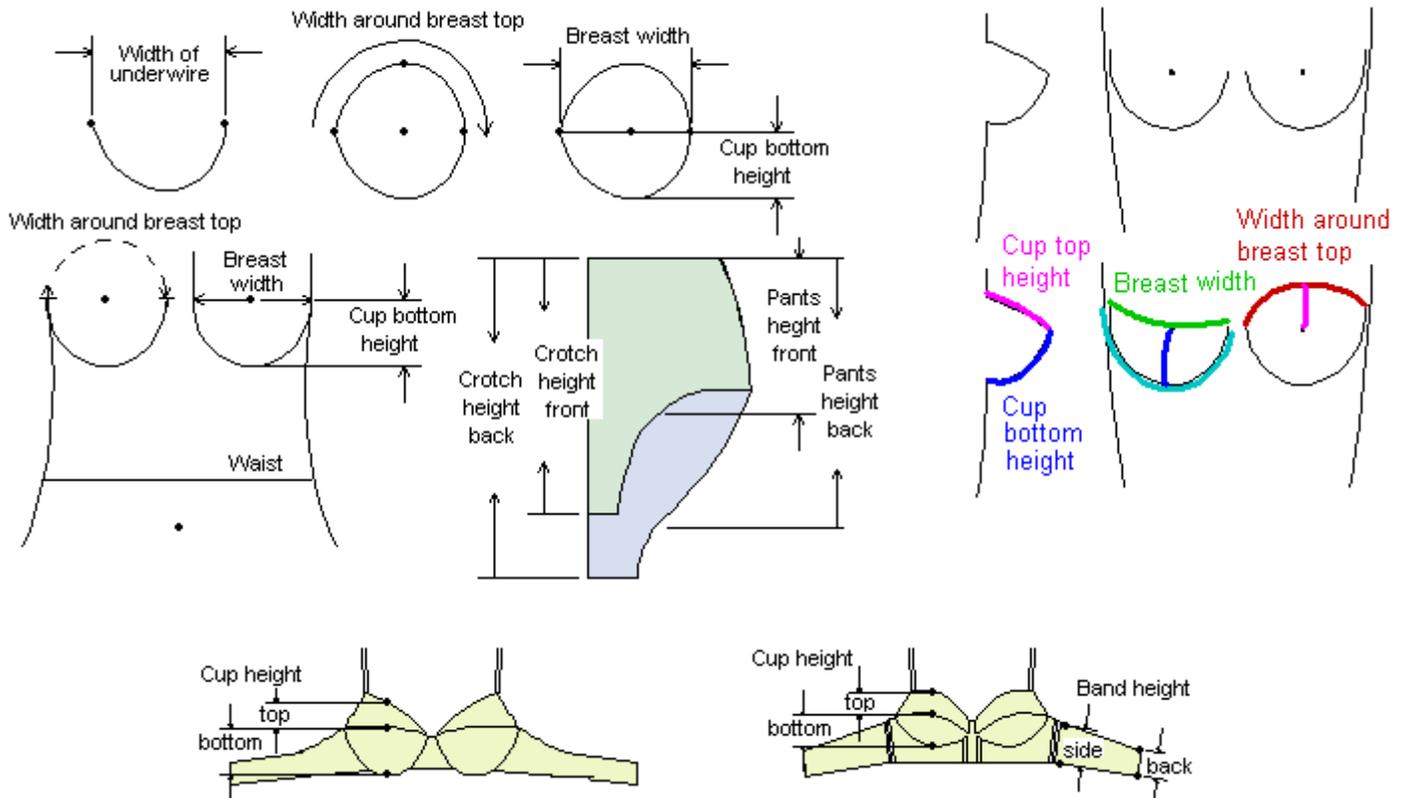|		
1	Neck Circumference: Measure around lowest part of neck, at the base	
2	Bust Circumference: Marked with elastic. Measure around the fullest part of the bust, keeping the tape high at the back	
3	Waist Circumference: Measure waist at the elastic tape	
4	Abdomen Circumference: Measured on the level where abdomen circumference is maximum	
5	Hip Circumference: Measured over the largest part of your bottom/thighs (at elastic)	
6	Bust Span: Horizontal distance between bust apexes (also called bust bridge). Measured along bust elastic.	
7	Bust Height: Measure from center of back neck over shoulder to apex of one breast	
8	**WAIST HEIGHT:** Measure from center of back neck over shoulder to breast apex and from there vertically to lower edge of waist elastic. To be sure to get right measurements, take this and bust height as a link around neck (=double) and divide the result by 2 (see picture).	
9	**BACK LENGTH:** Measure from center of back neck to lower edge of waist elastic	
10	**BACK WIDTH:** hang your arms relaxed on your sides. The measurement is taken horizontally between shoulder blades (i.e. from sleeve seam to sleeve seam), from and to the point where your arm meets your body (but not to armpit) about 4" (10 cms) from neck downwards.	
11	Shoulder length: Measure from neck to shoulder tip. Shoulder tip is found when you raise your arm to horizontal position and feel where there is hollow/pit between shoulder and arm bones. Hold your arm horizontal, if necessary, to find this point.	
12	Waist-Abdomen: Measure vertically from lower edge of waist elastic to lower edge of abdomen elastic. Measure at front center.	
13	Waist-Hip: Measure vertically from lower edge of waist elastic to lower edge of hip elastic. Measure at the side.	
14	Biceps circumference: Measure at widest point of upper arm.	
15	Wrist circumference: Measure over wrist bone	
16	Overarm: Arm length from shoulder tip (as described above) to wrist. Bend arm slightly and measure over outside of elbow.	
17	Outside seam: Measure from waist over the outside curvature of the hip to the desired cuff length.	
18	**CROTCH DEPTH:** Sit on *unpadded* bench or chair. Measure vertically from waist elastic to chair level on both sides, and use the longer measurement. Measure in a straight line, not along the outside hip curve. (Crotch depth can also be measured from a pair of old, well fitting pants.) Crotch depth is the difference between outside and inside length of pants.	
	Desired cuff circumference, not ankle circumference	
	Desired jacket length from waist elastic to hem	
	Desired skirt /dress length from waist elastic to hem	

PatternMaker Software
Lingerie Measuring Chart

Name: _____ **Date:** _____

1	Arc width (width of underwire)	horizontal measurement from one end to other end of bra underwire (you need to have the underwires before you take this measurement and run the macro; for testing purposes you can use underwire default width which corresponds to underwires for 32-36" (80-90 cm) measurement taken under breasts)	
2	Breast width	from end to end of underwire, across breast apex	
3	Breast top width	from end to end of underwire, around top contour of breast	
4	Breast/cup top ht	from breast apex to the point where you want the top edge of the bra to be. This measurement depends on bra design and is up to you; if you cannot decide this, try default measurement which is 3-1/8" (8 cm).	
5	Breast/cup bottom ht	bottom edge of breast to breast apex	
6	Crotch height, front	from front center waist to middle of crotch	
7	Pants height, front	from front waist to edge of front leg opening	
8	Crotch height, back	from back center waist to middle of crotch (check that total measurement of crotch length from front center waist to back center waist around your crotch is equal to crotch height front + crotch height back)	
9	Pants height, back	from back waist to edge of back leg opening under buttocks	

Important things to be taken into consideration when measuring

The most important measurements are the ones written in on the measuring chart in **BOLD CAPITAL LETTERS**: waist height, back length, back width, and pants' crotch depth.

If one of these four measurements is wrong, the result may be a distorted pattern and it is difficult to figure what measurement is wrong. If some other measurement is wrong, you get either a too-tight or a too-loose garment and you can easily see what measurement to correct and to what direction.
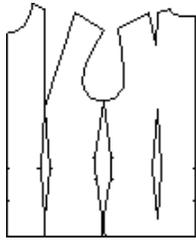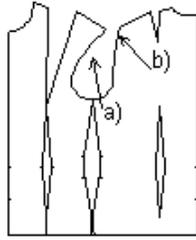

Figure 3: normal sloper
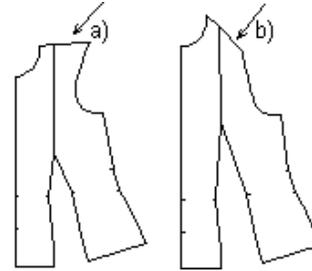
Figure 2: back width wrong

Figure 1: waist height/back length wrong

Normally the pattern for basic sloper is more or less like Figure 1. Front and back shoulders slope downwards to shoulder tip. Armscyes curve inward. Back armscye can be rather straight but should never bulge outward.

If the pattern is like in Figure 2 -- i.e. front armscye curves strongly inward (a) and back armscye bulges outward (b), back width has been measured wrong and is too much. Measure back width anew.

Please note that this measuring error causes the garment to be too loose at back and too tight at front. Therefore the situation cannot be corrected by only reducing width of back piece. The pattern must be redrawn using the correct back width measurement.

If waist height in relation to back length is wrong (refer to Figure 3), the result is either a shoulder that slopes to wrong direction (a) or a shoulder which is too steep (b). If you measure waist height as instructed in PatternMaker measuring instructions i.e. double around back neck and divide the result by 2, there seldom is any error in waist height. Therefore the error usually is in back length.

If shoulder slopes in wrong direction (a), back length is too much and if shoulder is too steep (b), back length is too little. Change back length 2-3 cm in the needed direction and see if it is enough to correct the situation. If it looks good, you see to which point at neck back length has to be measured to be OK.

If the subject stands in a very upright, military position with bust out and abdomen in, also waist height may be too much. Please make sure that the subject stands in a relaxed position when she is being measured.

In some cases a steep shoulder may be due to the subject's body shape. This is the case if the subject has a very prominent bust. And conversely, if a subject has a very flat bust and/or a very round back, the shoulder can be rather straight.

Thus, there are cases, where the patterns are all right even if they look "odd". When the patterns are drawn according to a person's own measurements, they should not be compared with patterns drawn according to "normal" or "average" measurements. If you are not sure of the measurements taken, you have a very good and simple way to check them: sew a muslin with the basic bodice patterns. If it fits on the subject, you can be sure that all other garments sewn with PatternMaker macros will fit well.

If you get an error message:

    value out of range in line …
   coord (32,33,sqrt(op*op-oke*oke),-oke);

it means the measuring error is so drastic that the program is unable to draw the patterns at all. Front shoulder does not meet armscye line. Then either back length is too little or waist height too much. It may also be that shoulder length has some influence: shoulder length may be too short.

Also, in some other cases there may be reason for checking shoulder length measurement. If shoulder is too short, there will be a corner inward where front and back shoulder meet at shoulder tip and vice versa.

PatternMaker Software
Lingerie macro set
Designer: Leena Lähteenmäki
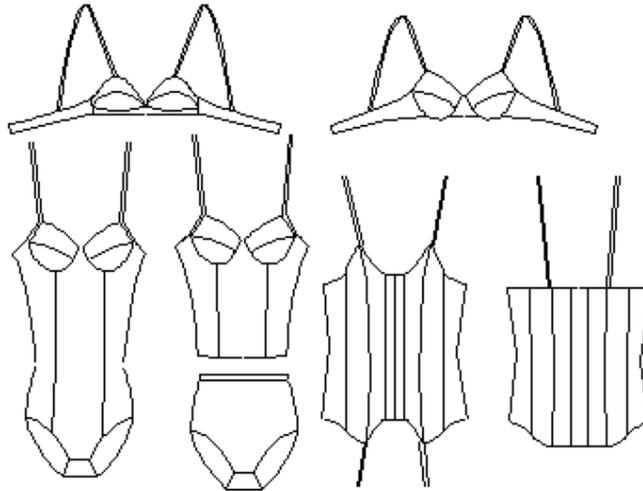
SEWING LINGERIE

To sew your own lingerie to your personal measurements is most rewarding. With modern sewing machines and sergers it is also easy and quick. With luxurious fabrics, beautiful laces, lace appliqués and light lingerie elastics, you can make beautiful lingerie that is all your own.

After you have learned and practiced your techniques, you can sew personal, well-fitting and beautiful lingerie quickly and at a fraction of store prices for yourself, for your daughter, for your mother, or for your friends. You can also use the sewing techniques you have learned to sew swimming suits and action wear.

TERMINOLOGY

Please refer to the illustration at the right to get acquainted with the terminology used.

Nowadays most bras are made with underwires. They are of metal or plastic and are inserted into casings at bottom edge of the cups. If you cannot find underwires in your fabric shop, you can use used ones from an old bra. Sometimes you can find bras at very low prices at sales or in discount stores. If so, it might be worthwhile buying very cheap bras just for their underwires and - why not - shoulder straps.

Women with a prominent bust are recommended to sew classic bras without underwires

BRA WITH UNDERWIRE

Shoulder strap
Cup
Side part
Center angle

BRA WITHOUT UNDERWIRE

Shoulder strap
Cup
Side part
Midriff part
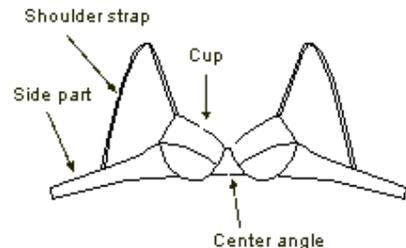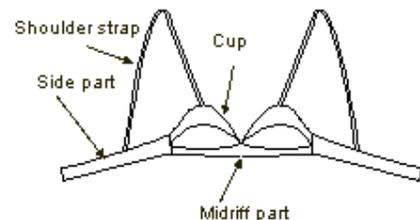
FABRIC SELECTION

PatternMaker macro lingerie can be sewn of elastic or non-elastic fabrics. Use lightweight, easy-care fabrics of cotton, silk or synthetic fiber content, in either knit or wovens. Buy enough fabric for a test garment. Sometimes you may need to make a couple of test garments before you master the sewing and measuring techniques.

REDUCING PATTERNS TO ACCOUNT FOR STRETCHING IN THE FABRIC

One of the best features of PatternMaker Macro Patterns for Lingerie is the fact that patterns can be reduced in size to account for stretching in the fabric. You will need to calculate the stretching factors for the fabric you use. Examine how much the fabric stretches horizontally and vertically and let the program resize the patterns accordingly. There is a Dialog Box for this purpose in the PatternMaker Lingerie Macro. You are asked to give Horizontal and Vertical Scaling Factors.

To determine the scaling factors for a particular fabric, stretch the fabric and measure its elasticity. Fold a piece of fabric in two and stretch it separately in height and width along a ruler. "Height" is the direction that will be vertical when you put the pattern on the fabric, and "width" is the horizontal direction. Measure unstretched and stretched width and height of the fabric. The Scaling Factor needed is calculated by dividing the measurement of the unstretched fabric by the measurement of the stretched fabric. Stretch moderately, as the fabric would stretch on your body.

Example:

- if the unstretched width and height of the fabric is 16" (40 cm)
- and the stretched width of the fabric is 20" (50 cm) and height 18" (45 cm)
- Horizontal Scaling Factor is 16/20=0.8
- Vertical Scaling Factor is 16/18 = 0.9

In other words, if the fabric stretches 20%, the scaling factor is 0.8. (Europeans, please remember that the decimal point in PatternMaker is always a period, not a comma).

The Lingerie Macro does not reduce patterns for bra cups, bra front center triangle and body front center piece, nor does it reduce corset patterns. These parts should be made of a non-elastic fabric. If you sew them of elastic material, make them double thickness or line or cover them with non-elastic fabric or lace.

Hint:
When sewing normal, short bra, always use a vertical scaling factor of "1". It is better not to reduce height of bra back panels even if the fabric is somewhat elastic in height.

Hint:
If you want the patterns to exactly match your body measurements, use default scaling factors "1". It is also possible to use scaling factors greater than "1". In this case, the patterns are drawn larger than your body measurements i.e. the patterns will have ease. This might be necessary if you use the waist length bra patterns to sew an evening top of non-elastic fabric, for instance.

If you sew lingerie entirely of non-elastic fabric, you have to use scaling factors that are greater than "1". How much "ease" you have to add, is a question of the model and the fabric used. If you are not familiar with adding ease to patterns, it is better to use elastic fabrics.

Your Basic Bodice (Sloper) is the basis for all the lingerie patterns. The Lingerie Macro lets you decide whether to include the bodice on the screen along with lingerie pattern pieces when you run the macro. (See illustration at right.) Use this as a reference to see how the pieces fit the sloper pattern. By doing so you will see how lingerie patterns are drawn in relation to basic bodice.
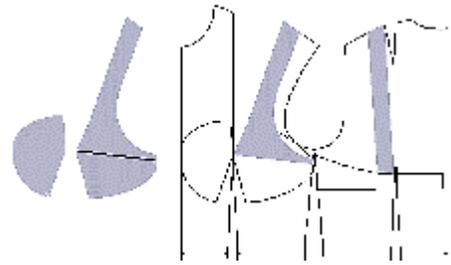
Please notice also, that the Basic Bodice pattern is not reduced in scale even if you use scaling factors smaller than 1. Therefore, if you want to experiment to see how lingerie patterns are drawn in relation to basic bodice patterns, use scaling factors of 1.

MATERIALS AND NOTIONS

In addition to the fabric you will need:

BRA:

- narrow lingerie elastic for finishing top and bottom edges of bra back panels
- hooks of two-row hook-and-eye tape for back closing
- bra underwires, which come in sizes according to measurements taken under breasts (28", 30", 32" etc.)
- elastic tube band for casings for underwires, or alternatively, 3/4" (2 cm) wide bias binding tape basted lengthwise in two
- band for shoulder straps (optional; you can also make shoulder straps from bra fabrics)
- shoulder strap adjustment clips (optional)

WAIST LENGTH BRA:

- same accessories as for bra above except for hook-and-eye tape
- a zipper which opens from both ends, or accessories for another kind of front closing
- bra ribs (bones) or rigid plastic/nylon tape sold for this purpose to stiffen bra vertical seams. Measure the needed amount of tape from pattern.

BODYSUIT WITH BRA CUPS:

- same accessories as for bra above
- hooks from one-row hook-and-eye tape for crotch closing

CORSET:

- corset ribs (bones) or rigid plastic/nylon tape sold for this purpose to stiffen corset vertical seams (measure the needed amount of tape from pattern, but note that tape is not inserted in the seam which goes over bust)
- lace, embroidery and/or lace appliqués for corset top and bottom edgings
- a zipper which opens from both ends or other kind of front closure
- for an adjustable corset, button loop tape and draw string for back center seam

PANTIES:

- lingerie elastic for edges of leg openings
- 3/4" to 1-1/4" (2-3 cm) wide elastic or elastic lace for waist

LACE, LACE APPLIQUÉS OR OTHER LINGERIE DECORATIONS:

If you want to, you can decorate lingerie with lace. You can replace part of fabric with lace or lace fabric or you can use lace fabric to cover the lingerie fabric. Examine ready-made lingerie for ideas. Before you do this, however, learn the basic techniques for sewing lingerie. Only after you are familiar with the basic techniques should you try special techniques or materials.

> ***Hint:***
> If you want to sew a padded bra, use the bra cup patterns to cut padding from thin batting or fleece. Line bra cups and place padding between bra fabric and lining. Cut bra cups a bit larger than the pattern so that the padding fits inside the bra.
>
> You can also line only the padding and fasten it into the bottom seams of the cups. In this way - leaving the padding free at top edges of the cups - you give the padding better form.
>
> ***Hint:***
> Try sewing bra cups of padded fabric and bra back panels of elastic fabric matching the color of the padded fabric. It is quick and easy.

MEASURING

For the Lingerie Macro you need several of the same measurements as for other PatternMaker macros, plus a few additional measurements. The standard PatternMaker measurements are explained in the measurement chart included with this booklet. Take the additional measurements according to the instructions on the last page of this booklet. The easiest way to take the bra cup measurements is to put on a bra you already have that fits well and take the measurements from it.

Have a set of the underwires that you will use available before you start measuring yourself, since the length of these is one of the measurements you will need.

All measurements are taken along the contours of your skin.

Important:
Do not try to measure yourself - it does not work. Ask a friend to take the measurements.

PREPARING THE FABRIC, CUTTING AND ADDING SEAM ALLOWANCES

If you are not sure that your fabric and laces won't shrink when washed, prewash and iron them to preshrink them.

Fold fabric in two. Cut the following pattern pieces on fold:

- bra center triangles/midriff pieces (2 each)
- bodysuit center front and center back pieces
- corset center front and center back pieces

On the cup patterns there is a two-headed arrow. Place the pattern on the fabric so that the elasticity of the fabric is parallel to this arrow. The cups will fit much better if the pieces are cut this way. If the fabric you are using stretches in both directions, it usually stretches more in one direction. In such a case place the pieces so that the arrows run parallel to the direction of greatest stretch.

The center triangles of the bra with underwire and the midriff piece of the bra without underwire can be cut from a non-elastic fabric. If you do cut these pieces from an elastic fabric, line or overlay the pieces with non-elastic fabric or lace.

The top pieces of the cups can also be cut from a non-elastic fabric or lace. If you line the cups, use elastic lining fabric for the bottom pieces of the cups and cut it the same direction you cut the cups.

The body pieces of the waist bra and bodysuit, and all of the pieces for the corset and panties, should be cut so that the fabric stretches horizontally.

Add 3/4" (2 cm) seam allowance to seams into which you are going to insert ribs (waist length bra and corset vertical seams). Add 3/8" (1 cm) seam allowance to all other seams. Add to panties' top edge a seam allowance that equals the width of the waist elastic you are using.

SEWING AND OVERLOCKING

SEAMS

Best results are achieved when sewing seams with a serger. If you don't have a serger, sew seams with narrow zigzag. Use at least 3 mm long stitches. Stitches that are too short can break the fabric. If sewing the garment of non-elastic fabric with sewing machine, trim seams to 6 mm and overlock seam allowances together with zigzag. Tricot and lace fabrics do not need overlocking.

LACE APPLIQUÉS AND MEDALLIONS

You can insert lace medallions and motifs cut from lace fabric on your lingerie. Use transparent tape to position lace inserts on right side of the garment and stitch near edge, through tape, using narrow zigzag and medium length. After fastening the lace, remove tape and cut the underlying fabric with sharp scissors.

FINISHING EDGES

Edge finishes can be done in many ways depending on the characteristics of the edge. If you want to reduce length of edge (in leg openings for panties, for instance), use edge elastic or sew transparent elastic into the seam. Following techniques can be applied for edge finishes:

1) **Bound edge finishes**: Cut seam allowance away from edges. Sew bias binding tape on wrong side of the edge, turn it round edge to the right side of the garment and sew at edge.

2) **Picot edge finishes**: Overlock seam allowance of non-elastic fabric and turn it to wrong side. Sew on right side with straight stitch near edge. If you are using elastic fabric, use seam allowance of 3/4-1" (2-3 cm). Fold seam allowance inside and sew on right side with overedge or blanket stitch along edge. Trim excess fabric away from finished edge close to stitching. Using a twin needle is also a good solution and gives a professional look for this kind of edge treatment.

A beautiful **scalloped edging** is achieved by using wide and long overedge stitch, and stitching so that the right swing of the needle stitches over folded edge and the remaining stitches are on the fabric. Nice but easy wavy picot edging is sewn by using dense zigzag over folded edge and stretching the fabric tight when sewing. Excess fabric is trimmed away from the seam after sewing.

3) **Lace-trimmed edges**: If the fabric is elastic, the lace must also be elastic. If you use narrow edge lace, position the lace upside down on the fabric, right sides together, with straight edge of lace 3/8" (1 cm), or width of seam allowance, from raw edge. Machine-baste elastic near edge. Turn lace to final position and turn seam allowance inside. Stitch with 3-stitch zigzag on right side of the garment along edge of lace. Trim excess fabric from wrong side of garment.

If you use wide edge lace, tape lace in place, wrong side of lace against right side of garment, and zigzag over tape near edge of lace. Trim excess fabric from wrong side of garment.

4) **Elastic-trimmed edges**: Machine baste elastic to the edge upside down, right side against right side. Stretch elastic when basting. Turn elastic to its correct position on inside and topstitch on right side of the garment with 3-stitch zigzag stretching the elastic when zigzagging.

If the elastic is applied to an edge which will lie flat when complete (like edges of bra back panels), it needs to be stretched only a little.

If the elastic is applied to an edge which will be shrunk when complete (like panties' leg openings), stretch it a little more. Measure the length of elastics for this kind of edges (waist and leg openings) around your body. As a rule of thumb you can use the following: length of the edge elastic is 2/3 of the length of the edge.

> *Hint:*
> You can use regular narrow elastic to replace edge elastic. Machine baste it to wrong side of the edge, stretching it while basting. When turning elastic and seam allowance to wrong side of the garment, and topstitching the edge with 3-stitch zigzag on right side of the garment, the elastic is left hidden inside seam allowance.

Waist elastic for panties is fastened in the following way. Divide elastic and garment edge into fourths; mark both with pins. Pin elastic to fabric, wrong sides together and edge of elastic even with raw edge of fabric. Match pin marks. Machine baste close to picot edge, stretching while basting. Turn elastic to its final position inside the garment and topstitch with 3-stitch zigzag along bottom edge of elastic. Elastic is hidden inside waist seam allowance.

Sew **lace appliqué or medallion** at edge of garment in the following way. Finish edge of garment using one of the above-mentioned edge finishing techniques. Position lace, right side up, in its place on right side of the garment with transparent tape. For edges with elastic (like at panties' waist), stretch edge when taping the lace in place. Topstitch lace along its edges with narrow zigzag over tape. Finally, remove the tape and cut underlying fabric away with sharp scissors.

> *Hint:*
> You can use lace or lace fabric even in places where there originally is a seam. For example, by substituting panties' side seam with lace, you get a garment without side seam.

> *Hint:*
> Pieces of lace can be joined by sewing them together flat with narrow zigzag stitching. First position and tape them on top of each other, motifs matching. Best result is achieved when the joining stitching is sewed along a motif. Finally, cut excess lace away with sharp scissors near stitching.

> *Hint:*
> If you fasten a broad lace at a curved edge of a garment, tape it to its place at the edge which will be longer in the ready garment. Clip the lace from other edge, following motifs, as necessary to overlap and flatten lace. Tape. Stitch along taped edge with narrow zigzag. Stitch over clips through overlapped layers of lace, following motifs, with narrow zigzag. Remove tapes and cut excess lace with sharp scissors near zigzags.

> *Hint:*
> Lace edge with corners is done the following way. Position lace in place and folding it at corners. Tape and sew with narrow zigzag along edge and folds. Finally, cut excess lace away with sharp scissors.

SHOULDER STRAPS

Band for shoulder straps is sold ready-made. Another option is to sew shoulder straps of garment fabric. This might be necessary if you don't find band matching the color of your bra fabric. It is also much cheaper to sew shoulder straps of the lingerie fabric than to use ready-made shoulder strap band. Use one of the following techniques:

1) Sew a **tube strap** of garment fabric. Cut fabric strip twice as wide as the desired finished width plus seam allowance. Fold strip in half lengthwise, right sides together, and stitch along raw edges, stretching the fabric while sewing. Trim seam allowances to 2-3 mm. Turn the strap right side out with a loop turner or a safety pin.

2) Beautiful, **narrow shoulder straps** are made of tricot in the following way: Cut 3/8 - 3/4" (1-2 cm) wide tricot strip crosswise to the grain. Place strip right side up, stretch tightly to make it roll and sew over it with wide zigzag, taking care not to catch fabric in stitches.

> *Hint:*
> This technique can also be applied to sew draw strings for casual garments!

3) **Flat 3-fold shoulder straps** are sewn in the following way: Cut a fabric strip three times as wide as the desired finished width and fold it three times lengthwise, wrong side of the fabric inside. Sew along both edges with picot edge finish (explained above). If the strap is narrow you can use overlocking stitches or zigzag at center of strap. A twin needle can also be used. Cut potential excess fabric away from underside of the strap.

Fasten shoulder straps in place with narrow tight zigzag stitching. Fasten shoulder straps to back of the garment first and then find the right places for them at front of garment by trying the garment on. A handy way to fasten shoulder straps is to use 3-stitch zigzag: lower the feed dog of your sewing machine down and stitch in place.

TEST GARMENT

Sew a test garment first. This is necessary for learning the basic construction techniques. With a test garment you also ensure that you have taken the measurements correctly and that you have used correct scaling factors for fabric elasticity when drawing the patterns. If the garment does not fit, change the scaling factors you have used or take new measurements.

It is possible that you will have to do more than one test garment. This is a necessary process to learn to sew well-fitting lingerie.

SEWING A BRA

BRA WITH UNDERWIRE

Cut the bottom pieces of the cup so that the elasticity of the fabric is vertical. Cut the top piece of the cup so that the elasticity of the fabric is horizontal. (Refer to paragraph "Cutting and Seam Allowances," above.) The top pieces of the cups can also be cut of lace or lace fabric.

1) Cut center triangle on double fabric. Sew top and bottom edges of center triangle pieces, right sides together. Turn triangles right side out and edgestitch near edges. If you want to fasten a decoration to center triangle, do it now.

2) Sew dividing seams for cups, right sides together. Topstitch seam on right side.
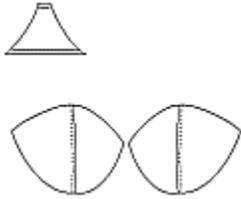
3) Finish bottom edges of bra back panels with elastic-trimming technique instructed above. Stretch elastic only a little. (Back panels should lie flat when ready.)

4) Sew back panels to cups, rights sides together. Stretch back panels when sewing. If you find it difficult to combine seams that curve in different directions, do as follows: First staystitch edge of back panels 3/8" (1 cm), or width of seam allowance, from edges. Clip seam allowances at 3/8" (1 cm) intervals. Now it is much easier to combine the seams.

5) Finish top edges of back panels and cups continuously with elastic-trimming technique. When doing this, turn seam where back panels meet cups towards inside of cups.
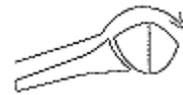
6) Attach center triangle to cup. Stretch center triangle when sewing.

7) Fold center triangle and one back panel on top of one cup, right sides together. Position tube tape or folded bias tape at bottom edge of cups. Leave 3/4" (2 cm) of tape over both ends.
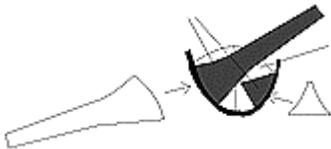
8) Sew along inner edge of tube tape. Fold tape to wrong side of cup and sew along other edge to form a casing for underwires. Sew casing to other cup in the same way. Insert underwires into casings. To form stoppers in the casings, fold inwards and fasten ends of tape at both ends of casings.

9) Try the bra on to check that the circumference of the bra is correct and fasten pieces of two-row hook-and-eye tape to ends of back panels. If you want to provide shoulder straps with shoulder strap adjustment clips, do it now. Look at your old bra to see how this is done. Fasten shoulder straps first at back of bra and then by trying the bra on, find the correct points to attach them to cups in front.
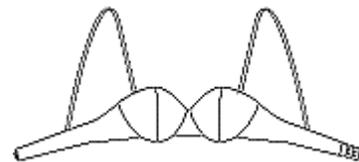

Another possible order of assembly is as follows: Finish center triangle as above. Finish top and bottom edges of back panels with edge elastic before you combine them to the cups. Finish top edges of cups with edge elastic or lace as well. Attach center triangle and back panels only now to cups. In this order of assembly, it is possible to use other material than edge elastic to finish top edges of cups, i.e. lace, embroidery or decoration tape. If you do so, sew transparent elastic at wrong side of top edges of cups to prevent the edges from getting too loose.

BRA WITHOUT UNDERWIRE

Cut the bottom pieces of the cup so that the elasticity of the fabric is vertical. Cut the top piece of the cup so that the elasticity of the fabric is horizontal. (Refer to paragraph "Cutting and Seam Allowances," above.) The top pieces of the cups can also be cut of lace or lace fabric.
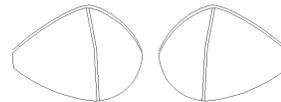
1) Cut midriff part on fold (two times). Sew them together at front center top edge and at bottom edge, with right sides together. Turn the piece right side out and topstitch with 3-stitch zigzag along these edges.
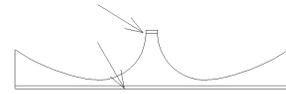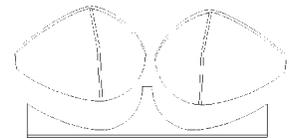
2) Sew dividing seam of cups and topstitch.
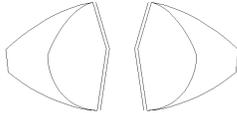
3) Finish top edges of cups with edge-elastic technique.

4) Attach cups to 2-layer midriff piece, matching notches on cup seams to midriff piece. Stretch midriff piece when sewing.

5) Finish top and bottom edges of back panels with edge-elastic technique.

6) Attach back panels to cup/midriff part.

7) Try the bra on to check that the circumference of the bra is correct and fasten pieces of two-row hook-and-eye tape to ends of back panels.

8) Make shoulder straps. Fasten them first to back of bra and then try the bra on, to find the correct attachment points in front, and attach.
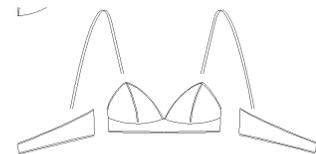
SEWING A WAIST-LENGTH BRA

Cut the bottom pieces of the cup so that the elasticity of the fabric is vertical. Cut the top piece of the cup so that the elasticity of the fabric is horizontal. (Refer to paragraph "Cutting and Seam Allowances," above.) The top pieces of the cups can also be cut of lace or lace fabric.

1) Sew halves of cups together, right sides together. Topstitch seams on right side.

2) Sew front, side and back seams of body, right sides together, with 3/4" (2 cm) seam allowances. Fold seam allowances towards center at front and at back, and towards back at sides.

3) Stitch seams from right side of the garment to form 3/8" (1 cm) wide casings for ribs/rib tape.

4) Insert ribs/rib tape into the casings. Do not extend ribs/rib tapes over top and bottom seam allowances. Topstitch rib tapes at both ends to prevent sharp ends from tearing the fabric when you move.

5) Combine bra body piece to cups in front. Keep body piece stretched while sewing.

6) Finish top edges of waist length bra with edge-elastic technique. Start and stop stitching at center front.

7) Sew tube tape/folded bias tape to wrong side of bottom edges of cups as with bra with underwire. Insert underwires into casings. To form stoppers in casings, fold inwards and fasten excess tape at both ends of casings.

8) Fasten a zipper or another kind of a closure (buttons and buttonholes, hooks and eyes, snaps) to center front. Fold inside seam allowance of bottom edge and edgestitch on right side with 3-stitch zigzag.

9) Fasten shoulder straps first to back of bra and then try the bra on, to find the correct attachment points in front, and attach.

DESIGNING BRA CUPS

Patterns for bra cups can be designed in many ways. You can make different designs by moving dividing seams of cups to different places. (As a starting point, the Lingerie Macro will let you choose whether the pattern is drawn with horizontal or vertical seams.) The only restriction is that the dividing seam has to go through bust apex. There is a notch mark at this point in basic patterns for bra.

A bra with vertical dividing seams does not fit as well as a bra with horizontal dividing seams. In the case of horizontal dividing seams it is possible to cut the cup pieces into different directions according to the elasticity of the fabric. (Refer to paragraph "Cutting and seam allowances" above.) The top pieces of the cups can also be cut of lace or lace fabric. If you divide the cups into more than two pieces, try to ensure that the pieces corresponding to the bottom piece of the basic cup can be cut so that the elasticity of the fabric is vertical.
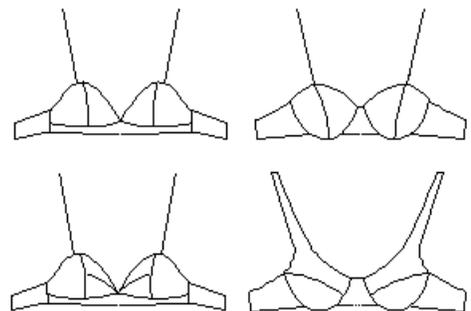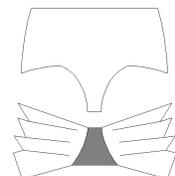
SEWING PANTIES

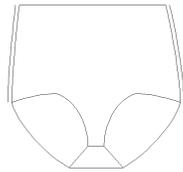1) Position crotch pieces right side against right side and put back crotch between them. Sew.
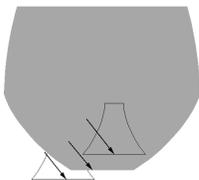
2) Fold front and back pieces of panties between the crotch pieces and sew crotch seam at front, with right sides together. Turn right side out.

3) Finish edges of leg openings with edge-elastic technique. Stretch elastic more in back than in front.

4) Sew side seams.

5) Cut a suitable length of waist elastic. Overlap and stitch the ends together. Attach waist elastic to panties according to instructions above.

SEWING A BODYSUIT OR SWIM SUIT

If you want to sew a bodysuit, start by sewing a bra with underwires. This will give you practice in the most important sewing techniques for elastic garments. After having sewn a bra, sew panties, which are easy and quick to sew. Then sew a waist length bra. By trying waist length bra and panties on, you can check that you have used correct scaling factors: bodysuit is a combination of waist length bra and panties. To be able to sew a comfortable and well-fitting bodysuit, its height measurements must be exact. Pay special attention to vertical scaling factor.

1) Cut the bottom pieces of the cup so that the elasticity of the fabric is vertical. Cut the top piece of the cup so that the elasticity of the fabric is horizontal. (Refer to paragraph "Cutting and Seam Allowances," above.) The top pieces of the cups can also be cut of lace or lace fabric.

2) Sew halves of cups together, right sides together.

3) Sew vertical seams of body parts.

4) Set crotch pieces right side against right side and lay back crotch piece of body part between them. Sew and turn right side out.

5) Finish edges of leg openings with edge elastic. Stretch elastic more at back.

6) Combine cups to body piece at front (keep body piece stretched while sewing). Finish top edge of body piece and cups with edge elastic. Start and end at side seam.

7) Sew tube tape/folded bias tape to wrong side of bottom edges of cups to form casings for underwires as for bra with underwires. Insert underwires into casings. To form stoppers in casings, fold inwards and fasten excess tape to both ends of casings. Insert underwires into the casings.

8) Fasten hook-and-eye tape at crotch.

9) Fasten shoulder straps first at back of bodysuit and then try the garment on, to find the correct attachment points in front, and attach. These garments do not have closures in front or in back. If you are making a swimming suit, don't sew hook-and-eye tape at crotch.

Hint:
If you want to make a body or swim suit without cups, make a pattern by combining patterns for basic

bodice and panties. Use the basic bodice which is drawn with Lingerie Macro (not the one from the Ladies' macro kit), because it is without ease. Another possibility is to draw patterns combining patterns for panties and pullover (lpullov.mac) with minimum (= 0") ease. If you use basic bodice, make dividing seams at front and back or reduce waist dart at side seams. With pullover macro you can make pattern without dividing seams.

SEWING A CORSET

1) Sew corset vertical seams with 3/4" (2 cm) seam allowances. Only the seam which goes over the breast is sewn with a 3/8" (1 cm) seam allowance.

2) Fasten zipper or other closure mechanism (hooks, buttons) at front.

3) Try the corset on. If you want it to be tighter, take it in at side seams.

4) Fold and iron seams towards the center at front and back, and towards the back at sides. Topstitch them to form 3/8" (1 cm) wide casings for ribs/rib tape. Insert ribs/rib tape into the casings leaving top and bottom seam allowances free. Topstitch rib tapes at both ends to prevent sharp ends from tearing fabric when you move.

5) Finish top and bottom edges of corset with lace or embroidery. Make shoulder straps using corset fabric. Fasten them to top edge of corset. Fasten garters to corners of front bottom if you want to.

   Hint:

   To make your corset adjustable, sew it with a back seam and fasten button loop tape and draw strings into back seam. Draw string can be made from tricot with one of the shoulder strap techniques above.

The style of the corset cups can be changed as described above under bra instructions.

SEWING A HALF SLIP USING BASIC SKIRT MACRO

1) Use Ladies' skirt macro (lskirt.mac in Women's Macro Set) to produce patterns for slip. Use skirt front piece as pattern for both front and back.

2) Cut half slip to desired length using elastic lingerie fabric. Omit darts.

3) Sew side seams.

4) Fasten waist elastic and hem lace according to instructions above.
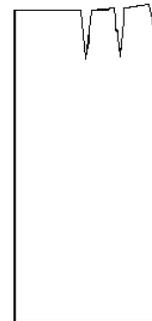
SEWING UNDER PANTS WITH LEGS USING BASIC PANTS' MACRO

Use basic pants macro (lpants.mac in Women's Macro Set). Give circumference of cuffs a suitable value for this purpose (9-11"/24-28 cm). Mirror front or back piece and position pattern pieces side by side at side seams as illustrated in the picture. Reduce front and back by an amount equal to the darts and side curve (take this out of the front and back center seams) and draw new pattern along existing points.

Reduce patterns according to elasticity of the fabric. Use PatternMaker command Edit - Resize to shrink the entire pattern. In the illustration, a horizontal scaling factor of 0.7 and a vertical scaling factor of 0.9 have been used. These factors would be used for a fabric that stretches 30% horizontally and 10% vertically. Shorten panties to suit your purposes.
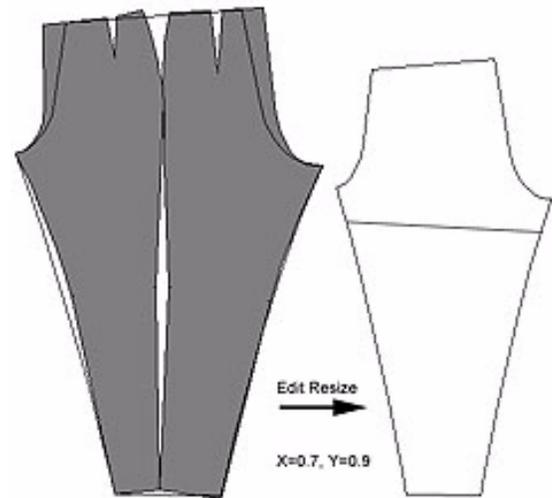
> **Hint:** This pattern can also be used for leggings or bike shorts.

Cut waist with seam allowance equal to the width of waist elastic and cuffs with 2" (5 cm) seam allowance. Sew front center and back center seams, right sides together. Sew crotch seam from cuff to cuff. Fasten waist elastic according to instructions above. Fold cuff seam allowances inside and topstitch from right side with twin needle at distance of 1-1/8" (3 cm) from picot edge. Cut excess fabric away from wrong side of the cuffs.

SEWING A FULL SLIP OR A CAMISOLE USING CORSET PATTERN

Add ease to corset front and back pieces, 5/8" to 3/4" (1.5 to 2 cm) per piece, leaving space at center of the pieces as illustrated in picture. Cut front side panels from breast apex to side seam (use Edit - Cut command) and rotate breast dart closed (use Edit - Rotate).

Draw new patterns according to picture: raise front bust corner 2" (5 cm) and slope side seams so as to leave 3/4" (2 cm) extra ease at front and back hip. Continue to the desired length. Make bottom corners round.

The amount of ease needed depends on the fabric used. If the garment is too loose, take it in at side seams or draw new patterns with less ease at center of the pieces.

Sew side seams. Finish top edge with one of the edge finishing techniques above. Attach lace appliqués or embroidery if desired. Make and fasten shoulder straps. Fasten lace at hem according to above instructions.
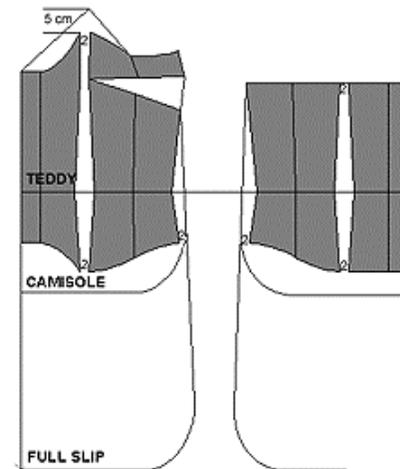
SEWING A TEDDY USING PATTERNS FOR CORSET AND PANTIES

Draw patterns for a teddy using patterns for corset and panties. Top part of teddy is same as top part of full slip. Add vertical ease of 1-1/8" (3 cm) at waist. Position panties' pattern at this distance from waist. Cut front and back pieces of panties vertically and position the pieces matching front/back center and side seams. Leg side seam starts from upper hip level (abdomen).

Add a seam at waist by cutting this piece in two. Do not forget to add seam allowance at waist seam.

Sew front darts of top piece. Sew side seams of top and bottom pieces. Combine top to bottom at waist. Sew transparent elastic into the waist seam. Finish top edge and edges of leg openings with one of the edge finishing techniques above.
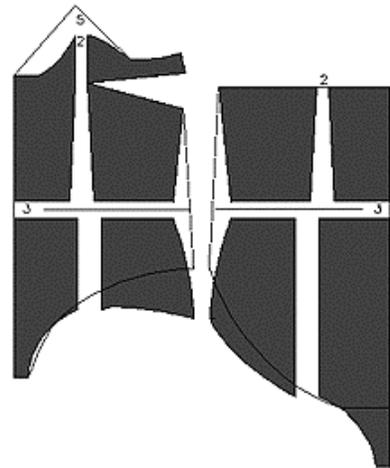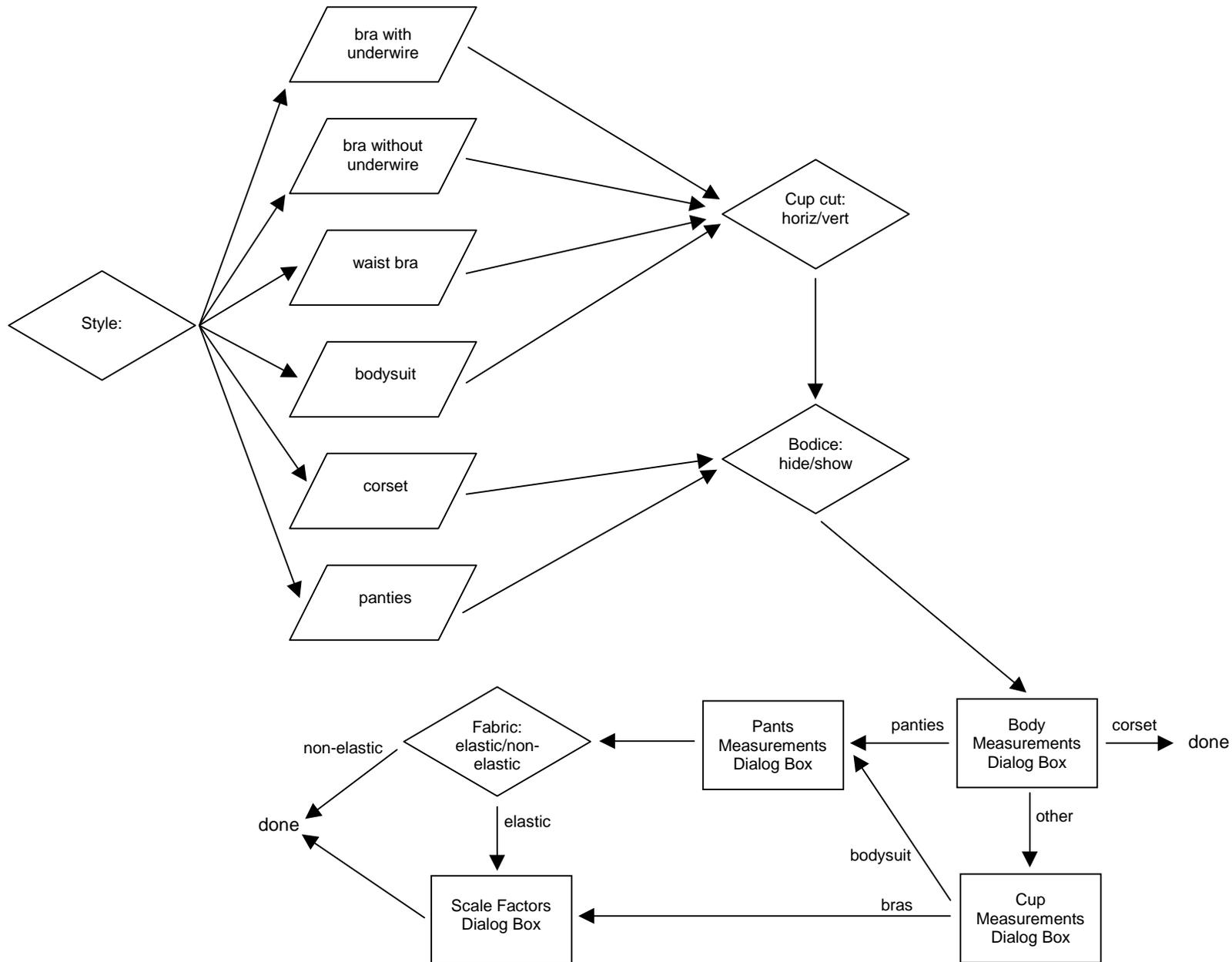
Finish front and back crotch seams with bias tape or satin tape and fasten hooks or snaps in it, or use hook-and-eye tape. Attach lace appliqués or embroidery if desired. Make and fasten shoulder straps.

RECOMMENDED READING

The following books can be recommended as excellent sewing books for lingerie. Sewing techniques are explained carefully with text and color photos. The books also give a lot of ideas for making and decorating lingerie.

- Kerstin Martensson: Sewing Lingerie (Kwik-Sew's), ISBN 0-913212-14-8

- Kerstin Martensson: Swim & action wear (Kwik-Sew's), ISBN 0-913212-18-0

- Singer Sewing Reference Library: Sewing Lingerie, ISBN 0-86537-261-2

LINGERIE.MAC

bra with underwire

bra without underwire

waist bra

Style:

bodysuit

Cup cut: horiz/vert

corset

Bodice: hide/show

panties

non-elastic

Fabric: elastic/non-elastic

Pants Measurements Dialog Box

panties

Body Measurements Dialog Box

corset

done

done

elastic

other

bodysuit

Scale Factors Dialog Box
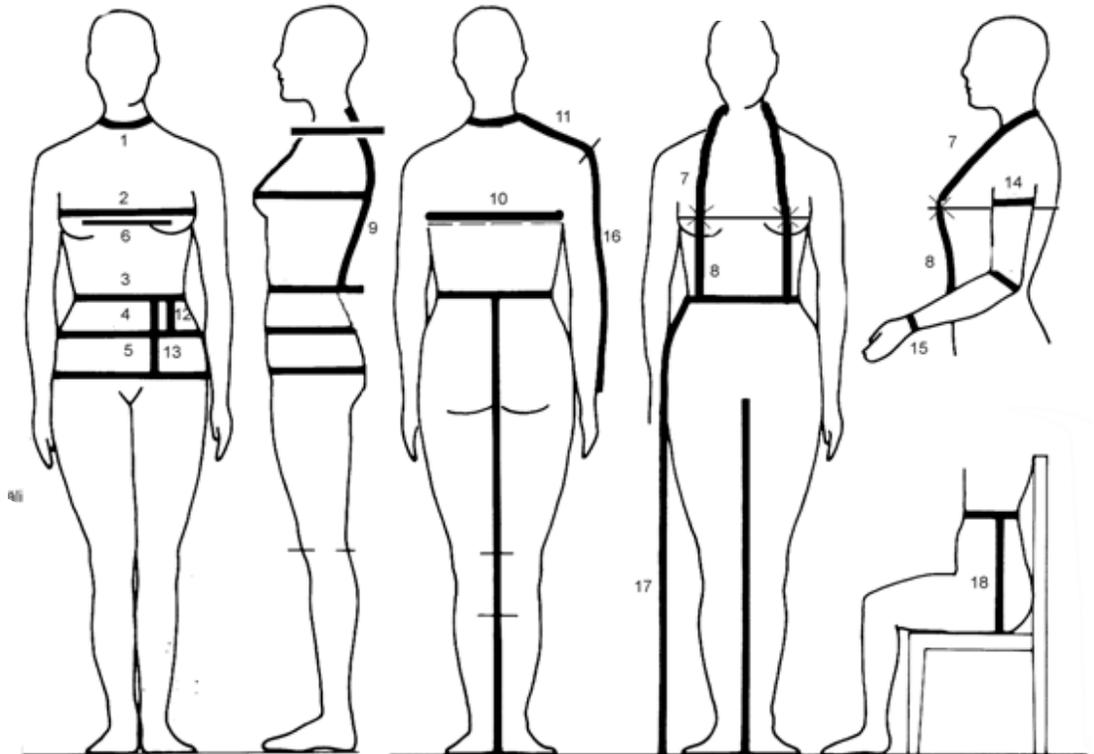
bras

Cup Measurements Dialog Box

PatternMaker Software
Measuring for Women's Macros

1. neck circumference
2. bust circumference
3. waist circumference
4. abdomen circumference
5. hip circumference
6. bust span
7. bust height
8. waist height
9. back length
10. back width
11. shoulder
12. waist-abdomen
13. waist-hip
14. biceps
15. wrist circumference
16. overarm
17. outside seam
18. crotch depth

Measure bust height (7) and waist height (8) around neck (double) and divide by 2.

Following are the instructions on how to measure for PatternMaker women's macros.

Don't try to take the measurements yourself. Ask someone else to take them. Stand straight but relaxed when you are being measured. You will receive the best results if the measurements are taken over underwear.

Place 1-inch wide elastic bands around your waist and hip. Search carefully for the correct places of these elastic bands. Keep these elastic bands on their places during the whole measuring process. Hip elastic is fastened on the level where hip circumference is maximum. Examine whether it is on your buttocks (7-8 inches/18-20 cm below the waist) or on top of your thighs (10-12 inches/25-30 cm below the waist). Measurements are taken from the bottoms of the bands.

Except for pants' cuff circumference and skirt/dress length, all measurements are body measurements. DO NOT ADD ANY EASE to the measurements. The program does it for you.

DO NOT TIGHTEN MEASURING TAPE.
Please, refer to the picture related to this measuring form.

BE ESPECIALLY CAREFUL WHEN TAKING THE **MEASUREMENTS WRITTEN IN CAPITAL LETTERS**.
They are crucial for good fitting patterns. After having taken all the measurements, take these important measurements once again.

You can use either centimeters or inches. Give inches in fractions.

PatternMaker Software
Women's Measuring Chart

Name: _____   **Date:** _____

1	Neck Circumference: Measure around lowest part of neck, at the base	
2	Bust Circumference: Marked with elastic. Measure around the fullest part of the bust, keeping the tape high at the back	
3	Waist Circumference: Measure waist at the elastic tape	
4	Abdomen Circumference: Measured on the level where abdomen circumference is maximum	
5	Hip Circumference: Measured over the largest part of your bottom/thighs (at elastic)	
6	Bust Span: Horizontal distance between bust apexes (also called bust bridge). Measured along bust elastic.	
7	Bust Height: Measure from center of back neck over shoulder to apex of one breast	
8	**WAIST HEIGHT:** Measure from center of back neck over shoulder to breast apex and from there vertically to lower edge of waist elastic. To be sure to get right measurements, take this and bust height as a link around neck (=double) and divide the result by 2 (see picture).	
9	**BACK LENGTH:** Measure from center of back neck to lower edge of waist elastic	
10	**BACK WIDTH:** hang your arms relaxed on your sides. The measurement is taken horizontally between shoulder blades (i.e. from sleeve seam to sleeve seam), from and to the point where your arm meets your body (but not to armpit) about 4" (10 cms) from neck downwards.	
11	Shoulder length: Measure from neck to shoulder tip. Shoulder tip is found when you raise your arm to horizontal position and feel where there is hollow/pit between shoulder and arm bones. Hold your arm horizontal, if necessary, to find this point.	
12	Waist-Abdomen: Measure vertically from lower edge of waist elastic to lower edge of abdomen elastic. Measure at front center.	
13	Waist-Hip: Measure vertically from lower edge of waist elastic to lower edge of hip elastic. Measure at the side.	
14	Biceps circumference: Measure at widest point of upper arm.	
15	Wrist circumference: Measure over wrist bone	
16	Overarm: Arm length from shoulder tip (as described above) to wrist. Bend arm slightly and measure over outside of elbow.	
17	Outside seam: Measure from waist over the outside curvature of the hip to the desired cuff length.	
18	**CROTCH DEPTH:** Sit on *unpadded* bench or chair. Measure vertically from waist elastic to chair level on both sides, and use the longer measurement. Measure in a straight line, not along the outside hip curve. (Crotch depth can also be measured from a pair of old, well fitting pants.) Crotch depth is the difference between outside and inside length of pants.	
	Desired cuff circumference, not ankle circumference	
	Desired jacket length from waist elastic to hem	
	Desired skirt /dress length from waist elastic to hem	

Important things to be taken into consideration when measuring

The most important measurements are the ones written in on the measuring chart in **BOLD CAPITAL LETTERS**: waist height, back length, back width, and pants' crotch depth.

If one of these four measurements is wrong, the result may be a distorted pattern and it is difficult to figure what measurement is wrong. If some other measurement is wrong, you get either a too-tight or a too-loose garment and you can easily see what measurement to correct and to what direction.
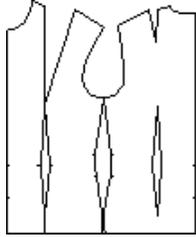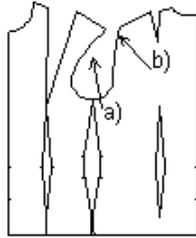

Figure 3: normal sloper
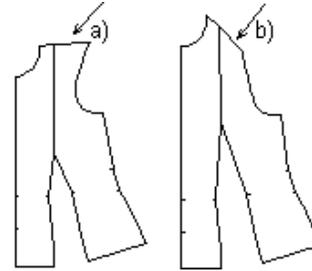
Figure 2: back width wrong

Figure 1: waist height/back length wrong

Normally the pattern for basic sloper is more or less like Figure 1. Front and back shoulders slope downwards to shoulder tip. Armscyes curve inward. Back armscye can be rather straight but should never bulge outward.

If the pattern is like in Figure 2 -- i.e. front armscye curves strongly inward (a) and back armscye bulges outward (b), back width has been measured wrong and is too much. Measure back width anew.

Please note that this measuring error causes the garment to be too loose at back and too tight at front. Therefore the situation cannot be corrected by only reducing width of back piece. The pattern must be redrawn using the correct back width measurement.

If waist height in relation to back length is wrong (refer to Figure 3), the result is either a shoulder that slopes to wrong direction (a) or a shoulder which is too steep (b). If you measure waist height as instructed in PatternMaker measuring instructions i.e. double around back neck and divide the result by 2, there seldom is any error in waist height. Therefore the error usually is in back length.

If shoulder slopes in wrong direction (a), back length is too much and if shoulder is too steep (b), back length is too little. Change back length 2-3 cm in the needed direction and see if it is enough to correct the situation. If it looks good, you see to which point at neck back length has to be measured to be OK.

If the subject stands in a very upright, military position with bust out and abdomen in, also waist height may be too much. Please make sure that the subject stands in a relaxed position when she is being measured.

In some cases a steep shoulder may be due to the subject's body shape. This is the case if the subject has a very prominent bust. And conversely, if a subject has a very flat bust and/or a very round back, the shoulder can be rather straight.

Thus, there are cases, where the patterns are all right even if they look "odd". When the patterns are drawn according to a person's own measurements, they should not be compared with patterns drawn according to "normal" or "average" measurements. If you are not sure of the measurements taken, you have a very good and simple way to check them: sew a muslin with the basic bodice patterns. If it fits on the subject, you can be sure that all other garments sewn with PatternMaker macros will fit well.

If you get an error message:

        value out of range in line …
        coord (32,33,sqrt(op*op-oke*oke),-oke);

it means the measuring error is so drastic that the program is unable to draw the patterns at all. Front shoulder does not meet armscye line. Then either back length is too little or waist height too much. It may also be that shoulder length has some influence: shoulder length may be too short.

Also, in some other cases there may be reason for checking shoulder length measurement. If shoulder is too short, there will be a corner inward where front and back shoulder meet at shoulder tip and vice versa.

PatternMaker Software
Lingerie Measuring Chart

Name: _____   **Date:** _____

1	Arc width (width of underwire)	horizontal measurement from one end to other end of bra underwire (you need to have the underwires before you take this measurement and run the macro; for testing purposes you can use underwire default width which corresponds to underwires for 32-36" (80-90 cm) measurement taken under breasts)	
2	Breast width	from end to end of underwire, across breast apex	
3	Breast top width	from end to end of underwire, around top contour of breast	
4	Breast/cup top ht	from breast apex to the point where you want the top edge of the bra to be. This measurement depends on bra design and is up to you; if you cannot decide this, try default measurement which is 3-1/8" (8 cm).	
5	Breast/cup bottom ht	bottom edge of breast to breast apex	
6	Crotch height, front	from front center waist to middle of crotch	
7	Pants height, front	from front waist to edge of front leg opening	
8	Crotch height, back	from back center waist to middle of crotch (check that total measurement of crotch length from front center waist to back center waist around your crotch is equal to crotch height front + crotch height back)	
9	Pants height, back	from back waist to edge of back leg opening under buttocks	