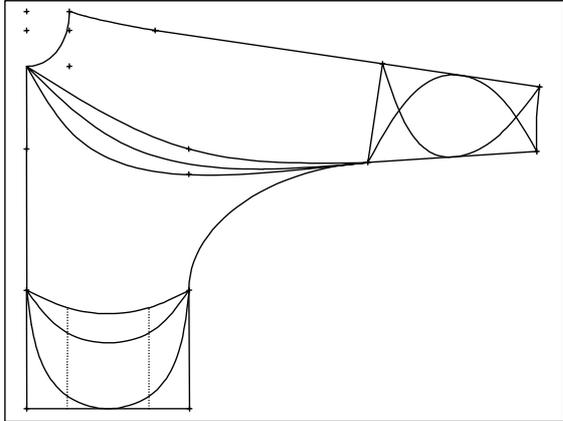


Chapter 9 “Curve construction and manipulation”

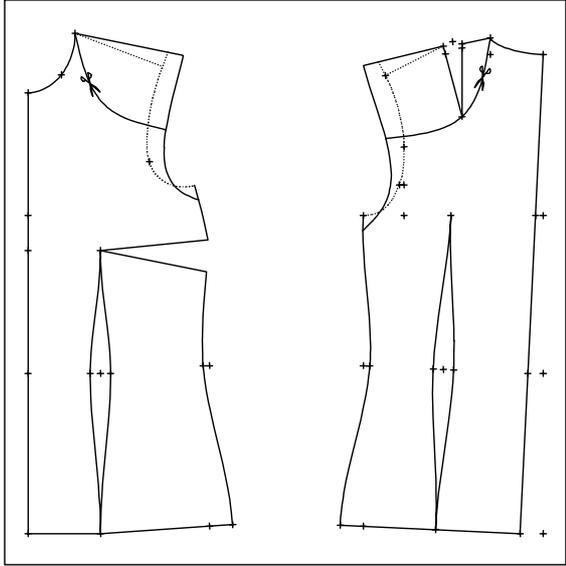
Content

- 9.1 Curve construction 2
- 9.2 Curve correction..... 5
- 9.3 Point manipulation (poma)..... 7
- 9.4 Exercises 9

This chapter starts with construction and shaping of curves. A section on correction of existing curves and their size-dependent shaping follows. At the end the functions of the point manipulation menu (*poma*) are explained.



After this chapter you can construct all GRAFIS objects. Conclusion of the teaching complex GRAFIS I are the functions for object transformation. GRAFIS II with modifying styles using construction parameters, work with parts, heredity automatic and generation of production patterns follows.



9.1 Curve construction

The curves menu

A new curve is constructed with the record function *curves* from the basic menu. After having clicked *curves* starting and final point of the new curve are to be determined. Here, also the user has to bear in mind that the construction steps will be repeated in other sizes. Therefore, starting and final point of the curve should be bound onto the construction.

After having constructed starting and final point of the curve, the *curves* menu opens and the curve can be shaped. The continuous direction of the curve is to be considered during direction construction. Therefore, the final point of the curve is highlighted in green.

A curve is shaped with so-called base and auxiliary points. The following applies:

base points

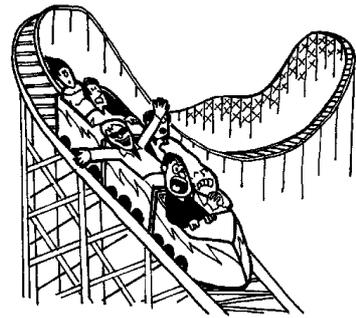
- are constructed, i.e. bound onto the construction
- in base points; the curve can be assigned a direction
- base points are indicated by crosses

auxiliary points

- are used for fine tuning of the curve shape between base points
- auxiliary points can be added, removed and dragged, easily
- auxiliary points are indicated by small red points.

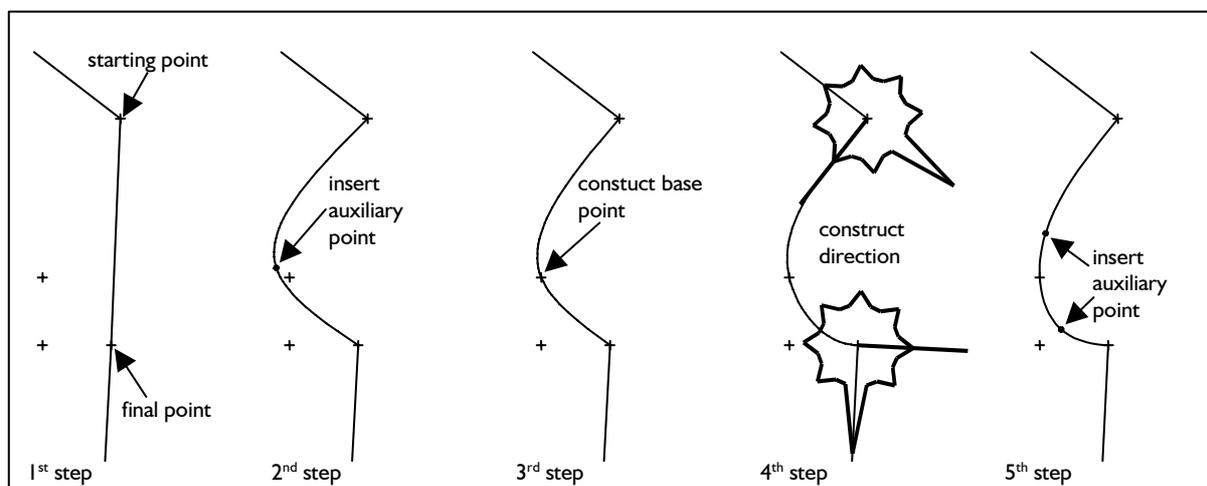
curves
curve only indicate
ux.point: insert
base point: construct set free
direction: constr. set free da=>x val
delete p
curve deposit depos.+end
place
delete
p+l+c+r measure

The fewer the auxiliary points, the smoother the curve. After construction of base points and assignment of directions, usually no or few auxiliary points are necessary.



Step-by-step guide

- ⇒ *Basic menu* --> *curves*
- ⇒ Construct starting and final point for the new curve
- ⇒ Set the base points along the curve; curve is graded with those base points:
 - *aux. point insert*
 - *drag auxiliary point*
 - bind the auxiliary point to the construction with *base point: construct*; it becomes a base point.
- ⇒ If the curve is to be given a specific direction in a base point it is recommended to construct the direction, now with *direction: construct*. The direction can always be fine-tuned later.
- ⇒ Set auxiliary points for fine-tuning of the curve.
- ⇒ If necessary, base points, auxiliary points, direction assignments or the complete curve can be deleted.
- ⇒ Aides during curve construction:
 - curve length in the GRAFIS Messages window
 - hide construction with *curve only indicate*; <F6> displays the construction again.
 - use of the menus *p+l+c+r* and *measure*
- ⇒ *deposit* or *depos.+end* to quit curve construction



Picture 9-1

Insert, drag and delete auxiliary points

Curve construction begins with *basic menu* --> *curves* and determination of starting and final point of the curve. For shaping of the curve, as a rule, base points are constructed, first by inserting auxiliary points and changing them into base points.

Using the armhole curve in basic block “bodice after Hohenstein” (Picture 9-1) as an example the individual steps are explained. Call basic block 001 and delete the front armhole. Determine starting and final point of the new armhole curve with *click p*, respectively. See Picture 9-1 (1st step).

<i>call</i>	basic block 001
<i>delete</i>	back
<i>curves</i>	
<i>click p</i>	end of shoulder
<i>click p</i>	corner armhole / side seam

Then, insert an auxiliary point by

aux. point insert activate, click the curve and position the auxiliary point with pressed left mouse, see Picture 9-1 (2nd step). Move the auxiliary point by

drag activate, click the point and drag it with pressed left mouse button.

Move the cursor along the curve. In proximity to an auxiliary point a dashed line to the nearest base points appears (in Picture 9-1 to starting and final point of the curve). The auxiliary point is defined through the relative lengths of these lines.

Insert further auxiliary points, position the points and then, delete them. To delete activate

delete p and click the objects to be deleted. Apart from starting and final point of the curve, all auxiliary points and base points can be deleted.

Construct base points

An auxiliary point is changed into a base point by binding it onto the construction with *base point: construct*.

According to Picture 9-1 (3rd step) the armhole is to run through the sleeve notch in all sizes. Therefore, bind the auxiliary point to the sleeve notch. It becomes a base point. Activate

base point: construct, click the auxiliary point and construct its new position with the sub-menu point construction (sleeve notch with *click p*). Now, the curve runs through this point in all sizes.

The position of a base point can be re-defined with *base point: construct*. This applies to starting and final point of the curve, also.

Construct direction in a base point

In base points the curve can be assigned a direction with *direction: construct*.

According to Picture 9-1 (4th step) the curve is to start at a right angle at the shoulder and end at a right angle at the side seam. These conditions are met by

direction: construct activate and click the base point to be assigned a direction. Start at the shoulder point and adjust a right angle to the shoulder, see Picture 9-1 (4th step). Then, construct the direction in the corner point armhole / side seam, see Picture 9-1 (4th step).

The direction must be defined following the direction of the curve, i.e. from starting point to final point. Direction settings should relate to lines of the construction. In Picture 9-1, these are shoulder and side seam.

Fine-tuning of the curve with auxiliary points

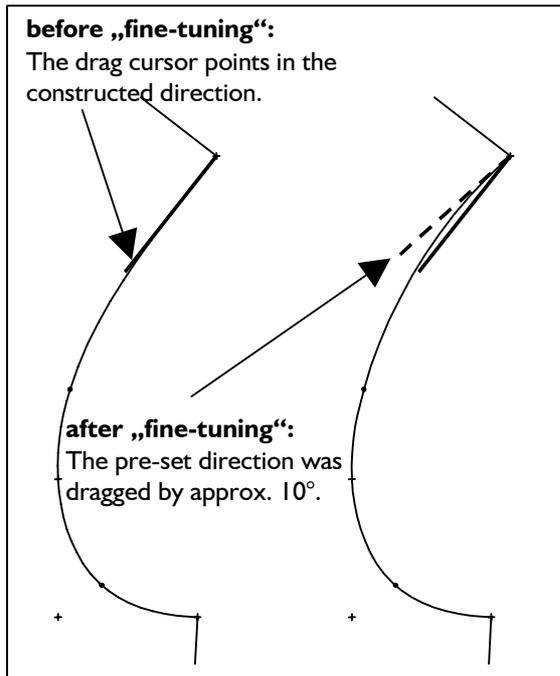
The curve is fine-tuned by inserting additional auxiliary points between the constructed base points. As a rule, one or two auxiliary points between adjacent base points suffice to obtain the required curve shape.

Shape the armhole according to Picture 9-1 (5th step) with additional auxiliary points. Activate

aux. point insert, click near the curve and position the auxiliary point with pressed left mouse button. The auxiliary points can be moved later with *drag*.

Fine-tuning an assigned direction

Assigned directions can be fine-tuned with *drag*. When the cursor is close to a base point with assigned direction a solid line and a dashed line appear (Picture 9-2). The solid line indicates the constructed direction. The dashed line is the handle for fine-tuning which can be dragged with pressed left mouse button. The fine-tuning angle *da* (difference angle) can be saved as a construction parameter with *da=>x val*. Try this option after having dealt with x values in Chapter 11.



Picture 9-2

Continue shaping the armhole from Picture 9-1 according to Picture 9-2. Activate

drag and move the cursor to the shoulder point. The handle appears, see Picture 9-2 (left), which you can drag with pressed left mouse button. The current correction angle and curve length are displayed in the GRAFIS Messages window.

Quit curve construction

With *curve deposit* the curve is deposited in your construction and you can begin construction of a further curve. *curve depos.+end* quits curve construction at the same time. In both cases, the switch *+/-replace* applies. If it is set to *+replace* a curve to be selected is replaced with the new curve.

curve delete deletes the constructed curve and you can start again.

Exercise: front neck

Call basic block 001 "bodice a. H. with normal dart" and delete the back. Construct a low neck according to Picture 9-3 and 9-4.

call basic block 001

delete back

curves

plg on l with *plg=30*. starting point at the shoulder

click p final point: point on CF at bust point height

... for result see Picture 9-3, No. 1.

Construct an auxiliary line of 50 mm length at a right angle, positioned in chest line height. You do not have to quit curve construction to do this; simply click on *p+l+c+r* in the right menu. After having constructed the auxiliary line and  resume curve construction.

... for result see Picture 9-3, No. 2.

Now, insert an auxiliary point and position it close to the auxiliary line.

aux. point insert click near the curve and position the auxiliary point with pressed left mouse button

... for result see Picture 9-3, No. 3.

Bind the auxiliary point to the end of the auxiliary line. It becomes a base point.

base point construct

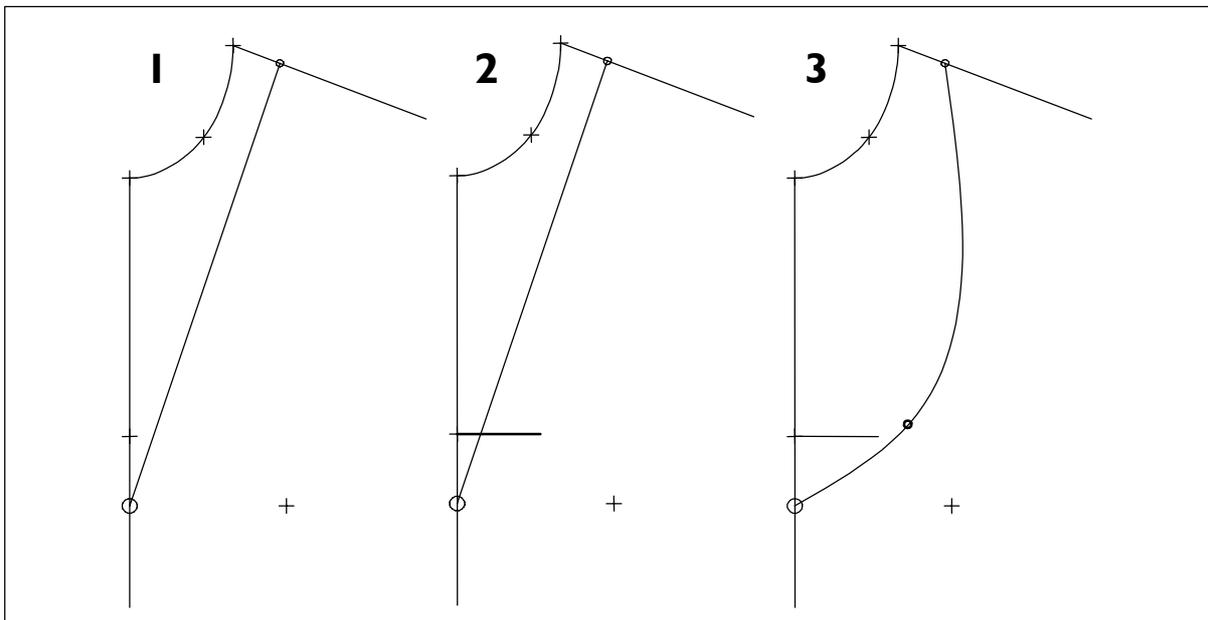
click the new auxiliary point

click pl final point of aux. line

... for result see Picture 9-4, No. 1.

The curve is now bound to the auxiliary line.

In the next step construct the required directions of



Picture 9-3

the curve at shoulder and centre front. The curve is to be parallel to the original neck at the shoulder and end at the centre front at a right angle.

direction: construct

click the starting point of the curve at the shoulder; construct the direction parallel to the original neck according to Picture 9-4, No.2.

direction: construct

click final point of the curve at the centre front; construct the direction at a right angle to the centre front according to Picture 9-4, No.2.

... for result see Picture 9-4, No. 2.

Both directions are to be assigned along the curve, i.e from shoulder to centre front, in this case.

Shape the curve at your discretion by inserting auxiliary points and dragging the constructed directions, if necessary.

aux. point insert

drag

... for result see Picture 9-4, No. 3.

Deposit the curve and grade in various sizes.

depos+end

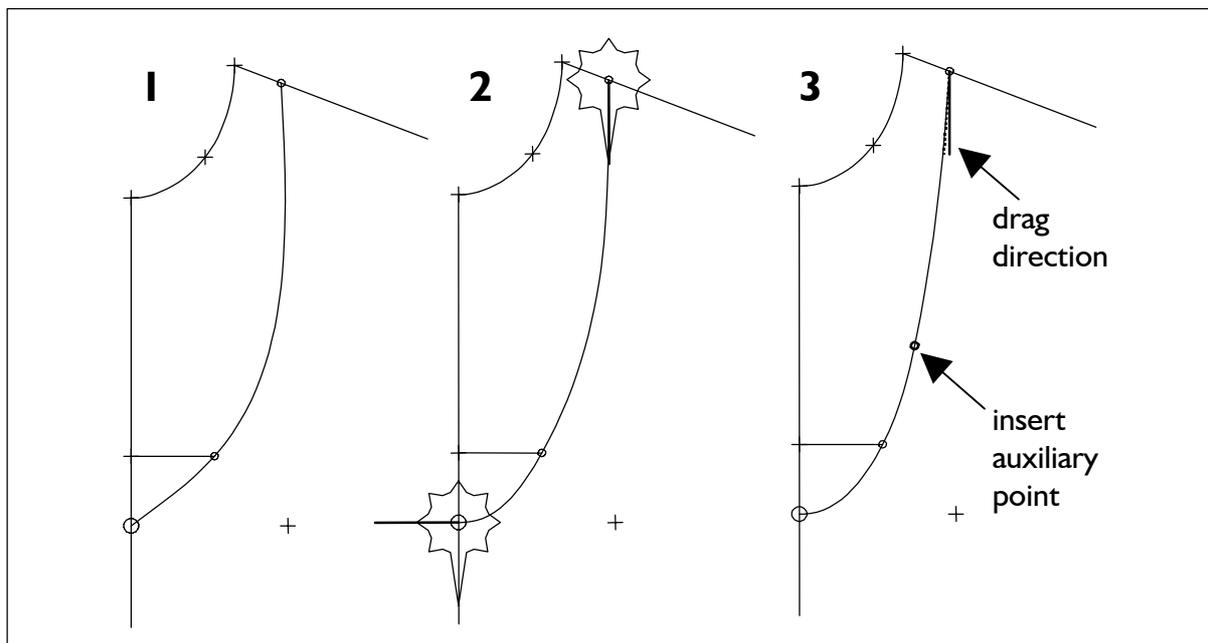
9.2 Curve correction

Existing curve can be corrected at any time (also subsequently) with *Test Run with Curve Correction*. Size-dependent shaping of curves is possible with *Grade with Curve Correction*. Both options are discussed in the following.

Step-by-step guide for curve correction in the base size

- ⇒ Call **Test Run with Curve Correction** from the *Grading* pull-down menu
- ⇒ Selection of curve: GRAFIS shows the correctable curves in their succession of generation. When the required curve is offered select “Yes”, otherwise “No”.
- ⇒ Correct the curve with:
 - *aux. point insert*
 - *delete auxiliary point*
 - *drag auxiliary point*
 - *drag the constructed direction in a base point,*
 - *deposit a direction correction (difference angle da) as x value (see Chapter 11).*

indicate: curve only
size table
aux.point insert
delete
direction: da=>x val
drag
changes: save no save
cancel



Picture 9-4

- ⇒ Aides during curve construction:
- curve length in the GRAFIS Messages window,
 - hide construction with *curve only indicate*, with <F6> the construction reappears.
- ⇒ Quit correction with *changes save*, *no save* or *cancel*.

Correct curve in the base size

For curve correction the same functions are available as discussed in the previous section for curve construction apart from:

- construct base points,
- set free or delete base points,
- assign direction in a base point and
- set free direction in a base point.

The corrected curve can be deposited in your construction with *changes save*. *changes no save* or *cancel* returns to the state before curve correction.

Step-by-step guide for size-dependent curve correction

- ⇒ Call **Grade with Curve Correction** from the *Grading* pull-down menu
- ⇒ Select the curve
- ⇒ As opposed to **Test Run with Curve Correction** the curve is now offered for correction **in all activated sizes in the size table**. Which size is being processed is stated in the status line at the lower edge of the screen.
- ⇒ Correct the curve as discussed
- ⇒ additional support during curve construction with:
- display: size table* This overview shows in which sizes curve shapes were already adjusted. Settings for individual sizes can be deleted from this list. **As a rule, adjustment of the curve shape in the base size plus one small and one large size is sufficient.**
- ⇒ Quit curve correction in the current size with *change save* or *change no save*. GRAFIS continues with correction in the next size. The curve correction operation can be quit with *cancel*. The curve shape in all previously accepted sizes remains existent; curve correction is terminated.

Size-dependent curve correction

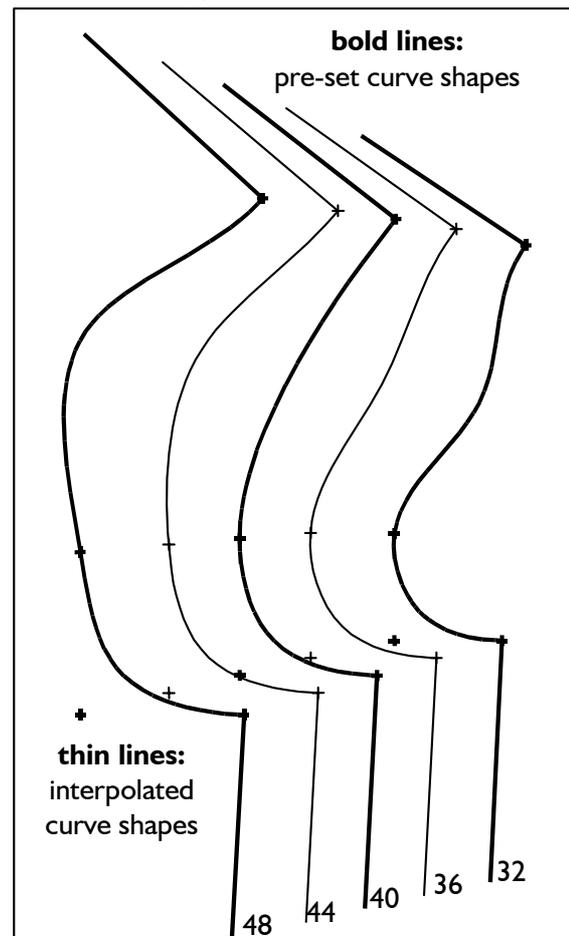
The previously discussed functions for curve correction are now available for all sizes activated in the size table.

It is recommended to adjust the curve in one small size (e.g. 36) and one large size (e.g. 46), only in addition to the base size. The curve shape for all other sizes is calculated through shape interpolation.

Exercise

Construct the armhole curve according to Picture 9-1 and continue the exercise as follows: Start *Grading | Test Run with Curve Correction* and correct the curve with the options stated in the Step-by-step guide (no Picture).

Now, carry out a - highly exaggerated - size-dependent correction according to Picture 9-5. The curve shape is to be adjusted in base size 40 and in sizes 32 and 48. Activate the sizes 40, 32 and 48 in the size table and start *Grade with Curve Correction* from the *Grading* pull-down menu.



Picture 9-5

When the armhole is offered for correction click on “Yes”. The first size offered is base size 40. This size is to remain unchanged. Therefore, click on save without any corrections.

The next size is 32, which you shape heavily to the outside by dragging the auxiliary point, according to Picture 9-5. Quit correction with save.

The next size is 48, which you shape heavily to the inside, according to Picture 9-5. Quit with save.

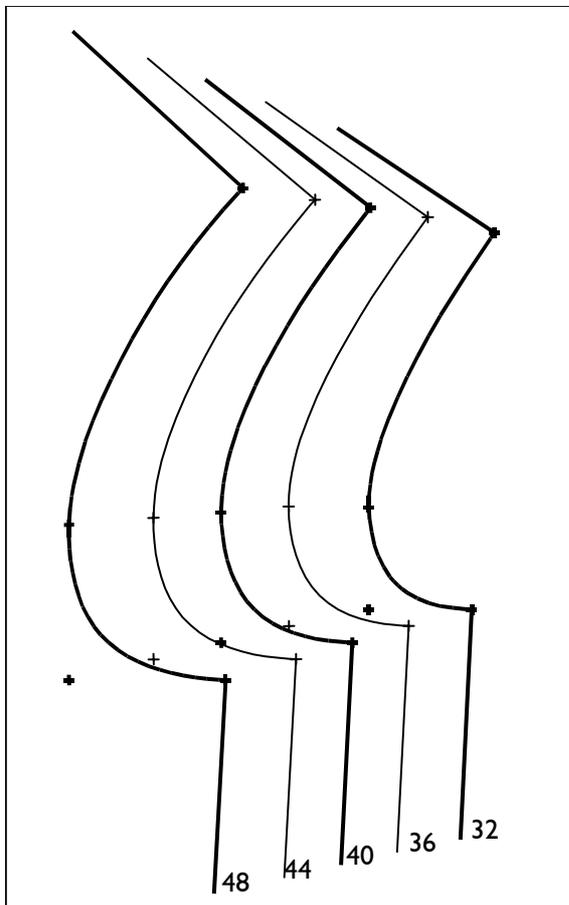
Curve correction is terminated as no other sizes are activated in the size table. The sizes with adjusted curve shapes are shown with bold lines in Picture 9-5.

Now, check the shape of the sizes in between. Enter sizes 36 and 44 into the size table and activate all sizes (40, 32, 48, 36 and 44). Start the *grading* function from the right menu and you obtain the result according to Picture 9-5.

The shape of the armhole was not adjusted in sizes 36 and 44 (thin lines in Picture 9-5). The shape of these curves is the result of shape interpolation of the adjacent sizes. The adjusted shapes in sizes 32 and 48 are evened out for sizes 36 and 44 but can still be detected.

Enter also sizes 34, 38, 42 and 46 into the size table and grade.

Now, correct the armhole in sizes 40, 32 and 48 and create a smooth armhole curve at your discretion.



Picture 9-6

Activate sizes 40, 32 and 48, only in the size table and repeat the previously described steps with a result analogous to Picture 9-6. In Picture 9-6, the curve shape is adjusted in sizes 40, 32 and 48 (bold lines) and calculated through shape interpolation in sizes 36 and 44 (thin lines).

9.3 Point manipulation (poma)

NB: Because of the options of the new curve construction and correction (sections 9.1 and 9.2) the functions in the point manipulation menu are usually no longer required. To complete the picture, they are explained, briefly, but should be used by GRAFIS experts, only.



The poma menu

Alteration of a curve starts from the basic menu by clicking on *poma*. After having clicked the curve to be altered the functions from the *poma* menu are available:

- alteration of base point positions,
- alteration of the direction in base points,
- switch between *+formed* and *-formed*
- switch between *+exact p* and *-exact p*
- clicking *form*
- clicking *refine*

poma

transitn tp
< >
-formed
-exact p
pos-manip.
drag
construct
dir-manip.
drag
construct
unbind p
deposit
-copy

form
refine

reset
measure

Step-by-step guide

- ⇒ Basic menu --> *poma*
- ⇒ Manipulate a curve according to steps 3., 4. and/or 5.:
- ⇒ Alter points after having activated one of the following functions and clicking the curve:
 - Switch between the different transition types
 - Move base point (*drag* or *construct* below *pos-manip*)
 - Alter the direction in a point (*drag* or *construct* below *dir-manip*)
 - Switch between *+formed* and *-formed*
 - Switch between *+exact p* and *-exact p*
 - If the alterations are to be undone: click *unbind p*
 - Adjust *+copy* or *-copy*
 - Terminate by clicking *deposit*

⇒ Activate *form* and click the part of the curve
 ⇒ Activate *refine* and click the part of the curve
 In the following the available options are introduced, individually. To get to know the curve manipulation construct new curves with *curves* and enhance them with *poma*.

Alter points

transition type

Clicking < or > below *transitn tp* switches between the various transition or differential functions.

+/-formed

Further variations of the transition and differential function can be adjusted with this switch.

+/-exact p

Switch means:

-exact p During automatic construction internal curve fulcrums are determined according to their relative length.

+exact p During automatic construction internal fulcrums are determined by counting out.

As a rule -exact p is to be used. Should the curve be a rough polygon with its single points being fulcrums at the same time and a constant number of points throughout all sizes, working with +exact p can be very effective.

pos-manip.

After having activated *drag* or *construct* below *pos-manip.* a point of the curve can be clicked and moved to a different position (dragged or constructed).

dir-manip.

After having activated *drag* or *construct* below *dir-manip.* a curve point can be clicked and its direction can be changed (dragged or constructed).

To drag a direction the distance fulcrum <=> cursor must be greater than 50 mm. If the distance is smaller the line is displayed in red and drag is inactive.

unbind p

Manipulation fulcrums are set free. The fulcrums to be unbound are to be clicked.

deposit

The manipulated curve is deposited/ saved.

+/-copy

+copy The original curve remains existent.

-copy The original curve of the manipulation does not remain existent.

Form curve

After having activated *form*, beginning and end of a part of the curve are to be determined by clicking. GRAFIS cuts out this part of the curve, internally and replaces it with a "mathematical" curve piece.

Refine curve

After having activated *refine* beginning and end of a part of the curve are to be determined by clicking. This part of the curve is refined by reduction of points and interpolation.

Refine curve

This function only applies to patterns output to Gerber layplanners. With this function further grading points are created along a curve.

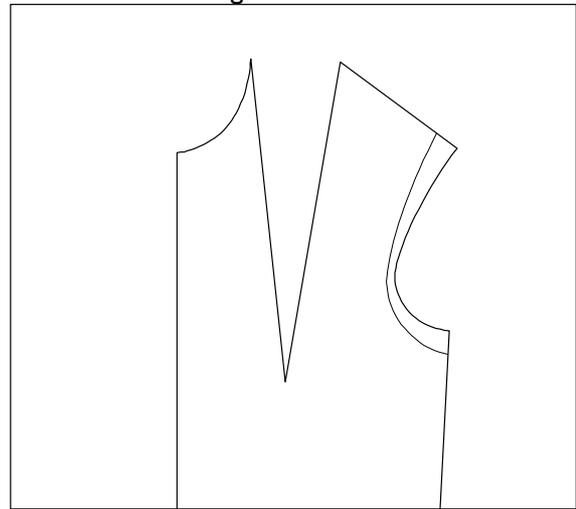
Further functions

Clicking *reset* terminates the current curve manipulation or resets the last construction step.

Clicking *measure* opens the sub-menu *measure*.

Exercise

Call the basic block 001 and manipulate the armhole in the front according to Picture 9-7:



Picture 9-7

call

link

both parts of the armhole curve

poma

+copy

pos-manip.-drag

all three fulcrums

unbind p

all three fulcrums

pos-manip.-construct

set fulcrum on the shoulder with *plg on l* to *lg=100*.

pos-manip.-construct

set fulcrum on the side seam with *plg on l* to *lg=20*.

unbind p

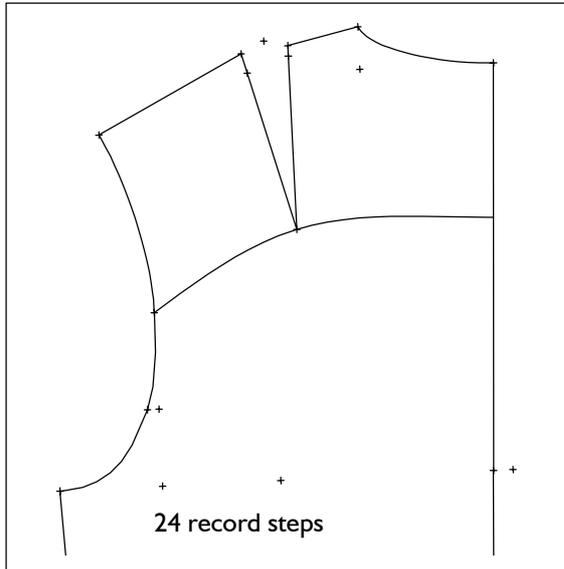
both fulcrums

Manipulate the armhole and neck line further with *form* and *refine*.

9.4 Exercises

1st Exercise

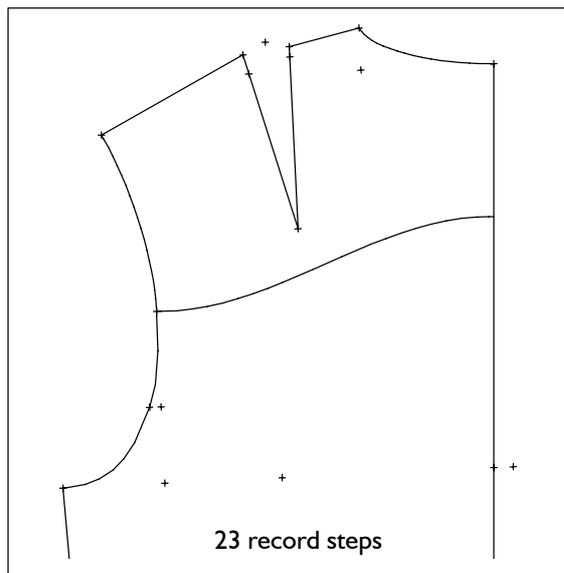
Construct a yoke in the back of basic block 001. The yoke is to run through the vertex of the shoulder dart (see Picture).



- call*
- delete*
- modify* adjust part vertically
- p+l+c+r* construct shoulder dart
- separate* remove dart hood
- curves* curve from upper armhole notch to centre back (80 mm from neck), right angle at centre back

2nd Exercise

Construct a yoke in the back as in 1st Exercise, but ending horizontally at centre back and armhole notch.

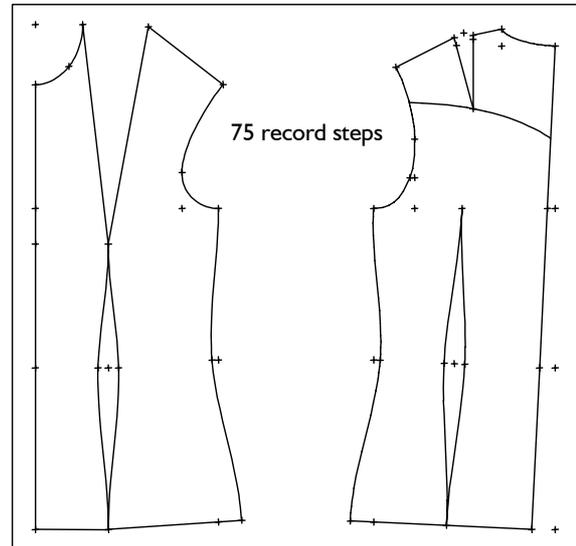


- call*
- delete*
- modify* adjust part vertically

- p+l+c+r* construct shoulder dart
- separate* remove dart hood
- curves* curve from upper armhole notch to centre back (80 mm from neck), direction horizontal, respectively (base direction 0°)

3rd Exercise

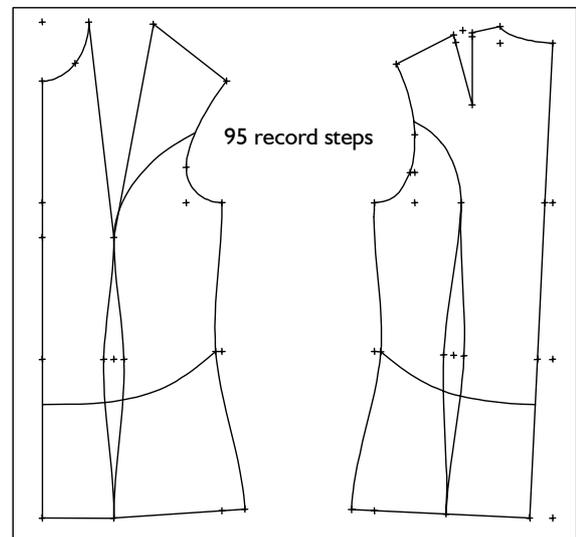
Construct the waist darts and new side seams in basic block 001 with the *curves* function.



- call*
- curves* waist darts
- delete* old side seams
- curves* new side seams, right angle to hem and armhole, respectively
- p+l+c+r* shoulder dart back
- separate* remove dart hood
- curves* yoke from the centre of the upper armhole curve to the centre back (120 mm from neck); angle at centre back: 60°; bind to the vertex of the shoulder dart

4th Exercise

Construct the waist darts and new side seams as in



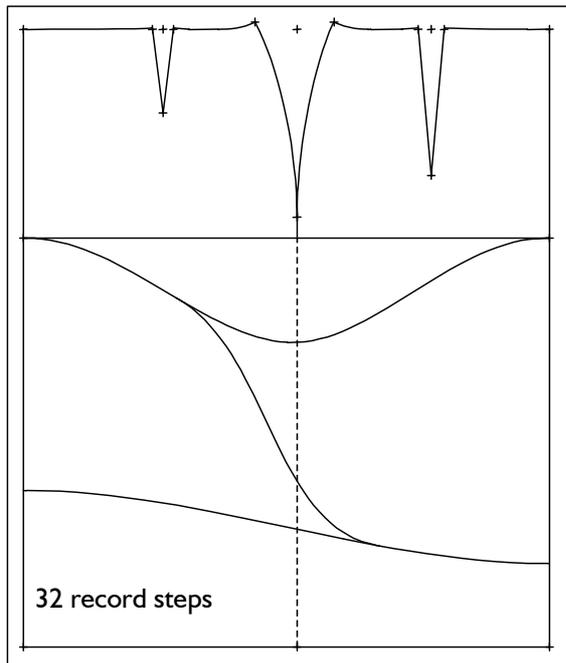
3rd Exercise. Continue the construction with a princess line in front and back and a style line for a panel in the hip area.

<i>call</i>	
<i>curves</i>	waist darts
<i>delete</i>	old side seams
<i>curves</i>	new side seams
<i>p+l+c+r</i>	shoulder dart bk
<i>separate</i>	remove hood
<i>curves</i>	princess lines, starting 80 mm from the shoulder on the upper armhole
<i>curves</i>	style lines at hip, starting at the waist point of the side seam and ending 150 mm from the hem at a right angle to centre front and centre back, respectively

5th Exercise

Construct the hip line in basic block 017 and draw style lines, roughly as shown:

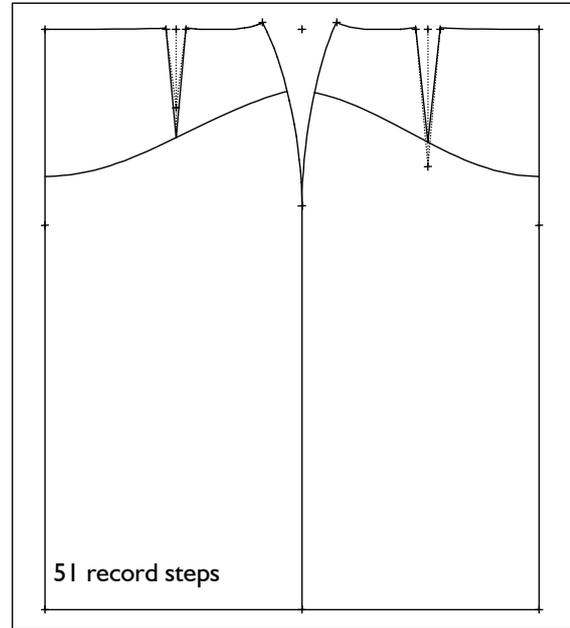
- two curves at right angle to centre front and centre back,
- a further curve which runs tangentially into the existing curves.



<i>call</i>	
<i>p+l+c+r</i>	construct hip line
<i>curves</i>	curve from hip point CF to hip point CB; bind curve to the side seam 120 mm from hip
<i>curves</i>	start at CF 150 mm from hem, end at CB 80 mm from hem at right angle, respectively
<i>curves</i>	tangential curve
<i>separate</i>	side seam
<i>attributes</i>	

6th Exercise

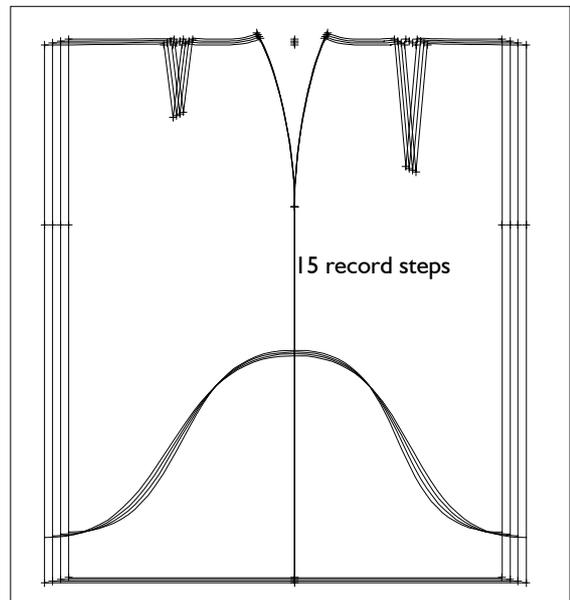
Construct a yoke in front and back of basic block 017 „skirt“, starting at the side seam (75 mm from waist), ending at the centre front and centre back 150 mm from waist, respectively. Lengthen or shorten the darts to the yoke.



<i>call</i>	
<i>curves</i>	yokes
<i>p+l+c+r</i>	construct bisector of the dart
<i>separate</i>	cut bisector of the dart at the yoke
<i>p+l+c+r</i>	new darts
<i>attributes</i>	

7th Exercise

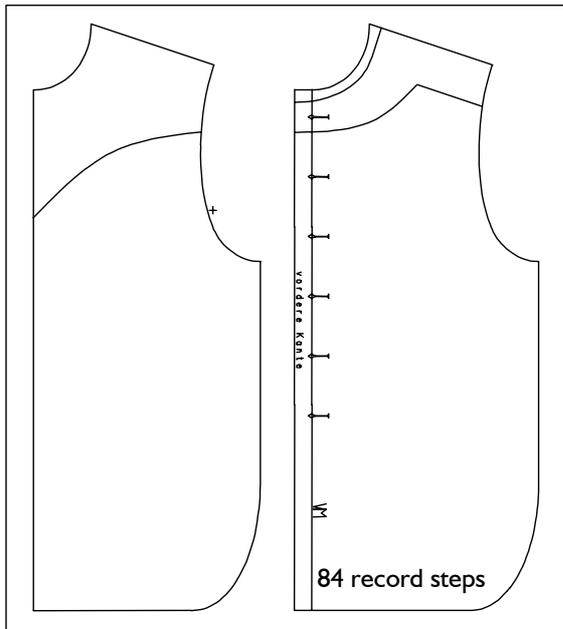
Construct a separate panel in the lower part of basic block 017 for contrast fabric. The panel is to run into centre front and centre back 50 mm from the hem and touch the side seam 250 mm from the hem.



call
curves
grading

8th Exercise

Construct a blouse with the left or right yoke option from basic block 010 „shirt blouse“. In the left option, the curve starts at the upper armhole curve 80 mm from the shoulder and ends at the centre front 150 mm from the neck.



In the right option, the neck was dropped by 15 mm at the front and shoulder and extended at the front edge. The 80 mm long yoke line starts at the armhole 50 mm from the shoulder and runs parallel to the shoulder. At the final point of this line, a curve starts, ending at the centre front 50 mm from the neck.

call
delete
corners
curves
side seam

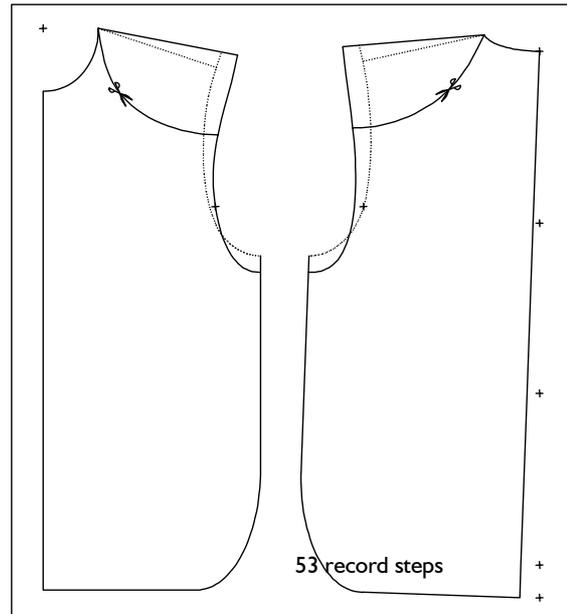
for the right option instead of curves:

parallel 20 mm to centre front
curves drop neck
 $p+l+c+r$ yoke line
curves yoke to centre front
raster
symbols
texts

9th Exercise

Construct a blouse with round yoke from basic block 010 „shirt blouse“ and

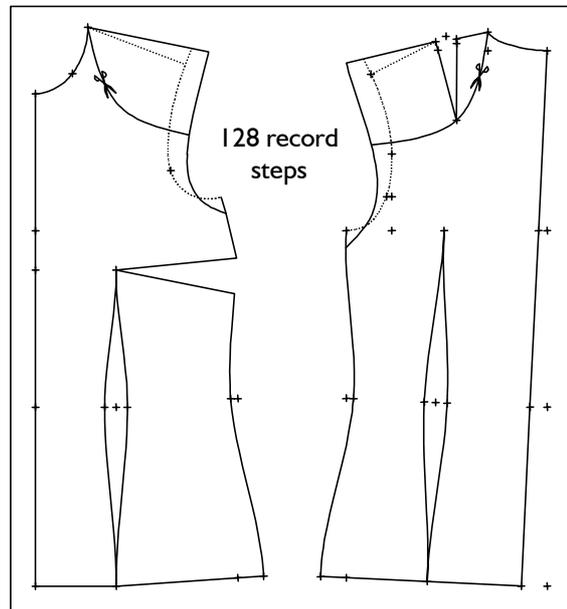
- extended shoulder by 20 mm,
- lifted shoulder by 20 mm,
- dropped armhole at side seam by 20 mm.



call
corners
lengthen
 $p+l+c+r$
curves
symbols

10th Exercise

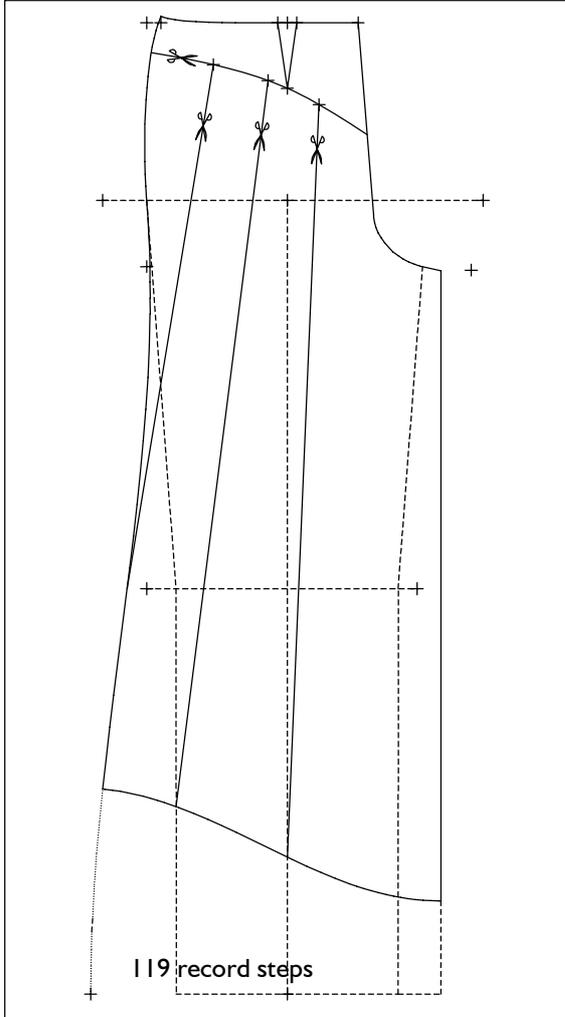
Construct the blouse from 9th Exercise from basic block 001 “bodice after Hohenstein”.



call
curves
 $p+l+c+r$
separate
modify
lengthen
 $p+l+c+r$
curves
symbols
side seam and waist dart
shoulder dart back

11th Exercise

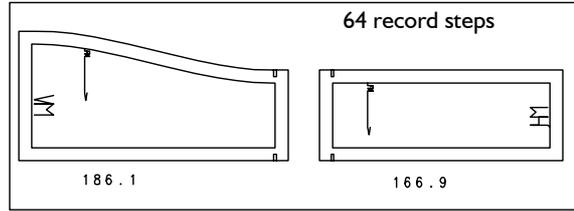
Construct the trouser shown from basic block 008 "trouser a. Hohenstein" with pleats, yoke and shortened, flared and rounded leg. Extend the crotch seam by 20 mm. The yoke is to start at the side seam 40 mm from the waist and end at the centre front (120 mm from the waist). The leg is flared 90 mm at the side seam. The inside leg seam is to be vertical.



- call
- delete
- lengthen
- $p+l+c+r$ hip line,...
- curves new hem (at side seam 220mm from hem, inside leg 100mm from hem at right angle, respectively)
- curves yoke (at side seam 40 mm from waist, at centre front 120 mm from waist)
- separate attributes
- $p+l+c+r$ points for pleat lines with $p+d$ on l and $d=60$.
- symbols

12th Exercise

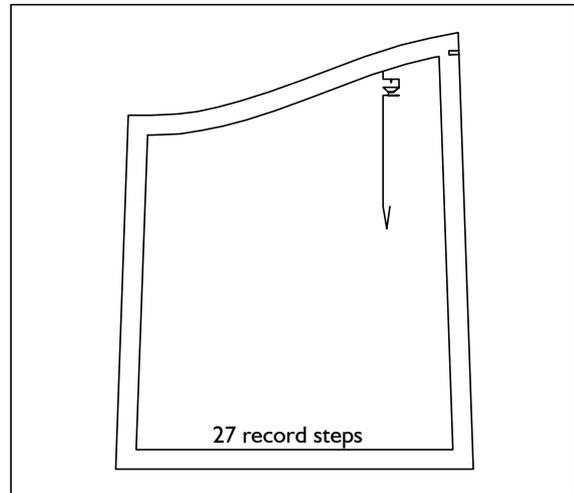
Construct a skirt waistband for size 38. Consider the length of the waist line, especially.



- $p+l+c+r$
- lengthen
- curves
- parallel
- corners
- symbols

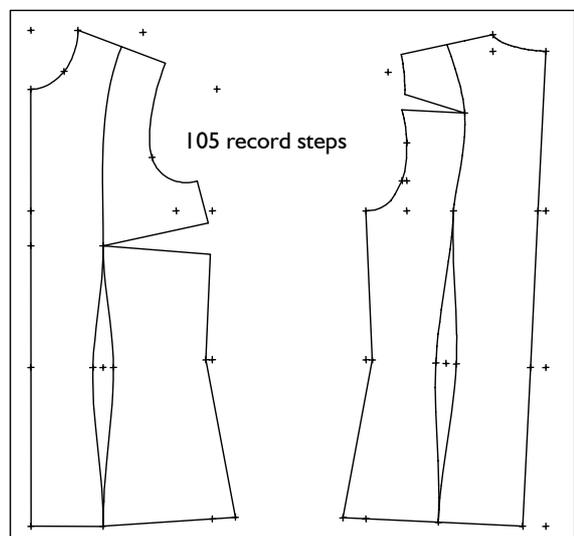
13th Exercise

Construct the patch pocket shown.



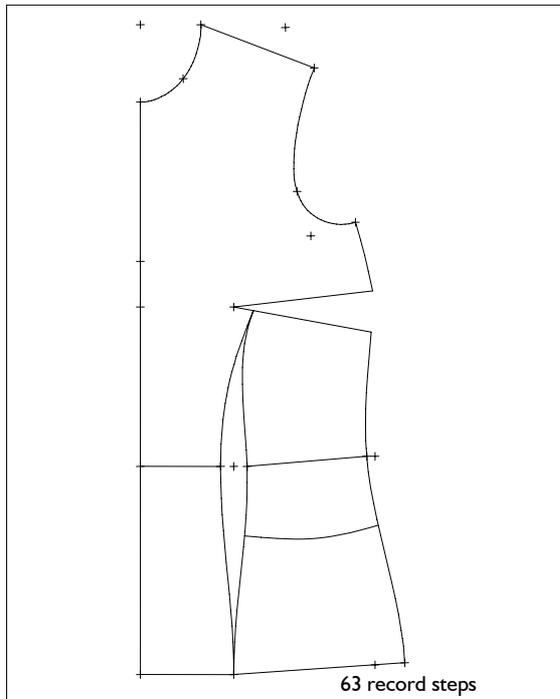
- $p+l+c+r$ construct sides at 89° angle to lower edge
- curves
- parallel
- symbols

14th Exercise



18th Exercise

Construct the waist dart in basic block 001 "bodice after Hohenstein" after having relocated the bust dart into the side seam. The waist dart is to start at the dart line 20 mm from the bust point. The curve in the side panel is to start and end 1/3 of the waist dart and 1/3 of the side seam, measured from the waist, respectively.



<i>call</i>	back
<i>delete</i>	new side seam
<i>curves</i>	old side seam
<i>delete</i>	relocate dart
<i>modify</i>	waist dart
<i>curves</i>	waist dart and side seam
<i>separate</i>	curve in side panel
<i>curves</i>	