Chapter 10 "Transformation"

**Content**

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Transformation of objects, such as move, turn or mirror are essential construction tools you will find in any CAD system. Only with the transformation functions can yokes be relocated or other pieces be positioned in the construction or mirrored. Each explanation of the 8 transformation types is followed by an exercise.

The emphasis in this chapter lies on the complex exercises. Invest plenty of time into these exercises to gain confidence in the use of GRAFIS.

After having finished this chapter you should begin to design your own styles with GRAFIS to gain practical experience.

This chapter forms the end of the GRAFIS I teaching complex. In the following teaching complex GRAFIS II you will learn about modifying styles with construction parameters, work with parts, heredity automatic and generation of production patterns.

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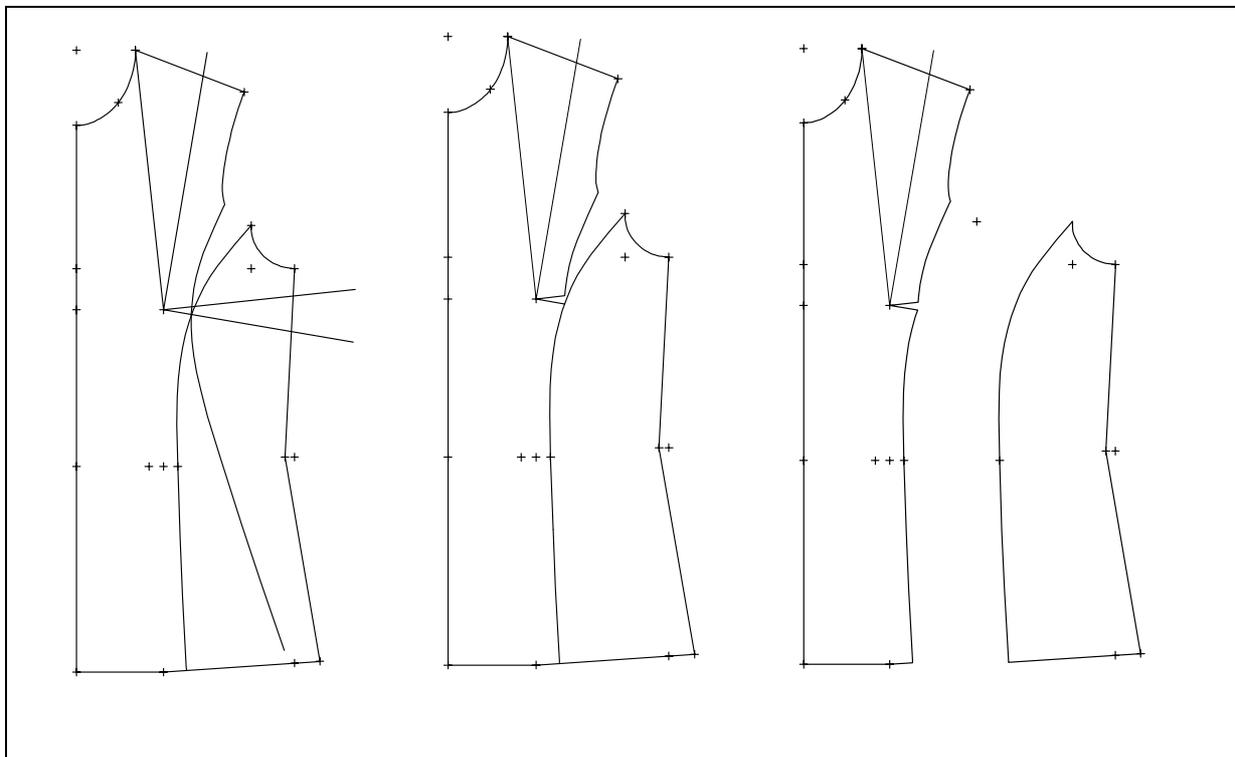
10.1 Transformation

The *transform* menu

The functions of this menu allow for moving, rotating, scaling and mirroring of GRAFIS objects. The eight transformation types are:
- 2 move transformations
- 2 turn transformations
- 1 turn and move transformation
- 1 scale transformation
- 2 mirror functions

Object types

You can transform:
- the complete part,
- points -individually-,
- lines -individually-.

Step-by-step guide

⇒ Adjust the transformation parameters
⇒ Select the type of object (*part, points,...*)
⇒ Activate the transformation
⇒ Adjust *+/-copy:* the original objects remains/ does not remain existent
⇒ Set the transformation direction with *+/-rev trans.* transformation in reverse/ normal direction (e.g. change of sign for set angle). No significance with *mirror*!
⇒ Click the objects to be transformed.

Further functions

reset　　　resets the last transformation step
measure　　calls the *measure* menu for measuring distances,...

The explanation for the individual transformation types follows:

move (Dx,Dy)

This move function (translation) with preset values requires the entry of the move value in x direction Dx and y direction Dy (Picture 10-1). A detailed explanation on the co-ordinate system can be found in chapter 4.3. The move values can be positive or negative:

　　Dx= - ....mm　　　　to the left
　　Dx=+ ....mm　　　　to the right
　　Dy= - ....mm　　　　downwards
　　Dy=+ ....mm　　　　upwards
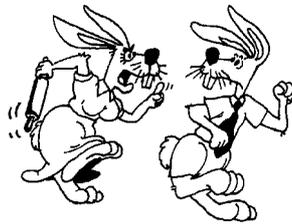
```
      transform
   ---------------
   move
    Dx=200.
    Dy=  0.
   move
    p==>p
   turn
    turnp. +
    ang=90.0
   turn
    tp+p=>p
   turn+move
   p+p=>p+p
   scale
    Fx=1.000
    Fy=1.000
   mirror
    p==>p
   mirror
    click I

   +rev trans.
   ---------------
   What ? :
    part
    only points
    only lines
   ----------------
   -copy
   reset
   measure
   ----------------
```
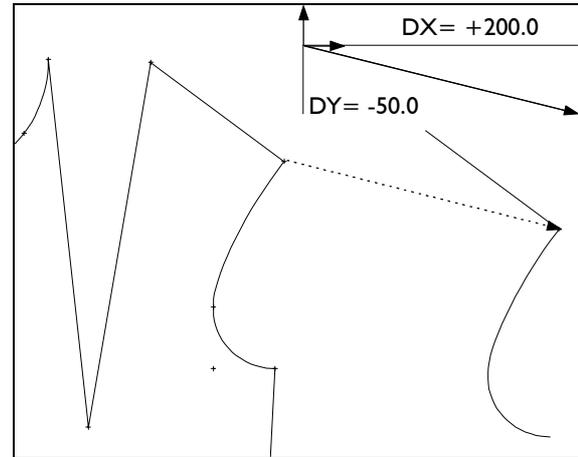
Exercise

Move the shoulder and armhole in basic block 001 by Dx=+200 and Dy=-50 (Picture 10-1).
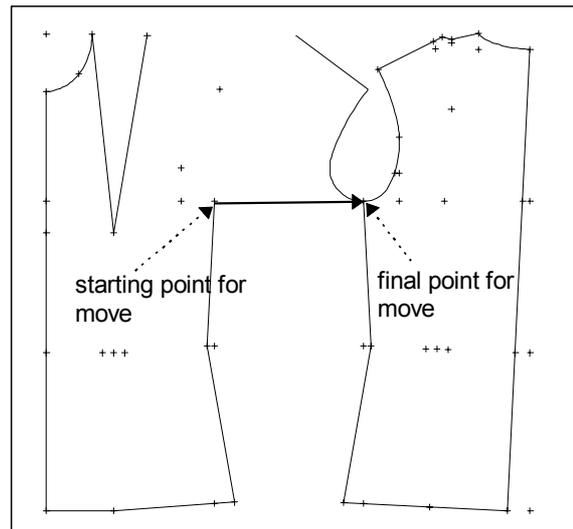

Picture 10-1

```
call
transform
    Dx=+200.              enter
    Dy=-50.
    only lines
    +copy
    -rev trans.
```
Click the shoulder and both parts of the armhole.
    only points
Click the corresponding points.

move p==>p

The objects are moved about the connecting line between two points of the construction (Picture 10-2).

Picture 10-2

After having clicked *p==>p* the starting and final point of the move line have to be constructed. Then, the line *move* (with *p==>p*) is active and the move of objects can begin.

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Exercise

Move the front armhole to the back armhole (Picture 10-2).

> *transform*
>> *p==>p*   click
>>> *intersectn* click armhole ft and side seam
>>> *intersectn* click armhole bk and side seam
>> *only lines*
>> *-copy*
>> *-rev trans.*

Click the shoulder and both parts of the armhole.

> *only points*

Click the corresponding points.

>> *+rev trans.*

Click the points just moved.

> *only lines*

Click the lines just moved.

The objects are positioned at their original position. Switch also between + and *-copy*. Refresh the screen with <F4>, if necessary. Grade the construction.

turn with turnp. + ang

With the transformation function "turn with turning point and angle" the objects are rotated about a constructed pivot point by a given angle (Picture 10-3).

Note: The set angle remains constant throughout all sizes !
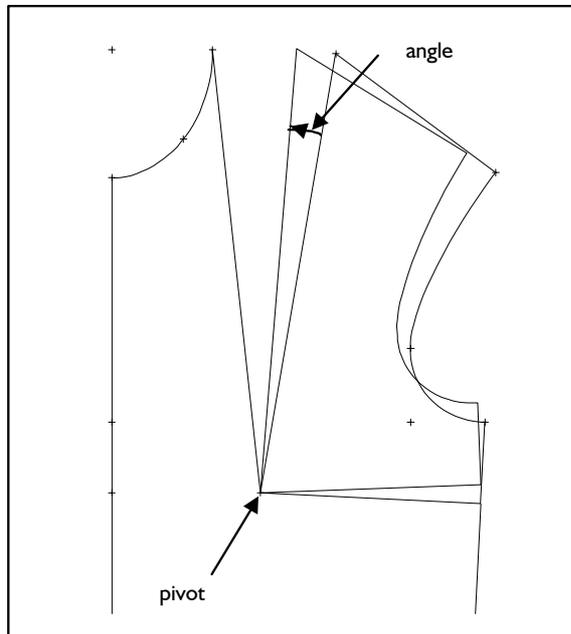
Picture 10-3

After having activated *turnp.+ang* the pivot point is to be constructed and the angle in ° is to be entered. Then, the line *turn* (with *turnp.+ang*) is active and turning of objects can begin.

Exercise

Relocate 5° of the bust dart into the side seam (Picture 10-3).

> *call*
> *p+l+c+r*
>> *perp. p => l*   perpendicular onto side seam
> *transform*
>> *turnp.+*   click
>>> *click p*   click bust point
>>> *ang=5.*   enter
>> *only lines*
>> *+copy*
>> *-rev trans.*

Click the shoulder, both parts of the armhole, the (bust) dart line and the new dart line in the side seam.

> *only points*

Click the corresponding points.

Relocation is terminated. Test the function also with:

> *-copy*
> *+rev trans.*

Click the points just rotated.
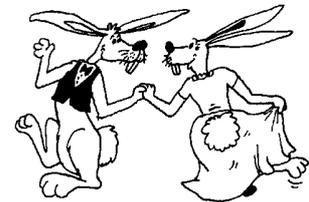
> *only lines*

Click the lines just rotated.

The objects are lying on top of each other at their original position (<F4>).

Grade the relocated dart in 4 sizes.

turn tp+p=>p

This transformation rotates the objects about a constructed pivot point. The angle is determined by the angle between turning point -> starting point of the rotation angle and turning point -> final point of the rotation angle.

After having activated *tp+p=>p* the points are to be clicked in the following order: turning point --> starting point of the angle --> final point of the rotation angle. Then, the line *turn* (with *tp+p=>p*) is active and the rotation of objects can begin.

Exercise

Relocate the bust dart into the sleeve notch (see Picture 10-4).

> *call*
> *p+l+c+r*
>> *p==>p*   auxiliary line between bust point and sleeve notch
> *transform*
>> *tp+p=>p*   click
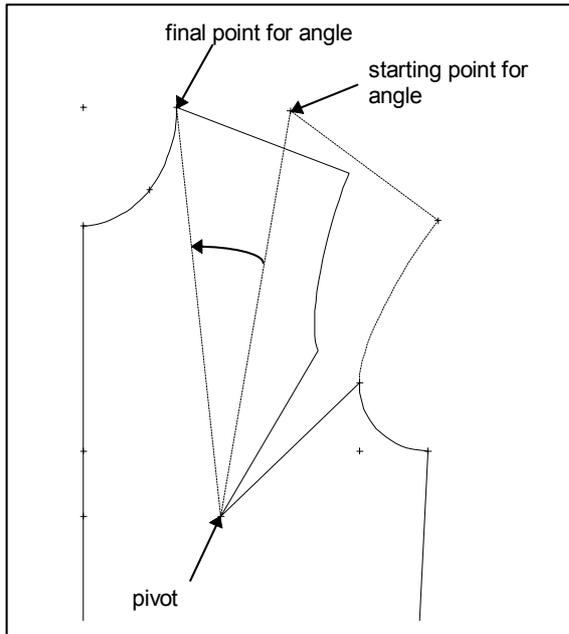>>> *click p*   click bust point
>>> *click pl*   right dart line
>>> *click pl*   left dart line

_____

Picture 10-4

only lines
+copy
-rev trans.

Click the shoulder, both parts of the armhole and the new dart line in the sleeve notch.

Rotate the corresponding points and then practise the reverse transformation with *rev trans*.

turn+move p+p=>p+p

The objects are moved and rotated in one operation. For this function four points are to be clicked. The move vector is defined by its starting and final point (Picture 10-5 top). The rotation angle is defined by the moved starting point and the final point of the angle (Picture 10-5 bottom).

After having activated *p+p=>p+p* the points are to be clicked in the order: starting point of the move vector, starting point of the rotation angle, final point of the move vector, final point of the angle. Then, the line *turn+move* (with *p+p=>p+p*) is active and the transformation of objects can begin.

This function is especially useful for relocating yokes or relocating the shoulder seam to the front.

Exercise (41 record steps)

Turn and move a yoke in the back according to Picture 10-5.

• Set the record to 001.
• Relocate the darts in front and back. Construct the relocation point of the back dart as the intersection of the vertical to the left dart line and the armhole.
• Construct the style line for the yoke.
• Separate the centre back.
• Transform the yoke.
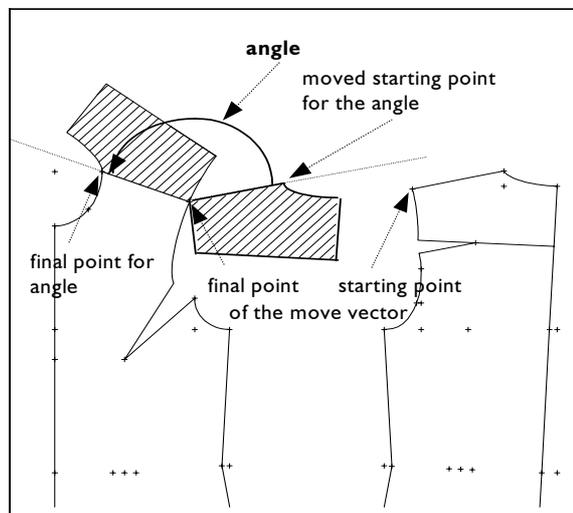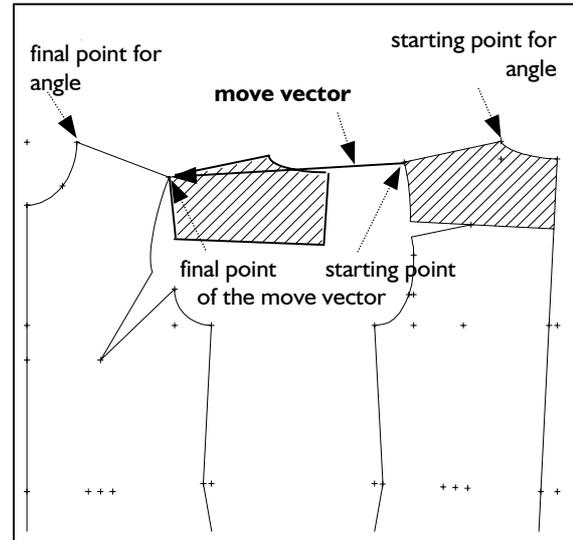
Picture 10-5

N=...
N*reset
test run
modify
    relocate dart
p+l+c+r
separate
transform

p+p=>p+p	click
click p	starting point for move
click p	starting point for rotation
click p	final point for move
click p	final point for rotation
only lines	
+copy	
-rev trans.	

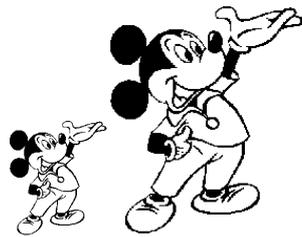Click the construction lines of the back yoke.
Transform the corresponding points.

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Scale

The objects are reduced and increased relative to absolute zero (Picture 10-6).

The factor Fx=... applies to the x component of the objects only, the factor Fy=... to the y component. Increase/ reduction/ stretching/ shrinking of the pattern is required for stretch material for example, lining or under collar or for the correction of changes in length after washing. The following applies: Fx=Fy=1.00 - no change in scale; Fx=1.10, Fy=1.00 - stretching of the pattern by 10% in horizontal direction; Fx=Fy=0.90 - shrinking by 10% in all directions.

Different values in Fx and Fy distort the construction in width and height. The same values increase or reduces the construction to scale; Fx=Fy=0.5 halves the dimension of the construction and Fx=Fy=2 doubles it.
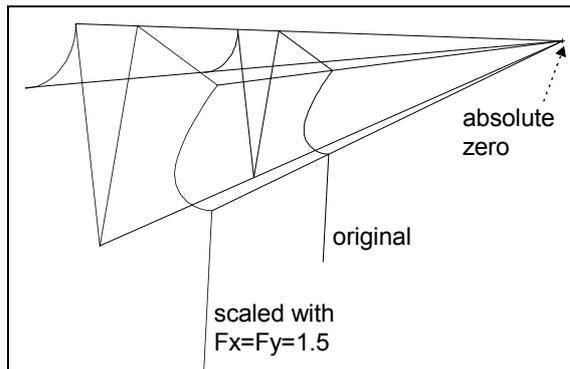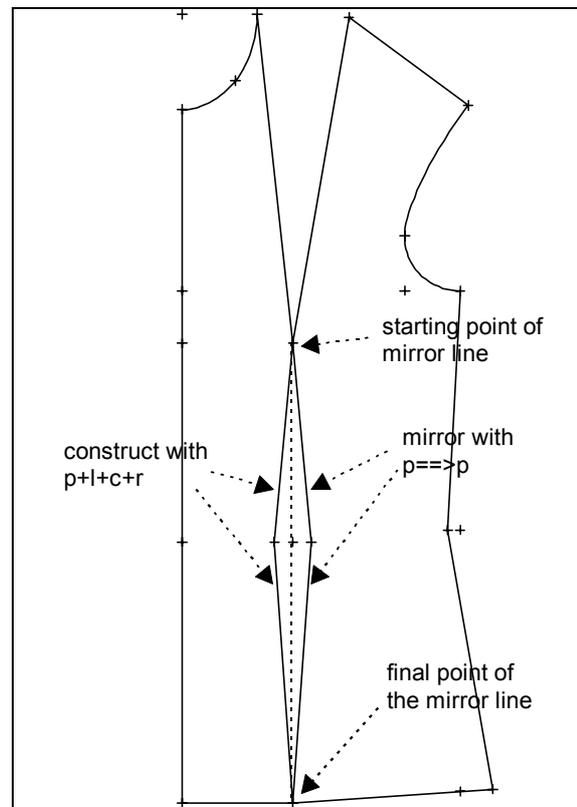
Picture 10-6

Exercise

Increase the front by the factor 1.5 (Picture 10-6).

> *N=...* set record to 001
> *N*reset*
> *test run*
> *delete* back
> *transform*
> > *Fx=1.5*
> > *Fy=1.5*
> > *scale* activate
> > *only lines*
> > *+copy*
> > *-rev trans.*

Click the lines of the front individually. Reset the record to 002 and repeat with the values Fx=1.00 and Fy=1.10. Increase the lines of the front again.

mirror p==>p

The objects are mirrored at the connecting line of two points (Picture 10-7).

Picture 10-7

To activate this function the line *p==>p* (below *mirror*) is to be clicked and the points of the mirror line are to be defined with the sub-menu point construction. Then, the objects to be mirrored can be clicked.

Exercise

Mirror lines in the front
- Reset record to 002
- Construct the left waist dart line in the front with *p+l+c+r* and mirror it at the symmetry line of the dart.

> *N=...* set record to 002
> *N*reset*
> *test run*
> *p+l+c+r*
> *transform*
> > *p==>p*
> > > *click p* starting point of the mirror line
> > > *click p* final point of the mirror line
> > *only lines*
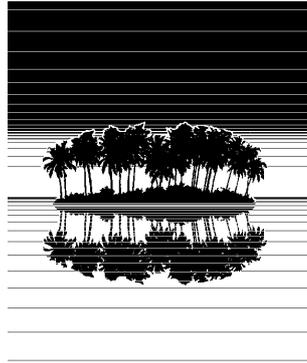> > *+copy*
> > *-rev trans.*

Click the dart lines to be mirrored.
Define another mirror line and keep practising.

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mirror with click l

The objects are mirrored at an existing line of the construction (Picture 10-8).

To activate this function the line *click l* is to be clicked and the mirror line is to be defined. Then, the objects to be mirrored can be clicked.

Exercise

Mirror the front at the centre front

N=...	set record to 002
N*reset	
test run	
transform	
click l	click CF
only lines or *part*	
+copy	
-rev trans.	

mirror line
with click l

6 record steps
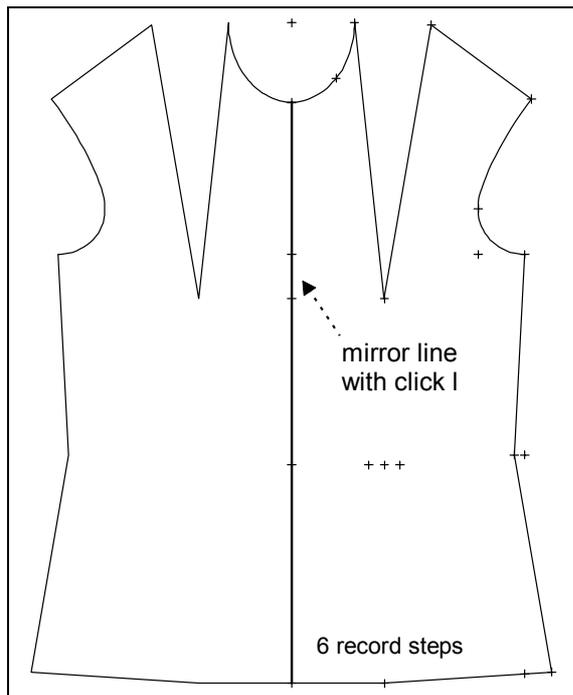
Picture 10-8

Click the lines and points to be mirrored or the complete part. If you mirror the part the centre front is doubled and cannot be seen. In this case delete one centre front.

Define another mirror line and keep practising.

10.2 Complex Exercises

1st Exercise

Move front and back skirt of basic block 017 apart with the values Dx=100. and Dy=0.
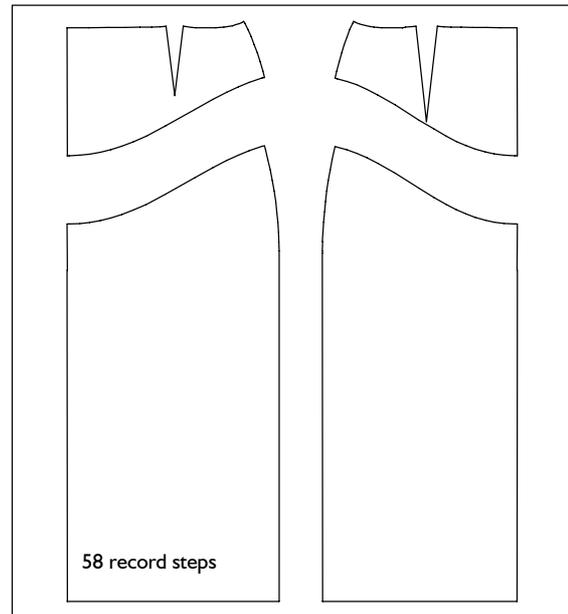
21 record steps
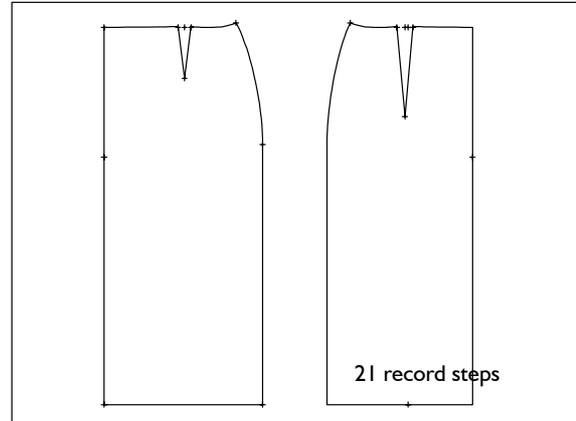
call
separate
transform

2nd Exercise

Construct a yoke in front and back skirt of basic block 017 "skirt after Hohenstein", shorten the dart in the back and move the pieces apart with Dx=50 and Dy=80.
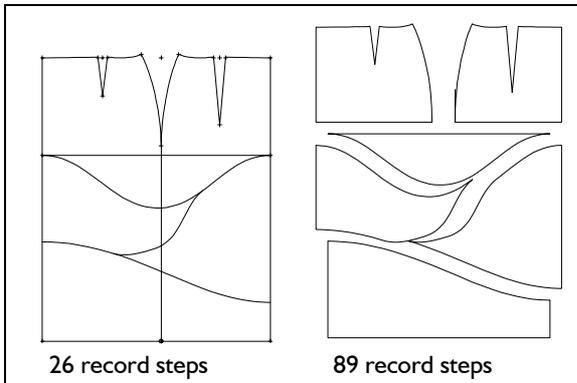
58 record steps

call
curves
p+l+c+r
delete
transform

_____

3rd Exercise

Construct two curves between CF and CB in basic block 017 and bind another curve onto these new curves. Separate and move the individual areas.

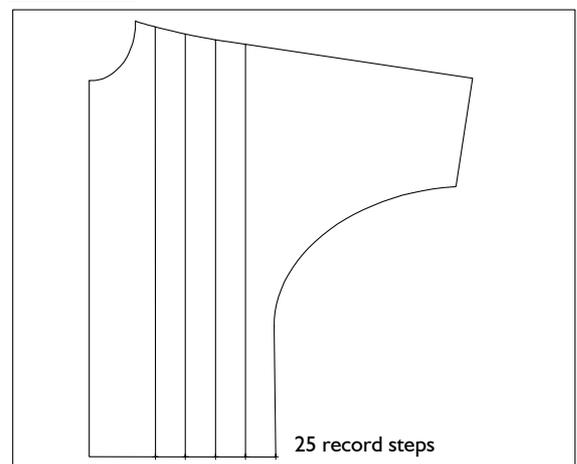| 26 record steps | 89 record steps |

call
p+l+c+r
curves
separate
transform

4th Exercise

In basic block 001 move the front to the back so that they touch at the hem (left image). Move the front to the back so that they touch at the armhole (right image).


| 10 record steps | 12 record steps |
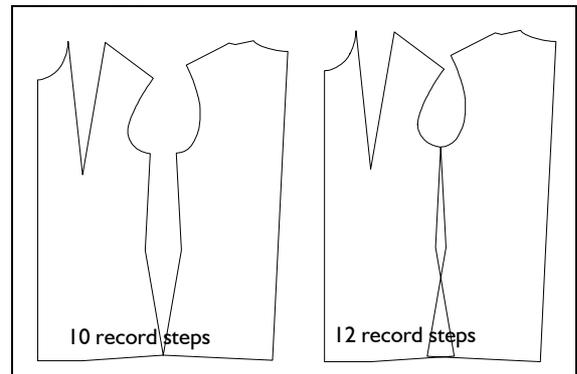
call
transform
   move p=>p

5th Exercise

25 record steps

Construct three lines for pleats in the front of kimono block 009. Use the transformation function *move p=>p*.

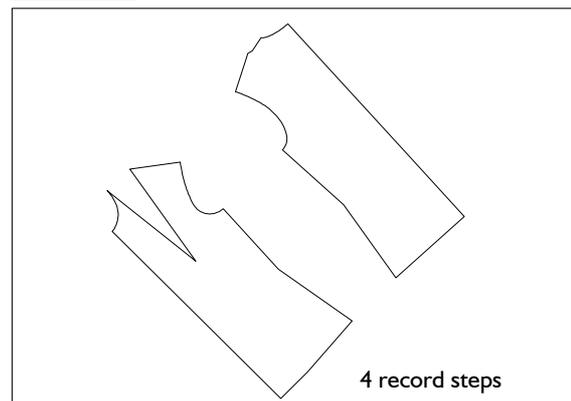| *call* | |
delete	
separate	sleeve
p+l+c+r	perpendicular from shoulder point
raster	
raster4	
transform	
move p=>p	move perpendicular
separate	

6th Exercise

Move the dart in basic block 017 "skirt" to 1/3 of front and back width. To do this, construct lines from hem to waist and move the darts onto those lines.

23 record steps
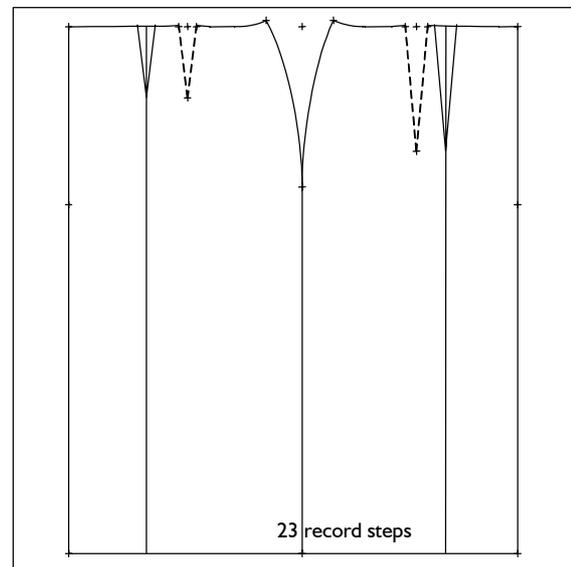
call	
separate	hem at side seam
p+l+c+r	auxiliary lines at 1/3
separate	
transform	
move p=>p	move darts
curves	

7th Exercise

4 record steps

_____

Delete the points in basic block 001, define the bust point as pivot point and rotate the front and back by 45°.
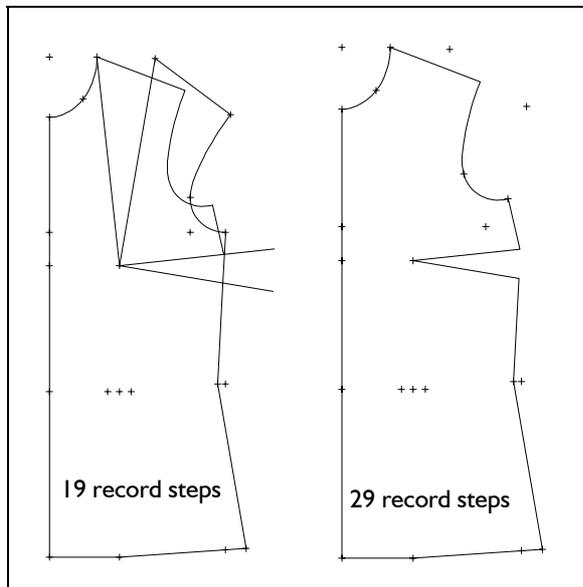
> *call*
> *transform*

Define other turning points and angles and continue practising. Switch also between *+copy* and *-copy*.

<u>8th Exercise</u>

Relocate the dart in basic block 001 "on foot" into the side seam.

- Construct auxiliary line for the new dart with *p+dir+lg* for example
- Move the dart:
  pivot =   bust point
  starting point =   top end of right dart line
  final point =   top end of left dart line
  Rotate the dashed lines and the auxiliary line.
- Treat the corners and generate the right image. Grade the construction.

19 record steps   29 record steps

> *call*
> *p+l+c+r*
> *separate*
> *transform*
> > *tp+p=>p*
> *corners*
> *grading*

<u>9th Exercise</u>

Relocate the dart in basic block 001 (ft) "on foot" into the side seam, construct the lines displayed. Move and turn the pieces according to the image. Relocate 50% of the new dart into the waist dart.

> *call*
> *p+l+c+r*   construct auxiliary line
> *separate*   separate side seam
> *transform*
> > *tp+p=>p*
> *separate*
> *transform*
> > *move(Dx=0., Dy=-25.)*
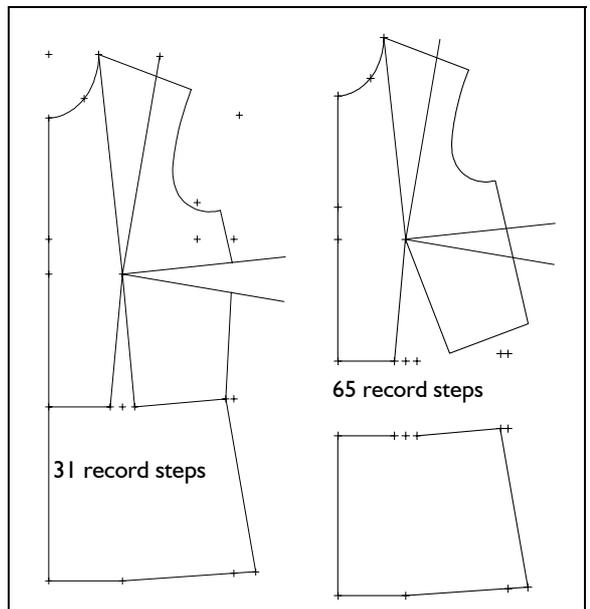

71 record steps

37 record steps
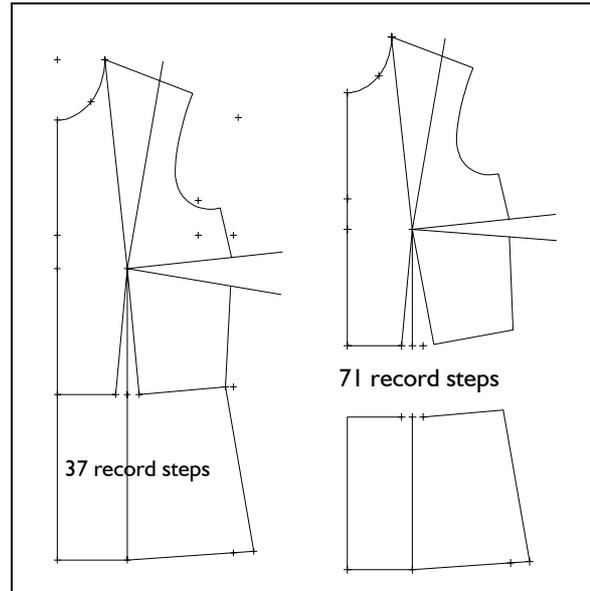
> *tp+p=>p*
> *separate*
> *grading*

<u>10th Exercise</u>

Construct a separation in the waist in basic block 001 (ft). Proceed as in Exercise 9. As opposed to Exercise 9, the complete dart is to be rotated into the waist dart.

65 record steps

31 record steps

> *p+l+c+r*
> *separate*
> *transform*
> > *tp+p=>p*
> *separate*
> *transform*
> > *move(Dx=0., Dy=-25.)*
> > *tp+p=>p*
> *grading*

_____

11th Exercise

Align the back of basic block 001 vertically.

8 record steps
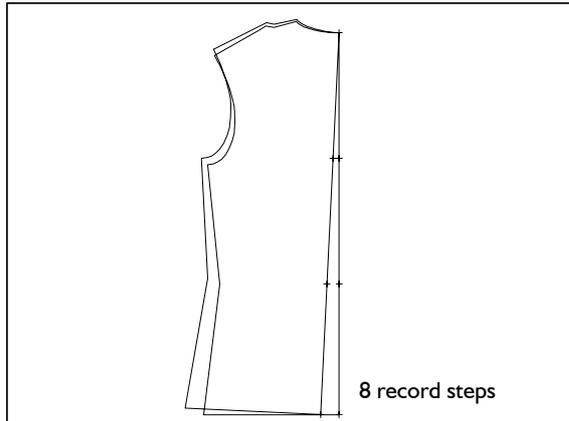
> *transform*
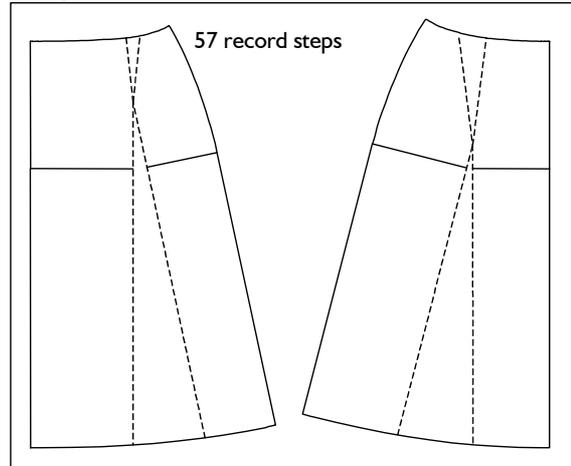> > *tp+p=>p*

12th Exercise

Construct a yoke in basic block 017 "skirt" starting at centre front and centre back 150 mm from the waist, ending at the side seam 75 mm from the waist. The yoke is to be bound to the vertex of the dart in the back. Lengthen the dart in the front to the yoke. Pivot the darts close.

52 record steps
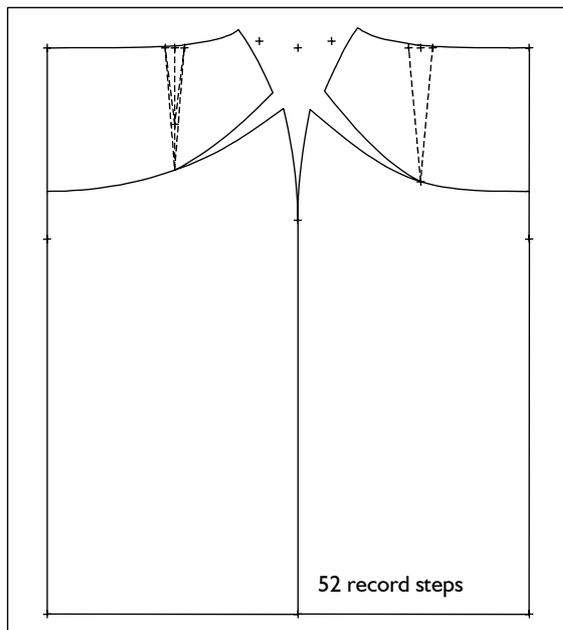
> *call*
> *curves*
> *p+l+c+r*
> *separate*   yoke and side seam
> *transform*
> > *tp+p=>p*

13th Exercise

Construct the shown flared skirt (through pivoting darts) from basic block 018 „skirt".

57 record steps

> *call*
> *separate*
> *transform*
> > *move* with *Dx=250* and *Dy=0*
> *p+l+c+r*   separation line with perpen-
> >   dicular
> *separate*   hip line and hem
> *transform*
> > *tp+p=>p*   close dart
> *curves* or *link with curve*

14th Exercise

Construct a princess line in basic block 001 "bodice after Hohenstein". Rotate the bust dart into the panel seam. Then, move the side panel away from the front (not shown).

36 record steps
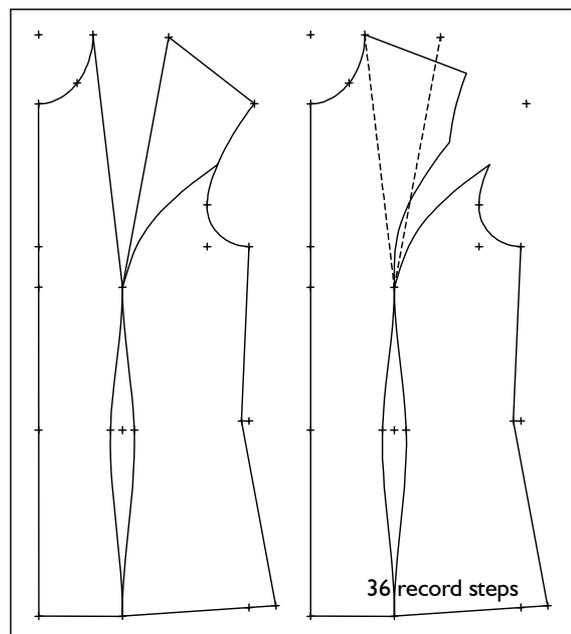
> *call*
> *delete*
> *curves*
> *transform*

_____

15th Exercise

Construct a princess line into basic block 001 as shown.

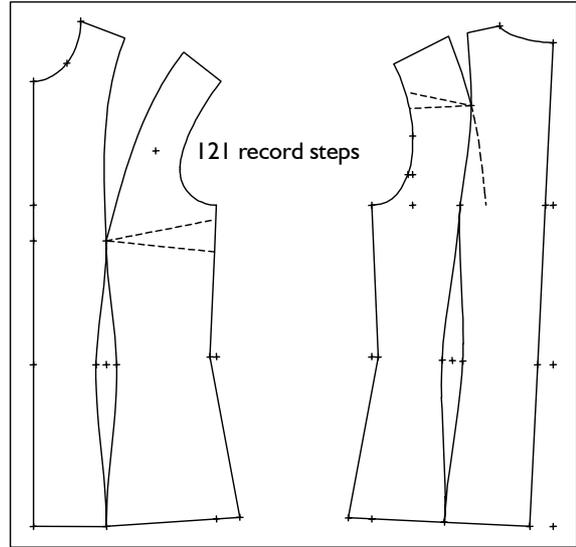24 record steps   28 record steps

44 record steps
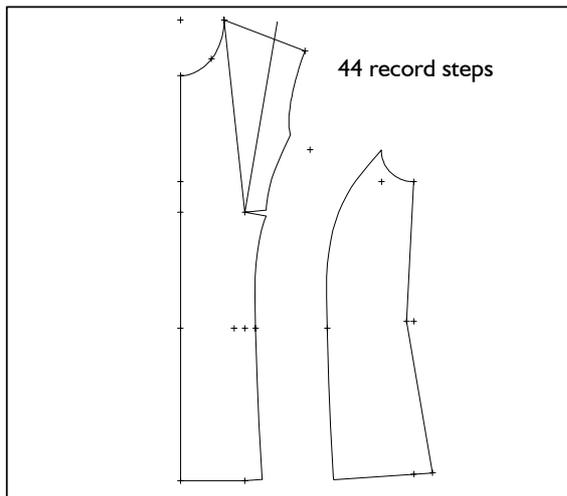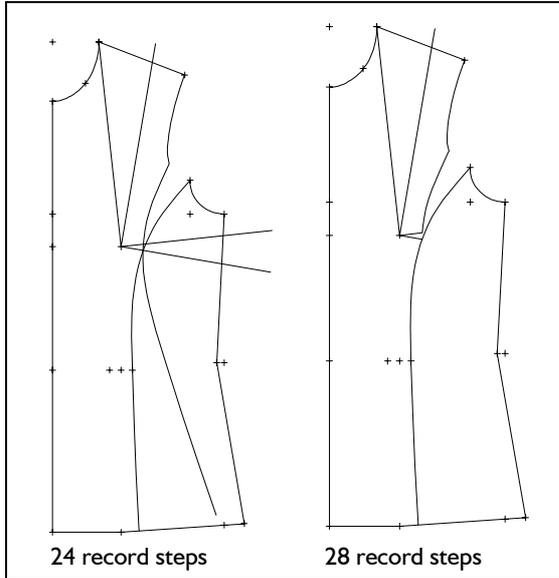
call
delete
p+l+c+r
modify
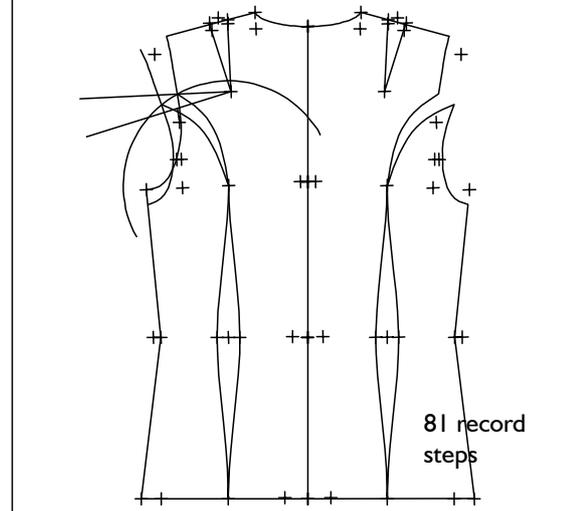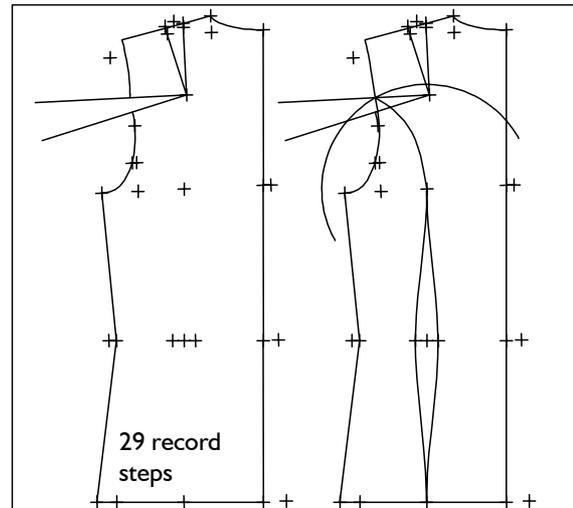*curves*
transform
delete

16th Exercise

Construct panel seams in front and back as in 14th Exercise from Chapter 9.4. Then, rotate the bust and shoulder dart into the respective panel seam.

call
p+l+c+r
separate
modify
link
curves
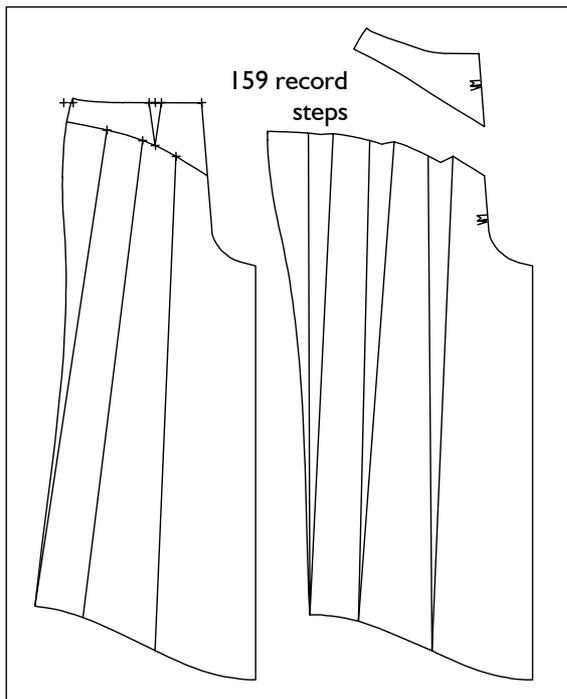*separate*
transform

121 record steps

17th Exercise

Relocate the shoulder dart of basic block 001 "bodice after Hohenstein" into the armhole to drop the armhole. Construct a princess line starting at the intersection armhole / dart insert point. Drop the armhole by rotating the new armhole about the top end of the waist dart.

29 record steps

81 record steps

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call	
delete	
p+l+c+r	construct dart
separate	remove dart hood
p+l+c+r	auxiliary line for insert position of dart
separate	upper armhole curve
transform	close dart (extra width in arm-hole)
link	new armhole curve
curves	waist dart, princess line
p+l+c+r	circle arc
separate	circle arc at princess line
transform	
tp+p=>p	mark amount of extra armhole width on circle arc
corners	
delete	

18th Exercise

Continue the 11th Exercise from Chapter 9.4 by moving the yoke and closing the dart. Construct pleats in the trouser front with 40 mm width at the yoke.
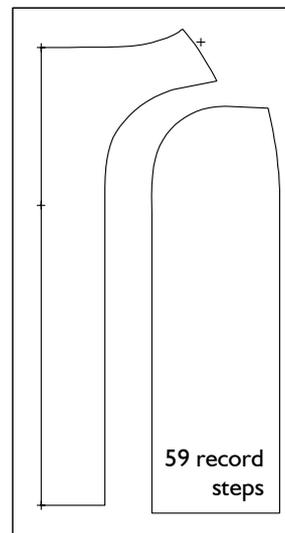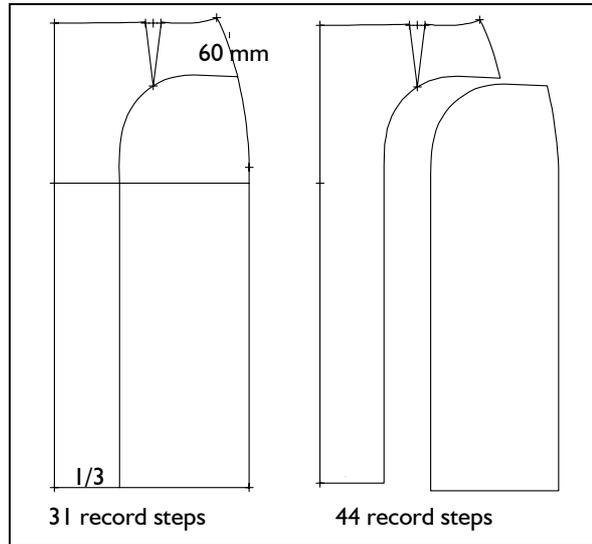

159 record steps

after the steps of 11th Exercise from Chapter 9.4:

transform
pleats
   spread
pleats
   dart hood
symbols

19th Exercise

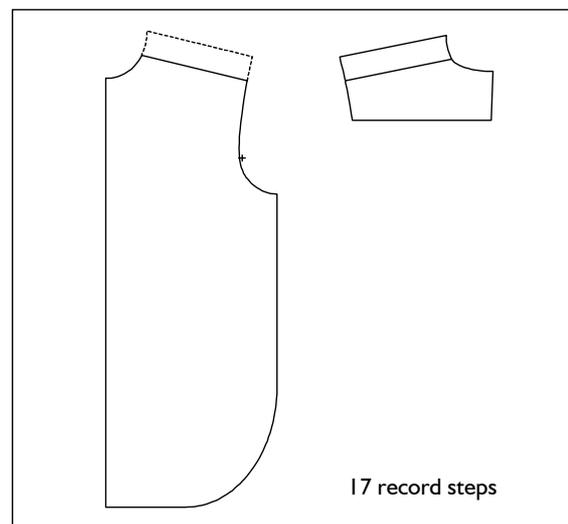Construct a curve in skirt 017 according to the image. To conclude, close the dart.

60 mm

1/3

31 record steps   44 record steps

call
p+l+c+r
curves
separate
transform
delete

59 record steps

20th Exercise

Author: Frau Prof. Brückner, Berlin

Relocate a front yoke to the back yoke in basic block "shirt blouse".

17 record steps

_____

call
p+l+c+r   draw yoke in the bk
   p+d on line (d=80.)
   p+dir+lg (lg=200.)
separate
delete
corners   cut-away
   curves
parallel (d: 40.)   draw yoke in the ft
separate
   cut
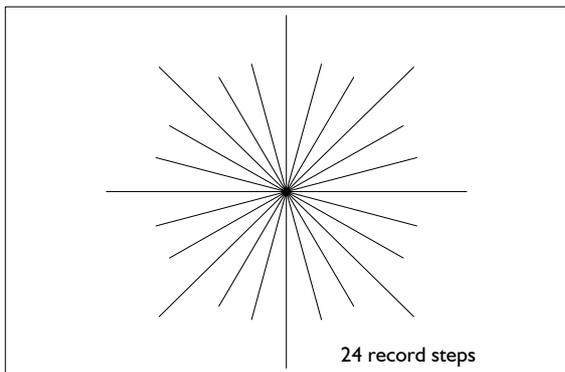*transform*   ft yoke to bk yoke
   p+p=>p+p

21st Exercise

Relocate the shoulder of basic block 001 to the front by 30 mm.

52 record steps
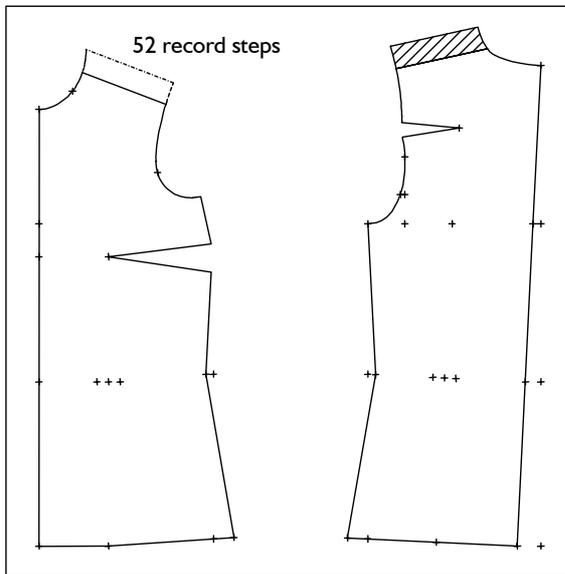
call
modify
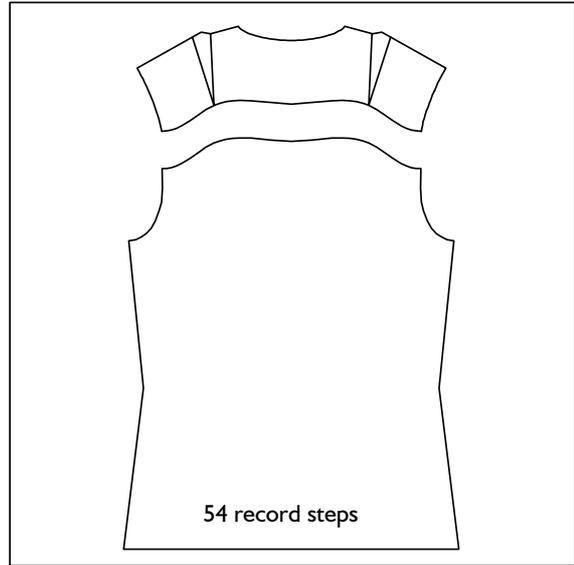*parallel*
separate
link
transform   ft-->bk

22nd Exercise

Construct a quarter of the star with *p+l+c+r* and generate the remaining quarters with the mirror function in *transform*.
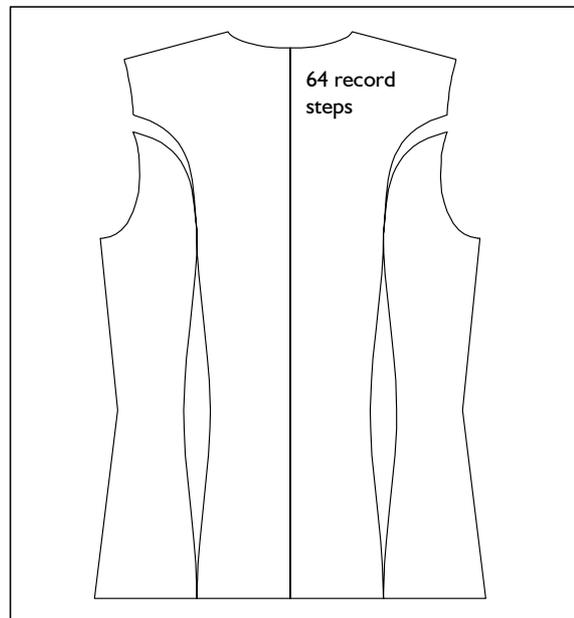

24 record steps

23rd Exercise

Construct a yoke in the back of basic block 001, align the CB vertically and mirror the part at the CB.

54 record steps

call
delete
curves
transform
   tp+p=>p
   mirror

24th Exercise

Construct the mirrored back shown.

64 record steps

call
p+l+c+r   darts and auxiliary line
separate
curves
transform
   mirror

_____

25th Exercise

Delete the front of basic block 001 "bodice after Hohenstein" and construct the shoulder dart. Pivot 100% of the dart into the hem for an A-line shape. Draw a yoke from the middle of the neck to the middle of the upper armhole curve. Separate a 75 mm wide panel at the hem. Move the pieces apart, mirror them and set symbols.

98 record steps
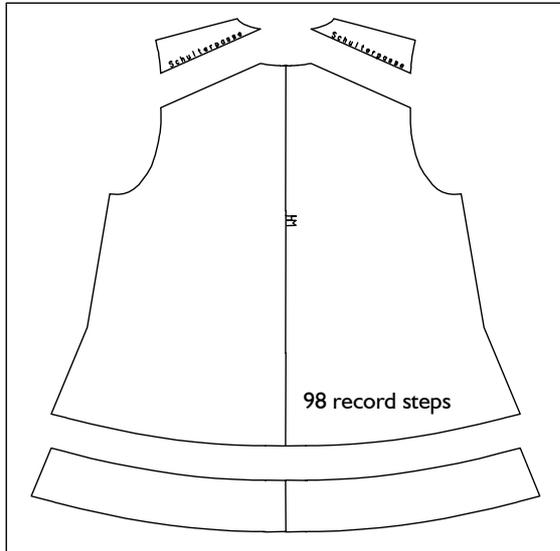
call
delete
p+l+c+r
separate
modify
link
delete   all points
p+l+c+r
parallel
separate
transform
   move
   mirror
symbols
texts

26th Exercise   Author: B.Götting, Mönchengladbach

Construct the princess line shown in the front of basic block 001.

   call
   delete   back
   curves   draw princess line
   transform
     tp+p=>p   turn dart into the seam
   symbols   set notches
   texts   CF, grain
   delete   auxiliary lines, points
   transform
     move   move pieces apart
   corners

44 record steps

VM FDL
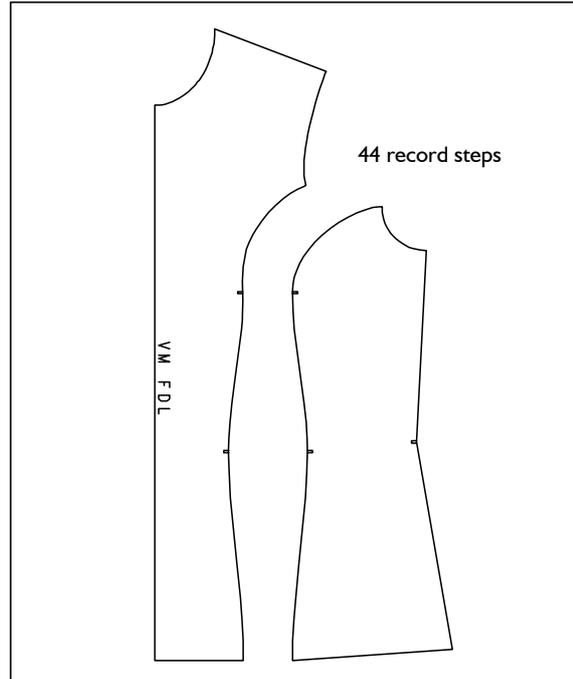
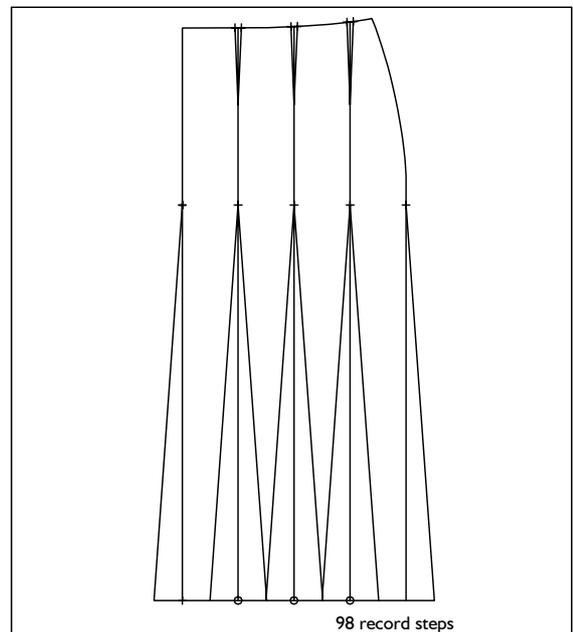## 27th Exercise

Author: B.Götting, Mönchengladbach

Modify the basic block "straight skirt (ft)" into a flared skirt with 4 panels in the front. The skirt is to be flared by 60 mm per panel. The dart is divided into the panel seams; its length remains constant.

98 record steps

Draw style lines and relocate the dart:

   call
   raster
     raster1 (N=5)
   p+l+c+r   draw style lines
   curves   draw new waist
   separate   lengthen style lines
   p+l+c+r
     p+d on line (d=3.3) construct new dart
   delete   auxiliary lines

_____

Flare skirt hem:
 separate   separate hem
 p+l+c+r
  p==>p   draw flares
   click p
  plg on l (plg=30.) hem
 lengthen   lengthen hem line by 30
           mm outwards each side
 p+l+c+r   draw new CF and side
           seam

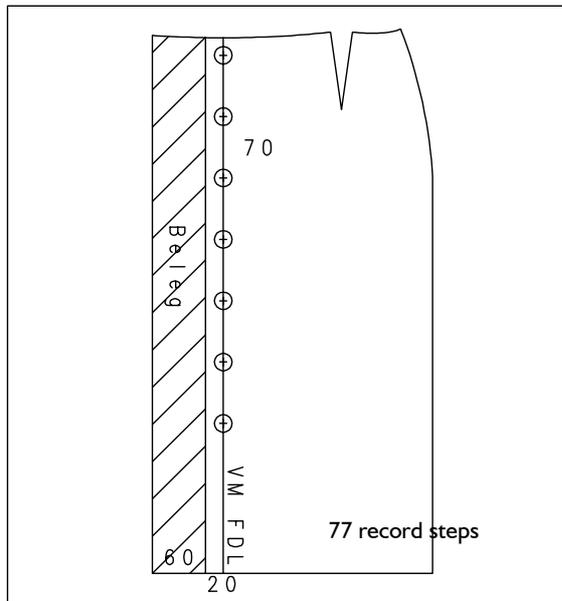Separate the pattern pieces:
 transform
 corners

116 record steps   190 record steps
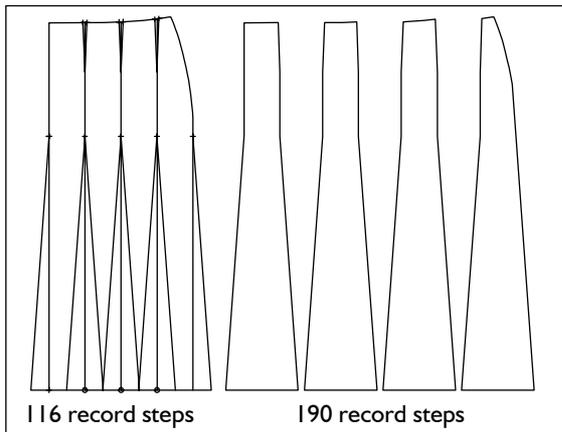
28th Exercise
      Author: B.Götting, Mönchengladbach

Construct a grown-on button stand in the front of basic block "straight skirt" with 20 mm button catch, 60 mm facing and 7 buttons.


77 record steps

 call
 parallel
  d=20.   button catch
  d=60.   facing

 transform
  mirror   mirror waist line
 raster
  raster3 (N=7, d=70., s=20.)
 texts
 hatching
 symbols

29th Exercise
      Author: B.Götting, Mönchengladbach

Create the following style with separate pleat from the front skirt of basic block 018 or alternatively the right skirt with two pleats.


20 record steps 45 record steps 44 record steps
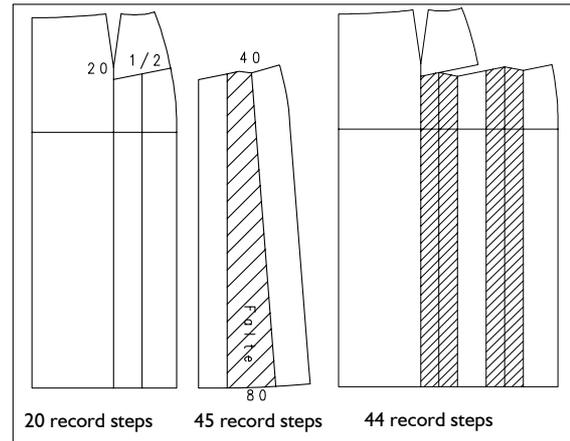
 call
 p+l+c+r
  p==>py
  perp p=>l   perpendicular onto the
           hem
   plg on l with *plg=20*
           perpendicular onto the
           side seam
  p==py
   rlg on l with *rlg=50*
 transform
  move (Dx=150.)
 pleats
  spread with *click l*
   s1=40.
   s2=80.
  single hood
 *link with curve*   draw hem

30th Exercise

Call the basic block 001 and develop a batwing sleeve. Relocate 100% of both bust and shoulder dart into the hem and link the hem lines respectively.

Call the basic block 004 „one-piece sleeve" and construct a vertical auxiliary line from the sleeve head (shoulder point).

_____
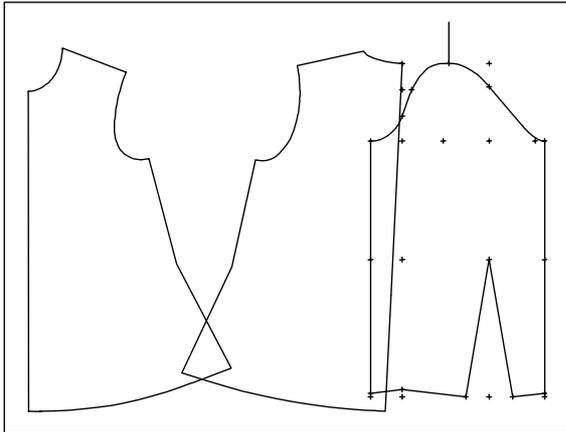
Move front and back to the auxiliary line at the sleeve head.

51 record steps
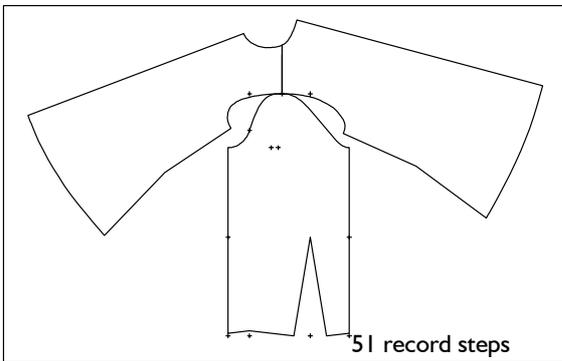
Generate front and back sleeve seam, vary the curve shape and the assigned directions. Both sleeve seams still have different lengths. Correct this with the function *lengthen to* and *forming*.

71 record steps
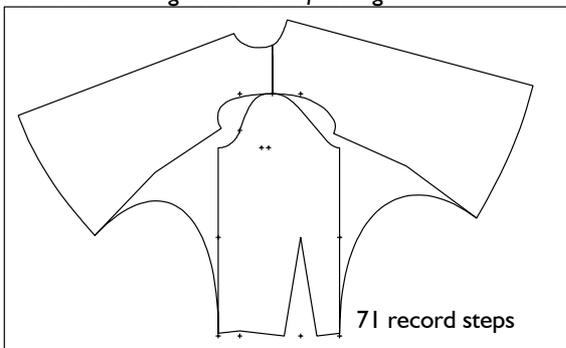
call
modify
link
delete
call   sleeve
p+l+c+r
transform
curves
lengthen
grading

Note: with this construction the sleeve seam has the same length in all sizes. With the use of construction parameters x or z value (teaching complex GRAFIS II) the length is to be adjusted size-dependently.

31st Exercise

Call basic block 008 "trouser after Hohenstein" and mirror the trouser back at an auxiliary line 300 mm from the front.
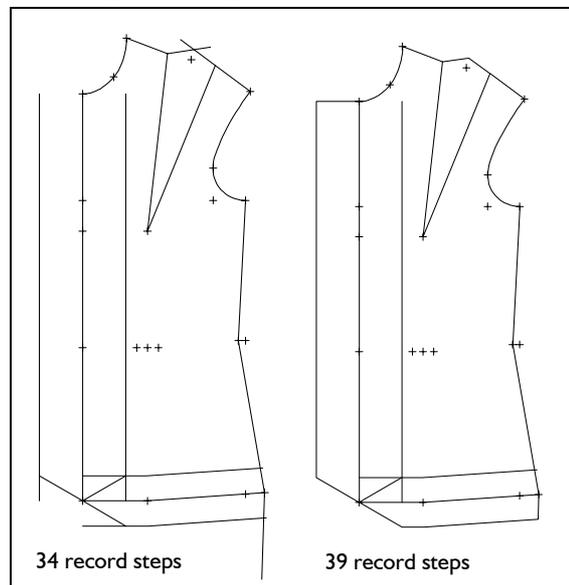
32 record steps
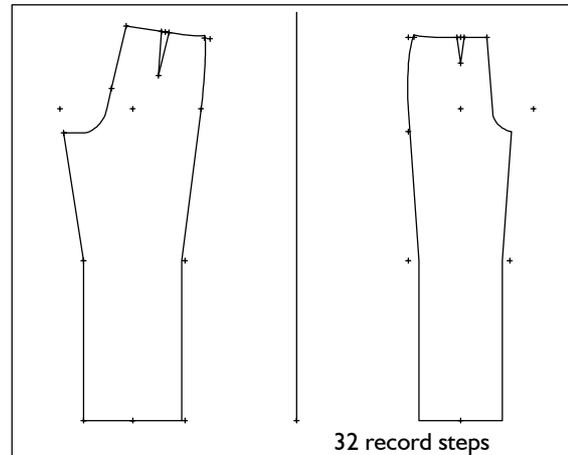
call
p+l+c+r
transform
grading

32nd Exercise

Style the basic block 001 "bodice a.H.w. normal dart":
- mirrored hem at the front,
- miter at the hem and
- a mirrored dart hood for the relocated dart, noting the folding direction.

34 record steps   39 record steps

call
delete
parallel
modify
p+l+c+r
transform
attributes
corners
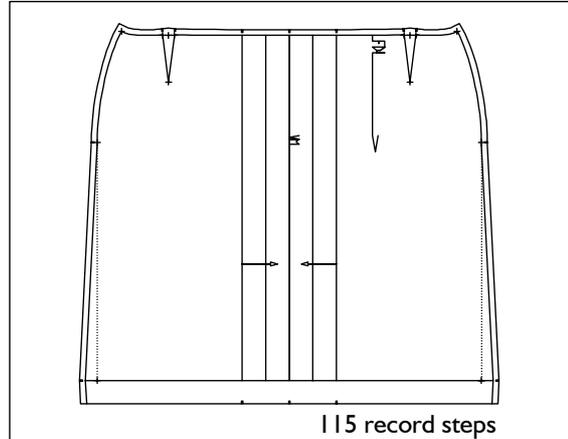*grading*

_____

33rd Exercise

Style the "skirt after Hohenstein" with a hip yoke (60 mm on the side seam, 150 mm on the CF, 150 mm on the CB) and 3 pleats in the skirt front and back. Move the yoke apart and close the darts in front and back skirt. Add seam allowance and set the notches.

276 record steps
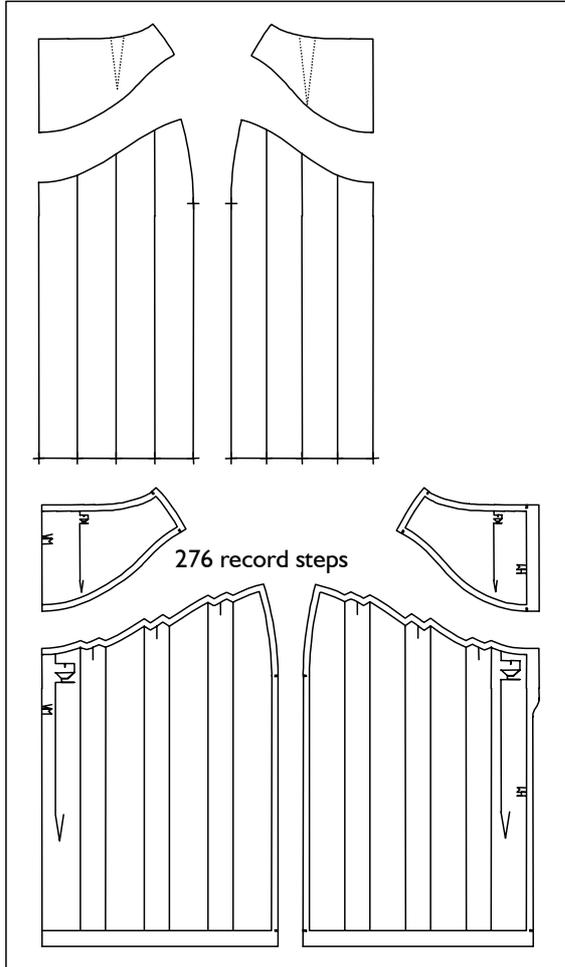
call
curves
raster
transform
p+l+c+r
pleats
    spread
    dart hood
attributes
parallel
corners
symbols
grading

34th Exercise

Create an inverted pleat (ironed) in the front of basic block 017 "skirt after Hohenstein", flare the side seams by 20 mm each and mirror the hem. Set the notches, add seam allowance and annotate the construction.

115 record steps

call
delete
corners
parallel
p+l+c+r
separate
transform
attributes
symbols
grading

35th Exercise

Design fashionable riding breeches from the "trousers after Hohenstein" with curve bows of 25mm at the hip and 35mm at the seat and separate trouser bottom starting 60 mm below the knee. Shorten the trousers by 60 mm and reduce the bottom width by 20 mm each side. Move the pattern pieces apart, set symbols and add seam allowance.

104 record steps