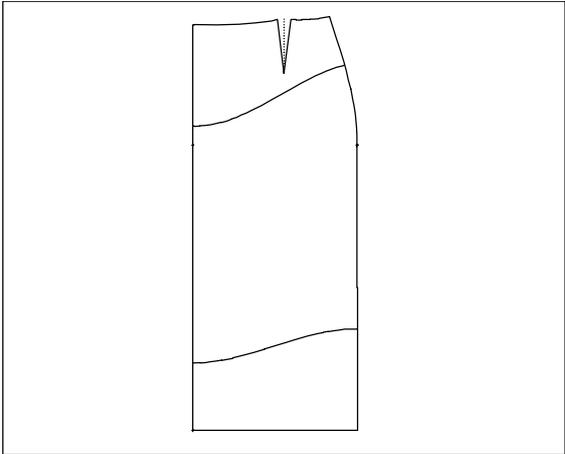


Chapter 9 “Curve construction and manipulation”

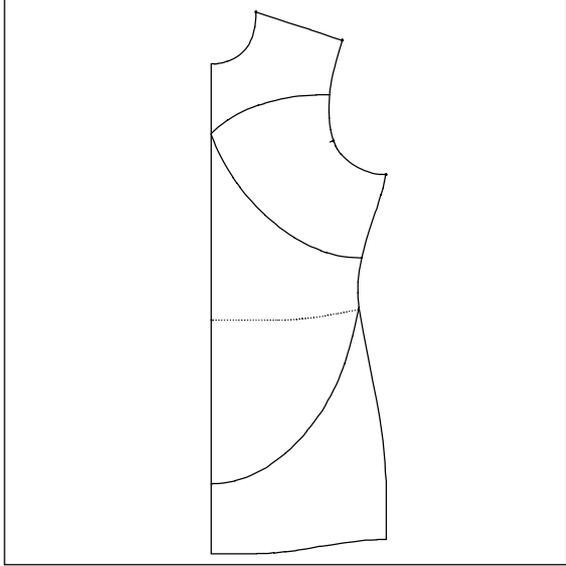
Content

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This chapter starts with construction and shaping of curves. A section on correction of existing curves and their size-dependent shaping follows.



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 must be attached to 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 beginning of the curve is indicated by a small pink point and the end point of the curve is highlighted with a green circle.

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

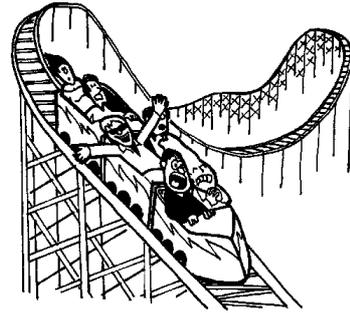
auxiliary points

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

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

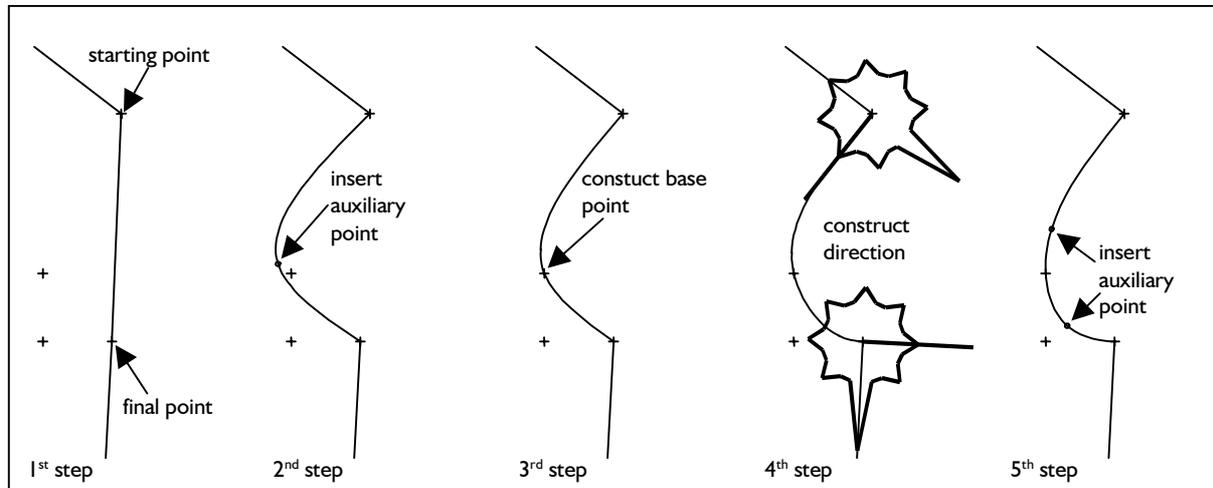
- auxiliary points are indicated by small red points.

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*; <F4> 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 “Grafis Bodice 10” (Picture 9-1) as an example the individual steps are explained. Call basic block 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).

Then, insert an auxiliary point by activating *aux. point insert*, clicking the curve and positioning the auxiliary point with pressed left mouse, see Picture 9-1 (2nd step). To move the auxiliary point activate *drag*, 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 point and final point of the curve, all base points and auxiliary points can be deleted (after *set free*).

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.

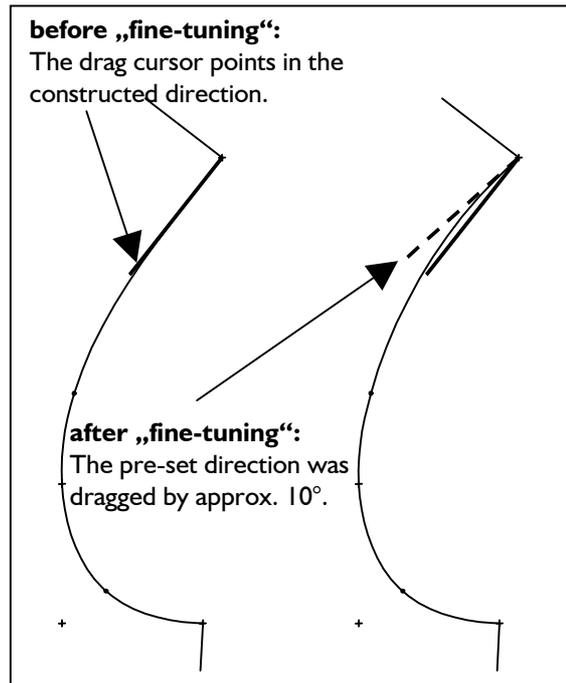
The position of a base point can be re-defined with *base point: construct*. This applies to starting and final point of the curve, also.

With *base point: set free* it is possible to undo the attachment of an auxiliary point to the construction.

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 fulfilled by activating *direction: construct* activate and clicking the base point to which a direction is to be assigned. Start at the shoulder point and adjust a right angle to the shoulder, see Picture 9-1 (4th step).



Picture 9-2

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.

With *direction: set free* it is possible to undo the assignment of a direction.

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.

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 „Grafis Bodice 10“ and construct a low neck according to Pictures 9-3 and 9-4. The neck is to be increased by 30mm at the shoulder and to end on the centre front at bust height (see Picture 9-3, No. 1.).

Construct an auxiliary line of 50 mm length at a right angle above the bust line. 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 with the state according to Picture 9-3, No. 2.

Now, insert an auxiliary point and position it close to the auxiliary line. Activate *aux. point insert*, click near the curve and position the auxiliary point with pressed left mouse button; for the result see Picture 9-3, No. 3.

Attach the auxiliary point to the end of the auxiliary line. It becomes a base point. Activate *base point construct* and click the new auxiliary point. Now click the end point of the auxiliary line with *click pl*, for the result see Picture 9-4, No. 1.

The curve is now bound to the auxiliary line.

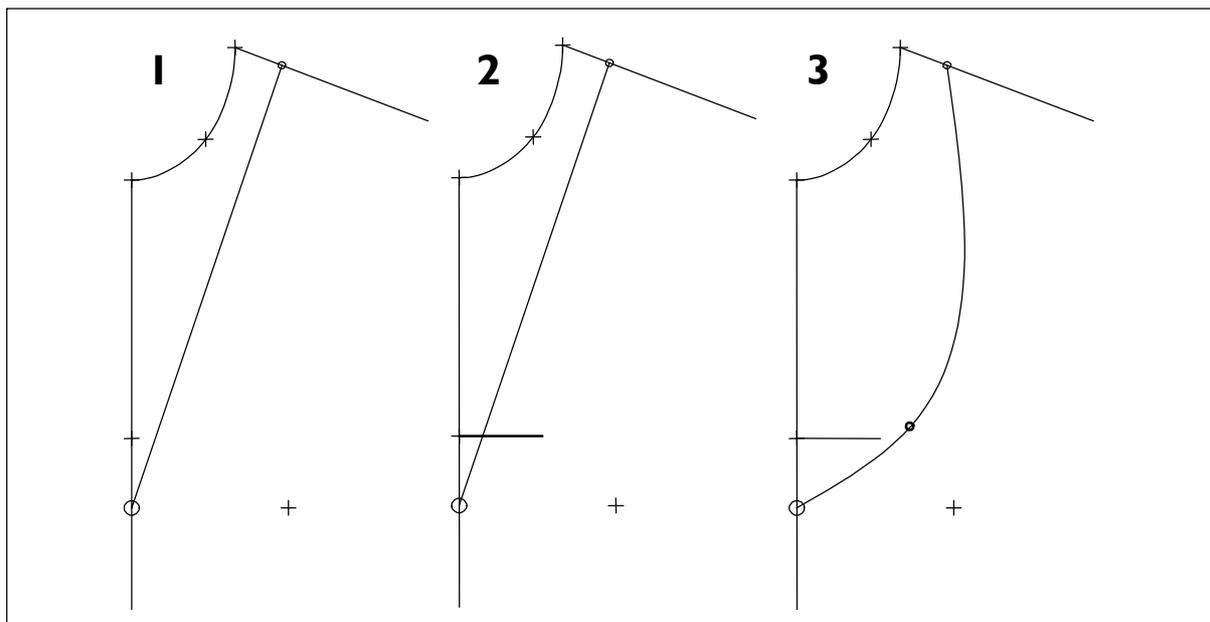
In the next step construct the required directions of the curve at shoulder and centre front. The curve is to be parallel to the original neck at the shoulder and end at the centre front at a right angle. Activate *direction: construct*, click the starting point of the curve at the shoulder and construct the direction parallel to the original neck according to Picture 9-4, No.2.

Again, activate *direction: construct* and click the 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.

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 with *aux. point insert* and dragging the constructed directions with *drag*, if necessary; for result see Picture 9-4, No. 3.

Deposit the curve with *depos+end* and grade in various sizes.



Picture 9-3

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).
- ⇒ Aides during curve construction:

- curve length in the Grafis Messages window,
 - hide construction with *curve only indicate*, with <F4> the construction reappears.
- ⇒ Quit correction with *changes save, no save or cancel*.

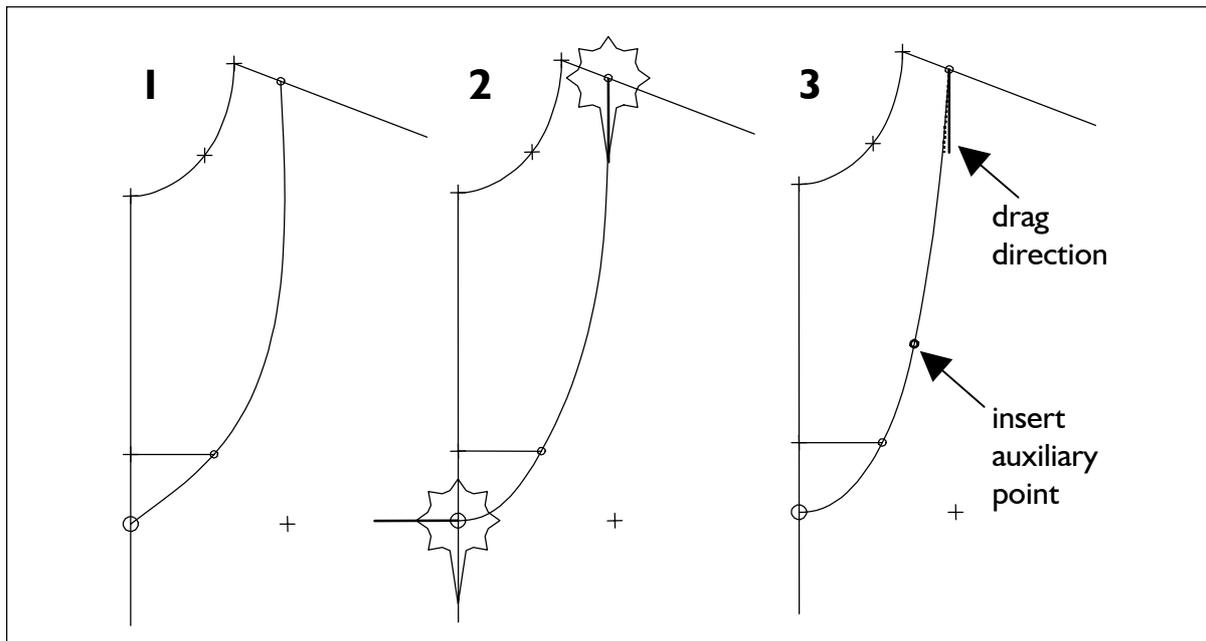
Correct curve in the base size

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.

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



Picture 9-4

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.

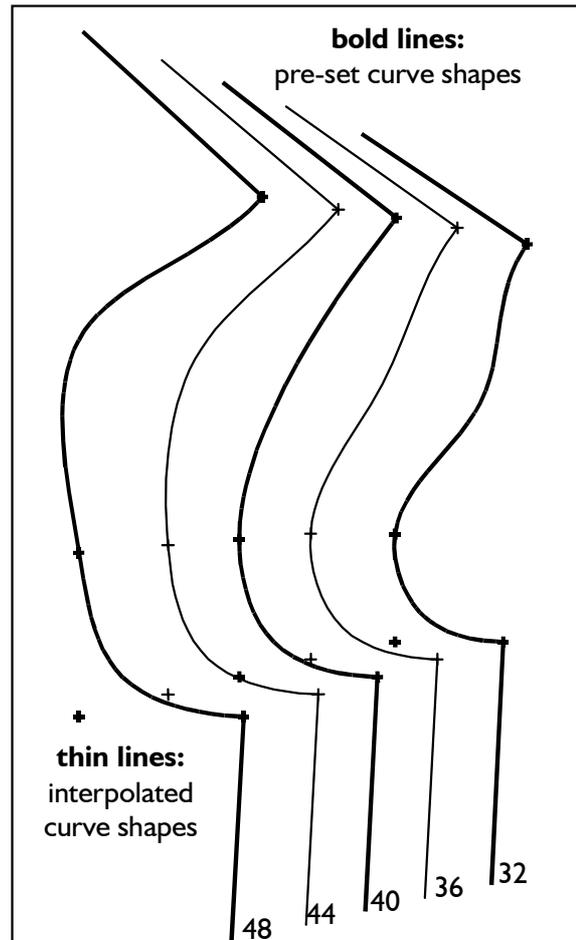
Exercise

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.

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*.



Picture 9-5

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.

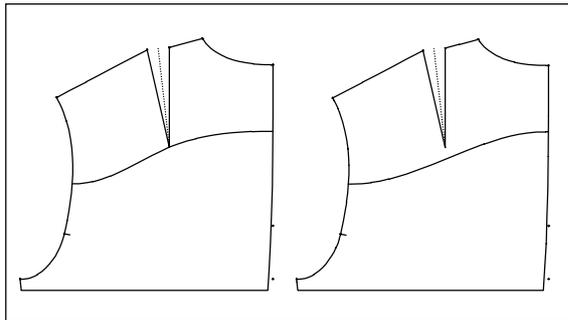
Enter also sizes 34, 38, 42 and 46 into the size table and grade.

Now, correct the armhole in sizes 40, 32 and 48 and create a smooth armhole curve at your discretion. Activate sizes 40, 32 and 48, only in the size table and repeat the previously described steps.

9.3 Exercises

1st Exercise

Construct a yoke in the back of basic block „Grafis Bodice 10“. The yoke is to run through the apex of the shoulder dart (see Picture). The curve is to begin at a right angle to the centre back 60mm from the neck and end at the armhole 80mm from the shoulder.

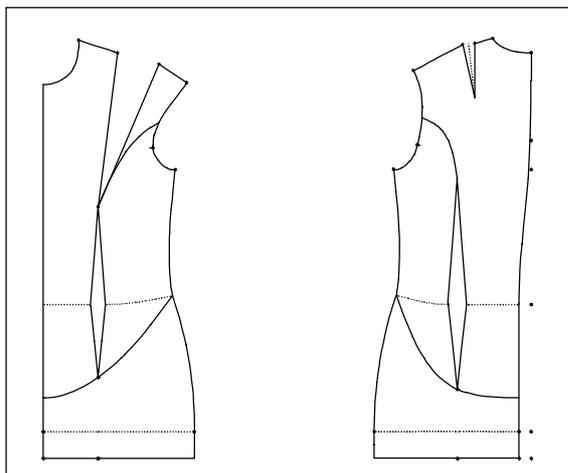


First, insert an auxiliary point in the curve and attach the auxiliary point to the dart apex. The curve is to run at a right angle to the centre back and horizontal at the armhole.

Reset the curve construction and construct a yoke curve in the same way, but not attached to the dart apex.

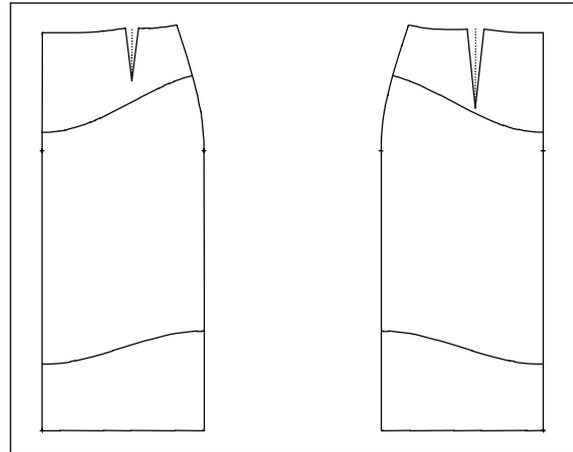
2nd Exercise

In the front and back of „Grafis Bodice 10“ construct a princess seam and curves in the hip area. The princess line is to begin on the armhole 80mm from the shoulder and end at the bust point. In the back, the curve is also to start 80mm from the shoulder and run into the waist dart. The curves in the hip area start at the intersection of waist line and side seam and end at a right angle 100mm from the hem on the centre front and centre back respectively. The curves are to be attached to the apex of the waist darts.



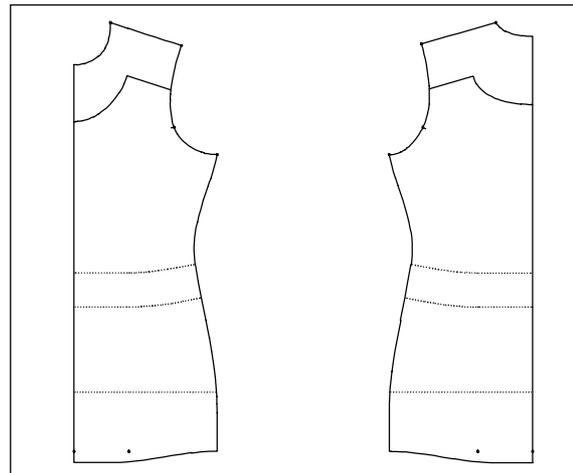
3rd Exercise

In the style „Straight skirt“ from Section 2.4 construct a yoke and a separate hem curve. The yoke is to start 150mm from the waist on the centre back and centre front and to end on the side seam 80mm from the waist. The curves are to finish at a right angle at the end points. The hem curve is to start 100mm from the hem on the centre front and centre back and end 150mm from the hem on the side seam. These curves are also to end in a right angle.



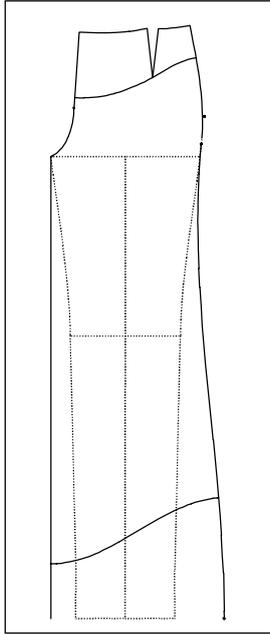
4th Exercise

Construct the displayed yokes in „Grafis Bodice 20“. The yokes start at the armhole with a straight line of 80mm at 80mm from the shoulder. The lines are to run parallel to the shoulder. A curve is to be attached to the new line, starting at a right angle at the centre front, measured 100mm from the neck and ending at a right angle at the straight line. In the back, the curve ends in a right angle at the centre back, measured 120mm from the neck.



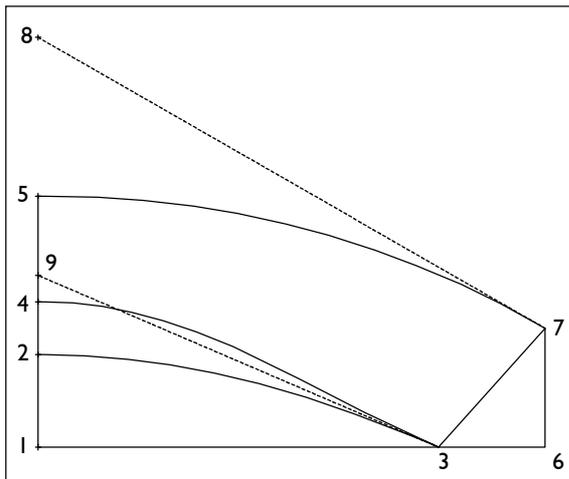
5th Exercise

From „Grafis Trousler 10“ (turn-up set to 0.) construct the displayed shortened, flared trouser front with yoke and curved hem. The yoke is to start on the side seam, 60mm from the waist and end on the centre front, 120mm from the waist. The curve is to run through the dart apex. The side seam is flared by 90mm. The inside leg seam is to be vertical. Construct a new side seam and inside leg seam. Shorten the hem by 220mm at the side seam and 100mm at the inside leg. Draw a new hem curve with a right angle at the side seam and the inside leg seam.

**6th Exercise**

Construct the collar band shown with the following points:

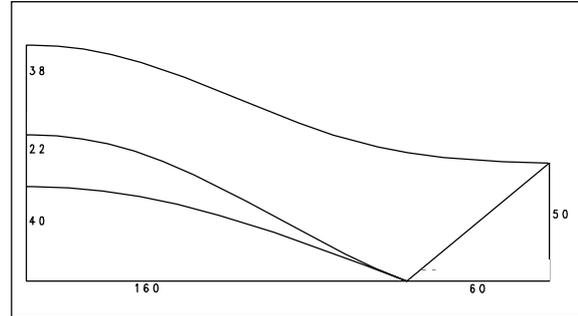
- point 1 - point 3: 150 mm
- point 3 - point 6: 40 mm
- point 6 - point 7: 45 mm
- point 1 - point 2: 35 mm
- point 1 - point 4: 55 mm
- point 1 - point 5: 95 mm
- point 1 - auxiliary point 9: 65 mm
- point 1 - auxiliary point 8: 155 mm.



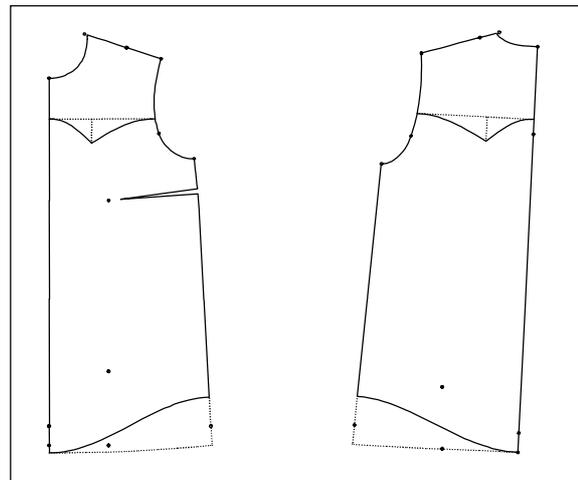
The connecting line between point 7 and point 8 is to define the direction of the outer edge of the collar in point 7. In the same manner, the connecting line between point 3 and point 9 defines the direction of the collar fold and neck line in point 3.

7th Exercise

Construct the collar shown with the given measurements.

**8th Exercise**

Open the style „Shirt blouse“ from Section 2.5 and construct a point at the front and back armhole, 100mm from the shoulder. From these points drop the perpendicular onto the centre front and centre back respectively. Construct an auxiliary line for the yoke point. The auxiliary line is to be 40mm long, start at 40% measured from the centre front or centre back and be aligned at a right angle to the perpendicular. Construct the displayed curves from the yoke point to the armhole and to the centre front or centre back. The curves are to run into the perpendicular.



The two new hem curves are to start at a right angle at the end point of the centre front and centre back and end at a right angle at the side seam, 80mm from the hem.