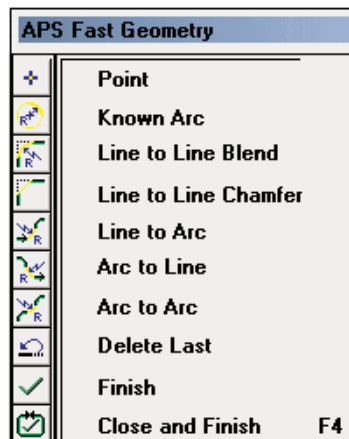


LICOM AlphaCAM

CAD/CAM system for Windows™

Geometry Creation Using APS Fast Geometry TUTORIAL



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Conventions When Using The Tutorial

Notes and comments are in *Italics* to separate them from the main text. If there are different ways of performing the same command or option, these are also in *Italics* and can be ignored the first time you work through the tutorial.

The symbol  indicates a new command for you to action.

The symbol  indicates a sub part of command for you to action

The HELP file is very comprehensive. When you have finished the tutorial, please take time to have a look at it. **Select HELP | Contents.**

Introduction

This **AlphaCAM** tutorial has been designed to give you a flavour of how **AlphaCAM** works, how interactive it is, how easy it is to learn and how easy it is to use. We assume that you are familiar with the concepts involved in CNC programming and have a reasonable understanding of your computer and the Windows operating system. **AlphaCAM** has been developed as a true 32-bit Windows application, so if you use other Windows programs you will be familiar with features such as floating button bars, tabbed dialog boxes, etc. If not, you should look at **HELP | Contents | Screen Layout.**

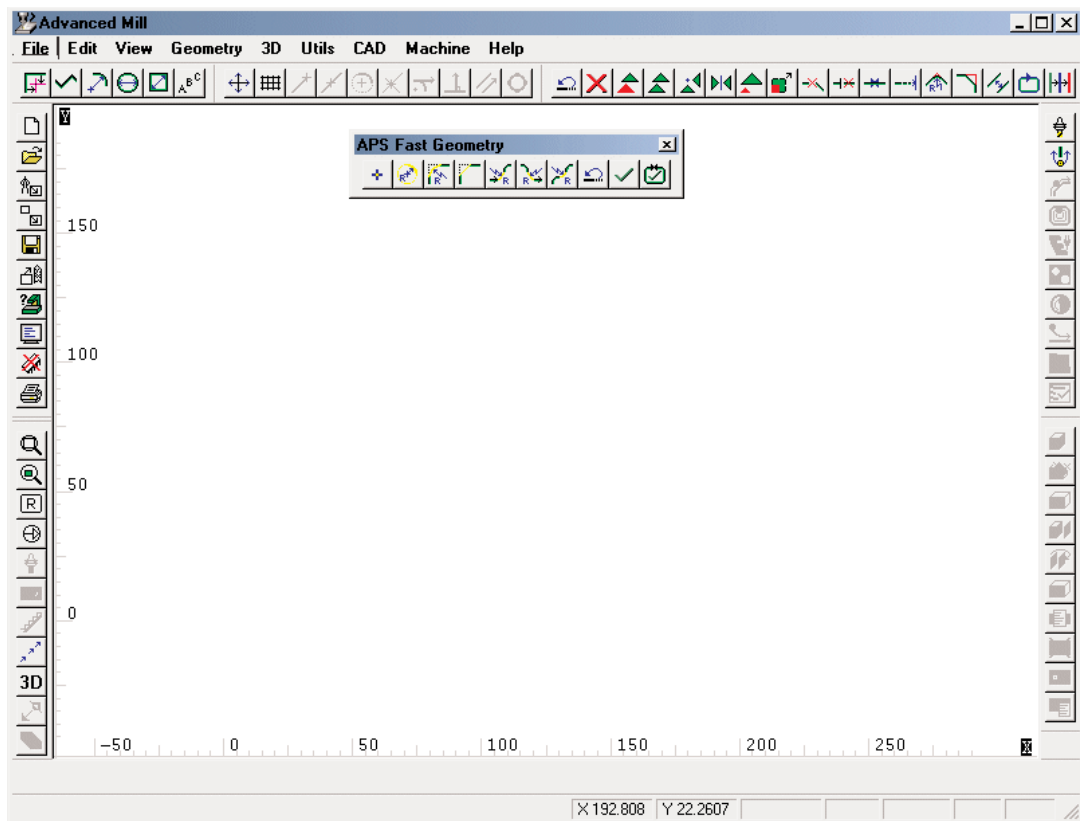
AlphaCAM systems are available for all machining disciplines. Each one is specifically designed for the machine type, but the look and feel of all the systems is standard. This tutorial can be used with both Standard and Advanced **AlphaCAM** modules. The tutorial describes the construction of the geometry using the **APS Fast Geometry** commands.

During this tutorial, which was created using Advanced Mill, we tell you where to find commands on the pull-down menus. If there is a button for the command, this will also be shown.

Take the trouble to locate the buttons on your screen. You can speed up your work by avoiding having to pull down menus and side menus to click on commands, when one click on a button will suffice.

To see what command a button performs, place the screen pointer over the button for a couple of seconds, and a prompt will appear beside the pointer.

If you have not already done so, start your **AlphaCAM** module. This will take you into the graphical portion of the system. Your screen will look similar to the one following.



APS Fast Geometry

This is a unique way of creating 'bounded' geometry. This can turn some designs into geometric contours much faster than with any conventional CAD system.





With APS Fast Geometry, you do not specify individual lines and arcs. Instead, you say how the tool should move from one element to the next. Each change in direction is called a **Turn**. APS Fast Geometry builds a 'bounded' geometry profile by automatically trimming, blending and filleting as Turn details are entered. This method is very powerful, because it allows you to answer 'Unknown' to questions about poorly specified co-ordinates and once AlphaCAM has enough information it will 'back-calculate' to solve the unknowns.





However, **CAD-style** geometry creation using Line, Arc and Circle commands is sometimes appropriate for some profiles. All the conventional CAD commands, plus Special Geometries, which automatically produce standard geometric shapes, should be considered when deciding upon the drawing creation method.

The following 4 examples endeavour to show how APS Fast Geometry is used to create geometry profiles.

APS Fast Geometry Definitions


- 1 Geometry is described as a continuous profile as though you were to walk along the profile.
- 2 During APS Fast geometry creation there is no command to draw a line. Lines are automatically created tangentially between “turns”.
- 3 A “turn” is where the geometric profile changes direction. Simplistically, all turns are arcs.
- 4 APS Fast Geometry Options

Point		An Arc with Zero radius (a sharp turn).
Known Arc		An Arc with radius and centre known.
Chamfer		A chamfer about a known corner position.
Blend		An Arc with known radius and unknown centre. Blends can have zero radius (a sharp unknown position).
- 5 Blend Types Are only applied to blend turns.

Line to Line		Known radius tangential to a Line before and after.
Arc to Line		Known radius tangential to an Arc before and Line after.
Line to Arc		Known radius tangential to a Line before and Arc after.
Arc to Arc		Known radius tangential to an Arc before and after



Note:

***The word Arc and Point are synonymous
A Point is a zero radius Arc.***

- 6 Angular directions are always described in absolute terms.
- 7 The Delete Last  command will cause the profile to return to the status of the previously defined turn.

Warning

***Do Not use UNDO
this will result in the profile
being completely removed.***

- 8 The Finish  command stops the profile creation.
- 9 The Close & Finish  command connects the current turn to the starting turn to create a closed boundary.

Planning

When creating geometry, it is preferable to plan the geometry creation method. The following is a procedural list in order to aid in the geometry creation planning

- 1 Establish a suitable datum. The point about which the geometry is to be created. This does not have to be the machining datum as the profiles can be moved to a suitable position for machining at a later date.
- 2 Decide upon the number of profiles that need to be defined and their make up, which bits to define using CAD techniques, which bits to be defined using APS Fast geometry, any commonality where the duplication commands can be used such as copy, mirror, etc.
- 3 Consider whether additional construction lines would aid the profile creation.

APS Fast geometry planning

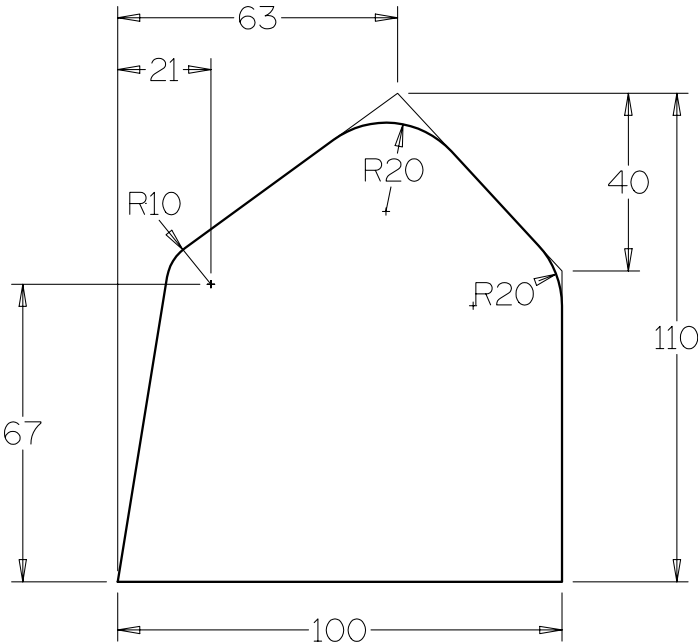
- 1 Identify where the geometry profile changes direction.
- 2 For each change of direction identify its type:
Points, Chamfers, Arcs and Blends
- 3 Select a starting position and direction.
Its is always preferable to start on a Point or an Arc.
- 4 Number the turns in order to keep a track of your position along the profile.
- 5 Where Blends are identified, select the blend type:
Line to Line, Arc to Line, Line to Arc, Arc to Arc
The blend type identifies the elements the blend fits between.

NOTE:

***When defining profiles using APS Fast Geometry,
the display is one or more turns behind the data entered,
as the data entered describes the next turn.***

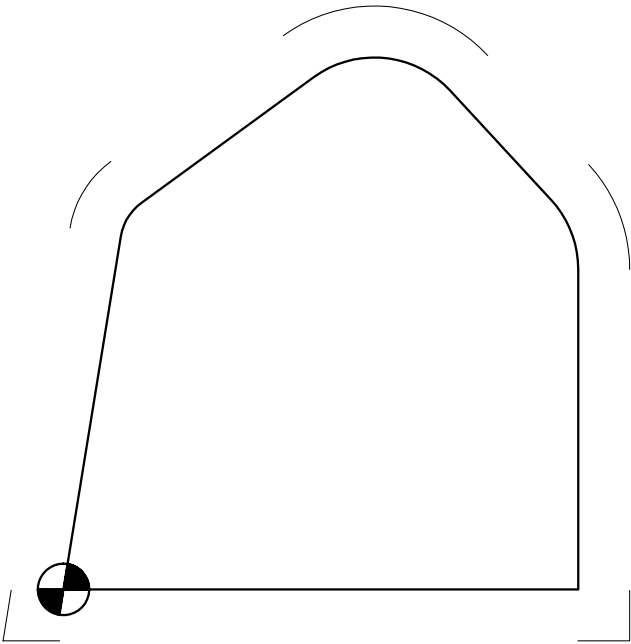
Example 1

The Profile



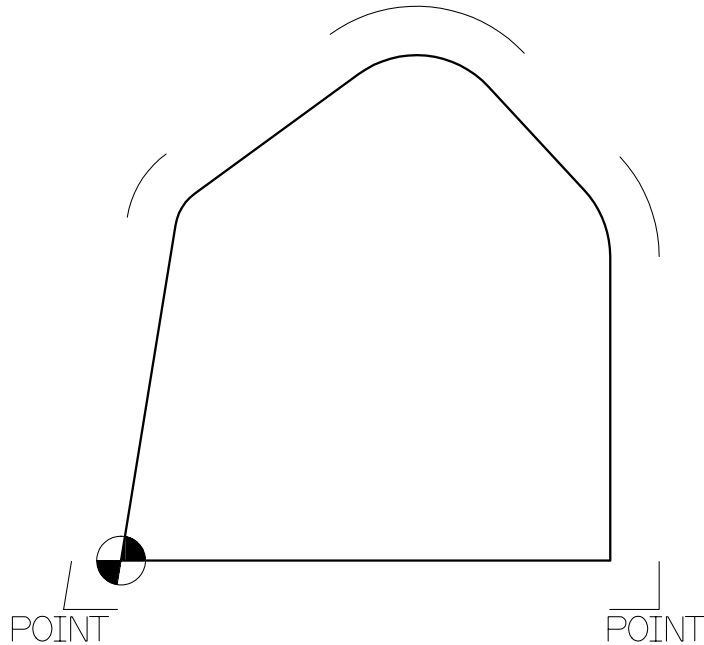
The Planning

Select the Datum and Identify the turn positions.



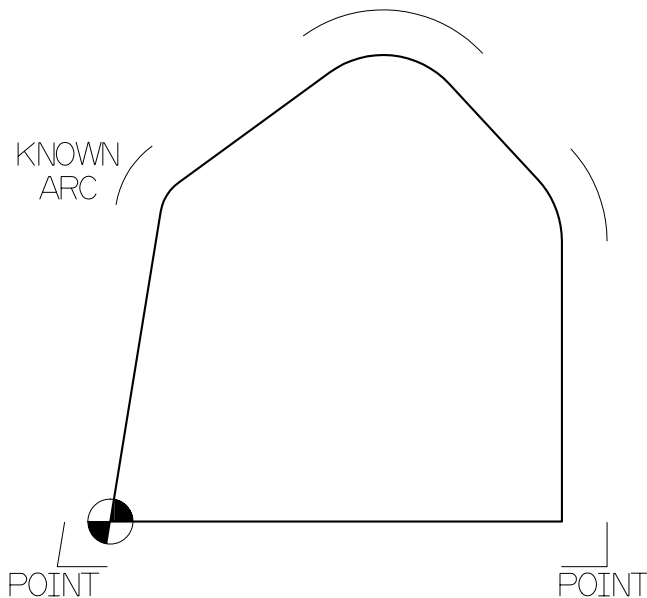
Identify The Points

A point is an arc with zero radius, a sharp turn about a known position.



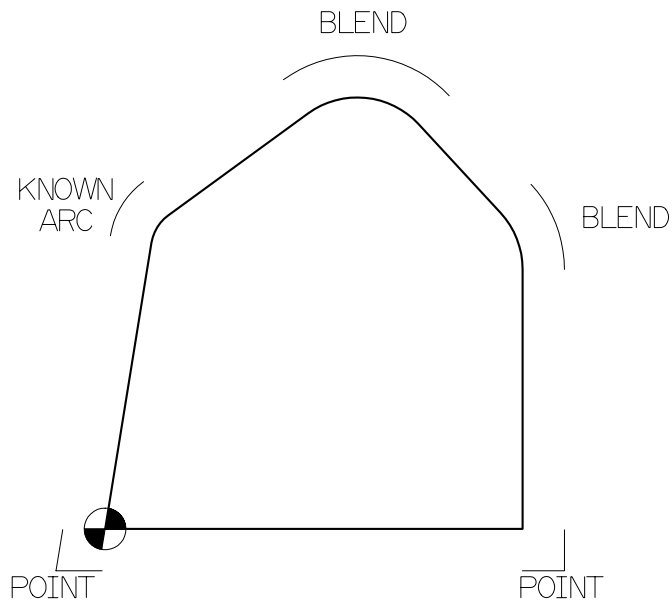
Identify The Known Arcs

A known arc is where both centre and radius are know directly or by implication. The centre co-ordinates may be defined by the directions into and/or out of the arc.



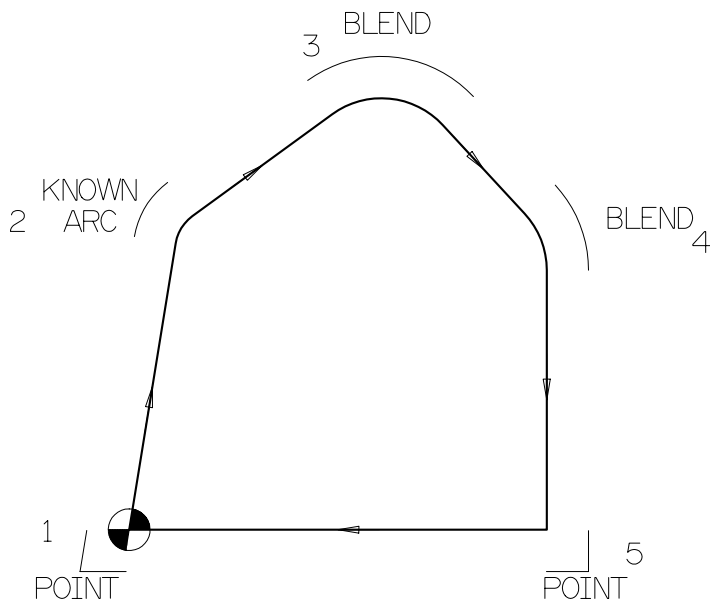
Identify The Blends

A blend is an arc with radius known and centre unknown, (can be zero radius).



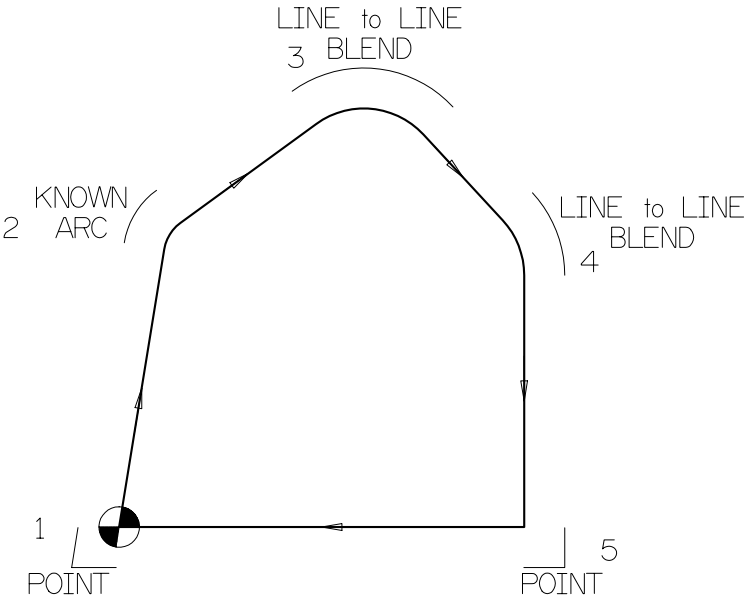
Set the direction of definition

Decide upon the direction in which the profile is to be defined and number the turns.




Identify the Blend Types

Identify the elements before and after the blend.



Draw the Profile.

 Select **GEOMETRY | APS Fast Geometry | Point** .


 The command line prompts you to enter the co-ordinates of the point.

POINT X F1=? Y F1=? . Type **0** **0** .

The cursor is displayed attached to the datum position.

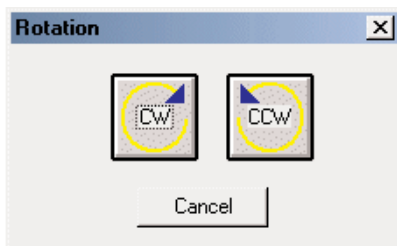
The current profile is drawn in YELLOW

 Select **GEOMETRY | APS Fast Geometry | Known Arc** .

 The command line prompts you to enter the radius of the arc.

KNOWN ARC: Radius . Type **10** .

 The Direction dialog prompts for the direction of the arc.




Click  on .

 The command line prompts you to enter the co-ordinates of the arc centre.


Arc Centre X F1=? Y F1=? . Type **21** **67** .

A solid line is drawn from the datum position to the tangent point on a phantom arc. The arc is drawn in phantom style to indicate its position and that it is not fully defined yet (the direction out has not been defined.).

 Select **GEOMETRY | APS Fast Geometry | Line to Line Blend** .



 The command line prompts you to enter the radius of the blend.


LINE TO LINE (Blend): Arc Radius . Type **20** .

 The command line prompts you to enter the co-ordinates of the intersection of the two lines between which the blend is to be fitted.


Intersection X F1=? Y F1=? . Type **63** **110** .

The previous arc is now drawn solid and a phantom line is drawn to the intersection point.

 Select **GEOMETRY | APS Fast Geometry | Line to Line Blend** . This command should be currently active and shouldn't need selecting again.

 The command line prompts you to enter the radius of the blend.


LINE TO LINE (Blend): Arc Radius . Type . *20 should be default.*

 The command line prompts you to enter the co-ordinates of the intersection of the two lines between which the blend is to be fitted.

Intersection X F1=? Y F1=? . Type **100** **110-40** .

The previous blend is now drawn solid and a phantom line is drawn to the intersection point.

 Select **GEOMETRY | APS Fast Geometry | Point** .

 The command line prompts you to enter the co-ordinates of the point.

POINT X F1=? Y F1=? . Type **100** **0** .

The previous blend is now drawn solid and a solid line is drawn to the point. The profile is almost complete.

 Select **GEOMETRY | APS Fast Geometry | Close & Finish**  .

The geometry will automatically close to form a closed boundary and it turns GREEN to indicate APS fast geometry is no longer active.

Save the example

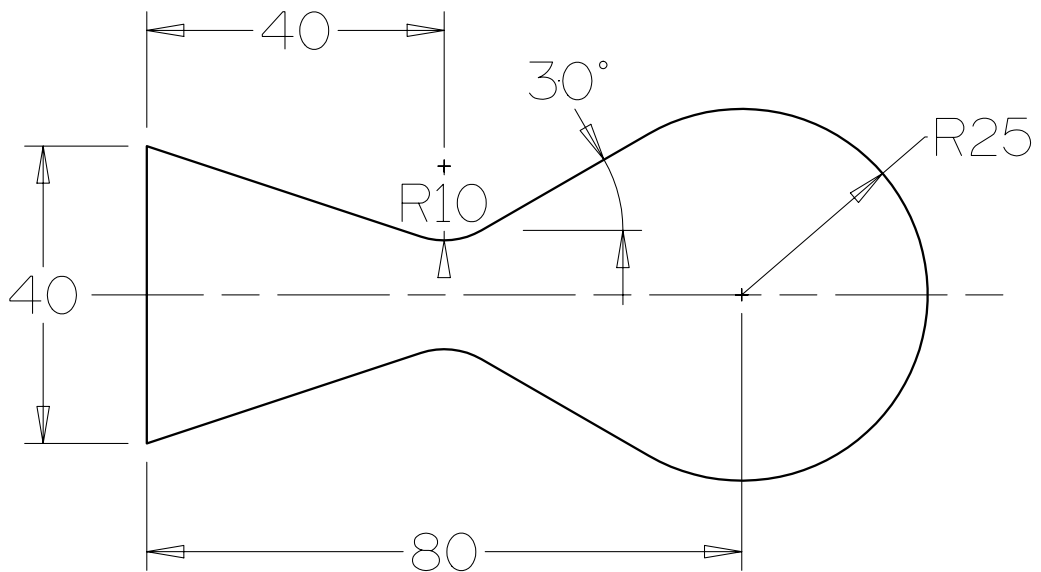
 Select **FILE | Save As:** the Save As dialog box is displayed.

 Select a suitable save in drive and directory.

 Enter a suitable filename for this job.

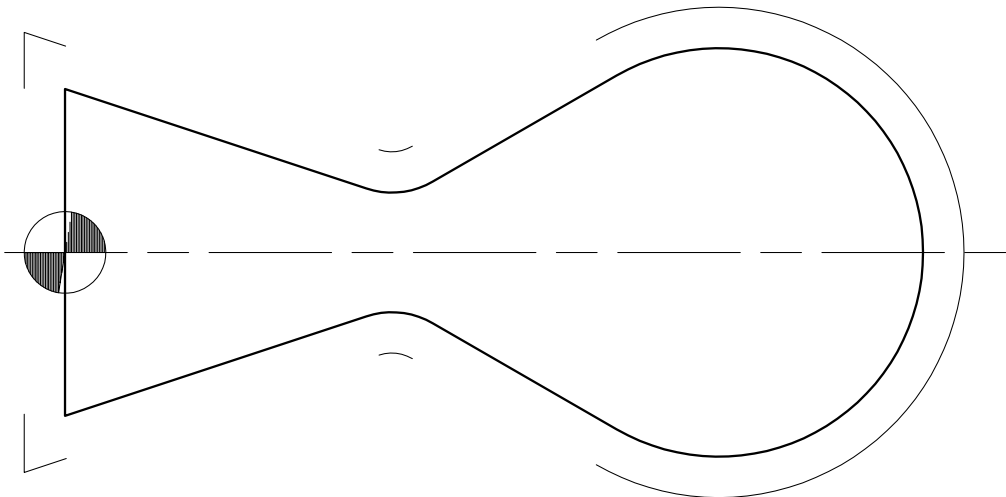
Example 2

The Profile



The Planning

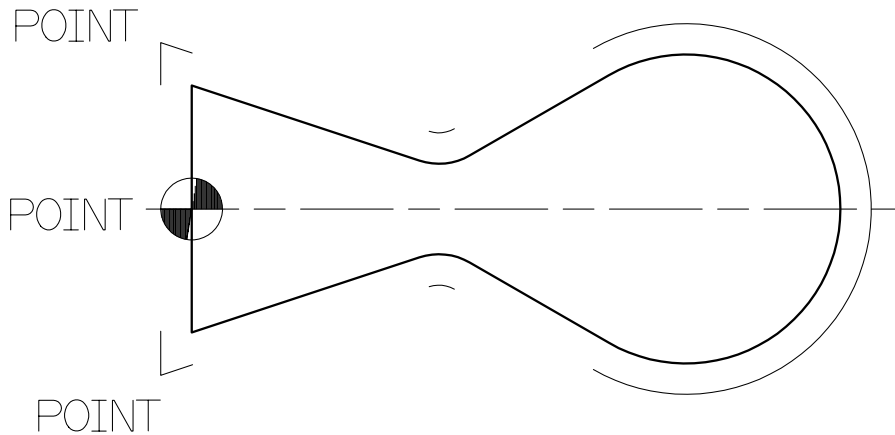
Select the Datum and Identify the turn positions.



Identify The Points

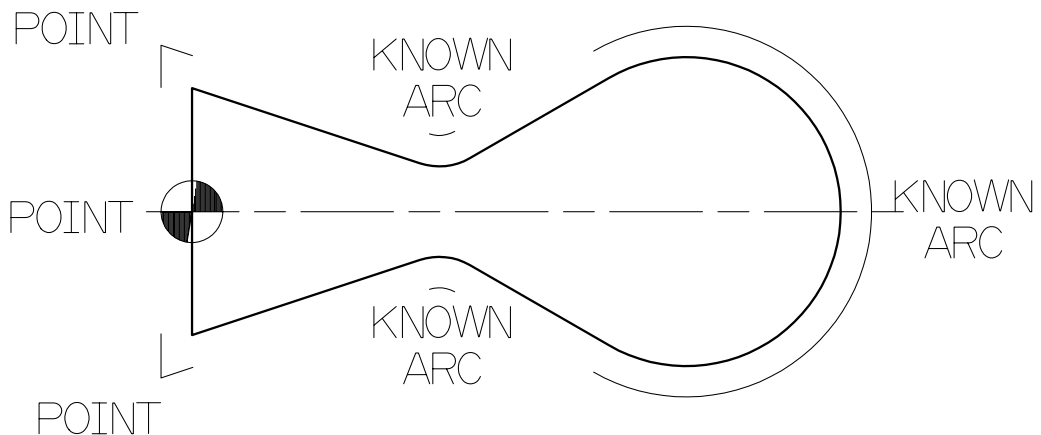
A point is an arc with zero radius a sharp turn about a known position. The datum is defined as a start point because the part is symmetrical. You could draw half the profile then use the mirror command to create the other half.

During geometry creation the use of duplication commands is not necessarily the most efficient.



Identify The Known Arcs

A known arc is where both centre and radius are known directly or by implication. The centre co-ordinates may be defined by the directions into and or out of the arc.

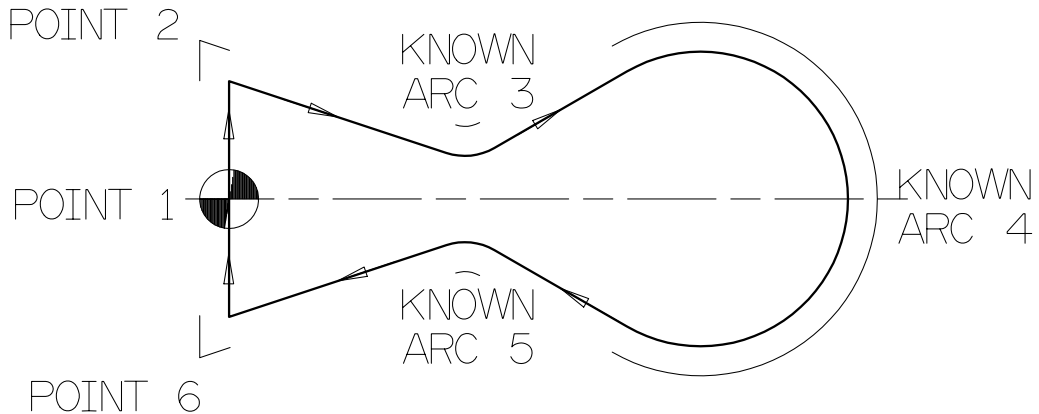


Identify The Blends

In this example there are no blends.


Set the direction of definition

Decide on the direction in which the profile is to be defined and number the turns.



Draw the Profile.

 Select **GEOMETRY | APS Fast Geometry | Point** .

 The command line prompts you to enter the co-ordinates of the point.

POINT X F1=? Y F1=? . Type **0**  **0** .

The cursor is displayed attached to the datum position.

The point command is still active.

 The command line prompts you to enter the co-ordinates of the next point.

POINT X F1=? Y F1=? . Type **0**  **20** .

The cursor is displayed attached to the last point.

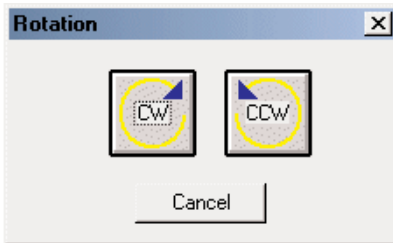
The current profile is drawn in YELLOW

☞ Select **GEOMETRY | APS Fast Geometry | Known Arc** .

☞ The command line prompts you to enter the radius of the arc.

KNOWN ARC: Radius . Type **10** .

☞ The Direction dialog prompts for the direction of the arc.



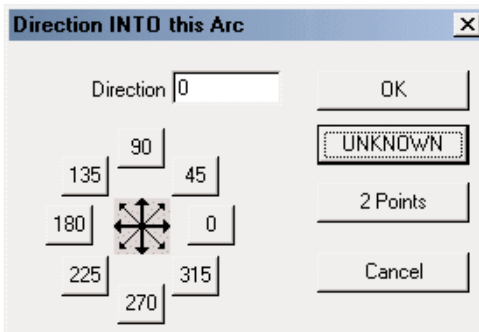
. Click  on .

☞ The command line prompts you to enter the co-ordinates of the arc centre.

Arc Centre X F1=? Y F1=? . Type **40**

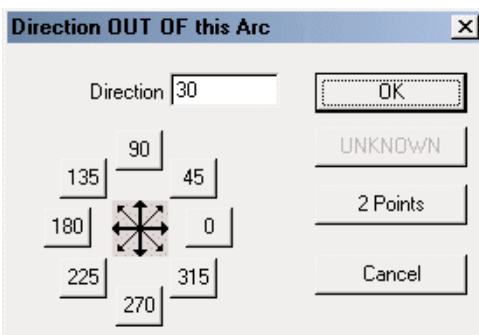
The command line disappears immediately when you press or select

☞ The Direction dialog prompts for the direction **INTO** the arc.



. Click  on **UNKNOWN**.

☞ The Direction dialog prompts for the direction **OUT** of the arc.



. Type **30** .

The arc is drawn in phantom style to indicate its position and that it is not fully defined yet.

Select **GEOMETRY | APS Fast Geometry | Known Arc**

The Known Arc command should still be active!

The command line prompts you to enter the radius of the arc.

. Type **25** .

The Direction dialog prompts for the direction of the arc.

. Click on

The command line prompts you to enter the co-ordinates of the arc centre.

. Type **80** **0**

The Lines and 10 radius arc are drawn tangential to a phantom 25 radius arc.

At this point you could finish the profile by selecting Finish .

The Finish Direction Dialog is displayed. Type 270

The geometry will turn GREEN and the APS Fast Geometry command will be aborted.

The Known Arc command should still be active!

The command line prompts you to enter the radius of the arc.

. Type **10** .

The Direction dialog prompts for the direction of the arc.

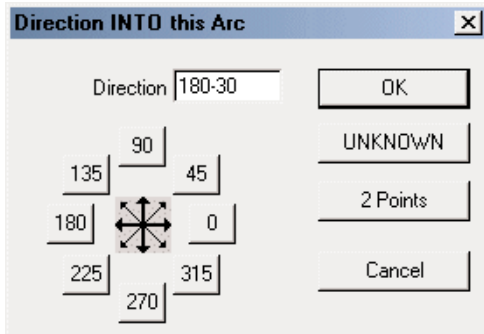
. Click on

The command line prompts you to enter the co-ordinates of the arc centre.

. Type **40**

The command line disappears immediately when you press or select


 The Direction dialog prompts for the direction **INTO** the arc.



. Type **180-30** .

The arc is drawn in phantom style to indicate its position and that it is not fully defined yet.

 Select **GEOMETRY | APS Fast Geometry | Point** .

 The command line prompts you to enter the co-ordinates of the point.



. Type **0**  **-20** .

The previous arcs are now drawn solid and a solid line is drawn to the point. The profile is almost complete.

 Select **GEOMETRY | APS Fast Geometry | Close & Finish**  **F4**.

The geometry will automatically close to form a closed boundary and it turns GREEN to indicate APS fast geometry is no longer active.

Save the example

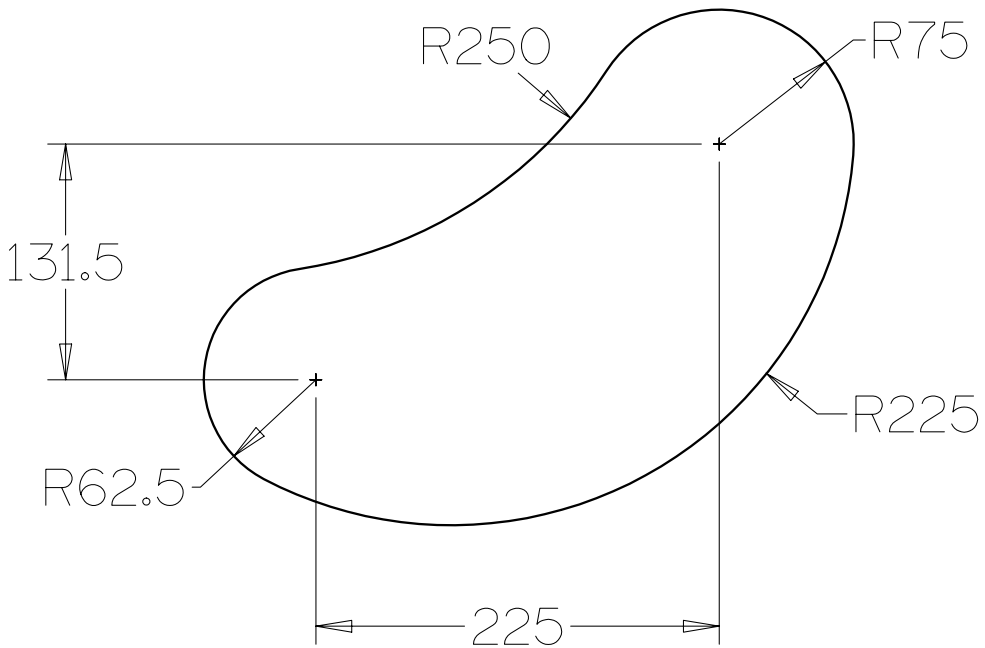
 Select **FILE | Save As**: the Save As dialog box is displayed.

 Select a suitable save in drive and directory.

 Enter a suitable filename for this job.

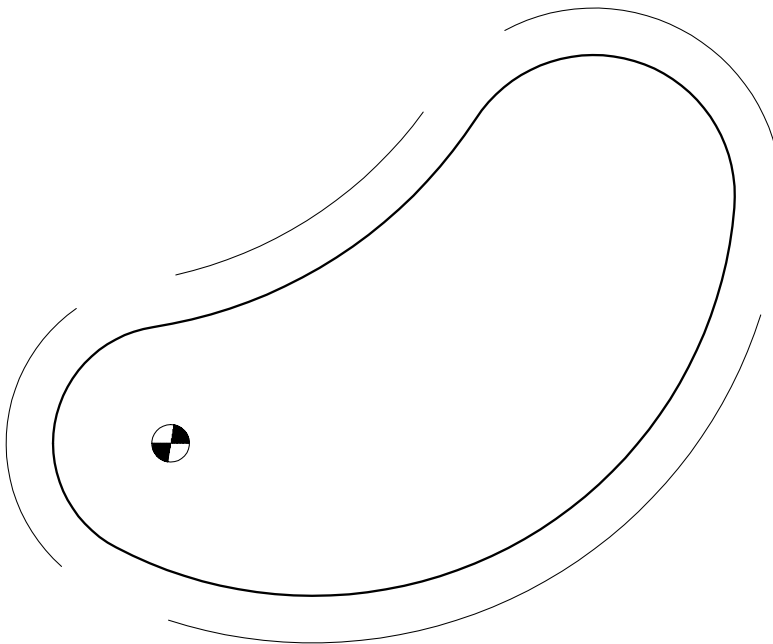
Example 3

The Profile



The Planning

Select the Datum and Identify the turn positions.

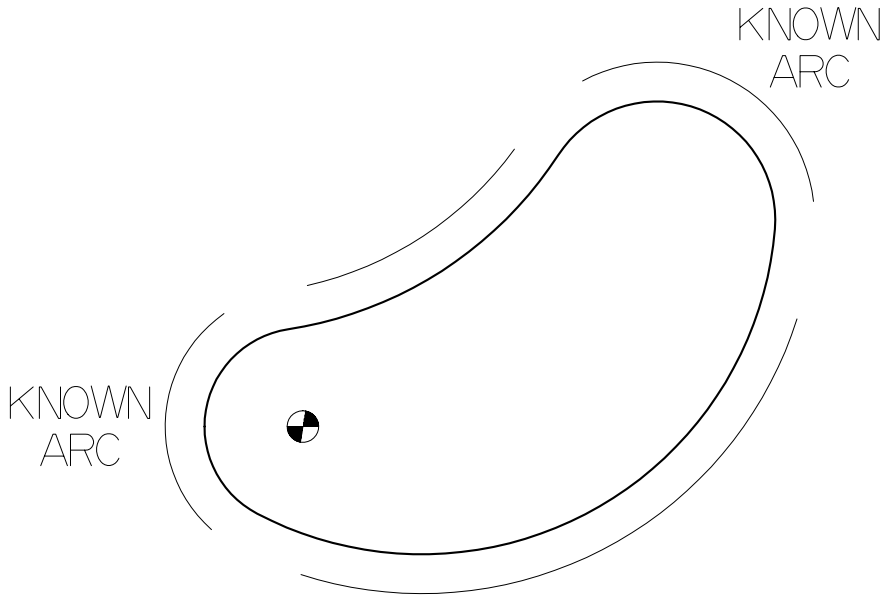


Identify The Points

In this example there are no points.

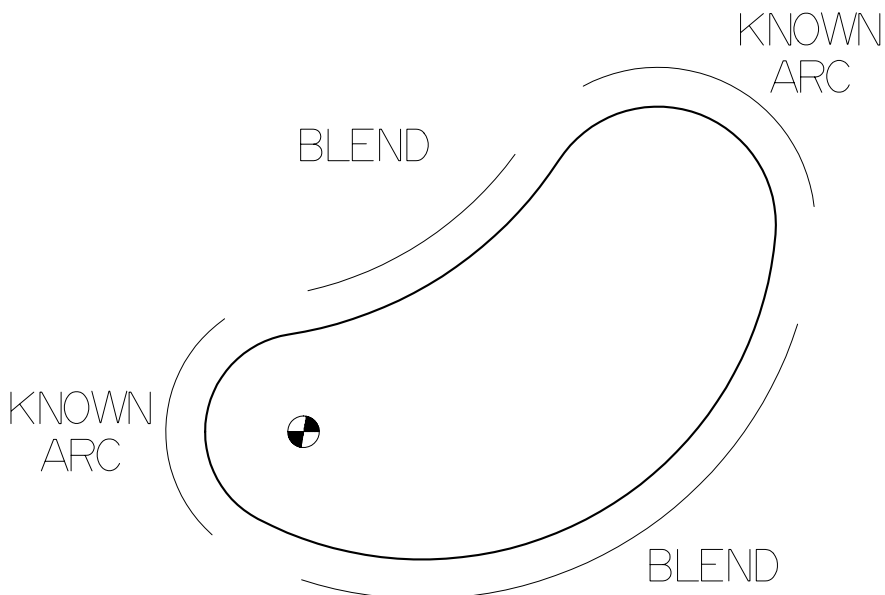
Identify The Known Arcs

A known arc is where both centre and radius are known directly or by implication. The centre co-ordinates may be defined by the directions into and/or out of the arc.



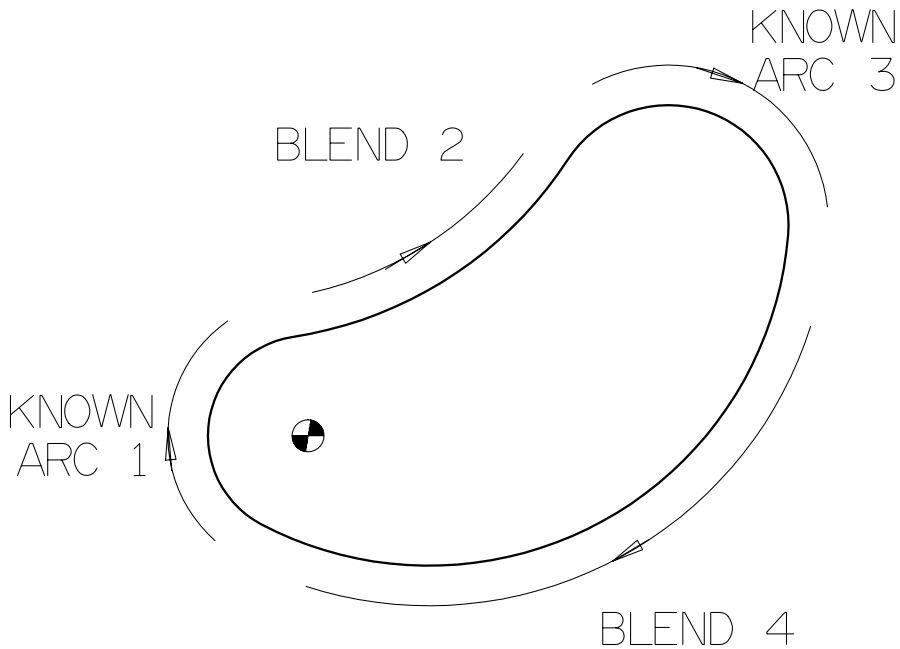
Identify The Blends

A blend is an arc with radius known and centre unknown, (can be zero radius).



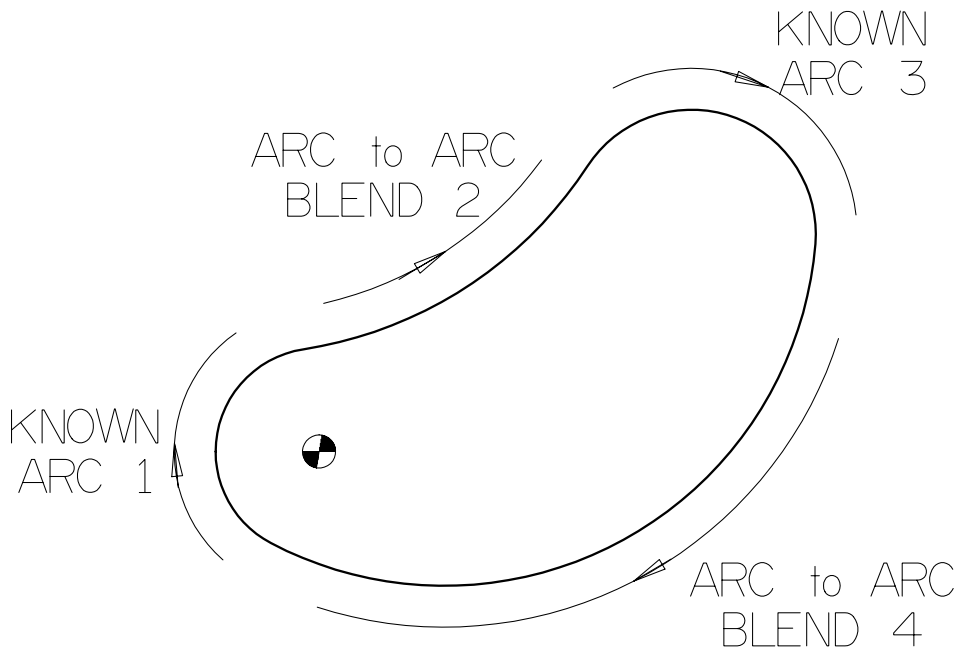
Set the direction of definition

Decide upon the direction in which the profile is to be defined and number the turns.



Identify the Blend Types

Identify the elements before and after the blend.



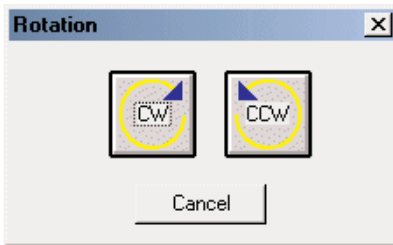
Draw the Profile.

Select **GEOMETRY | APS Fast Geometry | Known Arc**

The command line prompts you to enter the radius of the arc.

KNOWN ARC: Radius . Type **62.5** .

The Direction dialog prompts for the direction of the arc.

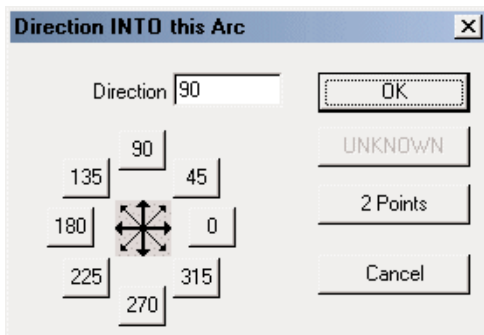


. Click on

The command line prompts you to enter the co-ordinates of the arc centre.

Arc Centre X F1=? Y F1=? . Type **0** **0**

The Direction dialog prompts for the direction **INTO** the arc.



. Type **90** .

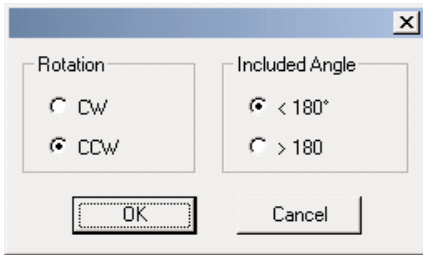
The arc is drawn in phantom style to indicate its position and that it is not fully defined yet. An arrow on the left side of the arc indicates the starting position and direction.

Select **GEOMETRY** | **APS Fast Geometry** | **Arc to Arc**

The command line prompts you to enter the radius of the arc.

ARC to ARC: Blend Radius . Type **250** .

The Direction dialog prompts for the direction of the blend arc and its included angle.



. Click on **CCW** and **< 180** then .

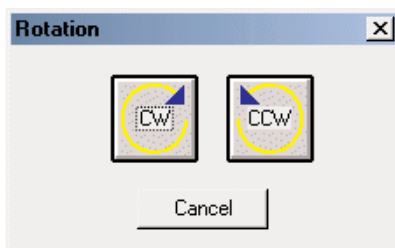
***Nothing will appear to happen on the screen.
Use the wheel on the mouse or press **Ctrl** + **PgDn**
To Zoom Out. The Blend circle is drawn
about the previous arc centre. This is OK***

Select **GEOMETRY** | **APS Fast Geometry** | **Known Arc**

The command line prompts you to enter the radius of the arc.

KNOWN ARC: Radius . Type **75** .

The Direction dialog prompts for the direction of the arc.



. Click on

The command line prompts you to enter the co-ordinates of the arc centre.


Arc Centre X F1=? Y F1=? . Type **225** **131.5**

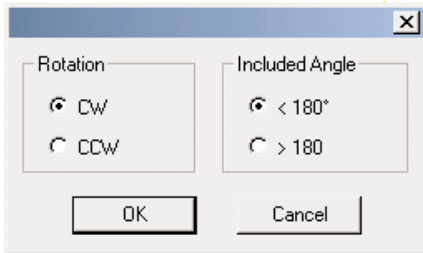
The first arc and blend are drawn together with the phantom arc.

 Select **GEOMETRY** | **APS Fast Geometry** | **Arc to Arc** .

 The command line prompts you to enter the radius of the arc.

ARC to ARC: Blend Radius . Type **225** .

 The Direction dialog prompts for the direction of the blend arc and its included angle.



. Click on **CW** and **< 180** then .

This is the end of the geometry profile. To finish, we want to automatically connect the 225 blend radius to the starting 62.5 radius arc.

 Select **GEOMETRY** | **APS Fast Geometry** | **Close & Finish**  .

The geometry will automatically close to form a closed boundary and it turns GREEN to indicate APS fast geometry is no longer active.

Save the example

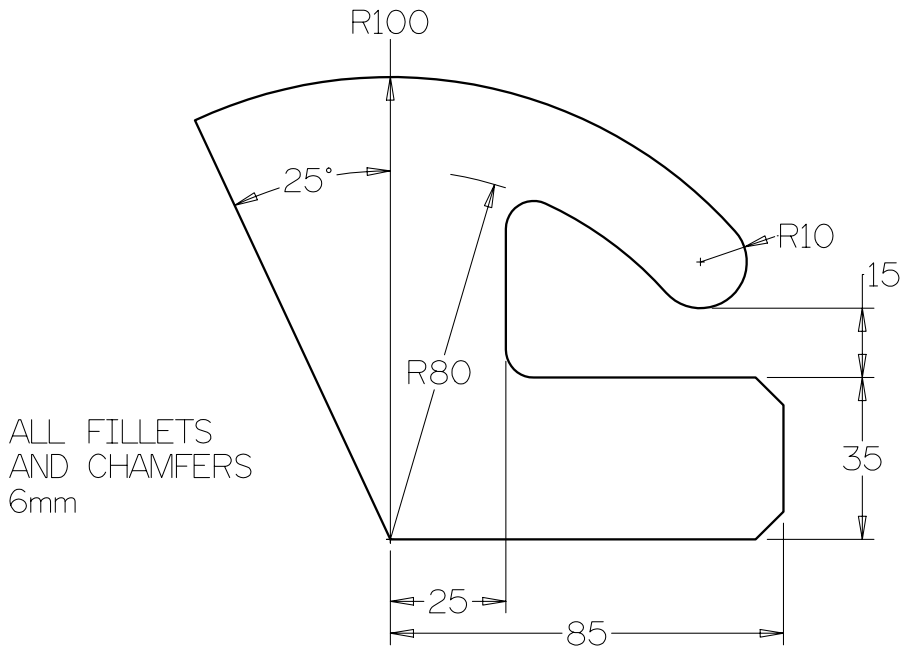
 Select **FILE** | **Save As**: the Save As dialog box is displayed.

 Select a suitable save in drive and directory.

 Enter a suitable filename for this job.

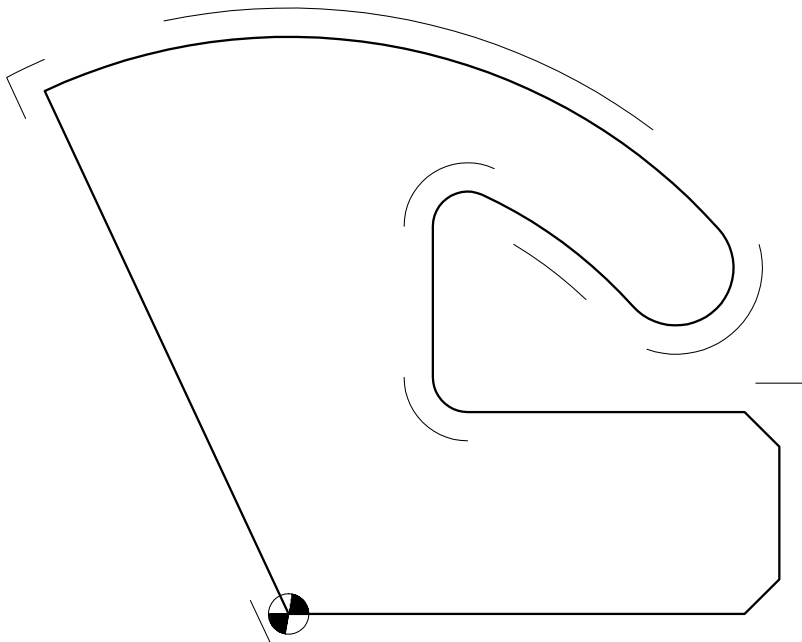
Example 4

The Profile



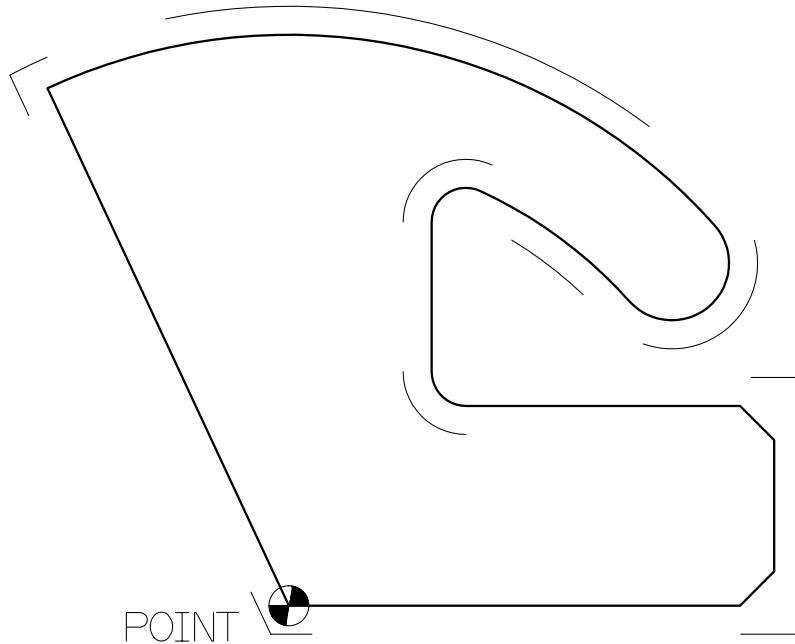
The Planning

Select the Datum and Identify the turn positions.



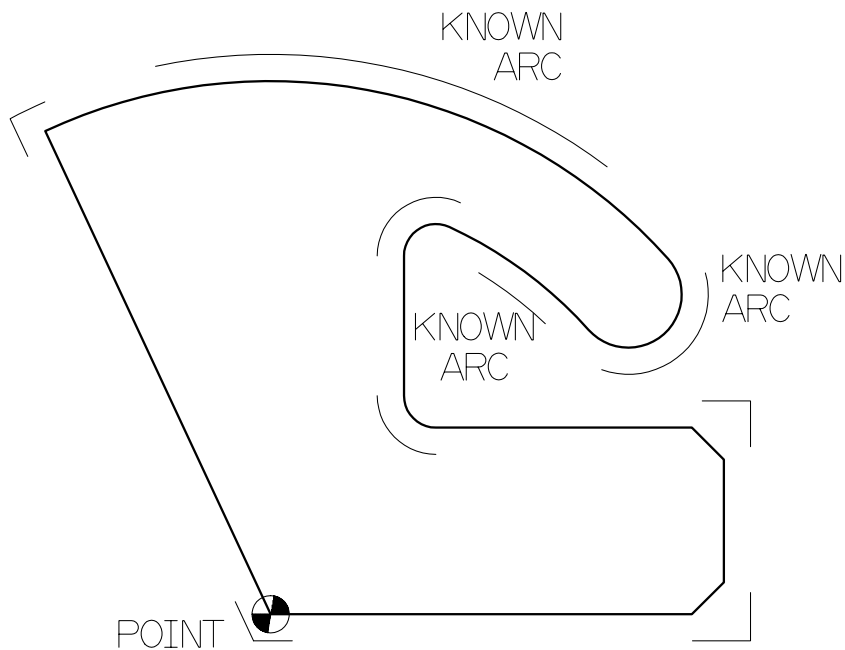
Identify The Points

A point is an arc with zero radius, a sharp turn about a known position.



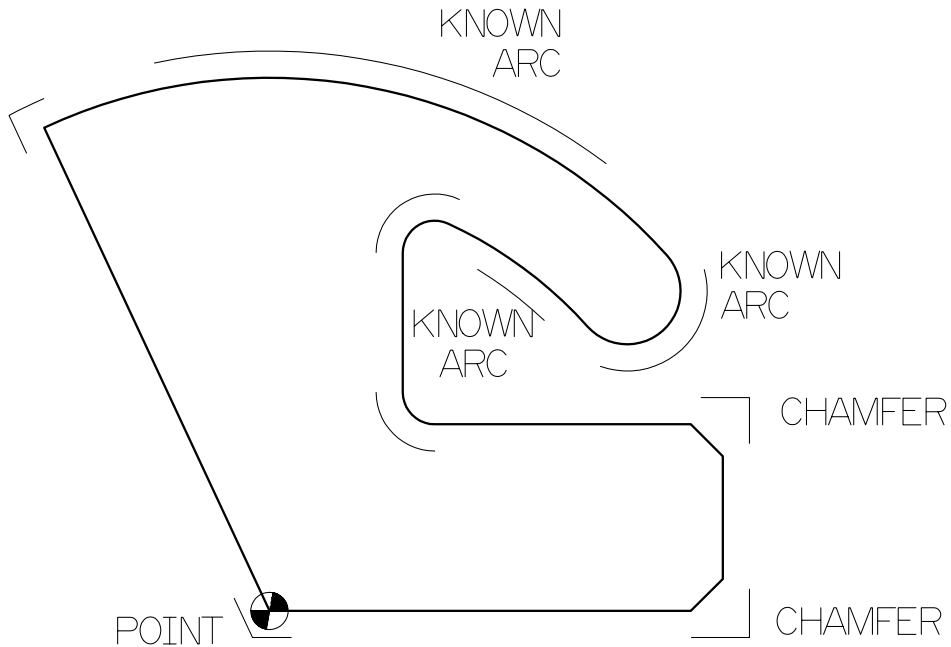
Identify The Known Arcs

A known arc is where both centre and radius are known directly or by implication. The centre co-ordinates may be defined by the directions into and/or out of the arc.



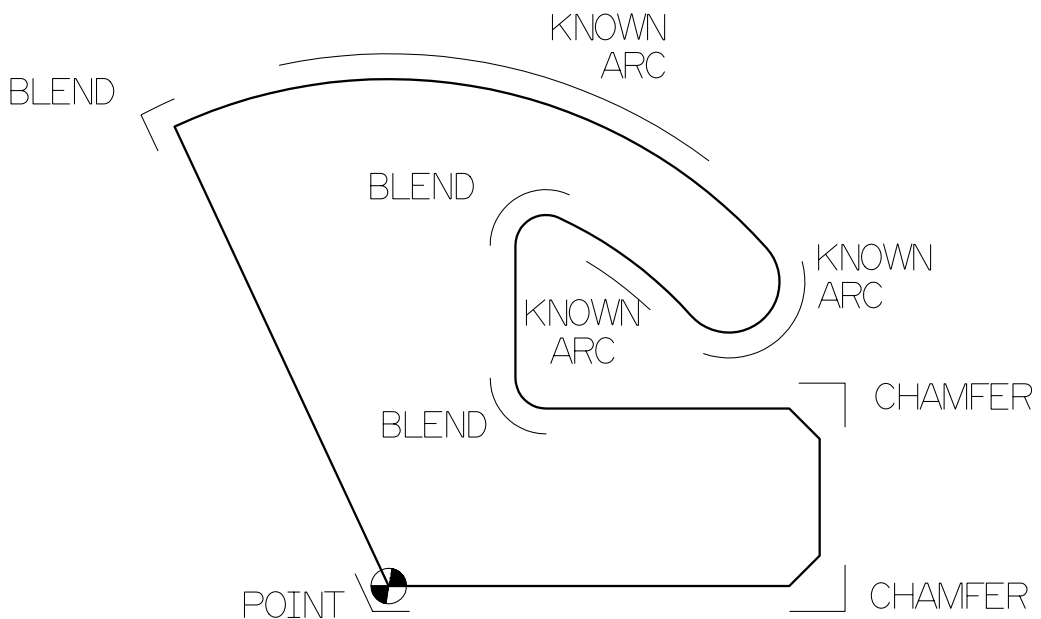
Identify The Chamfers

A chamfer is a cut of corner where the cut off distances and corner position are known.



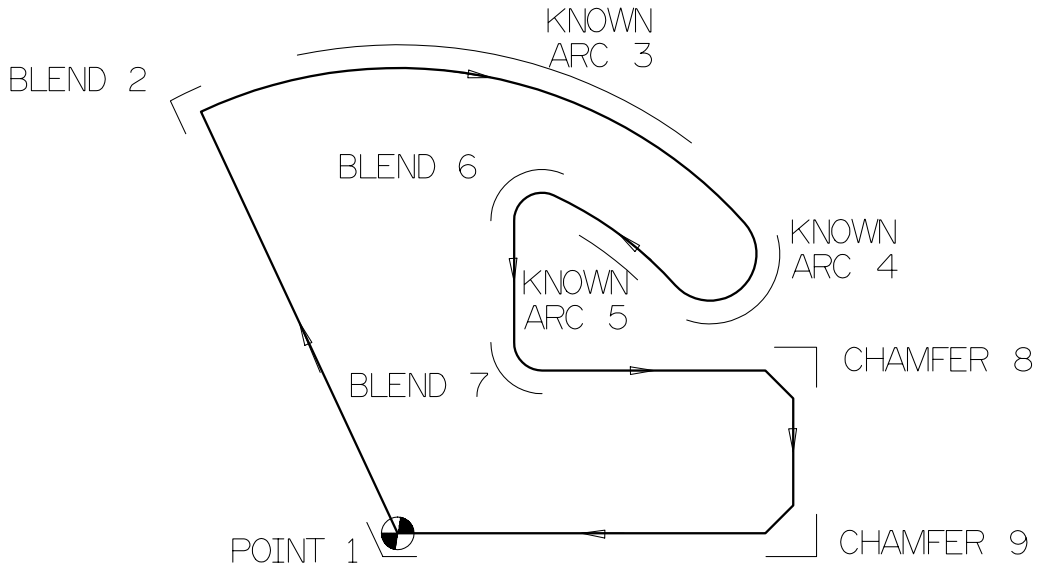
Identify The Blends

A blend is an arc with radius known and centre unknown, (can be zero radius).



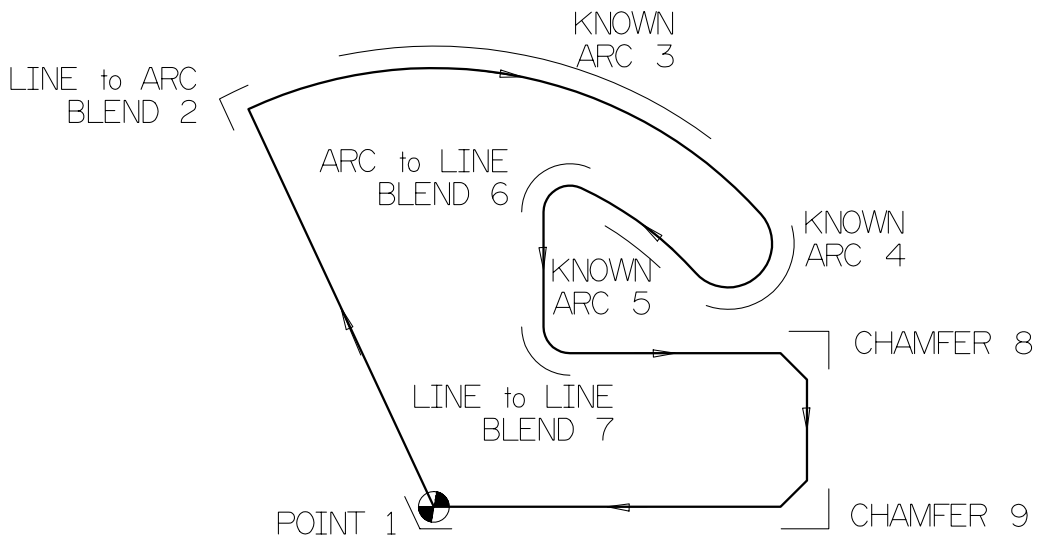
Set the direction of definition

Decide upon the direction in which the profile is to be defined and number the turns.




Identify the Blend Types

Identify the elements before and after the blend.



Draw the Profile.

 Select **GEOMETRY | APS Fast Geometry | Point** .


 The command line prompts you to enter the co-ordinates of the point.

POINT X F1=? Y F1=? . Type **0** **0** .


The cursor is displayed attached to the datum position.

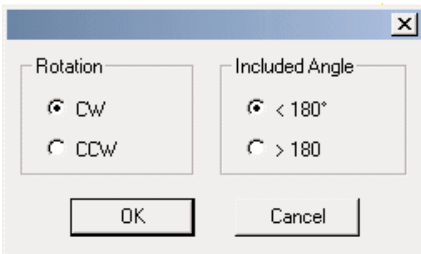
The current profile is drawn in YELLOW

 Select **GEOMETRY | APS Fast Geometry | Line to Arc** .

 The command line prompts you to enter the radius of the blend.

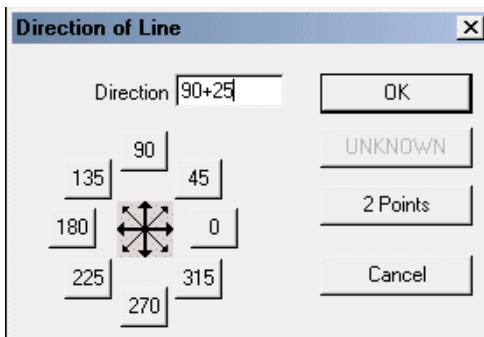
LINE to ARC: Blend Radius . Type **0** .

 The Direction dialog prompts for the direction of the blend arc and its included angle.



. Click on **CW** and **< 180** then .


 The Direction dialog prompts for the direction of the line.



. Type **90 + 25** .

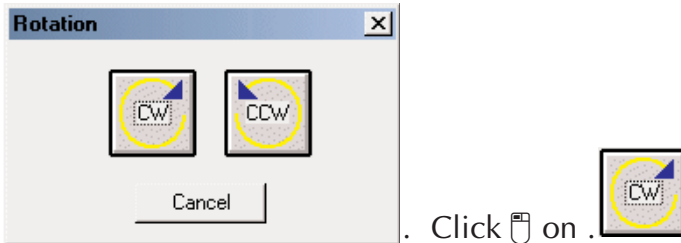
A phantom line is drawn from 0,0 at 115 degrees. Its length is not important.


 Select **GEOMETRY** | **APS Fast Geometry** | **Known Arc** .

 The command line prompts you to enter the radius of the arc.

KNOWN ARC: Radius . Type **100** .

 The Direction dialog prompts for the direction of the arc.




 The command line prompts you to enter the co-ordinates of the arc centre.

Arc Centre X F1=? Y F1=? . Type **0** **0** .

A solid line is drawn from the datum position to a point on a phantom arc. The arc is drawn in phantom style to indicate its position and that it is not fully defined yet (the direction out has not been defined.).

At this point you will realise that there is not enough information to draw the 10 radius arc. In order to calculate the arc centre you need to draw some additional construction geometry. APS fast geometry will automatically be suspended when construction geometry is started, then resumed when the construction command is turned off.

 Select **GEOMETRY** | **Construction** .


 The command line informs you Construction Geometry Started.

The previously drawn line turns green.

 Select **GEOMETRY** | **Circle** | **Centre + Diameter** .

 The command line prompts you to enter the radius of the arc.


Circle Radius 90 OK. Type **90** ↵.

 The command line prompts you to enter the co-ordinates of the arc centre.


Circle Centre X 0 Y 0 OK. Type **0** ↵ **0** ↵.

A magenta circle is drawn.

 Select **GEOMETRY** | **Line** .

 The command line prompts you to enter the start of the line.

LINE From X 0 F1=? Y 35+15+10 F1=? OK. Type **0** ↵ **35 + 15 + 10** ↵

 The command line prompts you to enter the end of the line.

LINE To X 100 F1=? Y 60 F1=? OK. Type **100** ↵ **60** ↵

A horizontal magenta line is drawn intersecting with the circle.

 Press Esc to abort the line command.

 Select **GEOMETRY** | **Construction** .

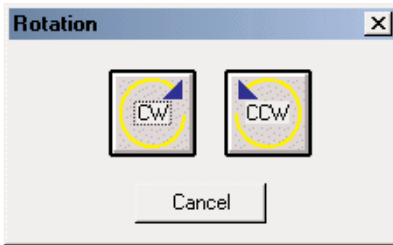
The line from 0,0 at an angle of 115 degrees is displayed in YELLOW, indicating that APS fast geometry has been reactivated.

Select **GEOMETRY | APS Fast Geometry | Known Arc**

The command line prompts you to enter the radius of the arc.

KNOWN ARC: Radius . Type **10** .

The Direction dialog prompts for the direction of the arc.



. Click on

The command line prompts you to enter the co-ordinates of the arc centre.

Arc Centre X F1=? Y F1=? .

Select the snap function Intersection of . The command line prompts **INTERSECTION: Select First Line or Arc** Click on the magenta circle.

The command line prompts **INTERSECTION: Select Second Line or Arc** Click on the magenta line.

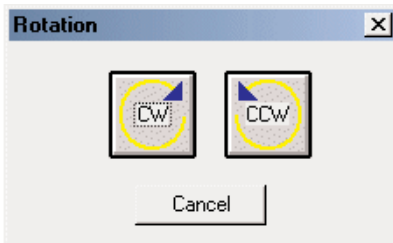
The 100mm radius arc is drawn solid and the 10 radius arc is drawn phantom.

Select **GEOMETRY | APS Fast Geometry | Known Arc**

The command line prompts you to enter the radius of the arc.

KNOWN ARC: Radius . Type **80** .

The Direction dialog prompts for the direction of the arc.




. Click on

The command line prompts you to enter the co-ordinates of the arc centre.


Arc Centre X F1=? Y F1=? . Type **0** **0** .

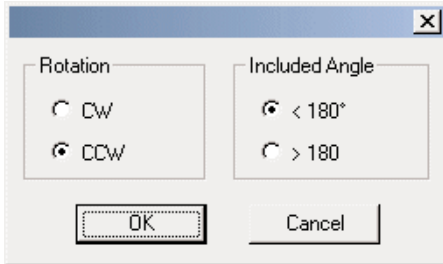
The 10mm radius arc is drawn solid and the 80 radius arc is drawn phantom.

 Select **GEOMETRY | APS Fast Geometry | Arc to Line** .

 The command line prompts you to enter the radius of the blend.

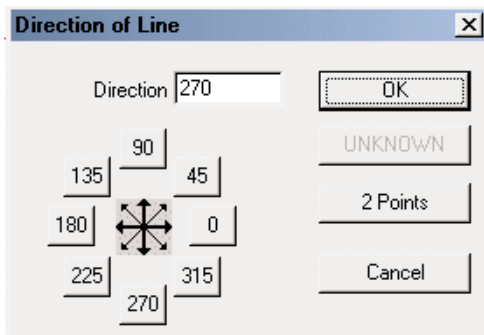
ARC to LINE: Blend Radius . Type **6** .

 The Direction dialog prompts for the direction of the blend arc and its included angle.



Click  on **CCW** and **< 180** then .


 The Direction dialog prompts for the direction of the line.




. Type **270** .

A phantom line is drawn from 0,0 at 270 degrees. Its length is not important. The line is drawn at the centre of the last known arc because its position has not yet been defined.

 Select **GEOMETRY | APS Fast Geometry | Line to Line Blend** .

 The command line prompts you to enter the radius of the blend.

LINE TO LINE (Blend): Arc Radius . Type **6** .

 The command line prompts you to enter the co-ordinates of the intersection of the two lines between which the blend is to be fitted..


Intersection X F1=? Y F1=? . Type **25** **35** .

The previous blend arc is now drawn solid and a phantom line is drawn to the intersection point.


 Select **GEOMETRY | APS Fast Geometry | Line to Line Chamfer** .

 The command line prompts you to enter the first chamfer distance.

LINE TO LINE (Chamfer): First Distance . Type **6** .

 The command line prompts you to enter the second chamfer distance.


CHAMFER: Second Distance . Type **6** .

 The command line prompts you to enter the co-ordinates of the intersection of the two lines between which the chamfer is to be fitted.


Intersection X F1=? Y F1=? . Type **85** **35** .

The previous blend arc is now drawn solid and a phantom line is drawn to the intersection point.


 Select **GEOMETRY | APS Fast Geometry | Line to Line Chamfer** .

 The command line prompts you to enter the first chamfer distance.

LINE TO LINE (Chamfer): First Distance . Type **6** .

 The command line prompts you to enter the second chamfer distance.

CHAMFER: Second Distance . Type **6** .

 The command line prompts you to enter the co-ordinates of the intersection of the two lines between which the chamfer is to be fitted.

Intersection X F1=? Y F1=? . Type **85** **0** .

The previous chamfer is now drawn solid and a phantom line is drawn to the intersection point. To complete the profile you need to connect back to the starting position

 Select **GEOMETRY | APS Fast Geometry | Close & Finish**  .

The geometry will automatically close to form a closed boundary and it turns GREEN to indicate APS fast geometry is no longer active.

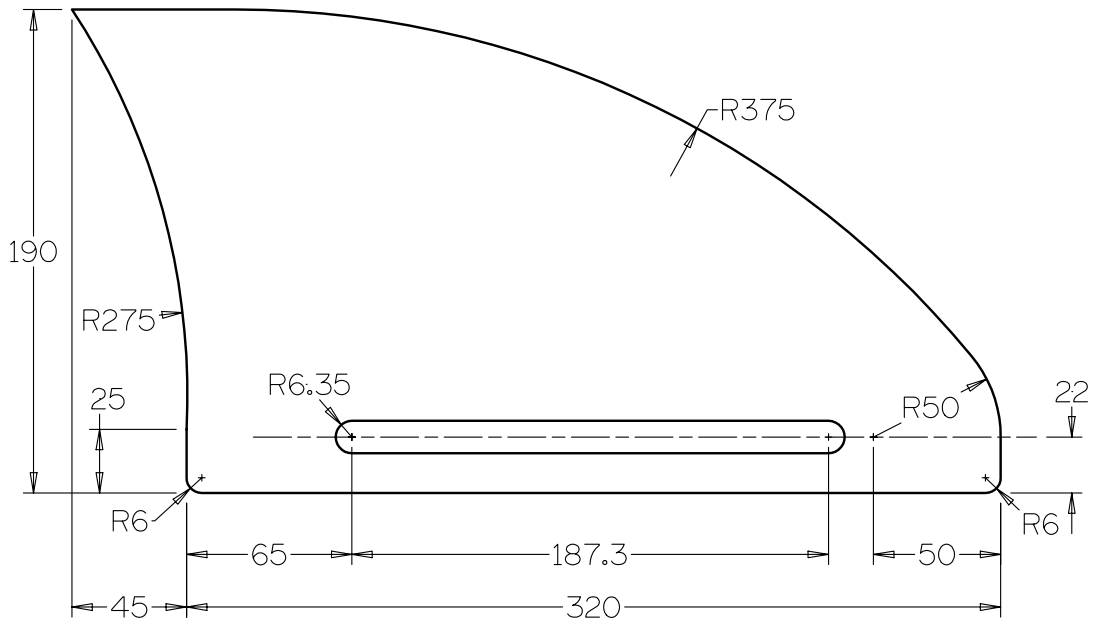
Save the example

 Select **FILE | Save As:** the Save As dialog box is displayed.

 Select a suitable save in drive and directory.

 Enter a suitable filename for this job.

Test Example 1



Test Example 2

