*Flexi*CAD 3

Contents

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Except as explained below, the software described in this document is licensed for use on a single computer. The distribution disk may be copied for backup purposes only.

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Please contact Flexible Software at the address given on the back of this booklet for further details and prices of multiple machine and site licences.

Hardware

FlexiCAD (version 3.0 or later) will run on any stand-alone or networked computer which uses Windows XP, Windows Vista or Windows 7. The program requires the minimum RAM recommended for each version of Windows, 4Mb of available hard disk space and VGA 640x480 graphics or better. It is essential that a mouse is available for use with this program.

1. How to use this booklet

This booklet is a general guide to the main features of FlexiCAD 3. Please use the **Help** system in the program tself for more detailed information.

If you are new to FlexiCAD it is recommended that you read chapters 2 to 9 of the booklet, working through each of the exercises as they occur.

The booklet is in six sections:

◆ Chapter 2 explains how to load and run the program.

◆ Chapters 3, 4, 5 and 6 cover getting started and drawing lines, arcs, circles, ellipses, corners and text.

◆ Chapters 7, 8 and 9 explain about fixing mistakes, using grids and snapping to a point and how to move or copy sections of your drawing.

◆ Chapters 10 to 18 cover a range of other facilities such as colour fills, hatching, polygons, Bezier curves, automatic dimensions, how to make full use of the objects system, symbol libraries and much more.

◆ Chapter 19 explains how to save and load your work on disk. Chapter 20 explains how to print your work.

◆ Chapter 21 explains how to install the program on your computer and some additional technical information.

2. Loading and running the program

Installing FlexiCAD

If you are using FlexiCAD 3 for the first time, insert the master CD and wait for it to automatically start the install program. If the installation program doesn't load itself then click on the **Start** button and then choose **Run** and type **D:\SETUP** (where D stands for the name of the drive that contains the CD).

Follow the instructions on screen. You will be asked to type in your **Registration key** which is printed in your licence agreement. If you are unable to find your Registration key then please contact Flexible Software (details on the back cover of this booklet). If you want further information about installing the program, please turn to page 58.

Starting FlexiCAD

Use any of the following methods to start the program:

1. If there is a **FlexiCAD 3** icon on the screen, use the mouse to point to it and then double click the left button.

2. Otherwise, click on the **Start** button, choose **Programs**, choose **Flexible Software** and then choose **FlexiCAD 3**.

3. Getting started
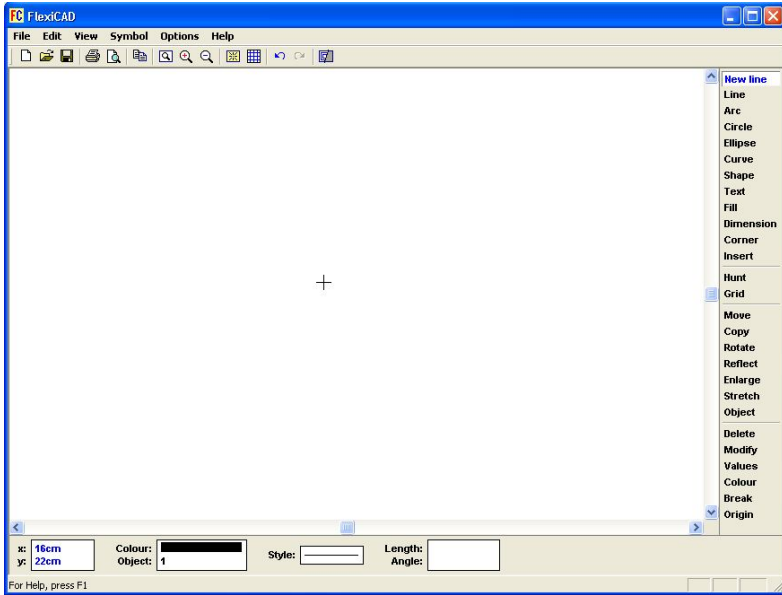
When the program has started you will be asked to type in your name. Once you have done so (and pressed the **ENTER** key) you will see the front page. Click on the ⟨**Start a new drawing**⟩ button and you will then be shown the **drawing screen**. In the centre of the screen is a cross, called the **cursor**. You can move it about the screen using the mouse. At the side of the screen you will see a menu of choices, called the **toolbox**. All of your drawing and editing is controlled by the current choice from this menu.

At the bottom of the screen you will see a number of values which will be used the next time you use the present drawing **tool** (ie, the current choice in the toolbox). In the bottom left hand corner of the screen you can see the current x,y co-ordinates of the cursor.

Using a mouse

To move the cursor round the screen, simply move the mouse! Whenever you want to select one of the options in a menu of choices, then **click on it**. This means moving the cursor until it points to the choice you want, and then pressing the left button on the mouse and releasing it straightaway. Usually when you are asked to click on something, you will not be able to do anything else in between pressing the button and letting it go.

When you are using some of the drawing commands, you can use the mouse to draw dynamically. In this case, you will be asked to **hold the button down and move**. This means pressing the *left* button down, and holding it down while you move the mouse. If you do this while drawing a line, for example, the end of the line will move with the cursor. When the line is in exactly the position you want, just release the button. This needs doing with a little care since it is quite easy to jerk the mouse just at the moment when you release the button.

Using the keyboard

Although it is essential that you use a mouse to do any drawing, most commands can be given using the keyboard. Each of the toolbox options can be chosen by pressing the first letter. For example, if you to draw a circle, you can choose that toolbox option by pressing **C**. (If you press **C** again you will choose the next tool beginning in C). You will still need to use the mouse to position the centre of the circle and to choose a point on the circumference.

If you want to use any of the menus that are along the top of the screen, then press the **ALT** key. The first word in the menus (which is always **File**) will now be highlighted. Now press the letter which is underlined in the menu word that you want. A menu of choices will drop down and you should again press the letter which is underlined in the command word that you want. If you want to cancel giving a command then press the **ESC** key.

4. Drawing lines

Drawing a line with FlexiCAD is very simple - just follow through this list of steps. If the **New line** tool is already selected you can start straightaway at Step 2.

Step 1   Move the mouse pointer to **New line** and click on it.

Step 2   Hold the left mouse button down and move the mouse. When the cursor is where you want the line to start, release the button.

Step 3   Hold the left mouse button down again and move the mouse. When the cursor is where you want the line to end, release the button.

After Step 2 a diagonal cross is left at the place where you fixed the start of the line, and FlexiCAD automatically selects the **Line** tool for you. After the line has been drawn, FlexiCAD moves the diagonal cross to the end of the line, ready to be the start of the *next* line.

So, if you want to draw another line that continues from the end of the previous one, just repeat Step 3. If you want to draw another line that isn't connected to the previous one, you will need to start again at Step 1.

If you select one of the other tools, such as **Delete**, the diagonal cross will disappear. If you then want to carry on drawing from the end of the previous line, select the **Line** tool and the diagonal cross will reappear, and you can continue with Step 3.

If you wish, you can put a grid on the screen by clicking on the **Grid** tool. From then on every point that you choose will be 'locked' to the nearest grid intersection. You can switch the grid on or off at any time by clicking on the **Grid** tool.

Exercise. Use FlexiCAD to draw each of the following lines:
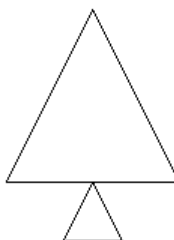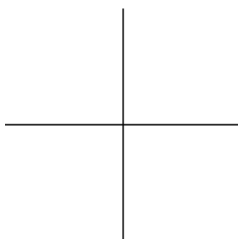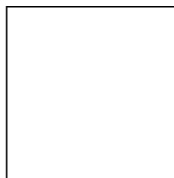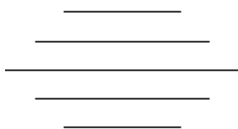
Choosing tool values

At the bottom of the screen is a set of values that will be used the next time a line is drawn - these are called the **tool values** and, in this case, the tool is a line. You can choose the colour of the line, the object (i.e. the part of the drawing) to which the line belongs, the style of the line, the length of the line and the angle of the line. To change any of these values, use the mouse to click in the appropriate box and then either choose the value you want from a list, or type in the value and then press **ENTER**. Please note that these choices will only affect lines you draw *from now on* - if you wish to change a value for an existing line then you need to use the **Modify** tool (see page 21).

Each type of tool (**Circle**, **Text**, etc.) has its own set of values, and these will appear at the bottom of the screen whenever you select that tool.

Colour

To choose a colour, use the mouse to click in the **Colour** box at the bottom of the screen. A dialog box will appear allowing you to choose the colour you want. When you have chosen the colour that you want, click on the **OK** button.

Object

Each item (such as a line, circle, arc or text) belongs to an **object**. You can think of each object as a separate part of your drawing, and it makes it easier to make changes to a particular section of the drawing. See chapter 14 for more details. To choose the object to which an item belongs, use the mouse to click in the **Object** box at the bottom of the screen. A list of objects will appear, and you can click on the one that you want, or you can type in a new object name or number. Object names are limited to a maximum of 16 characters.

Line style

There is a choice of six line styles. To choose one, use the mouse to click in the **Style** box at the bottom of the screen. A list of line styles will appear, and you should click on the one that you want.

```
Unbroken      ————————————————
Small dash    - - - - - - - - - - - - - - - - - -
Dot/dash      —·—·—·—·—·—·—·—·—·—·—·—·—·—·—
Large dash    — — — — — — — — — — —
Dots          ··························································
Close dots    ·······························································
```

Line length

If you want to fix the length of the line you are about to draw, you can do so by clicking the mouse in the **Length** box at the bottom of the screen. Type in the length of the line that you want and then press **ENTER**. If you wish, you can also include the units (mm, cm, m or km) in the length that you require.

Line angle

As its name suggests line angle allows you to draw lines at any angle between 0 and 360 degrees. Angles are measured anti-clockwise from 3 o'clock. Select **Angle** from the menu at the bottom of the screen by clicking the mouse in the box. Now type in the angle you want and press **ENTER**. If the angle is between 10° and 180° then you can use multiples of the angle selected, so that lines will be drawn at the angle chosen, or any multiple of that angle. So, for example, if you choose an angle of 45° then lines can be drawn at 45°, 90°, 135° and so on.

Exercise.   Use the **Edit | Wipe** command to delete all the items in your drawing and to clean the screen. Now draw each of the following lines. Make all of your lines exactly 5cm long.
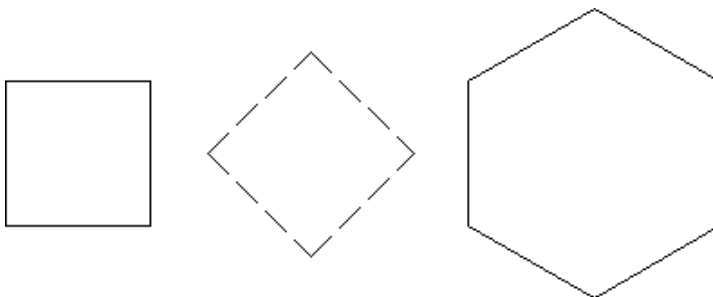
5. Circles, arcs, ellipses and corners

Drawing circles

The following steps show how to draw a circle by using the cursor to fix the centre of the circle and then any point on the circle itself.

Step 1   Move the mouse pointer to **Circle** and click on it.

Step 2   Hold the left mouse button down and move the mouse. When the cursor is where you want the centre of the circle to be, release the button.

Step 3   Hold the left mouse button down again and move the mouse. When the circle is the size that you want it to be, release the button.
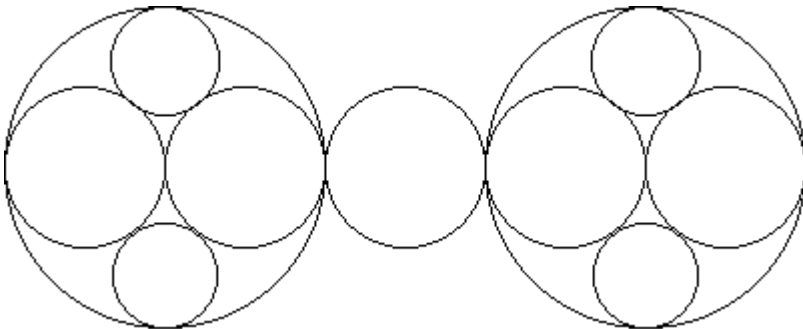
Exercise. Use FlexiCAD to draw the following diagram; begin by drawing three lines to make the triangle, and then follow the steps above to draw a circle. You will need to use your judgement to estimate where to put the circle centre.
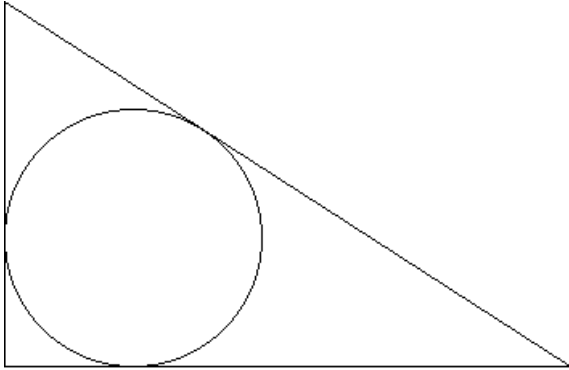

If you prefer, you can choose the radius of the circle:

Step 1   Move the mouse pointer to **Circle** and click on it.

Step 2   Move the mouse pointer to the **Radius** box and click inside it. Type in the radius you want, including any units, and then press **ENTER**.

Step 3   Hold the left mouse button down and move the mouse. When the circle is where you want it to be, release the button.

Drawing arcs

The following steps show how to draw an arc using the cursor to fix the start of the arc, the end of the arc and any other point on the arc.
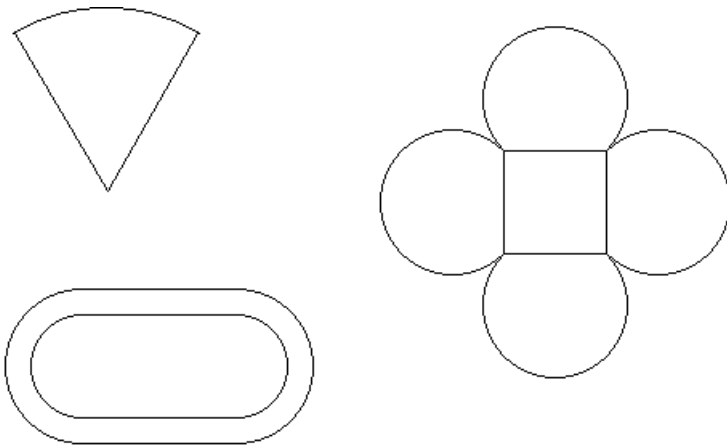
Step 1   Move the mouse pointer to **Arc** and click on it.

Step 2   Hold the left mouse button down and move the mouse. When the cursor is where you want the arc to start, release the button.

Step 3   Hold the left mouse button down again and move the mouse. When the cursor is where you want the arc to end, release the button.

Step 4   Hold the left mouse button down again and move the mouse. When the arc is the size and position that you want it to be, release the button.

3 Another point

2 End Point

1 Start point
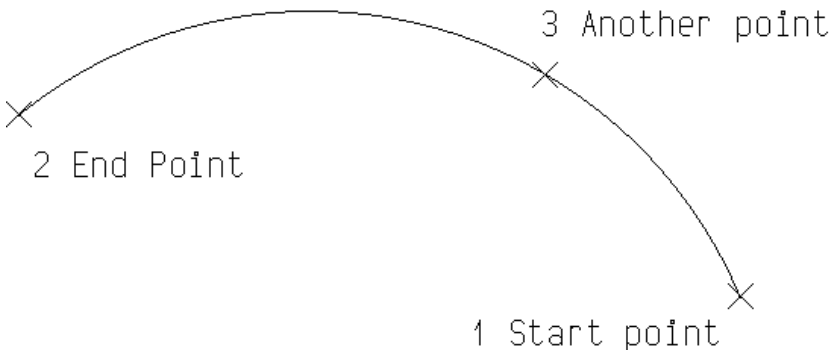
Arcs can be drawn in three different ways:

1. Use the cursor to fix the start of the arc, the end of the arc and then any other point on the arc.

2. Choose **Angle** and type in the value of the arc angle, between 0° and 360°. Then use the cursor to fix the start of the arc and the end of the arc. The arc will always be drawn anticlockwise from the start point to the end point.

3. Choose **Radius** and type in the radius of the arc. Then use the cursor to fix the start of the arc and the end of the arc. The arc will always be drawn anticlockwise from the start point to the end point. Please note that if the end point is too far away from the start point, no arc will be drawn.

Exercise.   Use FlexiCAD to produce the following drawings. In each case start by drawing the lines first. You will need to use your judgement to estimate where to put the arcs.

Drawing ellipses

The following steps show how to draw an ellipse. If the value shown for the slope is already correct then you can omit step 2.

Step 1   Move the mouse pointer to **Ellipse** and click on it.

Step 2   Move the mouse pointer to the **Slope** box and click inside it. Type in the angle of the slope of the major axis of the ellipse and then press **ENTER**.

Step 3   Hold the left mouse button down and move the mouse. When the cursor is where you want the end of the major axis to be, release the button.

Step 4   Hold the left mouse button down again and move the mouse. When the cursor is where you want the end of the minor axis to be, release the button.
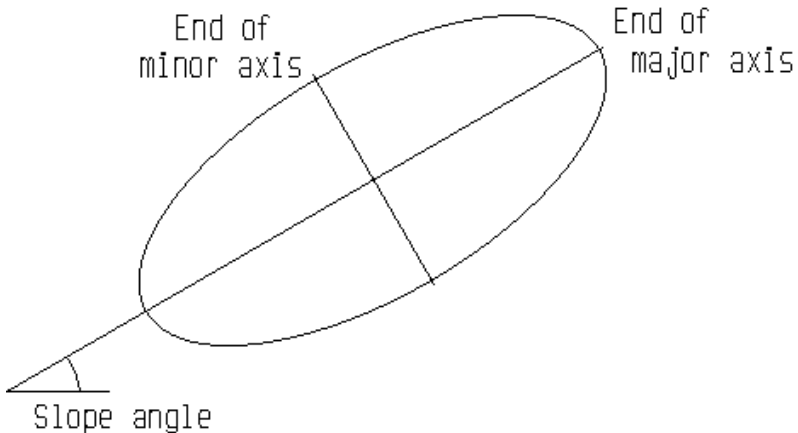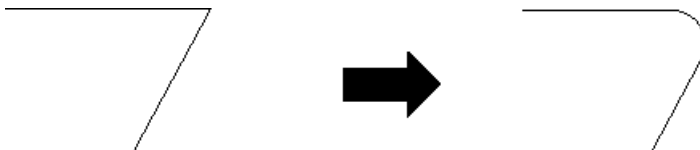
Exercise.   Create the following drawing which uses four ellipses. You will probably find it easier to draw the lines first, and then fit the ellipses in by eye.
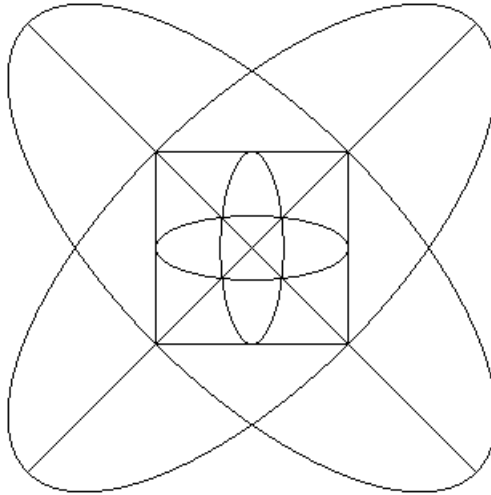
Corners

You can use an arc or a line to round off a corner where two lines meet. If you use an arc, it is called a **fillet**; if you use a straight line it is called a **chamfer**. For example :

To draw a fillet or a chamfer you must *already* have a corner where two lines meet.
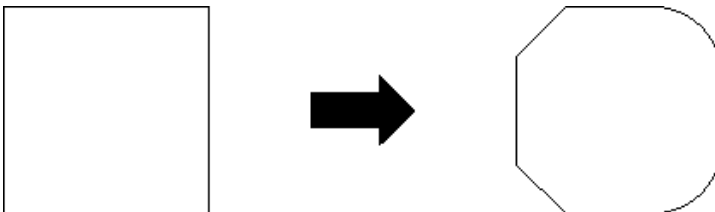
The following steps show how to fillet such a corner.

> Step 1 Move the mouse pointer to point to **Corner**. A sub-menu will appear - use your mouse to click on **Fillet**.
>
> Step 2 Hold the left mouse button down and move the mouse. When the cursor is near the corner you want to fillet, release the button.
>
> Step 3 Hold the left mouse button down again and move the mouse. When the fillet is the size that you want, release the button.

If you prefer, you can choose to use a line to **chamfer** a corner instead of an arc to **fillet** a corner. If you wish to do so then, after pointing to **Corner**, click on **Chamfer** in the sub-menu.

If you prefer, you can choose the radius of a fillet arc or the length of a chamfer line. This is useful if you want to make sure that several corners have the same size.

Exercise.   Create a square whose sides are 6cm long. Use two arc fillets and two line chamfers to produce the following drawing.

6. Adding text to your drawing

You can add text to a drawing to provide headings, instructions and title blocks etc. Text can be any size and at any angle.

The following steps show how to add text on your drawing:

Step 1   Move the mouse pointer to **Text** and click on it.

Step 2   If you want to choose the angle of the text, move the mouse pointer to the **Angle** box and click inside it. Type in the angle that you want the text and then press **ENTER**. (The text angle is measured in degrees, anticlockwise from 3 o'clock).

Step 3   If you want to choose the font of the text, move the mouse pointer to the **Font** box and click inside it. You will see the standard dialog box for choosing a font and its size. When you have made your choice, click on the **OK** button.

Step 4   Hold the left mouse button down and move the mouse. When the cursor is where you want the top-left of the text to start, release the button.

Step 5   Type in the text itself, and then press **ENTER**.

If you made a mistake when typing in your text you may have discovered that FlexiCAD includes a spell checker. If any of your words is not included its dictionary you will be offered a choice of words with a similar spelling, or of accepting the spelling anyway or of adding the word to the dictionary. If you prefer you can switch the spell checker off by using the **Option | Preferences** command.

Exercise. Use FlexiCAD to produce the following drawing:

Times New Roman 36pt

Arial 48pt at 30 degrees

Text at 90 degrees
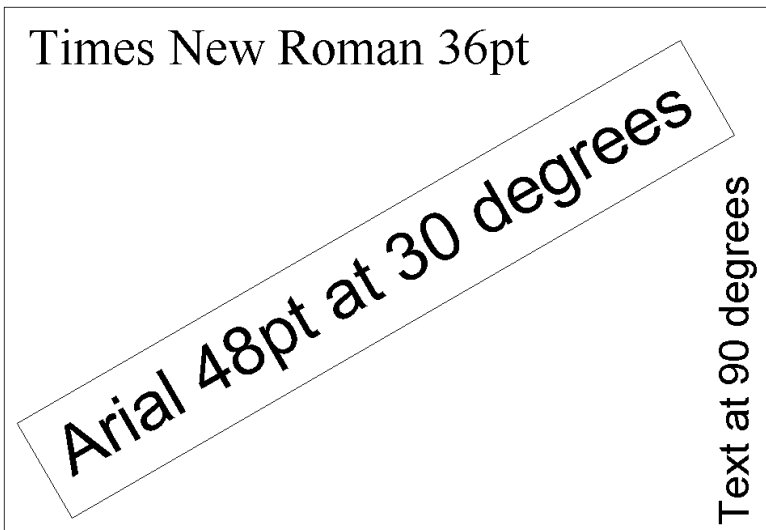
Editing text

Once you have added a piece of text to your work, you can still change it if you wish. To do so, choose the **Modify** tool. Then click inside the text that you wish to edit. A cursor will appear and you can edit the text in the normal way. If you wish to re-position the cursor within the text then you can either click again with the mouse or use the left and right arrow keys.

Moving text

Once you have added a piece of text to your work, you can move it if you wish. To do so, point to the **Move** tool and then click on **Move an item** in the sub-menu. Now use the mouse to point to the text, hold down the left mouse button and then move the mouse. When the text is in the position you want, release the mouse button.

7. Making things right

Undo and redo

The Undo tool will reverse the last action which changed your drawing. For example if you inserted a circle it will be removed. If you deleted a line it will be put back. If you keep choosing the **Undo** tool, successive actions will be reversed until either the drawing screen is clean or FlexiCAD runs out of space to remember your drawing actions. If you prefer you can press the **Ctrl Z** key to carry out this command (i.e., hold the **Ctrl** key down and, while doing so, press the **Z** key).

If you want to recover any action(s) that have been undone, you can use the **Redo** tool which reverses each undo action in turn. If you prefer you can press **Ctrl Y** to carry out this command.

Deleting things

If you wish to remove an item such as a line, arc, circle or piece of text, then you can use the **Delete** tool. Begin by clicking on **Delete**, then move the mouse until the cursor is over the item to be deleted and then click the left mouse button. The selected item will be highlighted and you should then click on ⌐**Delete the selected items**⌐ to confirm your intentions.

If you want to delete several items, you can do so by clicking on each of them in turn. Also, if you hold down the left mouse button and move the mouse, a rectangle will appear - releasing the mouse button will select all the items that are *completely* inside the rectangle. If you hold the **SHIFT** key down when you release the mouse button, all the items inside the rectangle will be de-selected. If you press the **CTRL** key down while you are pulling out a rectangle, the whole rectangle will move. The selected items will be highlighted and you should then click on ⌐**Delete the selected items**⌐ to confirm your intentions.

Modify

The modify tool lets you change some of the settings for existing items (lines, arcs, circles etc.). Once you have chosen the **Modify** tool you can move the cursor near to the item in which you are interested (such as a line, arc, circle, or ellipse) and click the left mouse button. The item will be highlighted, and the following values will be shown:

Line the colour of the line;
     the object to which the line belongs;
     the style of the line;

Arc   the colour of the arc;
     the object to which the arc belongs;
     the angle of the arc;

Circle the colour of the circle;
     the object to which the circle belongs;
     the radius of the circle;

Ellipse the colour of the ellipse;
     the object to which the ellipse belongs;
     the slope of the major axis of the ellipse;

Text the colour of the text;
     the object to which the text belongs;
     the font and size of the text;
     the angle of the text
     the width as a percentage of the normal font;

You can click inside any box at the bottom of the screen and choose a new value from a list, or type in a new value if appropriate. Once you have made any changes you want, you can choose any other item and modify the settings for that item.

Other items, such as curves, shapes, fills and dimensions (all of which you will meet in later chapters) also have their own sets of values which you can change in the same way.

As a quick alternative to selecting the **Modify** tool and then choosing the item you want to change, you can use the mouse to point to the item and then click the *right* mouse button - this will simultaneously select the **Modify** tool and choose that item.

Values

The values tool lets you look at any of the lines, arcs, circles or ellipses you have already drawn and find out the values associated with them. Once you have chosen the **Values** tool you can move the cursor near to the line, arc, circle or ellipse in which you are interested, and click the left mouse button. The line, arc, circle or ellipse will change colour, and the following information will be shown:

|	
Line	x,y co-ordinates of the start of the line;
	x,y co-ordinates of the end of the line;
	the length of the line;
	the angle of the line (measured from 3 o'clock);
Arc	x,y co-ordinates of the start of the arc;
	x,y co-ordinates of the end of the arc;
	x,y co-ordinates of the centre of the arc;
	the radius of the arc;
	the length of the arc;
Circle	x,y co-ordinates of the centre of the circle;
	the radius of the circle;
Ellipse	x,y co-ordinates of the centre of the ellipse;
	the lengths of the major & minor radii of the ellipse;
Text	x,y co-ordinates of the top left of the text;

Once you have noted any of the information you want, you can click on any other item and see the values for that item.

8. Grid, hunt and zoom

Grid

FlexiCAD can provide a grid system which makes it very easy to create simple drawings where things line up. If you switch the grid on, FlexiCAD will force all line, arc and curve ends to **snap** onto the nearest point on the grid. If you select the **Grid** tool (either by clicking on it with a mouse, or by pressing **G**) it will be highlighted in white, showing that the Grid facility is *on*. If you select **Grid** again then it will be switched off.

Grids are available in seven sizes, ranging from 1mm to 10cm. The grid can appear on the screen as lines or dots. You can choose the colour of the grid. You can choose a square grid or an isometric grid. If you want to change any of these settings, you will need to use the **View | Grid settings** command or choose the **Grid settings** tool from the toolbar. You will be given the following menu of choices:
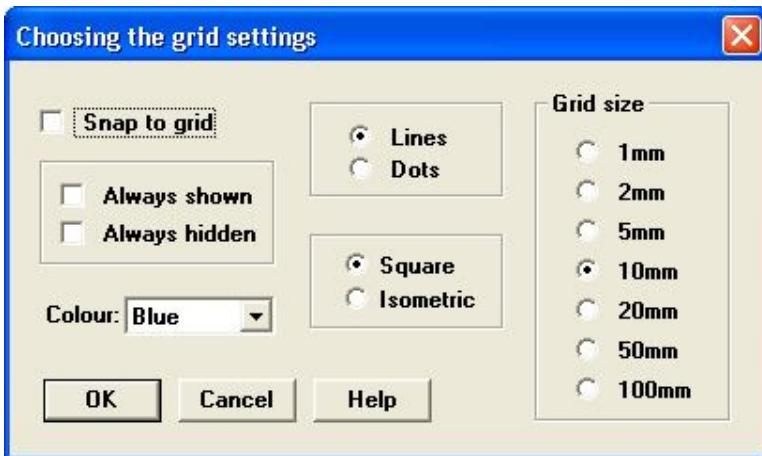
Note: If you select a very small grid size then when the screen is drawn the grid will not be shown on the screen.

Exercise.   Switch the grid system to show dots, with a grid spacing of 1cm. Now use FlexiCAD to produce the following drawing using the sizes shown.
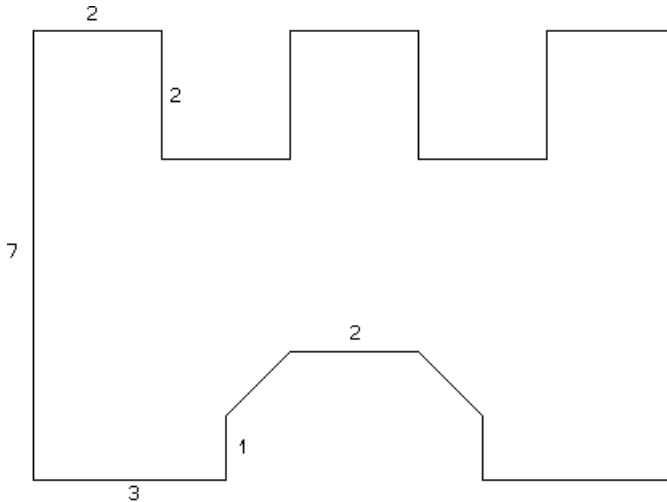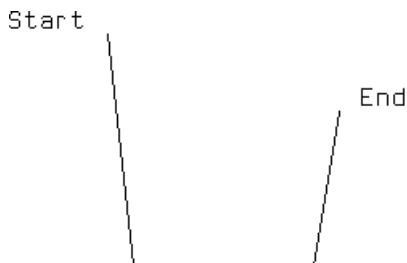

Hunt

This command allows you to 'snap' the cursor onto the nearest point which is at the end of a line, arc or curve, or the centre of a circle or an ellipse. It will help make drawings more accurate and avoid gaps between lines, arcs and curves.

If you select the **Hunt** tool (either by clicking on it with a mouse, or by pressing **H**) it will be highlighted in white, showing that the Hunt facility is *on*. If you select **Hunt** again then it will be switched off.

Exercise.   First choose the command **Edit | Wipe** (which will clean away your old work), and then draw the following shape (with the **Hunt** facility switched *off*).

Start

End

Now switch the **Hunt** facility on (either by clicking on it with a mouse, or by pressing **H**). Start to draw a fourth line, continuing from the end of the third line, but don't release the mouse button yet. You will see that although the cursor moves around freely as usual, the end of the line will move to one of the existing points if it is nearby.

or

Now move the cursor so that the line joins up with the start point and release the mouse button. This is called **closing** the shape. It is a good idea whenever you are drawing a shape like this to use the Hunt facility at the end to close it, rather than trying to get the end of the last line exactly on top of the start of the first line. This is particularly important if you intend to fill the shape with colour.

Exercise.   Use FlexiCAD to produce each of these shapes. In each case use the Hunt facility to make sure that each corner is only one point.
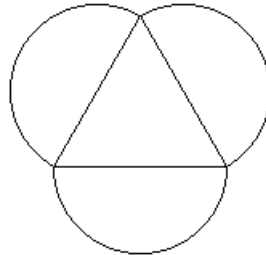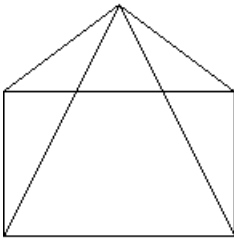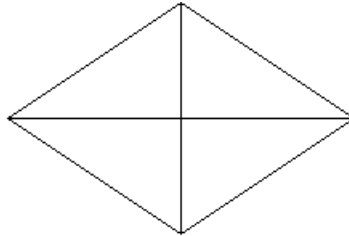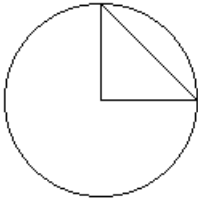
Zoom

If you want to look at part of your drawing more closely, then you can do so by choosing to **Zoom in**. To do this, press the **F9** key (or choose the **View | Zoom in** command). Use the mouse to move the zoom window to the part of the drawing you want, and then click the left mouse button.

If you want to look at more of your drawing at once, then you can do so by choosing to **Zoom out**. To do this, press the **F10** key (or choose the **View | Zoom out** command).

You can also automatically zoom in or out to fit the drawing on the screen by pressing the **F8** key (or choose the **View | Fit** command).

9. Moving and copying

The **Move** tool allows you to re-position anything on the screen. In its simplest form, you can move a single item around the screen.
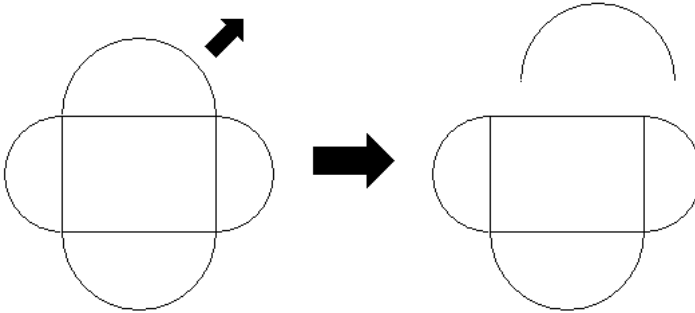
If you use the mouse to point to the **Move** tool you will see six choices:

Move an item	Moves a single item. The shape of the item will not be changed.
Move items	Moves several items together. The shape of the items will not be changed.
Move a point	Moves a single point. If the point is at the end of a line, arc or curve, then that line, arc or curve will stretch as the point moves.
Move points	Moves several points together. If only one end of a line, arc or curve is included, then the item will stretch as the points move.
Drag out a line	Makes a line longer or shorter without changing its direction.
Split a point	Use this to split the end of one line, arc or curve away from several others at the same point.

Moving several items

Step 1　Move the mouse to point to the **Move** tool and then click on **Move items** in the sub-menu.

Step 2　If you wish to do so, you can choose a particular angle at which the items are be moved - click in the box labelled **Angle**, type in the angle you want (between 0° and 180°) and then press **ENTER**.

Step 3　Select all the items that you wish to move. Each selected item will be highlighted. To select a single item, just click on it. Clicking on an item that is already selected will de-select it. If you hold the left mouse button down and move the mouse, a rectangle will appear - releasing the mouse button will select all the items inside the rectangle. If you hold the **SHIFT** key down when you release the mouse button, all the items inside the rectangle will be de-selected. If you press the **CTRL** key down while you are pulling out a rectangle, the whole rectangle will move. You can also select (or de-select) objects from the list that will appear.

Step 4　Click on the ⏐ **Move the selected items** ⏐ button.

Step 5　Now move the mouse to point to one of square grips that will appear, and hold down the left mouse button.

Step 6　Move the mouse until that point is in the position you want and then release the mouse button. If you have not chosen an angle to move and the **Grid** or **Hunt** tool is selected, then the point will be limited to grid points or to another point in the drawing, respectively.

Moving an item

If you only want to move a single item, such as a line, arc, curve, circle or a piece of text, then use the mouse to point to the **Move** tool and then choose **Move an item** from the sub-menu that appears. If you wish you can now choose a particular angle to move.

Move the mouse to point to the item that you want to move and press down the left mouse button. If you start near an end point on that item (or the centre of a circle or ellipse) then a square, grey grip will appear and you can drag this grip wherever you want. If you have not chosen an angle to move and the **Grid** or **Hunt** tool is selected, then the point will be limited to grid points or to another point in the drawing, respectively. However, if you do not start near an end/centre point then the **Grid** or **Hunt** tool will have no effect.

Once the item is in the   position you want, release the mouse button.

Moving a point

A **point** is the end of a line, arc or curve, the centre of a circle or an ellipse or the top-left corner of a piece of text. If the point is at the end of a line, arc or curve then that item will stretch as the point moves. If the point is the centre of a circle or an ellipse or the top-left of a piece of text, then the whole item will move. To move a single point you should point to the **Move** tool and then choose **Move a point** from the sub-menu that appears. If you wish you can now choose a particular angle to move.

Move the cursor onto the point and hold down the left mouse button. Move the cursor to the position you want the point to be (you will see all the items connected to that point being dragged along with the cursor) and then release the mouse button. This will fix the point in its new position.
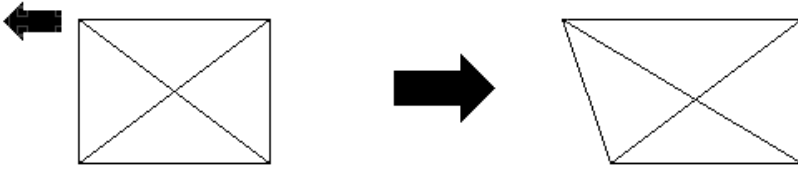
Moving several points

Step 1   Move the mouse to point to the **Move** tool and then click on **Move points** in the sub-menu.

Step 2   If you wish to do so, you can choose a particular angle at which the points are be moved - click in the box labelled **Angle**, type in the angle you want (between 0° and 180°) and then press **ENTER**.

Step 3   Select all the points that you wish to move. A **point** is the end of a line, arc or curve, the centre of a circle or an ellipse or the top-left corner of a piece of text.
Each point that is to be moved will have a square grey grip around it. To select a single point, just click on it. Clicking on a point that is already selected will de-select it. If you hold the left mouse button down and move the mouse, a rectangle will appear - releasing the mouse button will select all the points inside the rectangle. If you hold the **SHIFT** key down when you release the mouse button, all the points inside the rectangle will be de-selected. If you press the **CTRL** key down while you are pulling out a rectangle, the whole rectangle will move.

Step 4   Click on the **Move the selected points** button.

Step 5   Now move the mouse to point to one of square, grey grips and hold down the left mouse button. Move the mouse until that point is in the position you want and then release the mouse button. If you have not chosen an angle to move and the **Grid** or **Hunt** tool is selected, then the point will be limited to grid points or to another point in the drawing, respectively.

Splitting a point

Normally, if you move a point then all the lines and arcs which are connected to it will move together. However, if you want to separate one line from several others, you can do so by pointing to the **Move** tool and then clicking on **Split a Point** in the sub-menu that will appear.

Now move the mouse pointer so that it is close to the end of the actual line that you wish to move. Hold the mouse button down and you will see the line separate out from the rest of the point; move the mouse until the end of the line is where you want it to be and then release the mouse button.
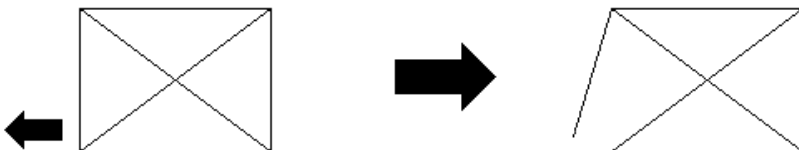
Dragging out a line

Normally, if you move a point at the end of a line, you can put the point anywhere on screen, thus changing both the direction and length of the line. However, if you want to preserve the direction of the line and just make it shorter or longer, you can do so by choosing the **Move** tool, clicking inside the **Action** box and then choosing the option to **Drag out a line**.

Now move the mouse pointer so that it is close to the end of the line that you wish to drag out. Hold the mouse button down, move the mouse until the end of the line is where you want it to be and then release the mouse button.
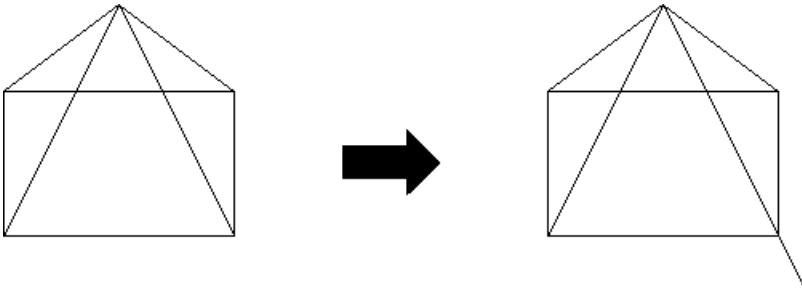
Copying items

The **Copy** tool allows you to copy one or more items such as lines, arcs, circles, ellipses or pieces of text. When an item is copied it always retains its original shape.

Step 1   Move the mouse pointer to the **Copy** tool and click on it. All the items on the screen will turn grey.

Step 2   If you wish to do so, you can choose the angle at which the new items are be moved and/or the distance they will be from the original.

Step 3   Select all the items that you wish to copy.
Each selected item will be highlighted. To select a single item, just click on it. Clicking on an item that is already selected will de-select it. If you hold the left mouse button down and move the mouse, a rectangle will appear - releasing the mouse button will select all the items inside the rectangle. If you hold the **SHIFT** key down when you release the mouse button, all the items inside the rectangle will be de-selected. If you press the **CTRL** key down while you are pulling out a rectangle, the whole rectangle will move. You can also select (or de-select) objects from the list that will appear.

Step 4   Click on the `Copy the selected items` button.

Step 5   Now use the mouse to any point one of the square, grey grips that will appear and then hold down the left mouse button. Move the mouse until that point is in the position you want and then release the mouse button. If you have not chosen an angle or distance to move and the **Grid** or **Hunt** tool is selected, then the point will be limited to grid points or to another point in the drawing, respectively.

Step 6   If you wish, you can repeat step 5 to produce more copies.

10. Fill and hatch

You can use the **Fill** tool to fill any enclosed shape with a solid colour. The boundary must consist of a series of lines, arcs, curves, circles and ellipses which are joined or intersect. The boundary items can be any colour.
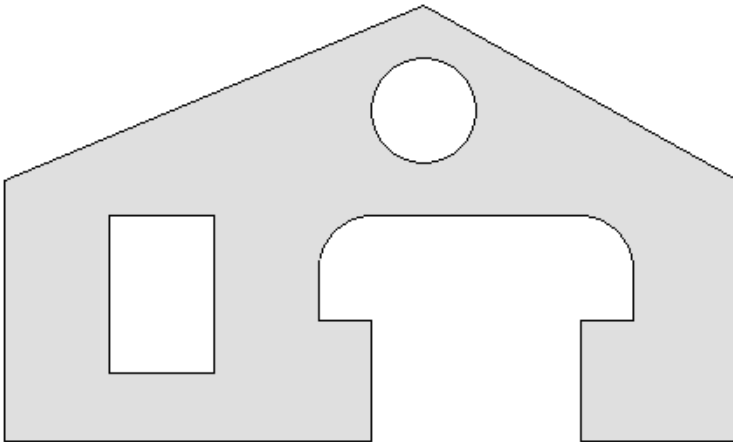
Choosing the area

It is a good idea to not add any fills until your drawing is nearly finished, since later changes may mean that the fill will have to be deleted and then re-done. Once you are ready to add a fill to your drawing, choose the tool **Fill**. You can then choose the colour that will be used by clicking in the **Colour** box at the bottom of the screen. A dialog box will appear allowing you to choose the colour you want. When you have chosen the colour, click on the **OK** button.

Now use the mouse to click anywhere inside the closed shape that you wish to fill.

Hatching

Instead of filling an area with a solid colour, you can fill it with a hatching pattern if you prefer. Before clicking inside the area that you wish to fill, click inside the **Fill type** box at the bottom of the screen. You should now choose **Hatch** and then click in the **Hatch** box that will appear. You will be a given a choice of hatch patterns - click in the one that you want. You can also choose the angle of your hatch pattern at this stage and/or the scale factor of the pattern.

Now use the mouse to click anywhere inside the closed shape that you wish to hatch.
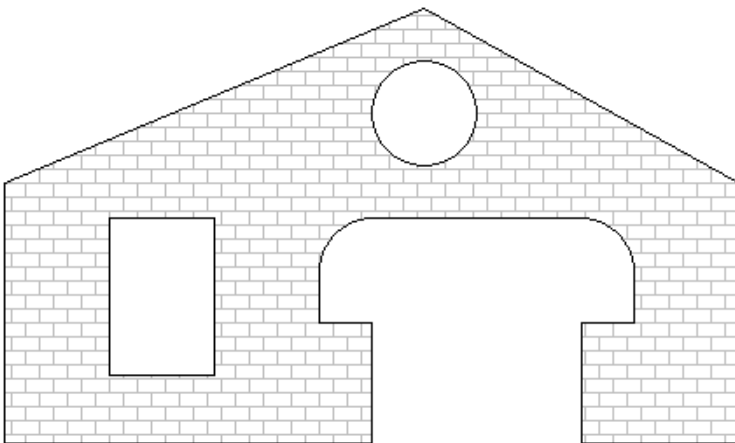
If you wish to change an existing solid colour fill to a hatch pattern, then choose the **Modify** tool and then click inside the filled area. You can then repeat the process above to change the fill that you have selected.

11. Shapes

If you wish to draw a regular polygon on screen, then you could do so using the **Line** tool. However, another tool - **Shape** can be used to achieve the same effect more quickly.
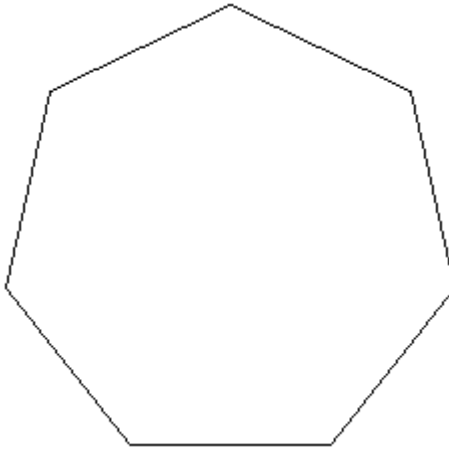
To add a shape to your drawing, use the mouse to point to the **Shape** tool and then choose **Square**, **Rectangle** or **Regular polygon** from the sub-menu that appear. You can then set the values for your shape, such as the number of sides, length of side and/or angle of rotation by clicking in the appropriate box at the bottom of the screen.

Once you have chosen the values you want for your shape, you can then use the mouse to choose the position of the bottom left corner of the shape in your drawing. If you have not specified both the side length and angle of rotation you can then use the mouse to choose the position of the next corner of the shape.

12. Curves

In some drawings you may want to include curves which are not just simple arcs. FlexiCAD enables you to draw a Bezier curve, named after the French mathematician Pierre Bézier. The curve consists of a start and end point, and two 'control' points which determine the direction of the curve as it leaves the start and end points.
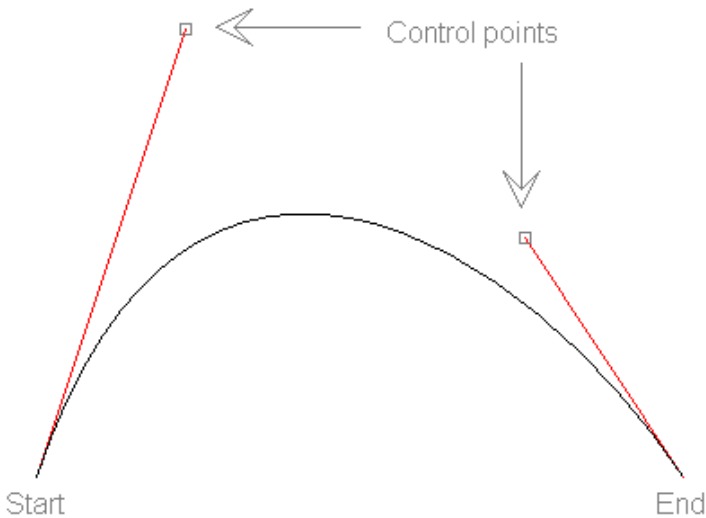
The curve leaves the start point in the direction of the first control point. Similarly the curve leaves the end point in the direction of the second control point. In other words, the curve is a tangent to the control line at the start and end of the curve. The distance from the start or end point to its respective control point sets the 'speed' at which the curve goes in that direction - in other words if the control point is further away it will tend to drag the curve more in that direction before it moves smoothly round towards the other control line.

To insert a curve:

Step 1   Move the mouse pointer to **Curve** and click on it.

Step 2   Hold the left mouse button down and move the mouse. When the cursor is where you want the start of the curve to be, release the button.

Step 3   Hold the left mouse button again down and move the mouse. When the cursor is where you want the end of the curve to be, release the button.

Step 4   Hold the left mouse button down again and move the mouse. When the cursor is where you want the first control point to be, release the button.

Step 5   Hold the left mouse button again down and move the mouse. When the cursor is where you want the second control point to be, release the button.

Changing a curve

Once you have inserted a curve you can change it by using the **Modify** tool. The control points will then be shown, connected to the start and end points by red lines. You can then adjust the position of the control points by dragging them round, or by typing the angle or length that you require into the appropriate input box at the bottom of the screen.

13. Dimensions

You can add automatic dimensions to your drawing at any stage. If you later re-scale your drawing, or move one end of the dimension then the value shown will change automatically. The following drawing shows (some) of the variations which are available:
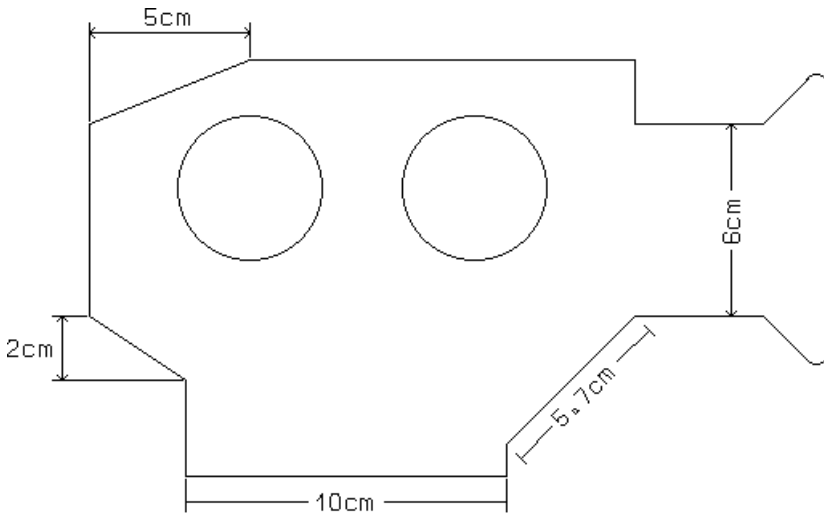
When you want to add a dimension, click on the **Dimension** tool. You can then change any of the following characteristics, by clicking in the appropriate box:

Type   Parallel, horizontal or vertical. For example, the 2cm dimension above is vertical. The 5cm dimension is horizontal. All the rest are parallel.

Font   This is normally set to 16pt Arial but you can choose any font and size, provided that there is room to fit the text within the dimension line.

Line ends	Normal, arrows, dashes, lines or none. The 2cm and 5cm dimensions above are normal, the 6cm has arrows, the 5.7cm has dashes and the 10cm has lines.
Text angle	Line angle or horizontal. All the dimensions above use the line angle except for 2cm, which is horizontal.
Position	In line, outside or inside. The 5cm and 2cm dimensions are outside. All the other dimensions are in line.

To add a dimension, use the following steps:

Step 1	Move the mouse pointer and click on **Dimension**.
Step 2	Check the values at the bottom of the screen. If you want to change any value then click inside that box and then choose the required value.
Step 3	Hold the left mouse button down and move the mouse. When the cursor is near a line, release the button.
Step 4	Hold the left mouse button down again and move the mouse. Drag the dimension out to the position you want and then release the button.

Dimensions without lines

In the diagram on page 39 you may have noticed that the 6cm dimension does not correspond to any line in the drawing. In order to insert a dimension like this, you need to insert a line across the position you want to dimension. Then add the dimension in the normal way and then, finally, rub out the line itself.

You can change any of the settings *after* the dimension has been added by choosing the **Modify** tool and then clicking on the dimension you wish to change. You can also choose four more settings at this stage:

Units   Preference, automatic, mm, cm, m or km. If you choose preference then the dimension will use the units that are set in the **Options | Preferences** command.

Decimal   The number of decimal places.

Arrow/dash   The length of the arrow or dash.

Extension   The length of the part of the extension line which is beyond the dimension line.

Moving a dimension

If you wish to move a dimension relative to the line it measures, you can do so using the following steps:

Step 1   Move the mouse pointer to **Modify** and click on it.

Step 2   Move the mouse onto the dimension that you want to move and click on it.

Step 3   While still pointing to the dimension, hold the left mouse button down *again* and move the mouse; when the dimension is where you want it, release the button.

14. Objects

Objects allow you to work with different parts of your drawing independently. You can have up to 30000 separate objects in your drawing. Each **item** (i.e. a line, arc, circle, ellipse, fill, piece of text etc) will belong to **one** of these objects. You do not need to use objects at all if you wish. However, if your drawing is more complex, it makes it much easier to make changes to sections of your drawing if you have divided it into different objects as you go along.

Putting an item into an object

The easiest way to put an item into an object is by using the **Object** box at the bottom of the screen just *before* you insert a line, arc, circle, ellipse or text item. If you want to change the object just click inside this box. You will see a list of the existing objects and you can either click on one of these or type in a new object. The new object can either be or a name (with a maximum of 16 letters) or a number (between 1 and 30000).

You can use the **Modify** tool to change the object of an individual item after it has been added to the drawing.

You can put several items into another object using the **Object | Transfer** tool. If you choose this tool you will be able to select as many items as you wish by clicking on each of them in turn. Also, if you hold down the left mouse button and move the mouse, a rectangle will appear - releasing the mouse button will select all the items that are *completely* inside the rectangle. If you hold the **SHIFT** key down when you release the mouse button, all the items inside the rectangle will be de-selected. If you press the **CTRL** key down while you are pulling out a rectangle, the whole rectangle will move. When you have finished selecting items, click on the **New Object** box and then choose one of the existing objects or type in a new object name or number. Now, click on the **Transfer the selected items** button.

Object tools

The **Object** tool gives you a range of commands that enable you to manage the objects:

Hide	Allows you to hide one or more objects. When an object is hidden then it is not shown on screen, the items in it cannot be dragged, modified or edited and it is not printed. You can un-hide an object by using the **Object	Hide** tool again.
Identify	Shows the drawing and allows you to choose an object and see all the items that are in it, or to click on an item and see all the items that are in the same object.
Name	Allows you to type in or edit the name of an object.
Transfer	Allows you to transfer several items into another object. See page 42 for details.

You can choose an object by either clicking on any item on the screen or by clicking in the **Object** box and then choosing from the list of object names and numbers.

Several other tools also allow you to operate on objects, such as **Delete**, **Colour**, **Copy**, **Move | Items**, **Rotate**, **Reflect**, **Enlarge** and **Reflect**. With these tools you can select or de-select an object by clicking on its name in the list of objects which appears in a corner of the drawing. You can also select some of the items in an object by clicking on the item directly. In the list, a blue tick will indicate that the whole object has been selected, while a blue dot will indicate that some, but not all, of the items in an object have been selected.

If the list of objects is not in a convenient position you can move it to one of the other three corners of your drawing by clicking in that corner of the list. (A small blue triangle will appear when you use the mouse to point to a corner of the list).

If you wish to review how many items are in each of your objects then you can do so using the command **View | Object list**. This command will show a list of all the objects in your drawing and count the items which are in each object.

15. Rotate, reflect, enlarge and stretch

Four more tools allow you to **Rotate**, **Reflect**, **Enlarge** or **Stretch** some (or all) of your drawing. When you choose one of these tools you will firstly be asked to identify which items are to be changed by the command using any mixture of the following techniques:

♦ Click on an object in the list at the side of the screen. Clicking on a selected item will de-select it.

♦ Click on individual items. Clicking on a selected item will de-select it.

♦ Hold down the left mouse button, move the mouse and a rectangle will appear - releasing the mouse button will select all the items that are *completely* inside the rectangle. If you hold the **SHIFT** key down when you release the mouse button, all the items inside the rectangle will be de-selected. If you press the **CTRL** key down while you are pulling out a rectangle, the whole rectangle will move.

Once you have chosen the items that you want to transform, you have three other options which you can change by clicking in the appropriate box at the bottom of the screen:

Number of actions (except for **Reflect**) - this is normally 1 but you can choose to apply the transformation several times over. You would normally choose to keep the original if you give a value other than 1.

Keep original - if this box is ticked then you will be left with the original items, as well as new ones. If the box is not ticked you will lose the original items and just be left with the transformed ones.

New object(s) - if this box is ticked then the new items will be put into different object(s). If the box is not ticked then the new items will be in the same object(s) as the original items.

Rotate
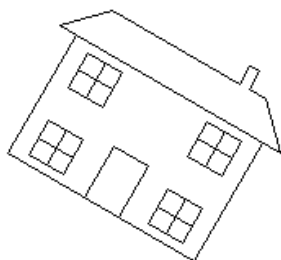
Reflect

Enlarge

Stretch
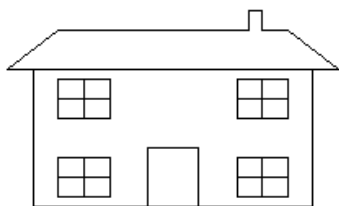
You will also need to choose the values for the transformation tool you are using:

Rotate	1)	Choose the angle to be rotated, measured in degrees anti-clockwise from 3 o'clock.
	2)	Click on **Rotate the selected items**.
	3)	Use the mouse to choose the position of the centre of rotation (i.e. the fixed point of the rotation).
Reflect	1)	Choose whether you want a horizontal or vertical mirror line.
	2)	Click on **Reflect the selected items**.
	3)	Use the mouse to move the mirror line to where you want it.
Enlarge	1)	Choose the scale factor - values greater than 1.0 will make the chosen items larger, values less than 1.0 will shrink the chosen items.
	2)	Click on **Scale the selected items**.
	3)	Use the mouse to choose the fixed point of the enlargement - this will determine the position of the new items.
Stretch	1)	Choose whether you want to stretch in a vertical or horizontal direction.
	2)	Choose the stretch factor - values greater than 1.0 will make the chosen items larger, values less than 1.0 will shrink the chosen items.
	3)	Click on **Stretch the selected items**.
	4)	Use the mouse to move the fixed line to where you want. The items will be stretched at right angles to the fixed line.

To create the following picture, start by drawing the house at the bottom left. Choose the **Enlarge** tool and then select all of the house. Choose a scale factor of 0.5, set the number of actions to 3 and ensure that the **Keep original** box is ticked.

Now click on the **Scale the selected items** button and move the mouse to choose the position of the fixed point.

Fixed point
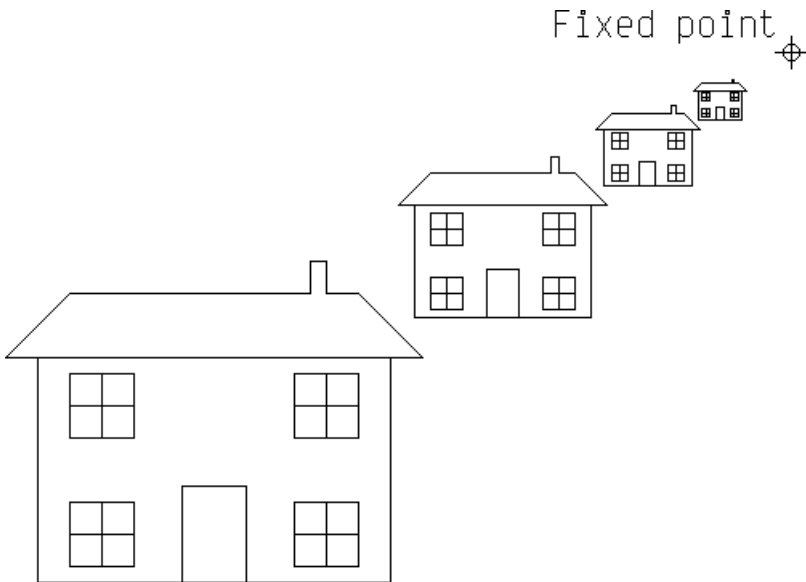
16. Symbol library

Using a symbol from a library

If you want to add a symbol to your work then use the following steps:

Step 1   Choose the command **Symbol | Library**.

Step 2   Move the mouse pointer to the library that you wish to use and click on it. If the library that you want is not in the main list, click on **Other** and choose the library file that you want.

Step 3   Choose the command **Symbol | Select**.

Step 4   Move the mouse onto the symbol that you want and click on it. Please note that the nearest point to where you click will be used to fix the symbol if you insert it with hunt or grid switched on.

Step 5   If you want to reflect, rotate, enlarge or stretch the symbol, use the commands **Symbol | Reflect**, **Symbol | Rotate**, **Symbol | Enlarge** or **Symbol | Stretch**.

Step 6   Choose the **Insert** tool.

Step 7   Hold the left mouse button down and move the mouse. When the symbol is where you want it to be, release the button.

If you want to insert the same symbol again, just repeat step 7. If you want to insert a different symbol from the same library then repeat steps 3 to 7. If you want to use a symbol from a different library then repeat all of steps 1 to 7. In the following drawing the trees were selected from the garden symbol library, and then added using the **Insert** tool.
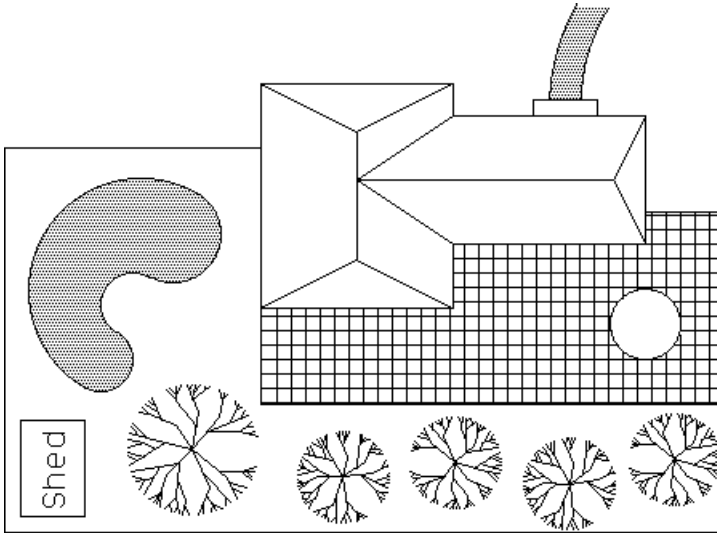
Creating your own symbol library

A symbol library is just an ordinary FlexiCAD drawing where each symbol is a separate object. You can create your symbols in the normal way, making sure that you give each symbol a different object name or number. You can add dimensions and text to a symbol (perhaps to label each symbol), but they will be ignored when you use the **Insert** tool to add the symbol to your actual drawing.

When the symbols are complete, choose the **File | Save as** command. When you see the *saving the drawing on disk* screen, click in the **Type of file** box and then choose **Symbol library files (*.fsl)**. Give the file whatever name you like and it will be given an **.fsl** extension.

17. More tools

Colour

You can change the colour of any single item using the **Modify** tool. However, if you wish to change the colour of a large part of the drawing it will be quicker to use the **Colour** tool. This tool enables you to select all the items you want to change to a particular colour in much the same way as the **Copy** tool (see page 33, for details). Once you have chosen the items, click inside the **Colour** box at the bottom of the screen, and then select the colour you want.

Origin

All the values at the bottom of the screen which show a co-ordinate position are measured relative to an arbitrary origin which is at the bottom left of the work screen when the program first starts. However, it can sometimes be useful to fix a new, temporary origin somewhere else in your drawing using the **Origin** tool. Once you have clicked on **Origin**, you can choose the **Hunt** or **Grid** tools if you want to fix the origin at an existing point, or at some point on the grid. Now hold down the left mouse button, move the mouse and then release the button when the new origin is in the position you want. You can move the origin as many times as you wish.

Break

The **Break** tool allows you to trim the end of a line or to split a line into sections where the line cuts other lines, arcs, curves, circles or ellipses. Begin by clicking on **Break**, move the mouse near the line you want to split and then click again. The line will be divided temporarily into sections wherever it meets other lines, arcs, curves, circles or ellipses. Each section of the line will flash in turn and you will be asked if you want to delete that section. You can delete as many or as few sections as you wish. Once the process is complete, any sections you have chosen to delete will be removed and any remaining adjacent sections will be re-combined.

18. Real world scale

When you create a drawing, it usually represents something in the real world. For example, suppose you decide to create a plan of your bedroom. The first step would be measure your bedroom; suppose you discover that it is 3900mm long and 2850mm wide. When you come to draw that rectangle in FlexiCAD you will find that you can quite easily draw a rectangle which is 390mm by 285mm that fills most of the screen, but this is only a tenth of the sizes of your room. Now, you have three choices: just ignore the problem and remember that every length is actually a tenth of its real length; zoom out several times and redraw the rectangle; or, best of all, you can change the *real world scale*.

If fact, FlexiCAD will choose a real world scale of 1 for any new drawing. If you use the **Edit | Real world scale** command you can choose a scale of 10 for the drawing of your bedroom. From then on, the x,y position on your drawing will use the same lengths as in your bedroom, and if you use the **Dimension** tool to put a dimension along each side, the lengths will be shown as 3900mm and 2850mm.

When you come to print your work, FlexiCAD allows you to choose another scale - in this case from the real world to the printed page. In fact, FlexiCAD will initially choose an automatic scale that will fit the drawing to fill the printed page, which is fine if all you want is the largest possible drawing. However, it is not likely to be a very convenient scale if you wish to take measurements from your printed drawing; in which case you can use the **Edit | Printing scale** command to choose a more convenient value for measuring. Please note that if you choose a printing scale which is too big for your printer, FlexiCAD will split the drawing over several pages.

19. Storing your work

There are two commands that enable you to store your work on disk. You can use the **File Save** command to save your drawing with its existing name, or the **File Save as** command to save it with a new name. If you finish the program *without* storing your work on disk then it will be lost forever.

Storing a drawing

When you have finished creating and editing your drawing, you should open the **File** menu and then choose the command **Save** if you want to use the file's existing name, or **Save as** if you want to change the file's name. The file will be automatically given an **.fcf** extension.

The file will normally be saved in the current folder. You can change this if you so wish - see page 53 for details. Once you have made any changes, simply click on $\boxed{\text{OK}}$ and the drawing will be saved on disk.

Loading a drawing

If you want to load a drawing file that is on disk into the program then open the **File** menu and choose the command **Open**. You will see a list of the files that are in the current folder (directory area) on the current disk drive. You can change the folder if you so wish - see page 53 for details.

If the file you wish to use is one of the sample files that comes with the program, click on the $\boxed{\text{Sample files …}}$ button.

To choose the file that you want, point to the name of the file that you want to load and then double click the left mouse button.

Changing the folder (directory)

The box at the top left of the dialog will contain details of the current folder (directory area). If you click on the down arrow which is at the right hand side of this box, a list will drop down of all the folders above the current one, all the available disk drives and special areas such as **My documents**. Click on the folder that you want to use.
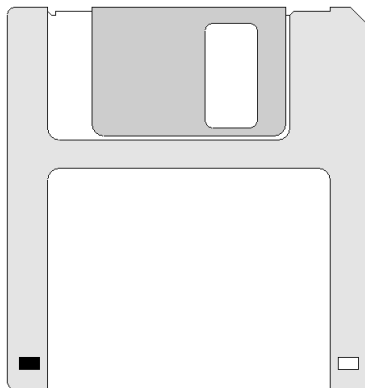
20. Printing your work

Getting ready to print

Before you start to print for the first time you may need to use the following commands. You should use them in the order shown.

Menu command	Function
File | Printer setup	Choose the printer you are using and the size of paper.
File | Page setup	Choose the margins, the overlap for multiple pages, landscape or portrait orientation and what footers to print.
Edit | Printing scale	Choose what scale to print.

Page layout

You may need to tell FlexiCAD the size of the margins. To change these settings, choose the **File \| Page setup** command. You can also change the multi-page overlap and the orientation of the drawing to be landscape or portrait. The multi-page overlap only applies if the drawing is spread over more than one page.

If you want to change any of the values then click inside the box that contains that value. You can now edit the value in the normal way and then press **ENTER**. When all the values are correct, click on **OK**.

Once you have made these choices, you can use the **Options \| Keep options** command to save these settings for future sessions.
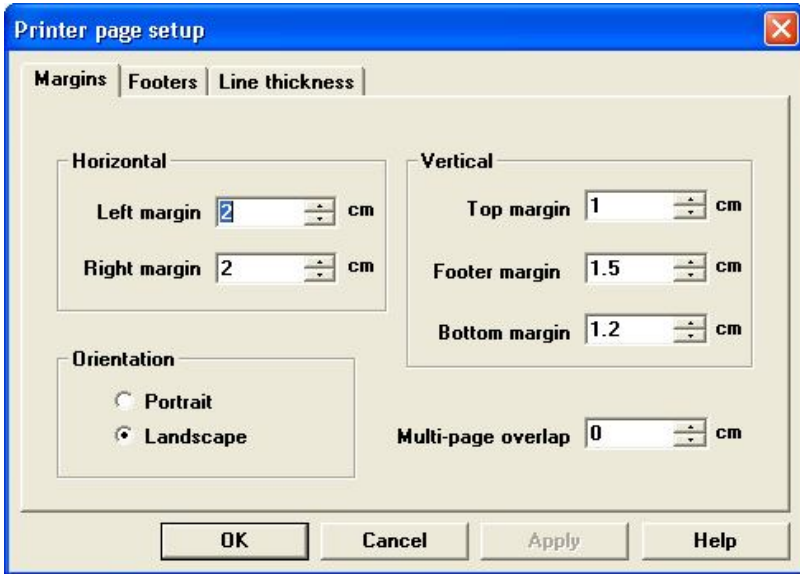
Print footers

Normally the printing scale, your name and the name of the file will appear at the bottom of any work that is printed. It is also possible to show the time and/or date the file was printed. You can choose which of these is printed using the **File | Page setup** command and then choosing the **Footers** tab.

Scale used for printing

FlexiCAD will choose a scale when printing your work so that the whole of your drawing will fit on one page. This is called the **Automatic** printing scale. You can choose a different scale if you wish, by using the **Edit | Printing scale** command. If you choose a scale that is too big to fit all of your drawing on one page, the program will spread the drawing over several pages. The new printing scale becomes part of the drawing itself. You can change it again at any time using the **Edit | Printing scale** command.
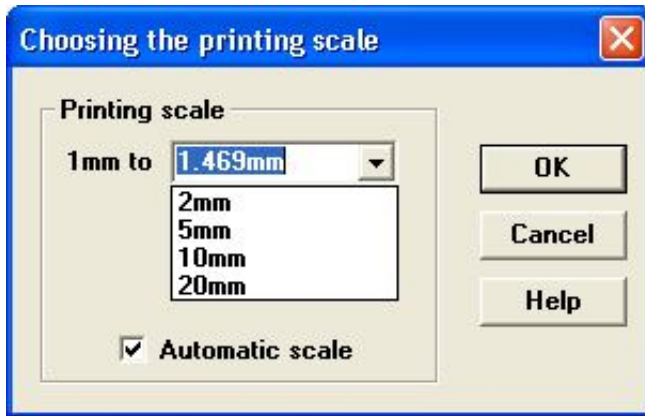
Printing your drawing

Once you have chosen the printer, set up the margins and chosen the printing scale, you can print your drawing using the **File | Print** command. You will be able to select which pages to print if the chosen scale means that the printout will not fit on one page. Once these values are correct, click on **OK** to start printing.
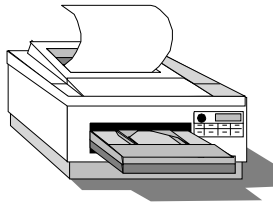
Print preview

If you choose the **File | Print preview** command you will see the exact layout of the printed page on screen. If you want to look more closely you can choose to **Zoom in**. If the chosen scale means that the printout will not fit on one page you can choose to look at each page in turn. When you have finished previewing the printout, you can either choose to **Print** or to **Close** the preview.

Copying to the Windows clipboard

FlexiCAD is able to save the drawing that is on the screen into the Windows clipboard. This is a bit map that can be accessed by other Windows applications such as Word for Windows or Paintbrush.

To carry out this process you should ensure that the part of the drawing that you want to save is shown on screen. You might wish to zoom in or out and to scroll left or right and up or down until you can *see* the drawing or part of the drawing that you want. There is no need to worry about leaving blank space either side of the drawing - FlexiCAD will automatically trim any blank space. If you wish to hide part of your drawing then you can do so using the **Object | Hide** tool.
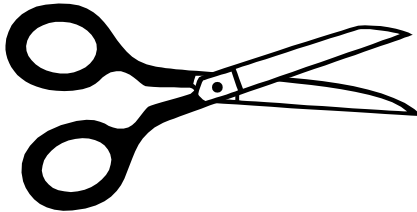
Now choose the command **Edit | Copy**. The drawing will be copied into the Windows clipboard as a graphic. It can then be inserted into other Windows applications usually using their **Edit | Paste** command. Please note that the image which is copied into the clipboard is a bit map, not a vector drawing.

21. Technical notes

Installing FlexiCAD

If you are using FlexiCAD for the first time then you will need to install FlexiCAD onto the hard disk of your computer. Switch on your microcomputer and start Windows. Insert the master FlexiCAD CD into the CD drive. The program should start automatically; otherwise, choose **Start** and then **Run** and type:

D:\SETUP

You should then follow the instructions as they appear on the screen. In the case of an RM Connect network, the setup program will automatically adjust its installation procedure.

Saving initial values on a network

If you want to save the initial values that FlexiCAD will use, such as the option preferences and page margins, then you can do so at any time by using the **Options | Keep options** command. However, on a network these values will be saved for the individual user, not the whole network.

If you are the network manager and you want to set up the initial values for the whole network, you can do so using the following steps:

♦ Log on as network manager, load FlexiCAD, choose whatever printer, page size and other preferences you want and then use the **Options | Keep options** command.

♦ Finish the FlexiCAD program and then copy the file **FCAD.INI** from your current work area into the same sub-directory as the **FCAD.EXE** file. Now set the file **FCAD.INI** to be read-only.

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