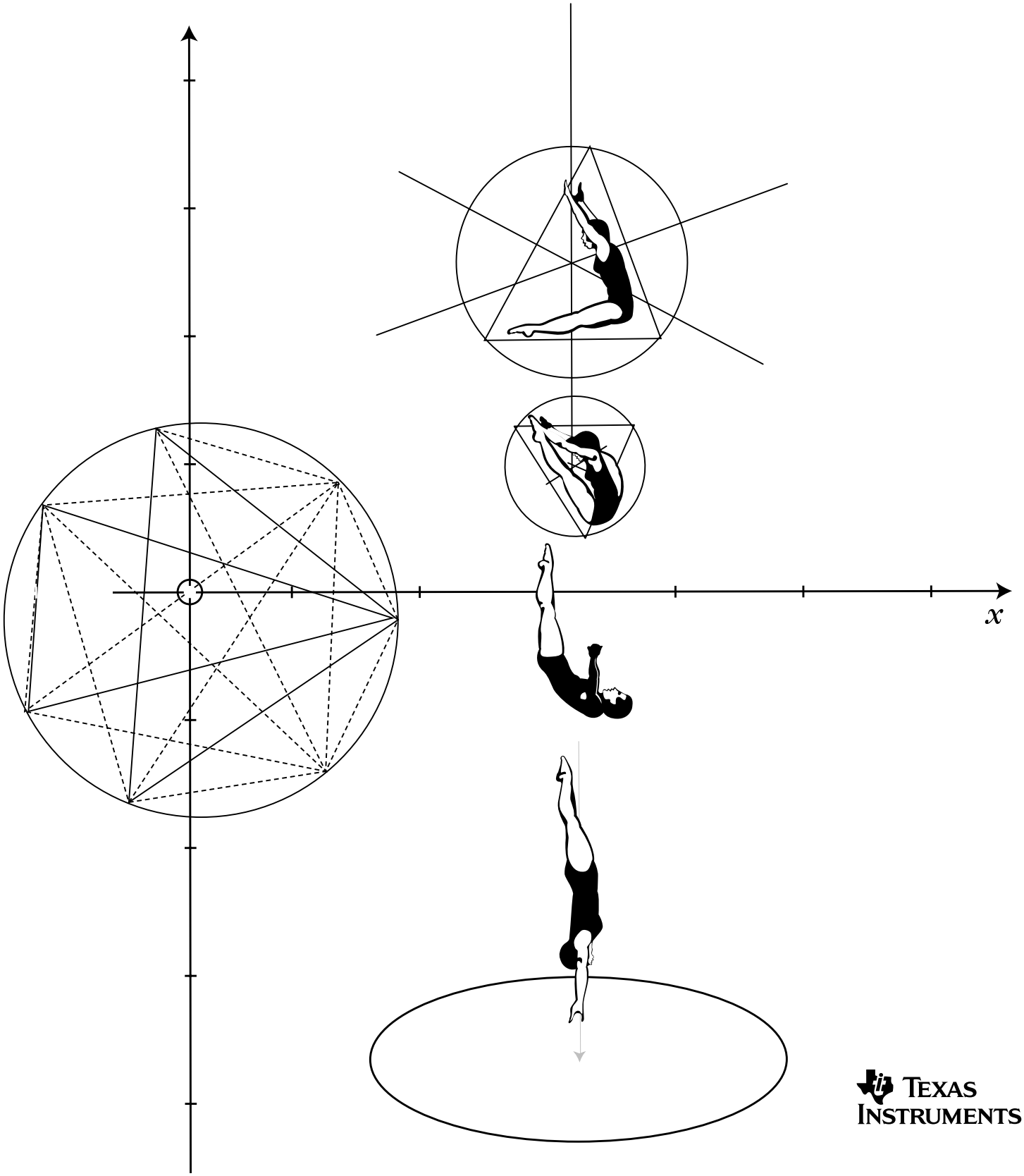
CABRI GEOMETRY® II



TEXAS INSTRUMENTS

Guidebook for Macintosh®, Windows®, and MS-DOS®

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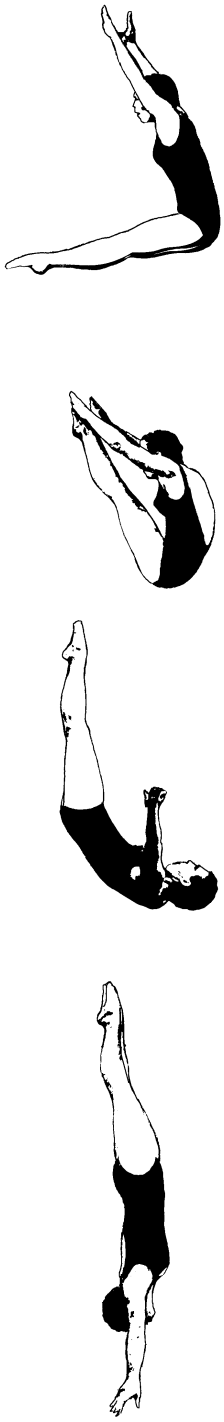
CABRI GEOMETRY II

Guidebook for Macintosh®, Windows®, and MS-DOS®



Dive into Geometry

Texas Instruments

About Cabri Geometry II

Cabri Geometry II lets you construct and explore geometric objects interactively. Jean-Marie Laborde and Franck Bellemain developed Cabri Geometry II at the Institut d'Informatique et Mathématiques Appliquées de Grenoble (IMAG), a research lab at the Université Joseph Fourier in Grenoble, France, in cooperation with the Centre National de la Recherche Scientifique (CNRS) and Texas Instruments.

Texas Instruments, the publisher for Cabri Geometry II in the United States and Canada, is pleased to bring computer-based geometry to classrooms. The geometric foundation of this easy-to-use software encourages exploring and conjecturing—from simple shapes to advanced projective and hyperbolic geometry.

About the Developers

Jean-Marie Laborde is founder and Research Director of Laboratoire de Structures Discrètes et de Didactique (LSD2), a research laboratory within IMAG. He graduated in mathematics at École Normale Supérieure in Paris in 1969. He earned a Ph.D. (Thèse d'État) in computer science at the University of Grenoble in 1977. Jean-Marie began work on the Cabri II project in 1981 as an environment for graph theory. He has devoted his research efforts to the use of geometric methods for the study of different classes of graphs, especially hypercubes.

Franck Bellemain earned a Ph.D. in mathematics at the Université Joseph Fourier in 1992. He began work on the Cabri II project in 1986 and is responsible for writing several versions of the software for Macintosh, PC-compatible, and Japanese computers. His research and thesis have been devoted to the use of technology in the classroom.

Cabri Geometry II Features

- Includes interactive analytic, transformational, and Euclidean geometry.
- Allows intuitive construction of points, lines, triangles, polygons, circles, and other basic objects.
- Translates, dilates, and rotates geometric objects around geometric centers or specified points plus reflection, symmetry, and inverse of the objects.
- Constructs conics easily, including ellipses and hyperbolas.
- Explores advanced concepts in projective and hyperbolic geometry.
- Annotates and measures figures (with automatic updating).
- Uses both Cartesian and polar coordinates.
- Provides for user display of the equations of geometric objects, including lines, circles, ellipses, and coordinates of points.
- Allows the user to create macros for frequently repeated constructions.
- Lets the teacher configure tool menus to focus student activities.
- Checks geometric properties to test hypotheses based on Euclid's five postulates.
- Hides objects used in constructions to reduce screen clutter.
- Differentiates objects through the use of paint-like color and line palettes.
- Computes a locus continuously.
- Illustrates the dynamic characteristics of figures through animation.
- Allows the user to save drawings and macros to disk.
- Opens geometry constructions created on the TI-92.
- Provides one square meter of full-size work space, and prints the 8.5 by 11.0 inches (21.59 by 27.94 cm) drawing area.

Table of Contents

About this Guidebook

The *Cabri Geometry II Guidebook* contains user information about the Cabri Geometry II software. It provides descriptions, procedures, illustrations, and examples for using the software features on Macintosh computers, and Windows™ and MS-DOS®-based PCs.

- Many of the procedures, illustrations, and examples are virtually the same for the different computer types. Significant differences between the Macintosh, Windows, and DOS versions are identified for your convenience.
- Most of the illustrations are from the Macintosh version; several are from the Windows and DOS versions. Due to space limitations, we could not show every illustration for each version. Therefore, some illustrations in this guidebook may be slightly different on your computer.
- Key names are shown in small capital letters such as CTRL for the Control key and ESC for the Escape key. The RETURN key on the Macintosh and the ENTER key on the PC keyboard perform the same function. In this guidebook, "Press ENTER" means to press either ENTER or RETURN.

Structure

The *Cabri Geometry II Guidebook* contains the following chapters and appendices:

- Chapter 1 describes the basic operations for using Cabri II, starting with checking system requirements for installing the software, through constructing objects, to saving and printing a construction file.
- Chapter 2 describes the Cabri II menus and provides step-by-step procedures for using them.
- Chapters 3 through 13 describe the Cabri II tools and provide step-by-step procedures for using them. Each chapter discusses a specific group of Cabri II tools.

Definitions

The following definitions will help you in your understanding of this guidebook.

point	When used as an instruction, point means to place the screen pointer on top of the object you wish to select.
click	Click means to press and release the mouse button quickly, usually when pointing to a specific location
double-click	Double-click means to click the mouse button twice in succession.
drag	Drag means to point to the object you want to drag, press and hold the mouse button to select the object, and move the screen pointer to a new location. Release the mouse button to stop dragging.
modify	When used as an instruction, modify means to change the appearance, size, location, or orientation of the object.
marquee outline	Marquee outline is the outline of an object in animated dots, similar to a movie marquee.
marquee rectangle	Marquee rectangle is the selection rectangle that appears when you drag with the **Pointer** tool from an unoccupied location in the drawing window. When you release the mouse button, objects that lie completely within the rectangle are selected.

Chapter 1: Learning the Basics

This chapter provides descriptions and examples of basic operations in Cabri Geometry II. Becoming familiar with these items will enhance your usage. Differences between the Macintosh, Windows, and MS-DOS versions are explicitly described where applicable. For convenience, DOS will be used in the remainder of this guidebook to mean MS-DOS.

The following topics are discussed:

FIRST STEPS	CONSTRUCTING OBJECTS
Checking system requirements	**Pointers that guide you**
Installing Cabri Geometry II	**Creating and selecting points**
Starting Cabri Geometry II	**Handling ambiguities**
Optimizing your Macintosh system configuration	**Determining dependent and independent objects**
Changing your Macintosh system configuration using Cabri Geometry II	**Dragging**
Using Cabri Geometry II on a network	**Using the Undo/Redo command**
The Cabri Geometry II window	**Deleting objects**
Accessing on-line help	**Changing the appearance of objects**
About menus and toolboxes	**Labeling objects**
	Scrolling the drawing window
	Saving and printing

First Steps

Checking system requirements

Macintosh	DOS
• Macintosh Classic or better. • System 6.0 or later. • 1 Mb available RAM for a Macintosh Classic. (Memory requirements will be greater for color or larger monitors than on the Classic.) • Hard disk with 1.2 Mb available for program and demonstration files.	• DOS-compatible computers (PCs), 386 or better, and running MS-DOS 3.3 or later. • EGA, VGA, SVGA video adapter and a color monitor. • 3 Mb RAM (minimum) memory installed. • Hard disk with 2.5 Mb available for program and demonstration files. • Mouse, or an equivalent pointing device.
Windows 3.1	**Windows 95**
• 386 PC or better required; 486DX recommended. • PC must be in 386-Enhanced mode with Virtual Memory enabled. • VGA, SVGA video adapter and a color monitor. • 6 Mb RAM (minimum) memory installed. • 7 Mb available hard disk space for program, demonstration files, and system extensions. • Mouse, or an equivalent pointing device.	• 386 PC or better required; 486DX recommended. • VGA, SVGA video adapter and a color monitor. • 6 Mb RAM (minimum) memory installed. • 2 Mb available hard disk space for program and demonstration files. • Mouse, or an equivalent pointing device.

Installing Cabri Geometry II

Macintosh	DOS
1. Create a folder named **Cabri II** on your hard disk. 2. Insert the Cabri Geometry II Macintosh diskette in your floppy disk drive. 3. Double-click on the **Installer** on the diskette and follow the directions on the screen.	1. Insert the Cabri Geometry II DOS diskette in your floppy disk drive. 2. At the DOS prompt, enter: `A:\INSTALL` or `B:\INSTALL`, and then follow the screen prompts.
Windows 3.1	**Windows 95**
1. Insert the Cabri Geometry II for Windows diskette #1 in your floppy disk drive. 2. From Program Manager, click on **RUN** and enter `A:\SETUP`, and then follow the screen prompts.	1. Insert the Cabri Geometry II for Windows diskette #1 in your floppy disk drive. 2. Click on **START/RUN** and enter `A:\SETUP`, and then follow the screen prompts.

Installing Cabri Geometry II on a network

If you have purchased the network license for Cabri Geometry II, you may run the software on your network. Use network procedures that are compatible with your network to install Cabri Geometry II. See your Macintosh, Windows, or DOS User's manual or your network documentation for more information, if necessary.

Note: Cabri Geometry II is supplied on high-density diskettes. If your computer will not accept these diskettes, call, 1-800-TI-CARES and a service representative will supply you with low density diskettes.

Installing Cabri Geometry II on a network (continued)

Macintosh and DOS

1. Install Cabri Geometry II on the network server using the instructions given on the previous page.
2. Run the program from the server the first time, and enter the requested information.
3. To run Cabri Geometry II on each network client, go to the directory on the network server where the Cabri Geometry II application is installed. Macintosh users may double-click on the Cabri II icon; DOS users may run Cabri2.exe to start the program.

The procedure described below, for Windows users, allows multiple client computers to run Cabri Geometry II using the application software installed on the network server. Each client computer is provided with the necessary system files to run Cabri Geometry II and a shortcut icon that is linked to the application file on the network server.

Windows 3.1 and Windows 95

1. Install Cabri Geometry II on the network server using the instructions given on the previous page. In the **Select Destination** screen, you must select a directory that will be accessible from each client computer on the network.
2. Temporarily copy **setup.exe** and **setup.w02** from the installation diskettes to the same directory in which you installed Cabri Geometry II in step 1.
3. On each network client, go to the directory on the network server that contains **setup.exe** and double-click to on this file to run the setup program.
4. In the **Select Destination Directory** screen, click on the **Browse** button and select the same directory that you used in step 1. Make sure the correct directory is displayed at the top of the window. You may edit the path, if necessary, and then click on **OK**. Ignore the message that the directory already exists.
5. In the **Select Components** screen, deselect the first three components. The installation program will determine if the fourth component is necessary for Windows 3.1x users.
6. When Cabri Geometry II has been installed on all client computers, delete the two files that were temporarily copied to the network server in step 2.

Starting Cabri Geometry II

Macintosh

You can use one of four methods to start the software on a Macintosh:

- Use **Open** in the **Finder**.
- Double-click on the **Cabri II** icon.
- Double-click on any Cabri Geometry II construction file, tool configuration file, or macro file.
- Drag and drop any construction file onto the **Cabri II** icon (System 7 users only).

DOS

Type `CABRI` and press ENTER from the DOS prompt directory where the Cabri Geometry II files are located.

(*Optional*) Add the Cabri directory to your DOS path to open Cabri Geometry II from any directory.

Windows

Double-click on the **Cabri II** icon.

Optimizing your Macintosh system configuration

If you are starting Cabri Geometry II on a Macintosh for the first time, you may need to make some adjustments to make Cabri Geometry II compatible with your Macintosh computer system configuration.

Graphics intensive programs require a large amount of memory to operate. The amount of memory required directly relates to the size of your monitor and to the number of colors chosen to represent graphical elements. Cabri Geometry II may require more memory than other applications due to its interactive nature. Cabri Geometry II can assist you in optimizing your system.

If you see a warning message from the **Finder**, you need to make some adjustments to your system configuration. This message indicates the amount of memory needed to run Cabri Geometry II efficiently on your computer with your current configuration.

Click the **OK** button to proceed (Cabri Geometry II does not start). Then close any applications or windows that are currently open. This frees the memory that these applications are using.

To change the amount of memory allocated to Cabri Geometry II, first make sure the **Cabri II** icon is selected. Then, from the **Finder**, select **Get Info** in the **File** menu. Once the **Get Info** window appears, decrease the application memory size to a value that is compatible with your computer.

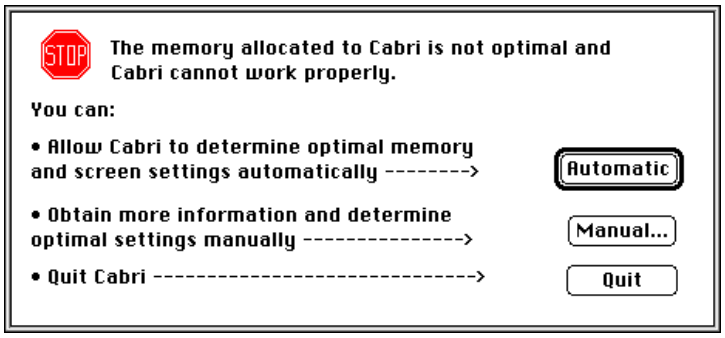
If you are using System 7, an optional method is to use **Virtual Memory** to increase the amount of memory available to applications. See your Macintosh User's manual for more information.

The previous dialog box indicates the amount of available memory on your computer. You may also select **About this Macintosh** in the **Apple** menu for the same information.

Changing your Macintosh system configuration using Cabri II

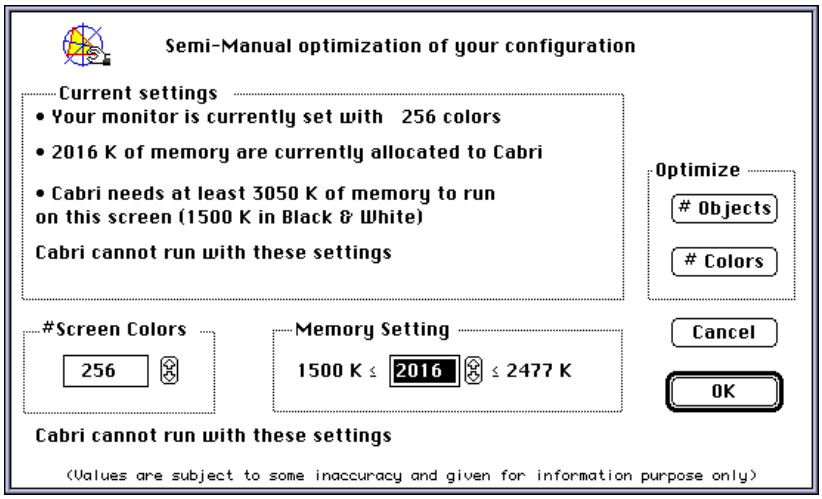
If you open Cabri Geometry II and the memory allocation on your Macintosh is not optimal, the following dialog box appears. We recommend that you allow Cabri Geometry II to select optimal parameters for your system automatically or that you select them using the **Manual** button.

You may wish to quit and modify the settings yourself if you are familiar with the memory and monitor control panels.



If you select the **Automatic** button, Cabri Geometry II computes the optimal settings for your computer and then quits. The number of colors may change in the process of optimizing your configuration. Double-click on the Cabri Geometry II icon for the changes to be applied to Cabri Geometry II.

If you select the **Manual** button, Cabri Geometry II continues to the optimization dialog box (see example on the next page) that allows you to optimize your configuration as you want. Read the items in the **Current Settings** field first, and then manipulate the other fields as described below the example. (You can also access the following dialog box by pressing the OPTION key when starting the software.)



Status: The status indicates whether or not Cabri Geometry II can run with the current settings.

 # Screen Colors The number of colors used to display objects is directly related to the amount of memory required to execute Cabri Geometry II. You can click on the up or down arrow buttons in this field to change the number of screen colors. Check the **Status** field to determine if these values are acceptable. Click on **OK** to continue.

Memory Setting The amount of memory available and the number of colors displayed determine the number of objects that can be constructed. You can click on the up and down arrow buttons in this field to change the amount of memory allocated to Cabri Geometry II. The value on the left indicates the amount of memory required to run Cabri Geometry II on your computer in black and white. The value on the right indicates the amount of memory currently available on your computer. Check the **Status** field to determine if these values are acceptable. Click on **OK** to continue.

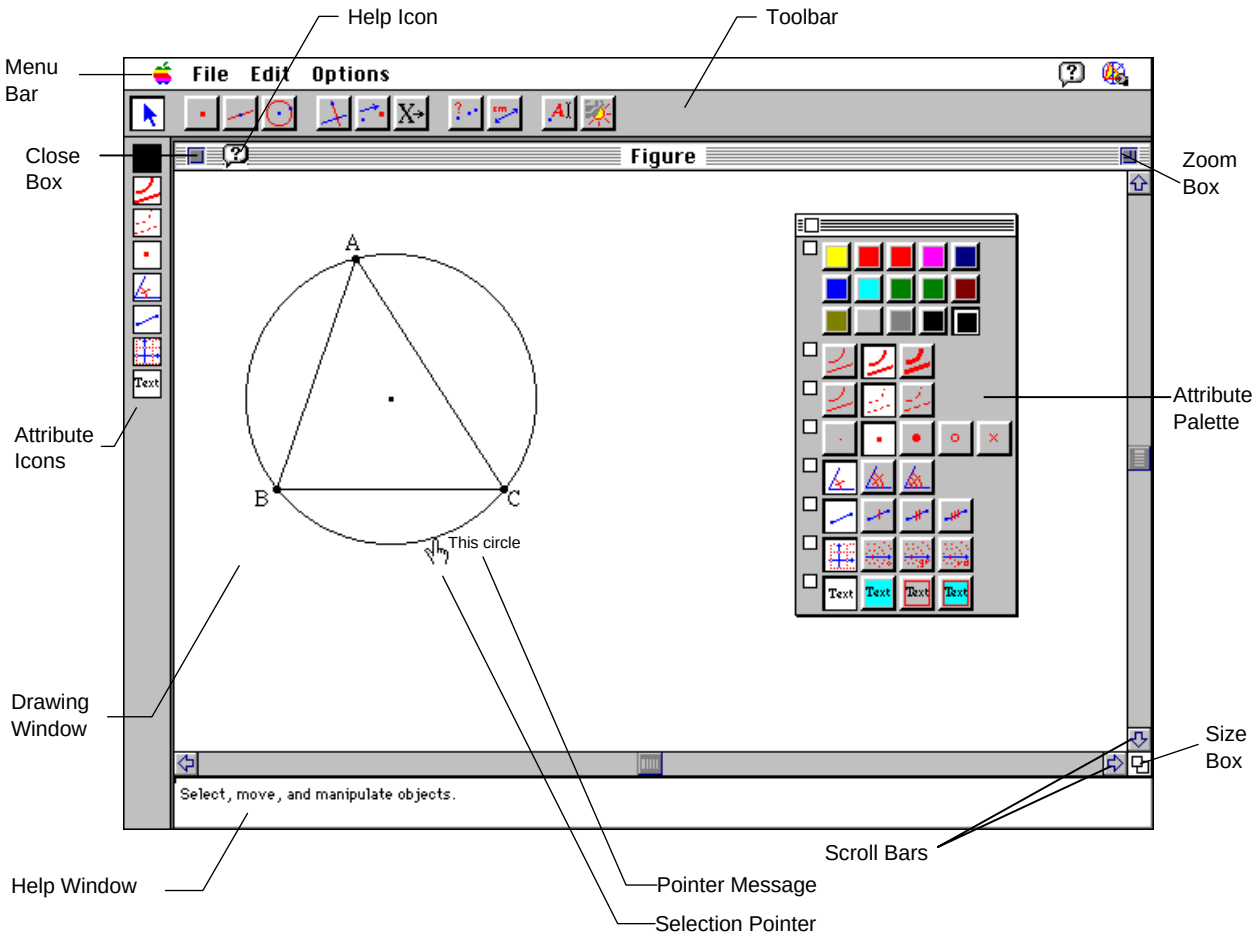
 # Objects The amount of memory available is directly related to the number of objects that can be constructed. Click on this button to optimize the number of objects that can be constructed. If memory is limited, Cabri Geometry II will probably suggest that fewer colors be used to construct more objects. For optimal performance, Cabri Geometry II attempts to allocate enough memory to construct at least 300 objects.

 # Colors The number of colors used to display objects is directly related to the amount of memory required to execute Cabri Geometry II. Click on this button to optimize the number of colors displayed. If you use other applications regularly that require 256 colors, you may wish to optimize the number of colors. Given limited memory, this decreases the number of objects that you can construct.

The Cabri Geometry II window

The illustration below shows the Cabri Geometry II window. This window contains the essential elements of the Cabri Geometry II software. A description of each element follows the illustration.

Note: The screen shown below illustrates the Macintosh version. Screens on Windows and DOS systems are similar but slightly different.

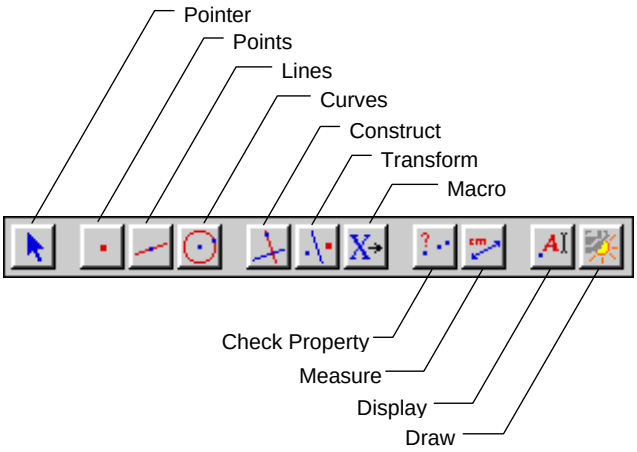


Elements of the Cabri Geometry II window

Drawing Window	This region is where you build geometric constructions.
Menu bar	The menu bar contains common graphic user interface menus for file management and editing, together with Cabri Geometry II options.

Toolbar

The toolbar contains tools for building constructions. Eleven toolboxes reside on the toolbar (see illustration below). To access a toolbox, press and hold the mouse button on the icon. The items in that toolbox appear.



Attribute icons

The attribute icons are not displayed unless you select the **Show Attributes** command in the **Options** menu on the menu bar. These allow you to modify the appearance of objects. You can create an attribute palette (tear-off menu) by dragging an icon from the attribute icons to the drawing window.

Help Icon ? (Macintosh)

Clicking on the help icon ? creates a help window at the bottom of your screen that contains useful help messages for each command. Clicking on the ? again removes the help window.

Help menu option (Windows, DOS)

Clicking on the **Help** menu option and selecting **Help** or pressing the F1 key toggles the help window ON and OFF.

Selection pointer

The selection pointer is the primary tool for selecting menus and building constructions. The shape of the pointer changes according to its current operation and location.

Close box

The close box closes the window and creates a dialog box that allows you to save your work if you have not done so.

Zoom box (Macintosh, Windows)

The zoom box toggles the size of the window between the current size and the full screen size.

Size box (Macintosh, Windows)

Dragging the size box to a new location resizes the drawing window.

Scroll bars (Macintosh, Windows)

Clicking in the scroll bars or on the scroll arrows moves the contents of the drawing window vertically or horizontally.

About menus and toolboxes

Operations are grouped by type in the pull-down menus located on the menu bar and on the toolbar. Once a tool is selected, it remains active until you select another tool. If the icon of the tool you want is shown on the toolbar, select it by clicking once on the icon. Commands in the menu bar must be selected each time they are used.

Descriptions of the Cabri Geometry II menus and toolboxes follow:

MENUS	
Apple (Macintosh only)	Apple menu items or the Cabri Geometry II logo screen.
File	Commands for opening, closing, saving, or printing constructions.
Edit	Commands for selecting or copying objects, refreshing the drawing window, or replaying constructions.
Options	Commands for tool configurations, hide/show attributes, preferences, or setting software defaults (Macintosh only).
Window (Windows)	Standard Windows display options.
Help (Windows, DOS)	Help options.

TOOLBOXES	Tools for ...
Pointer	Selecting or for free-hand transformations.
Points	Constructing points.
Lines	Constructing linear objects.
Curves	Constructing circles, arcs, or conics.
Construct	Euclidean geometry constructions.
Transform	Transformational geometry.
Macro	Making macros. New macros become part of this toolbox.
Check Property	Checking properties of constructions based on Euclidean geometry.
Measure	Measurements or calculations.
Display	Annotating your constructions or animating objects.
Draw	Changing the appearance of objects or displaying the coordinate system.

Accessing on-line help

Macintosh

- Access on-line help by clicking on the help icon [?] in the menu bar of the Cabri Geometry II drawing window.
- A window appears at the bottom of your drawing that contains information about the tool currently selected.
- Select additional tools to see their help information.
- Remove the help window by clicking on the help icon again or by clicking on the close box in the help window.
- The close box appears when you click in the help window.

DOS

- Access on-line help by clicking on the Help menu option in the menu bar of the Cabri Geometry II drawing window and selecting **Help**, or press F1.
- A window appears at the bottom of your drawing that contains information about the tool currently selected.
- Select additional tools to see their help information.
- Remove the help window by clicking on the help icon again or by pressing F1.

Windows

- Access on-line help by clicking on the Help menu option in the menu bar of the Cabri Geometry II drawing window and selecting **Help**.
- A window appears at the bottom of your drawing that contains information about the tool currently selected.
- Select additional tools to see their help information.
- Remove the help window by clicking on the help icon again.

Pointers that guide you

Several types of pointers exist to help guide you through your constructions. The pointers are illustrated below.

Pointer	Cursor looks like...	
arrow		The pointer is in the toolbar, menu bar, or scroll bars.
cross hair		The **Pointer** tool is active.
construction pencil		A construction tool is active.
selection pencil		A construction tool is active and a point can be placed on an object.
pointing hand		A point can be selected.
selection hand		An object is dependent or to show the intermediate stage between selecting an object and dragging.
dragging hand		An object can be moved.
open hand		The COMMAND key (Macintosh) or the CTRL (DOS) is pressed.
grasping hand		The window can be scrolled using the mouse.
magnifying glass		An ambiguity exists.
I-beam		Text or numbers can be entered or edited.
paint brush		Color or attributes can be changed.
paint bucket		An object can be filled with a pattern or color.
crossed lines		The **Comment** option is active.
column width		The column width of the table can be adjusted.

Creating and selecting point*s

All objects are constructed using one or more points. You create or select points when a tool is active. In general, the order of operation is to select a construction tool from the toolbox, and then to create or select the required points that define the tool.

A point is created by a single click of the mouse. You can create points in unoccupied space when the **construction pencil** cursor is visible. You can create a point on an object or at the intersection of two objects when a cursor message appears and the pointer changes to the **selection pencil** cursor. The following examples illustrate how to create and select points.

Example 1: Creating the perpendicular bisector of two points

1. Select the **Perpendicular Bisector** tool from the **Construct** toolbox.

2. Move the pointer to any place in the drawing window and click (not hold down) once.

   A flashing point appears on the window, indicating that this point has been selected for the construction.

3. Move to another place and click again.

   A second point appears as well as the perpendicular bisector of the segment connecting these two points. (**Note**: The segment does not appear.)

   If the pointer is near a valid object, a cursor message is displayed. In some cases, it is sufficient to select only one object to define a construction, as the next example demonstrates.

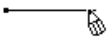
Example 2: Creating the perpendicular bisector of a side of a triangle

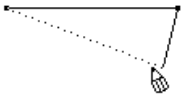
1. Select **Triangle** from the **Lines** toolbox.

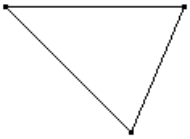
2. Move the pointer to any place in the drawing window and click. Move to a second location and click, and then to a third location and click.

   A triangle appears in the drawing window with the three points selected as vertices.

   Note: Depending on the speed at which you constructed these three points, the sides of the triangle might appear during the construction. Try doing this slowly and watch the triangle materialize.

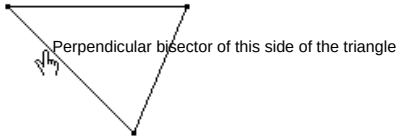




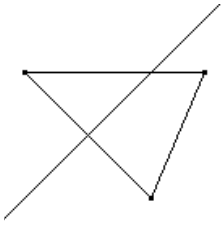


3. Select **Perpendicular Bisector** from the **Construct** toolbox.

4. Move the cursor as follows so that the message **Perpendicular bisector of this side of the triangle** appears.



When the cursor is in unoccupied space in the drawing window, the ☝ appears. Move the cursor near a side of the triangle. The cursor changes from the ☝ to the ☝ with the message **Perpendicular bisector of this side of the triangle**. (If the cursor is near a vertex of the triangle, the cursor message **This point** appears.)



Click once, and the perpendicular bisector of the side of the triangle appears.

Handling ambiguities

When two or more objects simultaneously occur at the location of the pointer, the **magnifying glass** 🔍 cursor and the cursor message **Which object?** appear. Press and hold down the mouse to see the options in a dialog box. Select an object by pointing to the appropriate choice in the box and releasing the mouse.

When multiple objects are present, they are listed in the order in which they were created. Selecting an object causes it to display in marquee outline. You can move (drag) it to a new location if it is an independent object and the **Pointer** tool is selected. Click in unoccupied space to deselect the object. If you are using a construction tool, the object is selected for the construction.

Determining dependent and independent objects

All objects are created using one or more points. The manner in which you create an object determines whether it is dependent or independent of the object. This distinction becomes very important with respect to dragging objects. An example of this distinction is given after the section "Dragging."

A point constructed by itself is called a **basic point**.

An **independent object** is an object created using only basic points. Independent objects can be moved (dragged) but not modified directly. By moving the basic points used for their construction, you can modify them indirectly.

A **dependent object** is an object constructed using an independent object (or another dependent object). Dependent objects cannot be moved (dragged) or modified directly. You can move or modify them indirectly by moving the basic points or independent objects responsible for their existence.

The more elaborate a construction becomes, the more difficult it can be sometimes to distinguish these types. However, the Cabri Geometry II software will assist you.

Dragging

Dragging objects is valuable for generating conjectures. You can modify an object by dragging all or part of it to a new location. Whether or not an object can be changed depends directly on how it was created.

You can drag (move) a basic point to a new location, modifying, in turn, any object constructed using it. An independent object can be modified with one of the tools from the **Pointer** toolbox. You cannot alter a dependent object directly by dragging, but you can change it by dragging the basic points used in its construction.

Whenever an object can be dragged, the pointer changes to the **selection hand** momentarily and then to the **dragging hand** cursor. When the is visible, the selected object follows the pointer as you move it.

If your computer's performance is sluggish, you may need to move the pointer to the location you want and wait for the computations to finish with the new characteristics. This is particularly evident when there are many objects in the drawing window.

If the object is dependent (cannot be dragged), the pointer changes to the **selection hand** and then reverts to the **cross hair** + cursor.

Example 3: Evaluating basic points, independent objects, and dependent objects

1. Construct the perpendicular bisector of a side of a triangle (see Example 2).

   (The vertices are basic points, the triangle is an independent object, and the perpendicular bisector is a dependent object.)

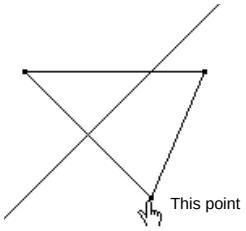
2. Basic points:

   Select **Pointer** from the **Pointer** toolbox.

   Move the + near a vertex of the triangle (the cursor changes to the with the message **This point**).

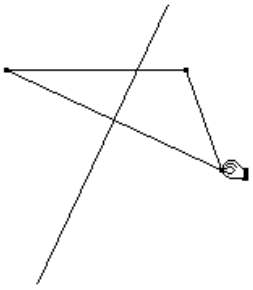
   Press and hold down the mouse button.

   The cursor changes to the and then almost immediately to the .



   When you drag the point, the triangle changes its size and shape, and the perpendicular bisector changes accordingly.

   These results are characteristics of using a basic point.



   An inquiry that could be made here is: "*When does the perpendicular bisector of one side of a triangle contain a vertex of the triangle?*"

3. Independent objects:

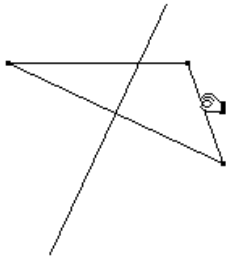
   Move the + near a side of the triangle (the cursor changes to the ☝ with the message **This triangle**).

   Press and hold down the mouse button.

   The cursor changes to the ☝ and then almost immediately to the ✊.

   Continue to hold down the mouse and move the triangle about the drawing window.

   The triangle does not change its size or its shape, while the perpendicular bisector moves along with the triangle. The triangle was constructed using three basic points as its vertices; therefore, it is an **independent object** and can be moved.



4. Dependent objects:

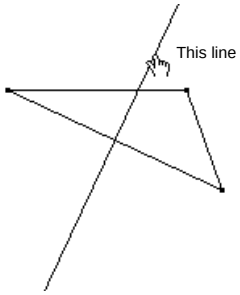
   Move the + near the perpendicular bisector (the cursor changes to the ☝ with the message **This line**).

   Press and hold down the mouse button.

   The cursor changes to the ☝ and then almost immediately back to the +.

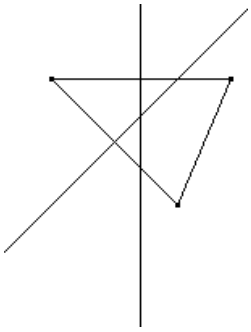
   The perpendicular bisector cannot be modified directly; it is a dependent object.

   Note: You can modify the perpendicular bisector indirectly by dragging the basic points or the independent objects used for its creation.



Example 4: Creating the circumcenter of a triangle

1. Construct the perpendicular bisector of one side of a triangle (see Example 2.)
2. Construct the perpendicular bisector of a second side.



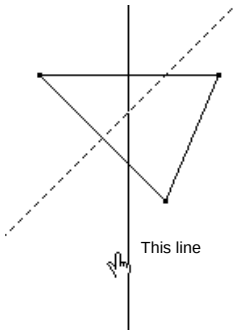
3. Choose **Intersection Point(s)** from the **Points** toolbox.

4. Point to one of the perpendicular bisectors (the cursor message **This line** appears) and click once.

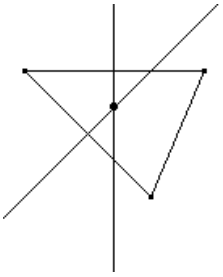
   The line changes to marquee outline.

5. Point to the other perpendicular bisector. After the cursor message appears, click once.

   The first line returns to solid, and a point at the intersection of the two lines appears. This point of intersection is known as the circumcenter of the triangle.



   The vertices of the triangle are basic points. The triangle is an independent object because its existence depends only upon basic points. The perpendicular bisectors are dependent objects because their existence depends upon independent objects (the sides of the triangle). The circumcenter is a dependent object because it was created using dependent objects (the perpendicular bisectors).



In Example 5, we will first create a circle, and then inscribe a triangle. You can move the circle by dragging its center point or modify it by dragging its circumference. The triangle cannot be moved. However, you can modify it by dragging any one of its vertices around the circle.

Example 5: Inscribing a triangle in a circle

1. Choose **Circle** from the **Curves** toolbox.

2. Move the ↖ to any place in the drawing window and click once.

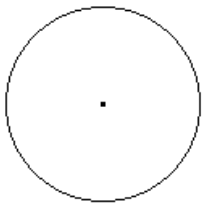
   A flashing point appears.

3. Move the cursor away from the flashing point.

   A circle appears with the flashing point as its center.

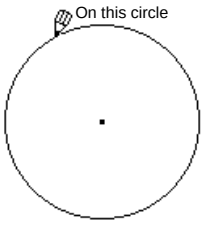
   Click again to finish constructing the circle.

   Note: The flashing point changes to solid to indicate the construction is completed.



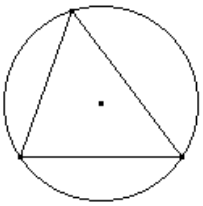
4. Choose **Triangle** from the **Lines** toolbox.

5. Move the ↖ to any point of the circle (the cursor message **On this circle** appears), and click once.



6. Move the cursor to a second and third point on the circle, clicking once at each point.

   A triangle becomes inscribed in the circle.

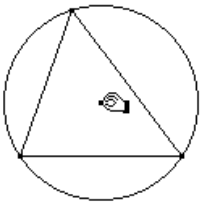


7. Choose **Pointer** from the **Pointer** toolbox.

8. Move the + cursor near the center point (the cursor message **This point** appears).

   Press and hold down the mouse button until the ✋ appears, and drag the center point around the drawing window.

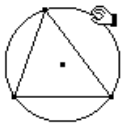
   Note: The radius of the circle remains unchanged.



9. Move the + near the circumference of the circle (the cursor message **This circle** appears).

   Press and hold down the mouse button until the ✋ appears, and drag the circumference.

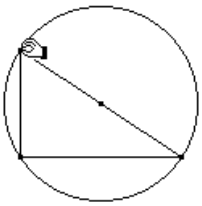
   Note: The center point of the circle remains fixed while the radius changes, and the vertices of the triangle stay on the circle.



10. Move the + near a vertex of the inscribed triangle (the cursor message **This point** appears).

    Press and hold down the mouse button until the ✋ appears, and then drag the point.

    Note: The point can only be moved along the circle.



If you move the pointer while creating points, Cabri Geometry II reverts to dragging. This feature anticipates your intent to modify your construction without requiring you to return to the **Pointer** toolbox. However, it can create some confusion if you are creating points quickly and inadvertently move the pointer while pressing the mouse. In this case, a point will not be created.

Using the Undo/Redo command

You can cancel an operation that has just been completed by using the **Undo/Redo** command in the **Edit** menu. Only the most recent operation can be undone.

To review additional steps in your construction, see the **Replay Construction** command in the **Edit** menu. This command allows you to replay each step of a construction.

Deleting objects

Delete objects by selecting them, and then pressing DELETE or selecting the **Clear** command in the **Edit** menu.

Select multiple objects by pressing the mouse in free space and dragging a marquee rectangle around the objects to be deleted. Only objects that are fully enclosed by the marquee rectangle will be deleted. All selected objects are displayed in marquee outline.

Select all objects in the drawing window by using the **Select All** command in the **Edit** menu. Then press DELETE or select **Clear** from the **Edit** menu. You can also clear the entire drawing window by pressing COMMAND+A (Macintosh) or CTRL+A (Windows, DOS) simultaneously, releasing, then pressing DELETE.

WARNING! When an object is deleted, all objects that depend on that object are deleted as well. It is possible to delete an entire construction by deleting a single point. If you accidentally delete an object, you can recover it by using the **Undo/Redo** command in the **Edit** menu.

Example 6a: Deleting objects — Method 1

1. Construct a circle and an inscribed triangle (see Example 5).

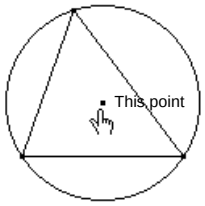
2. Select **Pointer** from the **Pointer** toolbox.

3. Point to the center point of the circle and click.

   The center point flashes.

   Press the DELETE key.

   The point, the circle, and the triangle disappear.



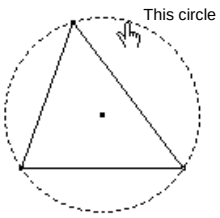
Example 6b: Deleting objects — Method 2

1. Repeat steps 1 and 2 in Method 1, or select **Undo/Redo** in the **Edit** menu.
2. Point to the circle and click.

   The circle appears in marquee outline.

   Press the DELETE key.

   The circle and the triangle disappear, but the center point remains.

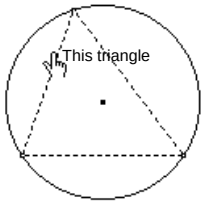


Example 6c: Deleting objects — Method 3

1. Repeat steps 1 and 2 in Method 1, or select **Undo/Redo**.
2. Point to the triangle and click.

   Press the DELETE key.

   The triangle disappears, but the circle, its center point, and the vertices of the triangle remain.

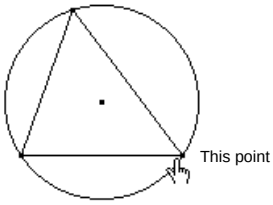


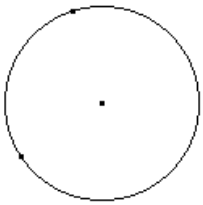
Example 6d: Deleting objects — Method 4

1. Repeat steps 1 and 2 in Method 1, or select **Undo/Redo**.
2. Point to a vertex of the triangle and click.

   Press the DELETE key.

   What happened? How does this differ from Method 3?





Changing the Appearance of Objects

You can change the appearance of objects from the **Attributes** toolbar or the **Draw** toolbox.

Access the **Attributes** toolbar from the **Hide/Show Attributes** command in the **Options** menu. In the **Draw** toolbox, use the **Fill**, **Thick**, **Dotted**, or **Modify Appearance** tools.

To apply attributes from tools in the **Draw** menu, select the tool, and then select the object to be modified. To use an option from the **Attributes** toolbar, first select the objects to be modified, and then select the attribute.

Labeling objects

You can label points in two ways — as you create them or with the **Label** tool in the **Display** toolbox.

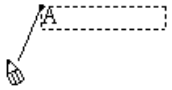
Labeling objects as they are created is intended for quick access and is limited to five alphanumeric characters. Editing is not available at this stage. However, after constructing the object, you can edit the label with the **Label** tool.

Example 7a: Adding labels during construction

1. Select **Triangle** from the **Lines** toolbox.

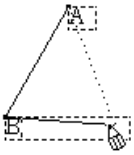
2. Click on the drawing window. Then type **A**.

   A point appears with a label **A** beside it.



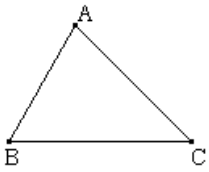
3. Move the , click once, and then type **B**.

   Another point, a segment connecting the two points, and a label **B** appear.



4. Move the to a new position, click once, and type **C**.

   The completed triangle appears as well as the label **C** beside the last point created.



The **Label** tool in the **Display** toolbox allows you to attach labels to a point, line, or circle. Once attached to the object, labels cannot be detached. You can position them near the object using the **Pointer**, and they will retain that position through all modifications to the object.

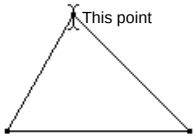
Example 7b: Adding labels after construction

1. Select **Triangle** from the **Lines** toolbox.

2. Construct a triangle on the drawing window.
3. Select **Label** from the **Display** toolbox.

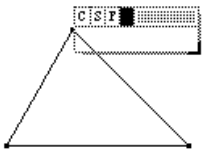
4. Move the + near a vertex of the triangle.

   The cursor changes to the I-beam I (the cursor message **This point** appears).



5. Click once and an edit box appears.

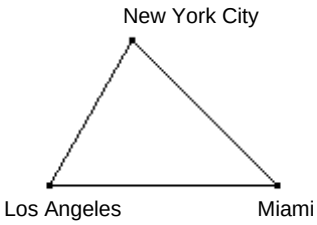
   Note: (Macintosh only) On the top row are four options that generate pull-down menus: **C** for font character set, **S** for font size, **F** for font style, and the last box for text color.



6. Type a name for the vertex, and then click anywhere outside the edit box.

   The box disappears, but the name remains.

7. Repeat for the other vertices.



You can also apply comments to measurements immediately after creating them. Just begin typing characters after creating the measurement.

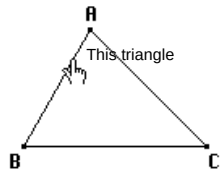
Example 8: Comments

1. Select **Triangle** from the **Lines** toolbox.

2. Construct a triangle and label its vertices **A**, **B**, and **C**.
3. Select **Area** from the **Measure** toolbox.

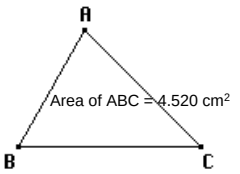
4. Move the cursor to a side of the triangle until it changes to the ☟ (the cursor message **This triangle** appears), and click once.

   Depending on the triangle and the default settings, a number and units label, such as 4.520 cm^2, appears.



5. Begin typing the comment **Area of ABC =**.

   The comment attaches to the left side of the measurement.



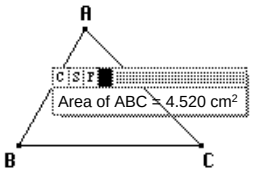
6. Select **Comments** from the **Display** toolbox.

7. Move the ✣ near the area (the cursor message **Edit this text** appears and the cursor changes to the I).

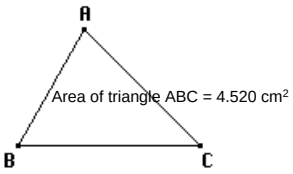
   Click once and an edit box appears with the value of the area and the comment entered in step 5 on the text line.

8. Move the cursor between **"of"** and **"ABC"** in the text line, and add the word **triangle**.

   The text now reads **"Area of triangle ABC = 4.520 cm^2."**



9. Click on the toolbar or press ESC to make the edit box disappear, leaving the comment on the drawing window.



Scrolling the drawing window

You can scroll the drawing window within a one-square-meter region by three methods:

- Use the Show Drawing command in the File menu to view the entire one-square-meter region in compressed form. You can reposition the active widow, which allows you to work in another section of the drawing. (**Note**: When you click and hold the mouse button, the grasping hand cursor (✋) appears.)
- Use the scroll bars on the right and bottom sides of the drawing window (Macintosh only). Clicking on the scroll bars or buttons moves the drawing in a horizontal or vertical direction.
- Press the COMMAND key (Macintosh) or the CTRL key (Windows, DOS), then press down on the left mouse button. The screen scrolls in the direction that you move the pointer.

Saving and printing

You can save a construction to a file at any time using the **Save** and **Save as...** commands in the **File** menu. If the construction has never been saved, these two commands have the same effect.

The **Save** dialog box allows you to name the construction and to choose the folder where it will be stored. If the construction has already been saved, the **Save** command is active only if the figure has been modified since the previous save. The new version of the construction replaces the older one.

The **Save as...** command allows you to save the figure to another folder or name without deleting the older version.

You can print your Cabri Geometry II constructions on a printer. Printed constructions enhance understanding by providing accurate, printed-to-scale manipulatives. The entire one-square-meter drawing or a specified portion can be printed in both black and white, or color.

Chapter 2: Using the Menus

The Cabri Geometry II menus contain standard graphic user interface functions for file management and editing, plus options for Cabri Geometry II. They are located on the menu bar at the top of the Cabri Geometry II window.

The following menu options are available. Each option is discussed in this chapter in detail according to its order on the pull-down menus.

FILE MENU	EDIT MENU	OPTIONS MENU	HELP
New	**Undo/Redo**	**Show/Hide Attributes**	**Help** (Windows, DOS)
Open...	**Cut**	**Defaults...**[1]	? (Macintosh)
Close[1]	**Copy**	**Preferences...**	**About (Cabri II...)**
Save	**Paste**	**Tool Configuration...**	
Save as...	**Clear**	**Language**[5]	
Revert...[4]	**Select all**	**Font**[5]	
Show Drawing...[4]	**Select all**	**Size**[5]	
Show Page...[3]	**Replay Construction**	**Style**[5]	
Page Setup...[5]	**Refresh Drawing**		
Printer Setup...[2]			
Print...			
Quit			

Note: [1]Macintosh only
[2]DOS only
[3]Windows only
[4]Macintosh, DOS only
[5]Macintosh, Windows only

File Menu

The **File** menu contains commands that relate to opening, closing, saving, printing, and viewing Cabri Geometry II constructions.

A description of each item in the File menu as it relates to Cabri Geometry II is given below. Consult your *Macintosh*, *Windows*, or *DOS User's Guide* for more information on the following menu items: **New**, **Open**, **Close**, **Save**, **Save as**, **Page/Printer Setup**, **Print**, and **Quit**.

New

Keyboard shortcut: COMMAND+N (Macintosh); CTRL+N (Windows, DOS)

The **New** command opens a new, blank Cabri Geometry II drawing window. For the Macintosh and Windows versions, the window appears on top of all other windows and is the active window. The window is not assigned a name until you save it using **Save** or **Save as**. For the DOS version, only one drawing window at a time is displayed. Therefore, you are prompted to save your current drawing before the new drawing window takes effect.

Open...

Keyboard shortcut: COMMAND+O (Macintosh); CTRL+O (Windows, DOS)

The **Open** command generates a dialog box for opening an existing construction file, macro, tool configuration file, preference file, or TI-92 file. Use the dialog box to specify the folder and file to open.

A construction file is displayed with the view that was visible when the file was last saved. You can view a summary of the steps used to create the construction interactively by selecting **Replay Construction** in the **Edit** menu.

A macro appears in the **Macro** toolbox and may be used immediately in the construction.

A tool configuration file immediately alters the Cabri Geometry II tool configuration as defined in the file. See **Tool Configuration** in the **Options** menu for more information.

A preference file immediately alters Cabri Geometry II preferences as defined in the file. See **Preferences** in the **Options** menu for more information.

Close

Keyboard shortcut: COMMAND+W. You also can click in the close box, located on the top left-hand side of the active window in the title bar.

The **Close** command (Macintosh, Windows) closes the active drawing window. If changes were made to the construction file, the **Close** dialog box appears and provides the option to save the changes. If the file is new, the dialog changes to the **Save** dialog box. Cabri Geometry II is still active in your computer's memory after all files have been closed and does not free memory for applications other than Cabri Geometry II.

Save

Keyboard shortcut: COMMAND+S (Macintosh); CTRL+S (Windows, DOS)

The **Save** command saves the construction in the active drawing window to the file name specified previously. The **Save as** dialog box appears if the file was not saved previously. The construction remains open and active after saving.

The current view of a construction is saved with the file so that it opens to the same view when reopened. Any macros used in the construction are automatically saved with the file and are available for use in future edit sessions with the saved file.

Save as...

The **Save as**... command generates a dialog box for saving and naming the construction in the active drawing window. The **Save as** dialog box provides the interface for saving a new file, saving a file to a new file name, file type, or location, or saving an existing file. Enter the information requested in the dialog box to save the file.

For the Macintosh only, you can save the file as a *text* file if you wish to view its contents with another program. For example, you can copy data in the Cabri Geometry II table to word processing or spreadsheet files for further analysis using this method.

Revert...

The **Revert...** command returns the construction to its most recently saved version. This feature is useful if you make modifications to your file that you later want to disregard. **Revert** is especially useful when demonstrating a construction in the classroom.

Show Drawing... (Macintosh, DOS), Show Page... (Windows)

The size of the drawing window in which you build a geometric construction is one meter by one meter. **Show Drawing/Show Page** lets you view this entire region. The entire figure, with the exception of text or measurement, is displayed in the following dialog box shown below.

A small window represents the portion of your construction that is visible on your computer screen. The construction cannot be manipulated at this stage, but you can position the window anywhere within the one-square-meter limits of the construction. Drag the window to move it to a new section of your construction. Click **OK** or **Cancel** to accept or cancel the operation.

- For the Macintosh, the visible part of your construction can also be moved by clicking on the scroll bars or by dragging the drawing window while pressing the COMMAND key. Pressing the COMMAND key changes the pointer to the **open hand** cursor; pressing the mouse button and the COMMAND key changes the pointer to the **grasping hand** cursor. You can perform either method without accessing the **Show Drawing/Show Page** command.
- For the DOS versions, the visible part of your construction can also be moved by dragging the drawing window with the **grasping hand** cursor. Moving the pointer to the drawing window changes the pointer to the **open hand** cursor; pressing the left mouse button changes the pointer to the **grasping hand** cursor. You can perform either method without accessing the **Show Drawing/Show Page** command.
- For the Windows version, the visible part of your construction can be moved by also clicking on and then dragging the drawing window.

Page Setup... (Macintosh, Windows)

The **Page Setup...** command lets you specify the paper size and orientation (landscape or portrait), as well as other options that vary according to the printer.

Note: Cabri Geometry II prints figures to scale. That is, a triangle in your construction will be printed exactly as specified, preserving the length of the sides and the measurement of the angles. If you change the **Reduce or Enlarge** option from 100%, the exact size of the figure will not be preserved.

Print... (Macintosh, Windows)

The **Print** command for the Macintosh and Windows versions opens a dialog box that provides several options for printing your construction. After specifying the options you want in **Page Setup** and **Print**, click the **Print** button to send your construction to the printer.

The **Placement options...** (Macintosh only) lets you position your construction as it will appear on a printed page by dragging the clear page in the screen. The drawing window (your computer screen) is shown for a reference. Select **Print labels in Italics** to automatically print all labels in italic font.

If your construction requires more than one page, select the **Posterize** option (Macintosh only) to number each page. You can select the position of the pages by using the pointer to drag the center page (outlined with bold lines) in the drawing region. You can change the number of pages by dragging the boxes in the upper-left and lower-right corners of the print region. This option makes it fun to create very large drawings, which can be taped together.

Printer Setup... (DOS)

The **Printer Setup...** command for the DOS version lets you select a printer and respective print quality, and to specify the page size (US Letter, US Legal, or A4 Letter) and orientation (portrait or landscape). Click on the selections to see the menu options.

The **Printer** option lets you select one of the printers listed below. If your specific printer is not in this list, select a printer that may be similar. (**Note:** The print quality setting that you select may affect the throughput of your printer. Allow ample time for high quality printer settings.)

- IBM/Epson 9 pin
- IBM/Epson 24 pin
- Epson Stylus Color
- DeskJet 500
- DeskJet 500C (CYM)
- DeskJet 500C (RGB)
- LaserJet HP
- Proprinter XL

Print... (DOS)

The size of the drawing window in which you build a geometric construction is one meter by one meter. **Print** lets you view this entire region before printing your construction. The entire figure, with the exception of text or measurement, is displayed.

A small window represents the portion of your construction that will be printed. The construction cannot be manipulated at this stage, but you can position the window anywhere within the one-square-meter limits of the construction. Drag the window to move it to a new section of your construction. Click **OK** or **Cancel** to accept or cancel the operation. Clicking on **OK** sends the screen image to your printer.

Quit

Keyboard shortcut: COMMAND+Q (Macintosh); CTRL+Q (Windows, DOS)

The **Quit** command closes all open files and quits Cabri Geometry II. It gives you the opportunity to save changed or unsaved files.

Edit Menu

The **Edit** menu contains commands that relate to modifying the construction sequence, commands for exporting items in the drawing to the clipboard, and commands for selecting and deleting items in the drawing.

Undo/Redo

Keyboard shortcut: COMMAND+Z (Macintosh) or CTRL+Z (Windows, DOS)

The **Undo/Redo** command lets you undo the previous action or redo the undone action. These commands have a recall of one action only. If you wish to review additional action steps, see **Replay Construction** on the next page.

The Windows version has an option in the **Options/Preferences** menu to let you disable the **Undo** command. Disabling **Undo** provides for faster manipulation of very large and complex figures.

Cut/Copy/Paste

For the Macintosh and Windows versions, the **Cut**, **Copy**, and **Paste** commands use the Macintosh/Windows clipboard to import and export selected items to and from a construction. For the DOS version, these edit commands use a custom Cabri Geometry II clipboard.

Cut removes the selection from the construction and places it on the clipboard (Macintosh, Windows), or in the file $CLIPCAB.FIG (DOS).

Copy places the selected objects on the clipboard without removing them from the construction. Additionally, for the DOS version, the selection is saved to a file depending on the type of items that are selected. Copying a construction creates two files $CLIPCAB.BMP and $CLIPCAB.FIG. Copying a table that contains data creates the file $CLIPCAB.TXT. Therefore, to copy and paste a construction or table into another application, such as a word processor or spreadsheet, when using the DOS version, select the objects and click on **Copy**. Then open the other application and insert the appropriate .BMP, .FIG, or .TXT file to the desired location.

Paste copies the objects from the clipboard into the drawing window that is active. After pasting, the clipboard still contains the objects. Therefore, you can paste them in another location or Cabri file, if you desire. In general, objects can be pasted as many times as available memory allows. One exception is copying the table. Because Cabri Geometry II defines only a single table and the contents of a table are dependent upon other objects, Cabri Geometry II cannot duplicate the table within the software. Further, only the contents of the table (the numerical values) are copied to another application.

Objects are pasted in the same position in which they were copied. If you are pasting to the same Cabri Geometry II drawing from which you cut or copied the objects, they are pasted in the same position but with a small offset in location. The pasted objects are independent of the objects from which they were cut or copied.

Keyboard shortcuts: COMMAND+X (Macintosh) or CTRL+X (Windows, DOS) for **Cut**, COMMAND+C (Macintosh) or CTRL+C (Windows, DOS) for **Copy**, and COMMAND+V (Macintosh) or CTRL+V (Windows, DOS) for **Paste**.

Clear

The **Clear** command removes selected objects from the construction. This command is equivalent to pressing the DELETE key. Objects are not placed on the clipboard.

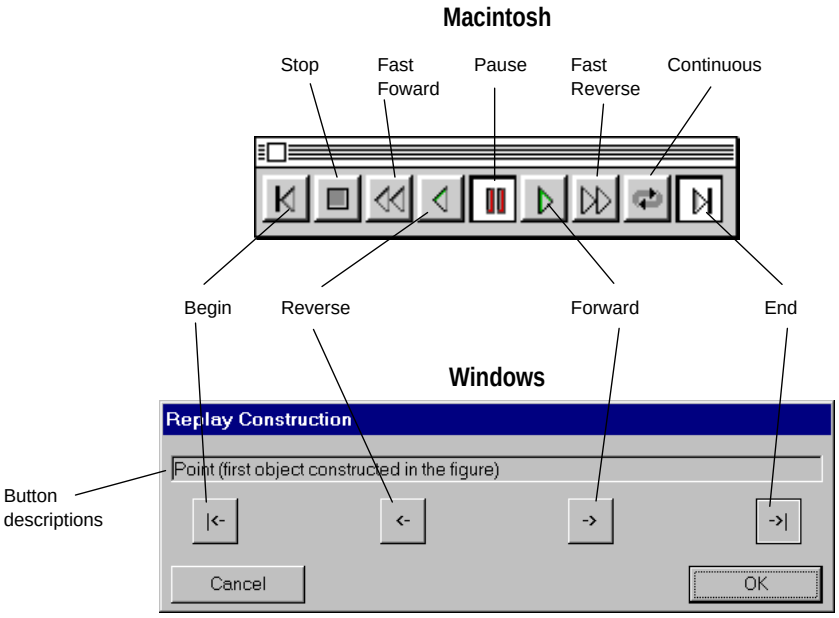
Select all

Keyboard shortcut: COMMAND+A (Macintosh) or CTRL+A (DOS)

The **Select all** command selects every object in a construction. Using **Select all** and then **Clear** is an easy way to erase the contents of a construction to start again with a clean drawing.

Replay Construction

The **Replay Construction** command for the Macintosh and Windows versions replays each step of a construction. You may stop the replay at any step in the construction and begin editing. If you stop the replay before the end of the construction is reached and begin to edit, all subsequent steps in the original construction are nullified. A floating toolbar is generated when this command is selected. Note that the Macintosh version provides several additional buttons.



The **Replay Construction** command for the DOS version replays each step of a construction when you press the left and right arrow keys on the keyboard. Pressing the right arrow key replays the construction in the forward direction and pressing the left arrow key replays the construction in the reverse direction. Unlike the Macintosh and Windows versions, you cannot edit a construction if you stop the replay before you reach the end of the construction. When you click the mouse at any point during the replay, the entire construction is displayed.

Refresh Drawing

Keyboard Shortcut: COMMAND+F (Macintosh) or CTRL+F (Windows, DOS)

The **Refresh Drawing** command redraws every object of a construction. In the process of redrawing, undefined elements are removed. Pixels turned on by **Trace** are removed in this manner.

(Macintosh, Windows) An alternative method for redrawing the construction is to click on the zoom box in the top right corner of the drawing window. This action also causes the window to expand to its logical maximum size. Clicking the box again causes the window to shrink back to its previous size.

Options Menu

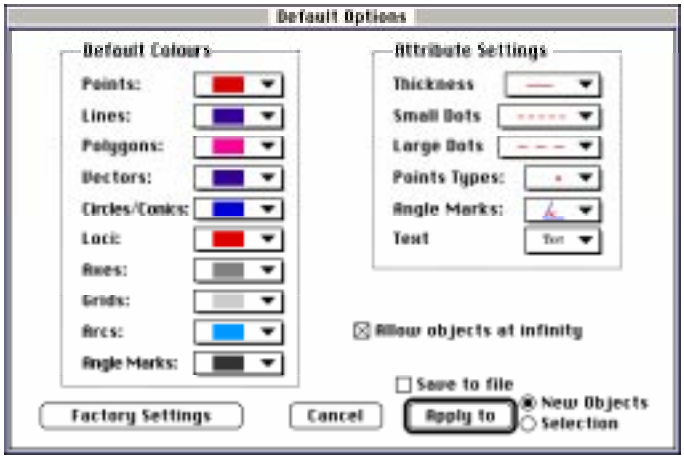
The **Options** menu contains commands that relate to showing attributes of each construction tool, setting defaults, and defining the contents and configuration of the toolbar.

Hide/Show Attributes

The **Hide/Show Attributes** command hides and shows the attributes toolbar. You can toggle the command from one to the other.

Defaults... (Macintosh only)

The **Defaults...** command for the Macintosh version provides options that allow you to select default colors and attribute settings for various classes of objects. The defaults can be saved to the Cabri Geometry II preference file. If the Cabri Geometry II preference file is placed in the Cabri Geometry II preferences folder or the system preferences folder, the settings saved in this file will be activated each time you open Cabri Geometry II. The Default Options dialog box is shown below. Click the **Factory Settings** button to return each default to its factory specification.



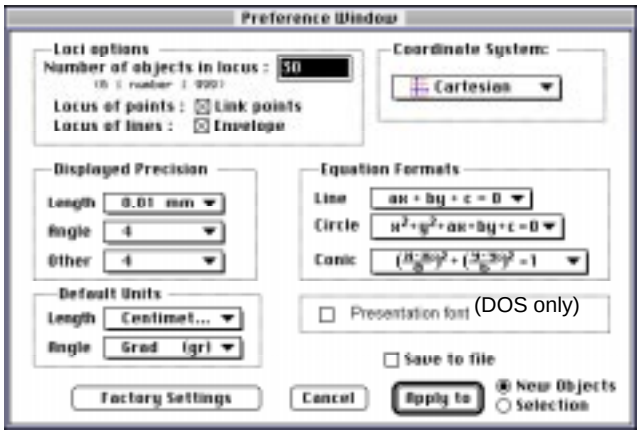
Preferences...

The **Preferences...** command lets you specify particular aspects of the program related to loci, the coordinate system, measurements, and equation formats. A dialog box, as shown on the next page, appears when you select this command. The options are described below the illustration.

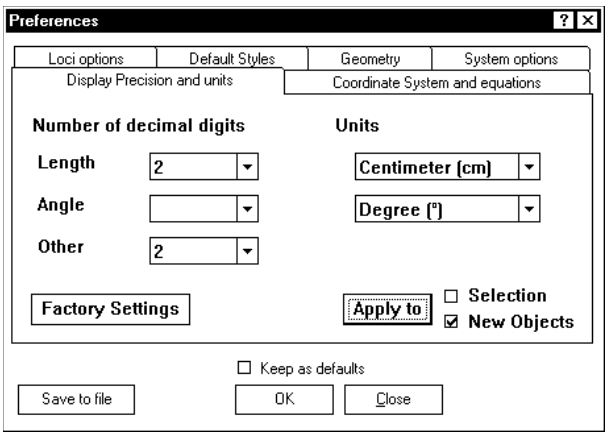
The settings specified in **Preferences** for the Macintosh and Windows versions can be saved to a Cabri Geometry II preferences file. This file also contains the defaults specified using the **Defaults** command. This file must reside in the Cabri Geometry II preferences folder or your Macintosh system preferences folder for it to be automatically referenced at run time. If more than one Cabri Geometry II preferences file is in either of these folders, Cabri Geometry II will use the first file that it finds. The Cabri Geometry II preferences file and preferences folder are created when a preference file or tool configuration file is saved to disk for the first time.

This menu option in the DOS version is very similar to the Macintosh version. However, only one preference file (cabri2.prf) can exist in the same subdirectory. Additionally, when you select **Preferences** and save to a file, the new preferences will be used when you start Cabri Geometry II the next time. To change preferences, go back to **Preferences** and change the settings or set them back to **Factory Settings**.

Macintosh, DOS



Windows



Loci options

This option applies to all loci constructed in the drawing.

The **Locus** tool performs a linear interpolation of the loci calculated. Therefore, the more objects in the locus, the smoother it will appear. You can change this number in this dialog box for the default setting or for a specific locus by selecting the locus, and then changing the values in this dialog. You can also change the number of objects in the locus by selecting the locus, and then pressing + or – on the keyboard to increase or decrease the number of objects.

Selecting the **Link points** option connects adjacent points with a solid line.

Selecting the **Envelope** option draws only the envelope of a line as the locus rather than the locus of the line.

Coordinate System

The default coordinate system can be set up for Cartesian or polar coordinates.

Displayed Precision

Select the precision of the units displayed. Cabri Geometry II always uses the maximum precision of the Macintosh when measuring objects. You can display additional precision by using **Numerical Edit** in the **Display** toolbox.

Default Units

Select the units you want when measuring objects. The default unit for length also specifies the unit for area.

Equation Formats

Select the equation formats you desire from the option listed for lines, circles, and conics. Some formats for conics may not be possible for all conics that can be constructed.

Presentation Font

This DOS-version option doubles the size of the text font for readability (e.g., for presentations).

Keyboard shortcut: CTRL+D

Geometry This Windows-version option lets you select if points should be implicitly defined, and if objects should be drawn to infinity.

Default Styles This Windows-version option lets you choose colors and font options for all toolbar commands.

System options This Windows-version option lets you set the following:

- **Bitmap Copy:** ❑ Enhanced MetaFile format (EMF) for 32-bit versions of Windows for high-quality, smooth lines. ☑ Supports only bit-mapped format (BMP), which is optional for Windows 95 and required for Windows 3.1x.
- **System Pallet:** Defines the color palette to use when Cabri is in the background and the palette is changed by another application. ❑ Cabri colors will change when another option is brought to the foreground. ☑ Cabri uses only colors present in the default system palette.
- **Disable Undo:** ❑ **Undo** is enabled. ☑ **Undo** is disabled, which provides for faster manipulation of very large and complex figures.
- **Cursor Font:** Lets you define the display font to use for display indicators.
- **Menu Font:** Lets you define the display font to use for menu options.

Tool Configuration...

The **Tool Configuration...** command allows teachers to configure Cabri Geometry II tools in the toolbar to the aptitude of their class. You can rearrange or remove any tool in the toolbar. You can place a tool configuration file in the preferences folder to automatically open Cabri Geometry II with the tool configuration specified in that file. The following steps show you how to customize your toolbar.

1. Select **Tool Configuration** in the **Options** menu.
2. To remove any tool from its current toolbox, select the tool.

   The tool becomes attached to the pointer.
3. To relocate the attached tool to an existing toolbox, open any toolbox.

   The relocated tool is inserted immediately below a tool that you highlighted with the cursor. The tool will be copied to the top of the toolbox if you do not highlight another tool.
4. To relocate the attached tool in a new toolbox, click in any empty section of the toolbar. To remove the tool from the toolbar, click on the toolbar trash can.
5. To add spaces between a toolbox or tool, press the spacebar while pressing and holding the mouse button down. You can add up to five spaces between toolboxes or tools.

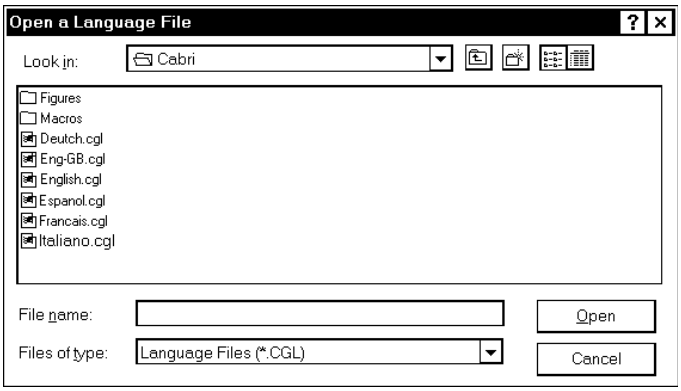
   To remove spaces between a toolbox or tool, press the BACKSPACE key while pressing and holding the mouse button down.
6. Add a password to prevent the tool configuration from being changed inadvertently.
7. Save your new tool configuration. If you save it to a tool configuration file, you can use the same configuration in future sessions of Cabri Geometry II. Otherwise, the configuration is only valid for the current session. If you want to return the tool configuration back to the factory configuration, click on the **Factory Settings** button.

Languages (Macintosh, Windows)

The **Languages** command lets you change the language of Cabri Geometry II menus, dialog boxes, messages, and labels. You may change the language at any time during a session.

Macintosh

Windows



The **Language settings** command opens a dialog box that lets you:

- Choose the language to be used the next time you start Cabri Geometry II.
- (Macintosh only) Choose to attach a language to the Cabri Geometry II software. Cabri Geometry II can recognize any language module that is in the same folder. This command integrates the language as part of the Cabri Geometry II software.
- (Macintosh only) Choose to exclude a language from the Cabri Geometry II software.
  - If the **And save in a file** option is selected, the language will be saved in a separate file and can be reattached later.
  - If the **And save in a file** option is not selected, the language will not be available unless you reinstall the software (for core languages) or place a language file in your Cabri folder.

Font (Macintosh, Windows)

The **Font** command in the Macintosh and Windows versions lets you view the fonts installed on your computer. The √ symbol in the Macintosh version is shown next to the default font. The default font applies to labels, comments, numerical values, and properties. You can specify fonts independently for the **Label**, **Comments**, or **Numerical Edit** tools by first selecting the tool, and then changing the font in this menu. Point to another font to select it as the new default font.

Note: The Windows version dialog box lets you set the font size and style.

Size (Macintosh)

The **Size** command in the Macintosh version lets you view the font sizes available on your computer. The point sizes in outlined text are sizes that your Macintosh should display without distortion. The √ symbol is shown next to the default size. The default size applies to labels, comments, numerical values, and properties. You can specify size independently for the **Label**, **Comments**, or **Numerical Edit** tools by first selecting the tool, and then changing the size in this menu. Point to another size to select it as the new size. For classroom demonstrations, it is useful to set the default font size at 14 or 18 points.

Style (Macintosh)

The **Style** command in the Macintosh version lets you view the text styles available on your computer. Text styles are independently applied to text and may be combined. For example, you can specify bold-italic text by selecting each style type separately. The default style applies to labels, comments, numerical values, and properties. You can specify style independently for the **Label**, **Comments**, or **Numerical Edit** tools by first selecting the tool, and then changing the style in this menu.

Help Menu (Windows and DOS), ? (Macintosh)

The **Help** menu in the Windows and DOS versions, and ? in the Macintosh version, let you view helpful information about each toolbar icon and information about the Cabri Geometry II software.

Help

Keyboard shortcut: F1 (DOS)

The **Help** command displays a description of the selected toolbar icon in the Help window at the bottom of the Cabri Geometry II screen. For the Macintosh version, click on ? to open the Help window.

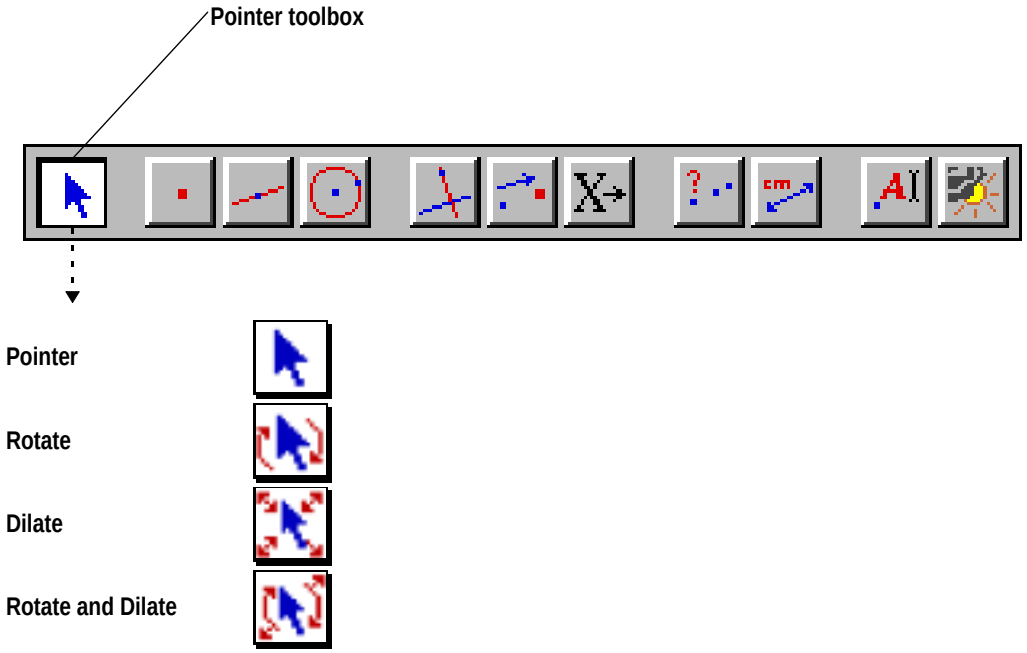
About (Cabri II)

The **About (Cabri II)** command displays information about Cabri Geometry II that includes authors' names, copyright notice, and the version number of the software.

Chapter 3: Using the Pointer Toolbox

The **Pointer** toolbox contains the tools associated with Cabri Geometry II pointer features. These features allow you to select objects and to perform freehand transformations.

The illustration below shows the location of the **Pointer** toolbox on the Cabri Geometry II toolbar, along with its pull-down menu. Procedures for using **Pointer** tools, including examples, are presented in this chapter in the order in which the tools appear on the pull-down menu.



Pointer

The **Pointer** tool selects or moves objects in a freehand manner.

Press and hold the mouse button in unoccupied space to observe all basic and independent points which display as flashing. You can also double-click on a label, comment, numerical value, or the table to automatically invoke the appropriate edit tool for the object.

Selecting or moving objects

1. Select **Pointer** from the **Pointer** toolbox.

2. *Selecting*: Select an object by pointing and clicking when the cursor message appears for that object.

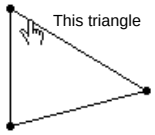
   Select multiple objects by pressing the SHIFT key when selecting objects, or by enclosing them in a marquee rectangle as shown in the example below.

   Deselect an object by pointing to an unoccupied location and clicking.

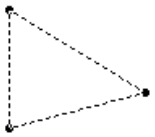
   Moving: Move an object by dragging it to a new location.

   Note: Sometimes multiple objects *cannot* be moved concurrently. Dependent objects *cannot* be moved directly. If a selected object cannot be moved directly, the cursor reverts to the **cross hair** + instead of the **dragging hand** cursor.

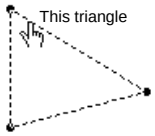
Point.



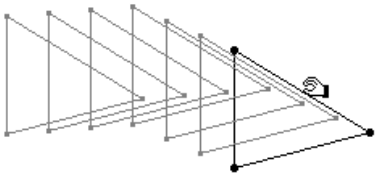
Click to select.



Point.



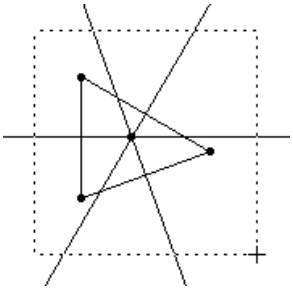
Drag.



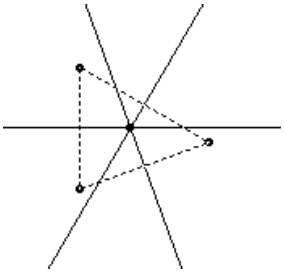
Example

Selecting multiple objects using a marquee rectangle:

Drag marquee rectangle around objects.



Release mouse button to select objects.



Rotate

The **Rotate** tool rotates an object about its geometric center or about a defined point in a freehand manner.

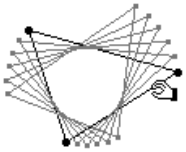
Rotating objects

1. Select **Rotate** from the **Pointer** toolbox.

2. *Rotating about the geometric center*: Select an object (not a point), and drag it in a circular motion.

   Note: Pressing the SHIFT key while dragging rotates the object in 15-degree increments.

Drag object in a circular path.

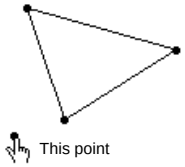


   Rotating about a defined point: Select a desired rotation point, and drag the object around the point.

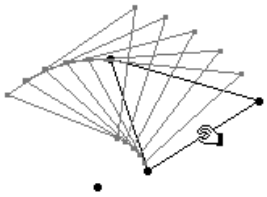
   Deselect the rotation point by clicking once in free space.

   Note: You can rotate an object automatically by using the **Animation** tool when the **Rotate** tool is visible on the toolbar. See the chapter "Using the Display Toolbox" for more information about **Animation.**

Select a rotation point.



Drag object in a circular path.



Dilate

The **Dilate** tool expands or contracts an object about its geometric center or relative to a defined point in a freehand manner.

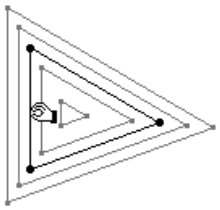
Dilating objects

1. Select **Dilate** from the **Pointer** toolbox.

2. *Dilating about the geometric center:* Select an object (**not a point**), and drag it away from its center to expand, or toward its center to contract.

   Note: Dragging an object through its center causes a negative dilation.

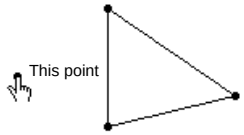
Drag object along a linear path.



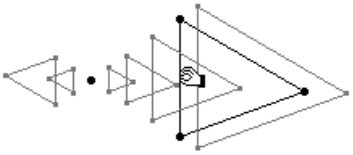
Dilating about a defined point: Select a desired dilation point, and drag the object (**not the point**) in a linear motion.

Note: You can dilate an object automatically by using the **Animation** tool when the **Dilate** tool is visible on the toolbar. See the chapter "Using the Display Toolbox" for more information about **Animation**.

Select a dilation point.



Drag object along a linear path.



Rotate and Dilate

The **Rotate and Dilate** tool rotates and dilates an object about its geometric center or a defined point in a freehand manner. See the **Rotate** tool and the **Dilate** tool for more information.

Using Rotate and Dilate

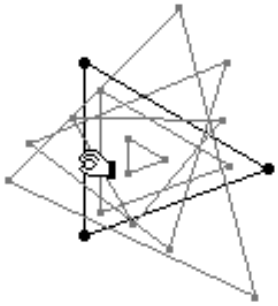
Select **Rotate and Dilate** from the **Pointer** toolbox.

Note: You can rotate and dilate an object automatically by using the **Animation** tool when the **Rotate and Dilate** tool is visible on the toolbar. See the chapter "Using the Display Toolbox" for more information about **Animation.**

Examples

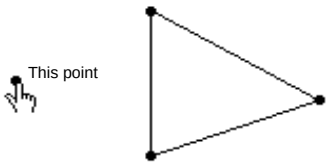
Freehand rotation and dilation of an object about its geometric center:

Drag object in a circular or linear path.

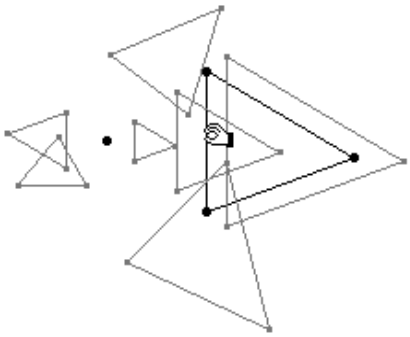


Freehand rotation and dilation of an object about a defined point:

Select a transformation point.



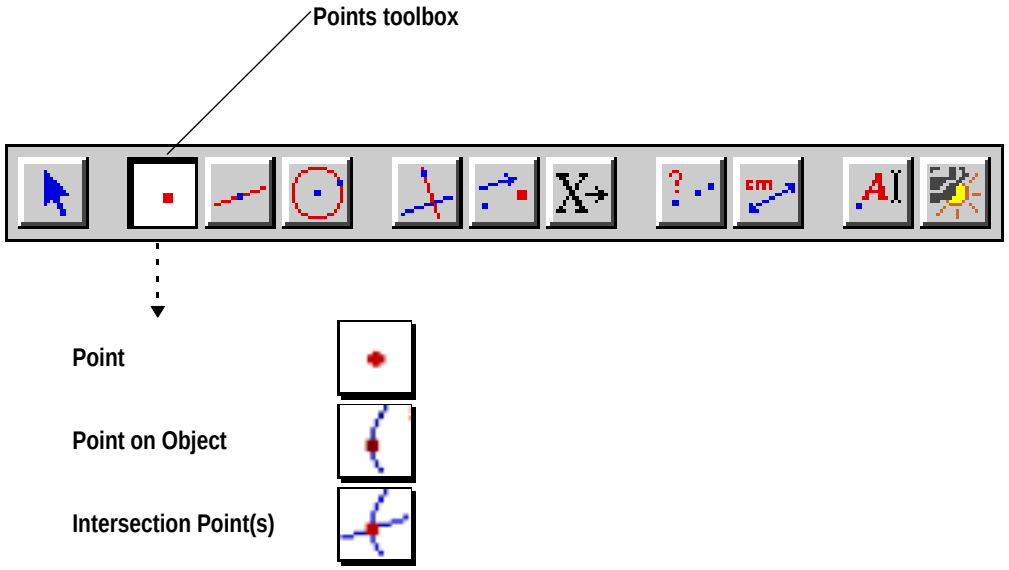
Drag object in a circular or linear path.



Chapter 4: Using the Points Toolbox

The **Points** toolbox contains the tools associated with creating or constructing points in Cabri Geometry II. These features allow you to create points anywhere in the plane, on objects, or at the intersection of two objects.

The illustration below shows the location of the **Points** toolbox on the Cabri Geometry II toolbar, along with its pull-down menu. Procedures for using tools in the **Points** toolbox, including examples, are presented in this chapter in the order in which the tools appear on the pull-down menu.



Point

The **Point** tool creates points that can be placed anywhere in the plane, on existing objects, or at the intersection of any two objects.

If you create a point on an object, it remains on that object throughout any changes made to the point or to the object. If a point is at the intersection of two objects, the point remains at the intersection throughout any changes made to the object(s). If you change the objects so that they no longer intersect, the intersection point disappears, but reappears if the objects intersect again.

Creating a point

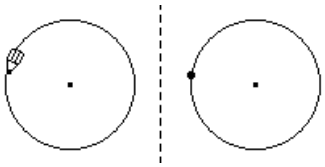
1. Select **Point** from the **Points** toolbox.

2. Move the cursor to any location in the plane where you want a point. When the cursor message appears, click once to create a point. If in free space, a cursor message does not appear.

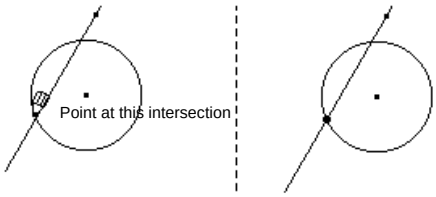
   Note: You do not have to select the **Point on Object** or **Intersection Point(s)** tools to create a point on an object or at an intersection.

Create points in free space.

Create points on objects



Create points at intersections.



Modifying a point

Move a point by dragging it to a new location.

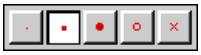
You can change the appearance of points using:

- the **Defaults** option under the **Options** menu (Macintosh only).
- the **Attributes** toolbar under the **Options** menu.
- the **Modify Appearance** option in the **Draw** toolbox.

You can construct a point as a •, ●, ●, ×, or ○.

Refer to the chapters “Using the Menus” and “Using the Draw Toolbox” for these features.

Point types toolbar.



Point on Object

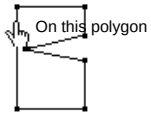
The **Point on Object** tool creates points on any object.

Creating a point on an object

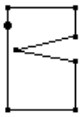
1. Select **Point on Object** from the **Points** toolbox.

2. Move the cursor toward the object until a cursor message appears for that object, and then click once.

Point.



Click.



Modifying a point on an object

Move a point by dragging it to a new location. The point always remains on the object.

Intersection Point(s)

The **Intersection Point(s)** tool creates a point at the intersection (or intersections) of any two objects.

An intersection can be defined for only two objects. If more than two objects intersect at the same place (for example, the perpendicular bisectors of a triangle), an ambiguity message appears. If this happens, hold down the mouse button and select the correct object from the list.

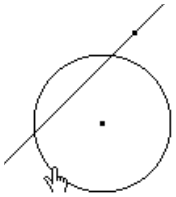
If you change the objects so that they no longer intersect, the intersection point(s) disappears, but reappears if the objects intersect again.

Creating an intersection point

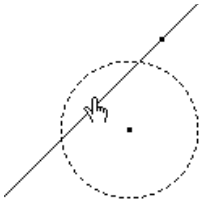
1. Select **Intersection Point(s)** from the **Points** toolbox.

2. Select two intersecting objects.

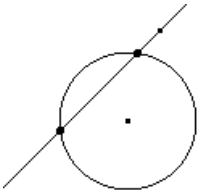
Select the first object.



Select the second object.



Points are created at each intersection.



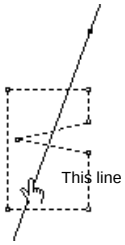
Modifying an intersection point

Intersection points are dependent and cannot be moved.

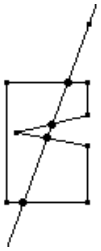
Example

Intersection of a line and a polygon:

Select polygon and line.



Points are created at each intersection.

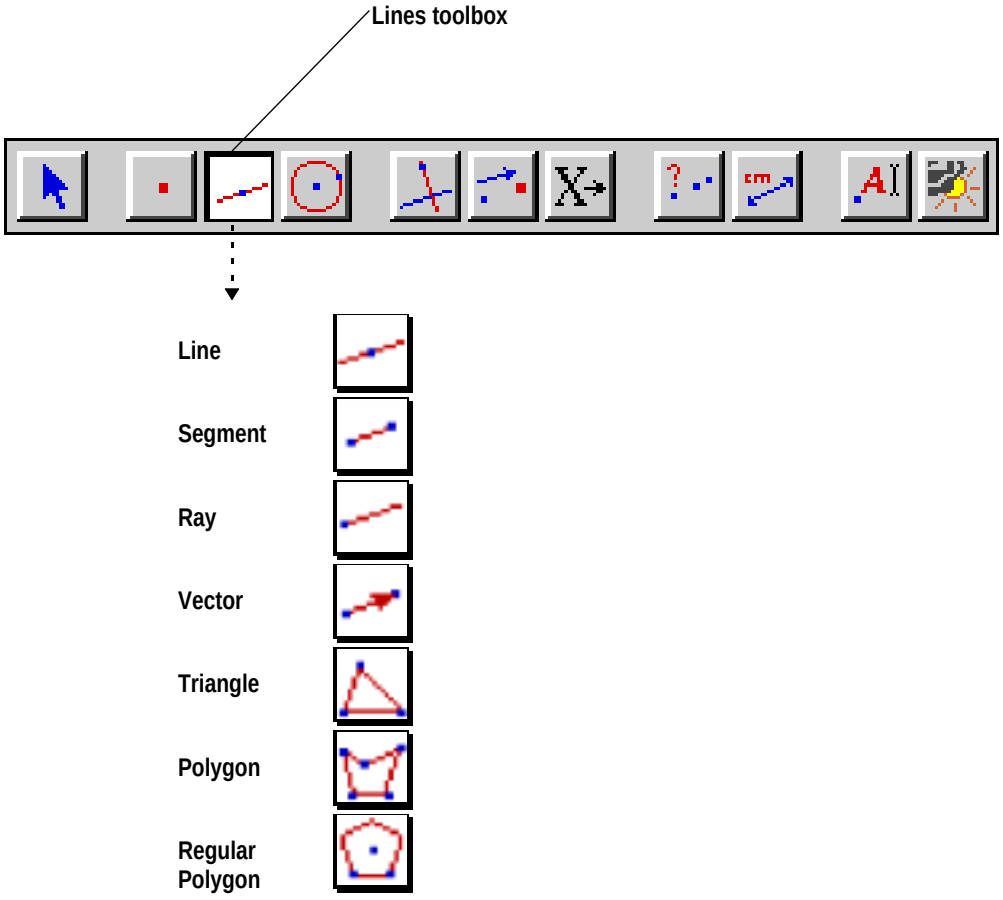


Chapter 5: Using the Lines Toolbox

The **Lines** toolbox contains the tools associated with line features in Cabri Geometry II. These features allow you to construct linear objects and polygons.

The illustration below shows the location of the **Lines** toolbox on the Cabri Geometry II toolbar, along with its pull-down menu. Procedures for using tools in the **Lines** toolbox, including examples, are presented in this chapter in the order in which the tools appear on the pull-down menu.

Defined objects in Cabri Geometry II, such as triangles and polygons, can be translated, rotated, or dilated. Refer to the chapters "Using the Pointer Toolbox" and "Using the Transform Toolbox" for more information about these methods.



Line

The **Line** tool creates a line that extends infinitely in both directions through a point at a specified slope. The slope can be specified in free space or defined by a second point.

Note: You can constrain the slope to 15-degree increments by pressing the SHIFT key when creating or modifying a line.

Creating a line

1. Select **Line** from the **Lines** toolbox.

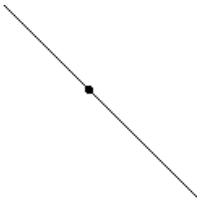
2. Click to create or select the initial point of the line.

Create a point.

Specify the slope.

3. Specify the slope by positioning the line in the desired orientation and clicking.

   When specifying slope, you can create a point on an object, select an existing point, or click in unoccupied space.



Modifying a line

Translate a line without changing the slope by selecting the **Pointer** tool from the **Pointer** toolbox. Then using the **Pointer**:

- For a line constructed with a *single point*, drag the point.
- For a line constructed with two *basic* points, grab the line away from the points, and drag.

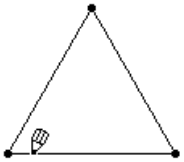
Note: A line constructed with at least one *dependent* point (a point attached to another object) cannot be moved using the **Pointer** without changing the slope.

Change the slope of a line by selecting the **Pointer** tool. Then using the **Pointer**:

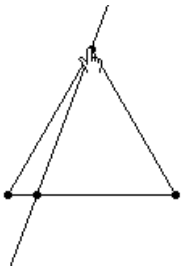
- To change a line constructed with a *single point*, grab the line away from the point and drag. Press the SHIFT key to constrain the slope to 15-degree increments.
- To change a line constructed with two *basic* points, drag either of the points.
- Changing a line constructed with a *dependent* point is relative to the object to which it is attached. You may drag the object or the point, depending on the construction.

Example

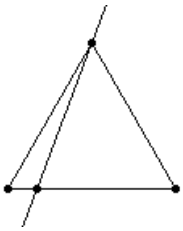
Create a point.



Create a point.



The line is attached to a side of the triangle and the opposite vertex.



The **Segment** tool creates a segment between two endpoints.

Note: You can limit the slope of the segment to 15-degree increments by pressing the SHIFT key when creating the segment.

Creating a segment

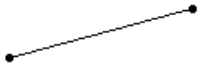
1. Select **Segment** from the **Lines** toolbox.

2. Click to create or select the initial endpoint of the segment.

Create the initial point.

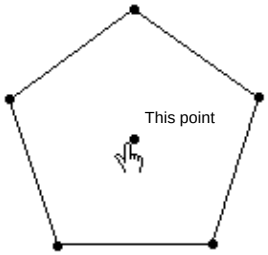
3. Move the pointer to the location for the final endpoint of the segment, and click to create or select the final endpoint.

Create the final point.

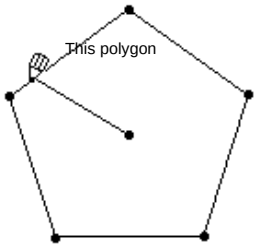


Example

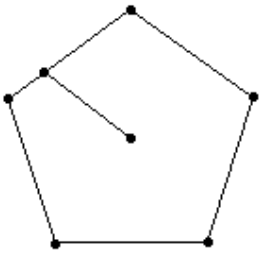
Select the initial point.



Point to the object.



Create the final point.



Note: See **"Regular Polygon"** in this chapter for more information on creating the regular pentagon in the above figures.

Modifying a segment

Change a segment by dragging either endpoint.

Translate a segment by grabbing away from the endpoints, and dragging it.

Ray

The **Ray** tool creates a ray defined by an initial endpoint and extending infinitely in a specified direction.

Note: You can constrain the slope to 15-degree increments by pressing the SHIFT key when creating or modifying a ray.

Creating a ray

1. Select **Ray** from the **Lines** toolbox.

2. Click to create or select the initial endpoint of the ray.

Create a point.

3. Position the ray in the desired orientation, and click to specify direction and slope.

   If the ray is created in free space, a point is not created. If the ray is not in free space, it is attached to a second point.

Click to specify the slope.

Modifying a ray

Translate a ray without changing its direction and slope by selecting the **Pointer** tool from the **Pointer** toolbox. Then using the **Pointer:**

- For a ray constructed with a *single point*, drag the point.
- For a ray constructed with two *basic* points, grab the ray away from the points and drag.

Change the direction and slope of a ray using the **Pointer** tool:

- To change a ray constructed with a *single point*, grab the ray away from the point and drag. Press the SHIFT key to constrain the slope to 15-degree increments.
- To change a ray constructed with two *basic* points, drag either of the points.
- Changing a ray constructed with a *dependent* point is relative to the object to which it is attached. You may drag the object or the point, depending on the construction.

Vector

The **Vector** tool creates a vector defined by magnitude and direction with a tail (initial endpoint) and head (final endpoint).

Creating a vector

1. Select **Vector** from the **Lines** toolbox.

2. Click to create or select the tail of the vector.

Create the tail.

3. Move the pointer to the location for the head, and click to create or select the head of the vector.

Create the head.

Modifying a vector

Change a vector by dragging either endpoint.

Translate a vector constructed with two basic points by grabbing the segment away from the endpoints, and dragging it to a new location.

Triangle

The **Triangle** tool creates a triangle defined by three points (vertices). A point placed on a triangle can be moved along the entire perimeter of the triangle.

Creating a triangle

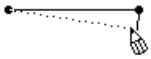
1. Select **Triangle** from the **Lines** toolbox.

2. Click to create or select the initial vertex.

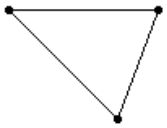
Create the first vertex.

3. Move the cursor from the initial vertex, and then click to create the second vertex. Repeat to create or select the final vertex.

Create the second vertex.



Create the final vertex.



Modifying a triangle

Move a triangle as an object by dragging one of its sides.

Change a triangle by dragging any of its vertices.

Note: Vertices dependent on other objects may restrict movement or modification of the triangle.

Polygon

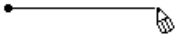
The **Polygon** tool constructs an n-sided polygon of any shape defined by n points (vertices). A point placed on a polygon can be moved along the entire perimeter of the polygon.

Creating a polygon

1. Select **Polygon** from the **Lines** toolbox.

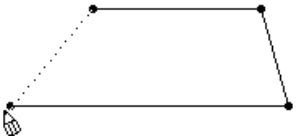
2. Click to create or select the initial vertex.

Create the initial vertex.



3. Move the cursor from the initial vertex, and then click to create or select the other vertices. To terminate polygon construction, double click or select the initial vertex.

Create additional vertices.

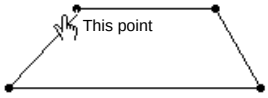


Modifying a polygon

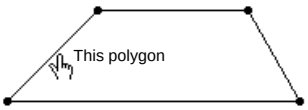
Move a polygon as an object by dragging one of its sides.

Change a polygon by dragging any of its vertices.

Select the original point.



Polygon is complete.



Regular Polygon

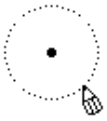
The **Regular Polygon** tool constructs a regular convex or star polygon defined by a center point and n sides (30 or less). A regular polygon consists of congruent sides and congruent angles. A point placed on a regular polygon can be moved along the entire perimeter of the polygon.

Creating a regular polygon

1. Select **Regular Polygon** from the **Lines** toolbox.

2. Click to create or select the center point.

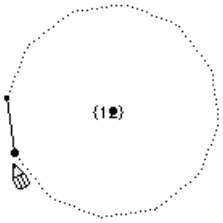
Create the center point.



3. Move the cursor from the center point, and click to specify the radius of a regular polygon.

   The number of sides is displayed at the center point.

Specify the size.

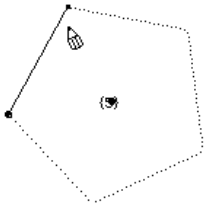


4. To create a regular *convex* polygon, move the cursor *clockwise* from its current position.

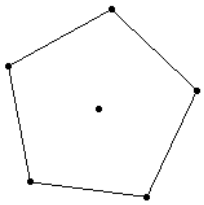
   To create a regular *star* polygon, move the cursor *counterclockwise*, and click when the regular polygon is the desired size.

   Note: If you move beyond 30 sides or 180 degrees from the initial vertex and the center point, a convex polygon becomes a star polygon. A fraction is displayed at the center point. The numerator determines the number of sides; the denominator, the number of times the star has crossed. The maximum star is 30/13; the minimum is 5/2.

Rotate clockwise.



Pentagon.



Modifying a regular polygon

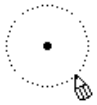
Move a regular polygon as an object by dragging one of its sides.

Change a polygon by dragging any of its vertices.

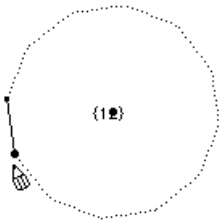
Dragging the center point changes the size of the regular polygon since the original vertex is anchored (location dependent).

Example

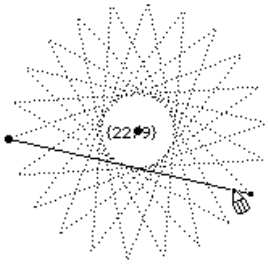
1. *Create the center point.*



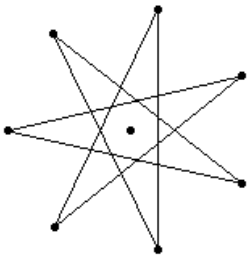
2. *Specify the size.*



3. *Rotate counter-clockwise.*



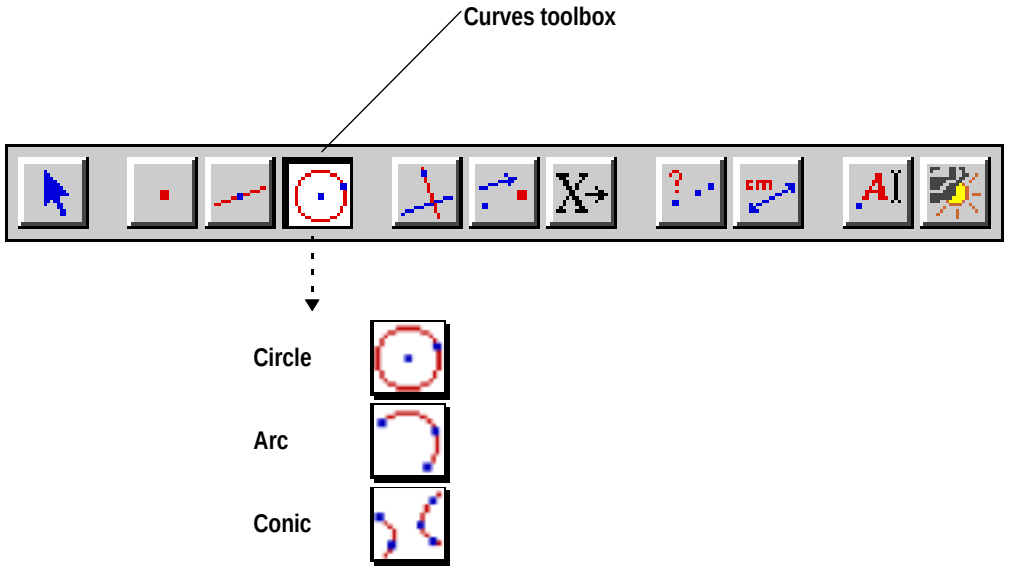
4. *7/3 star polygon.*



Chapter 6: Using the Curves Toolbox

The **Curves** toolbox contains the tools associated with curve features in Cabri Geometry II. These features allow you to create curved objects, including ellipses, parabolas, and hyperbolas.

The illustration below shows the location of the **Curves** toolbox on the Cabri Geometry II toolbar, along with its pull-down menu. Procedures for using tools in the **Curves** toolbox, including examples, are presented in this chapter in the order in which the tools appear on the pull-down menu.



Circle

The **Circle** tool creates a circle defined by a center point and a radius that can be specified in free space, at an existing point, or on an object.

Note: You can constrain the radius to integer values by pressing the SHIFT key while defining or modifying the radius.

Creating a circle

1. Select **Circle** from the **Curves** toolbox.

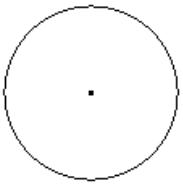
2. Create or select the center point of the circle.

Create the center point.

3. Move the cursor from the center point, and click once to set the radius.

   If you click in free space, a point is not created. You can also create or select a point.

Specify the radius.



Modifying a circle

To translate a circle without changing its radius, the circle must be constructed with a single point. Drag the point to translate the circle.

To change the radius of a circle:

- If the circle was created with a *single point*, grab the circle anywhere on its circumference and drag.
- If the circle was created with a *basic* point, grab either point on the circle and drag.

Arc

The **Arc** tool creates an arc defined by three points—two endpoints and a radius (or curvature) point.

Note: By definition, an arc created on a circle has a radius equivalent to that of the circle.

Creating an arc

1. Select **Arc** from the **Curves** toolbox.

2. Create or select the initial endpoint of the arc.

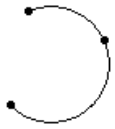
Create the initial point.

3. Move the cursor from the initial endpoint, and click to create or select the curvature point.

Create the second point.

4. Move the cursor from the curvature point, and click to create or select the final endpoint.

Create the final point.



Modifying an arc

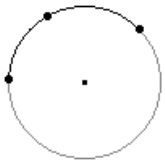
Change an arc by dragging any of its three points.

If an arc is defined by basic points, grab the arc away from the points, and drag it to a new location.

Example

Construct a circle.

Construct an arc on the circle.



Conic

The **Conic** tool creates a parabola, hyperbola, or ellipse defined by five points. Each point can assume a new definition, depending on its location on the conic.

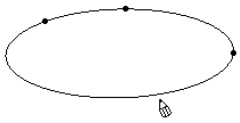
Creating a conic

1. Select **Conic** from the **Curves** toolbox.

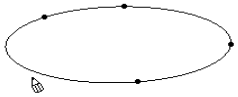
2. Click to create or select the five points.

   Note: After placement of three points, the conic is drawn to aid you in placing the remaining points.

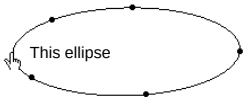
Create three points.



Shape with the fourth point.



Complete with the fifth point.



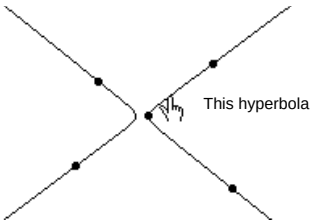
Modifying a conic

Move a conic by grabbing it away from its defining points, and dragging it to a new location. If any of the points are dependent, the conic also changes.

Modify the conic by dragging any of its five points.

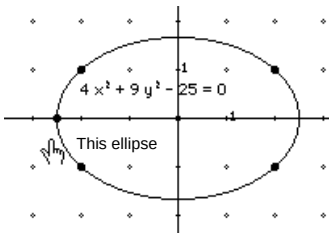
Note: Depending on the placement of the points, the conic will be an ellipse, a hyperbola, or a parabola.

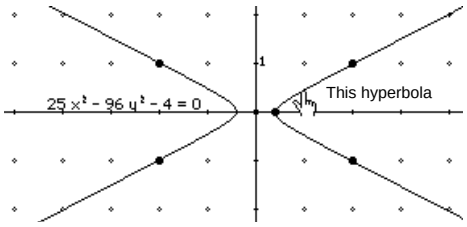
Drag any point to reshape.

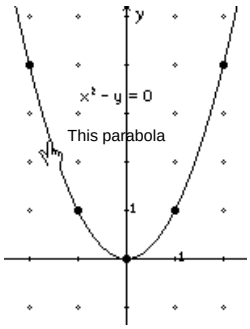


Examples

Conics in the coordinate plane:



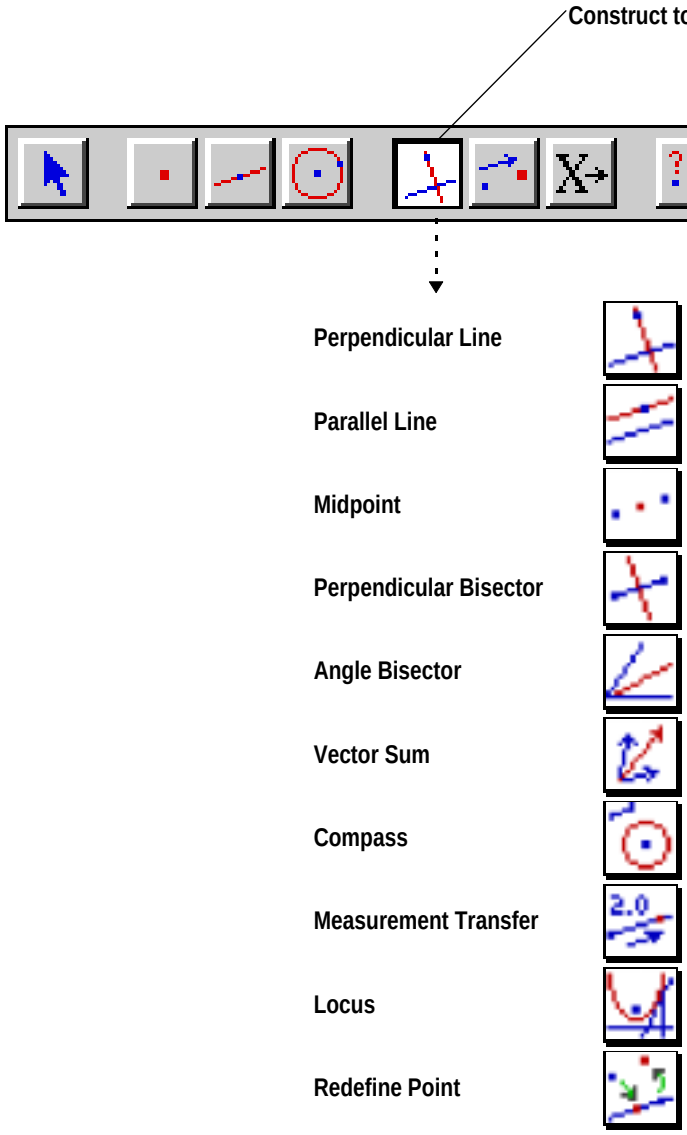




Chapter 7: Using the Construct Toolbox

The **Construct** toolbox contains the tools associated with construction features in Cabri Geometry II. These features allow you to construct objects in relation to other objects.

The illustration below shows the location of the **Construct** toolbox on the Cabri Geometry II toolbar, along with its pull-down menu. Procedures for using **Construct** tools, including examples, are presented in this chapter in the order in which the tools appear on the pull-down menu.



Perpendicular Line

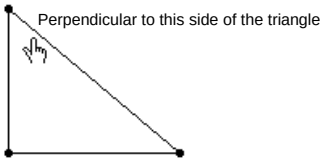
The **Perpendicular Line** tool creates a line passing through a point and perpendicular to a selected linear object (line, segment, ray, vector, or side of a polygon).

Creating a perpendicular line

1. Select **Perpendicular Line** from the **Construct** toolbox.

2. Point to the line, segment, ray, vector, or side of a polygon that will be perpendicular to the constructed line, and click to select.

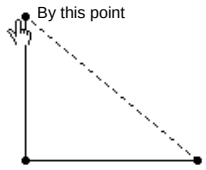
Select a linear object.



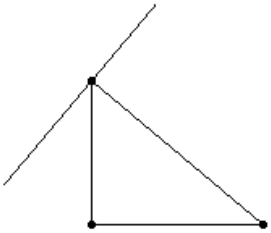
3. Click to create or select the point through which the perpendicular line will pass.

   Note: The order of steps 2 and 3 may be reversed.

Select a point.



A dependent line is created.



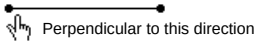
Modifying a perpendicular line

Move a perpendicular line by dragging the point through which it passes.

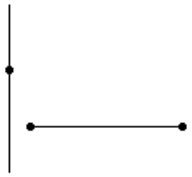
The line cannot be altered directly because it is, by definition, a dependent object.

Example

Select a linear object.



Create a point, and the perpendicular line is constructed.



Parallel Line

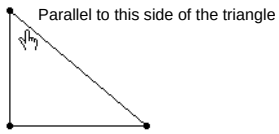
The **Parallel Line** tool creates a line that passes through a point and is parallel to a selected linear object (line, segment, ray, vector, or side of a polygon).

Creating a parallel line

1. Select **Parallel Line** from the **Construct** toolbox.

2. Point to the line, segment, ray, vector, or side of a polygon that will be parallel to the constructed line and click to select.

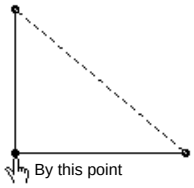
Select a linear object.



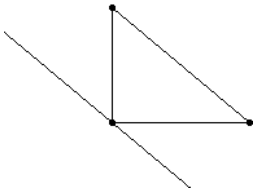
3. Designate the point through which the parallel line will pass.

   Note: The order of steps 2 and 3 may be reversed.

Select a point.



A dependent line is created.



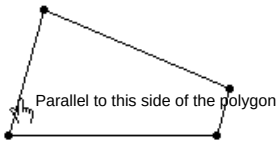
Modifying a parallel line

Move a parallel line by dragging the point through which it passes.

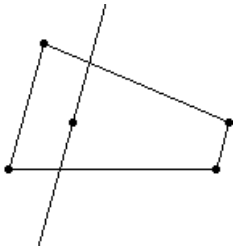
The line cannot be altered directly because it is, by definition, a dependent object.

Example

Select a linear object.



Create a point, and the parallel line is constructed.



Midpoint

The **Midpoint** tool creates a point at the midpoint of a segment or vector, the side of a polygon, or between two points.

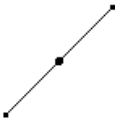
Creating a midpoint

1. Select **Midpoint** from the **Construct** toolbox.

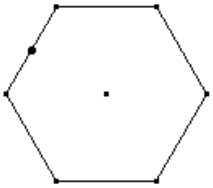
2. Point to one of the following and click to select:

Two points (create or select).

A segment.



The side of a polygon.



Modifying a midpoint

Modify a midpoint by modifying its defining objects.

Perpendicular Bisector

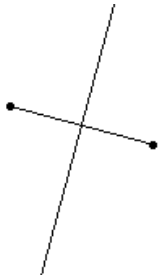
The **Perpendicular Bisector** tool creates a line that is perpendicular to a segment, a vector, a side of a polygon, or between two points, and passes through the midpoint of the selected object.

Creating a perpendicular bisector

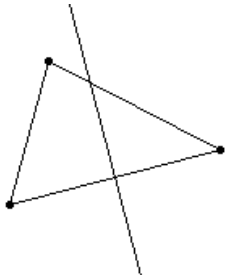
1. Select **Perpendicular Bisector** from the **Construct** toolbox.

2. Point to one of the following and click to select:

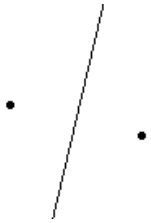
A segment or a vector.



The side of a polygon.



Two points (create or select).



Modifying a perpendicular bisector

A perpendicular bisector cannot be translated directly unless it is constructed between two *basic* points. Modifying the defining object causes the perpendicular bisector to change accordingly.

Angle Bisector

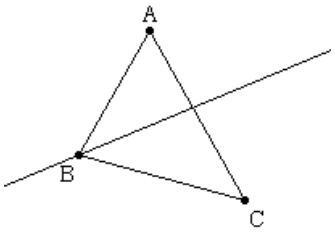
The **Angle Bisector** tool creates a line that bisects an angle identified by three points. The second point defines the *vertex* of the angle through which the line passes.

Creating an angle bisector

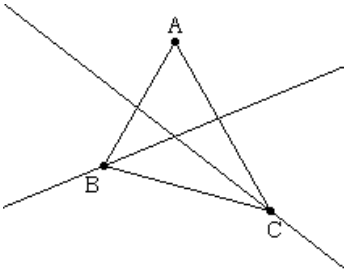
1. Select **Angle Bisector** from the **Construct** toolbox.

2. Click to create or select three points that define the angle to be bisected. (The second point selected is the vertex of the angle.)

Select points A, B, and C.



Select points, B, C, and A.



Modifying an angle bisector

An angle bisector cannot be translated directly unless it is defined by three *independent* points. Modifying the points that define the angle causes the angle bisector to change accordingly.

Vector Sum

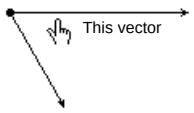
The **Vector Sum** tool creates a resultant vector that is the sum of two selected vectors. The selected vectors do not have to share a common endpoint (tail) and may also be previously defined vector sums.

Creating a vector sum

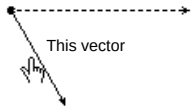
1. Select **Vector Sum** from the **Construct** toolbox.

2. Point and click to select any two vectors.

Select the first vector.

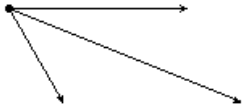


Select the second vector.



3. Click to create or select the initial point for the resultant vector.

Select a tail point for the vector sum.



Modifying a vector sum

A vector sum cannot be modified directly. Modifying either one of the selected vectors causes the vector sum to change accordingly.

Compass

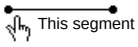
The **Compass** tool creates a circle with a radius equal to the length of an existing segment or the distance between two points.

Creating a circle using Compass

1. Select **Compass** from the **Construct** toolbox.

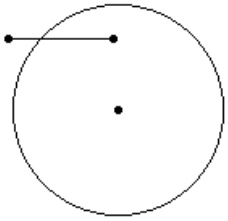
2. Create or select two points or select a segment to define the radius of the circle.

Select a segment.



3. Create or select the center point of the circle.

Select a center point.



Modifying a circle created using Compass

Modify the radius by dragging one of the defining endpoints.

Translate the compass circle by dragging the center point.

Measurement Transfer

The **Measurement Transfer** tool creates a point on a ray, on a vector, from the initial point of a polygon, or from another point at a distance proportional to a selected measurement or numerical value. From a point on a circle, the point created is at an equivalent arc length. The direction of the distance or arc length depends on the sign of the selected numerical value.

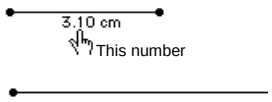
The magnitude of the measurement transferred is represented without regard to units.

Creating a measurement transfer

1. Select **Measurement Transfer** from the **Construct** toolbox.

2. Point to any measurement or numerical value and click to select.

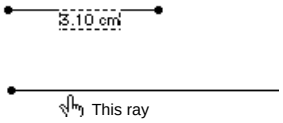
Select a numerical value.



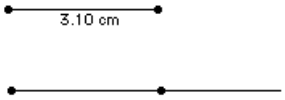
3. To construct:

   - a point at a proportional linear distance, select a ray, vector, polygon, or point. If you select a point, a dotted line appears. Position the dotted line as you want it, and click to set the position.

Select a ray.

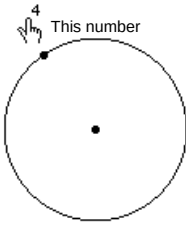


The point created is an equivalent distance from the endpoint of the ray.

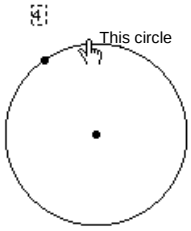


   - a point at a proportional arc length away, select a circle, and then select (do not create) a point on the circle.

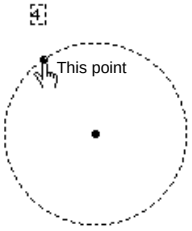
Select a numerical value.



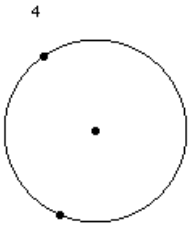
Select a circle.



Select an existing point on the circle.

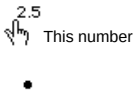


The point created is an equivalent arc length from the existing point.

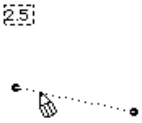


Example

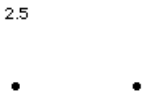
Select a numerical value.



Select a point.



Position the point and click. The points are 2.5 cm apart.



Modifying a measurement transfer

Modify the constructed point by changing the measurement or numerical value. The point cannot be translated directly.

Locus

The **Locus** tool creates a set of objects defined by the movement of a point along a path. When you select a point on a path (object), the locus is completely constructed and is considered a defined object. As such, points can be attached. When you modify an object that defines a locus, the locus is recalculated and continuously displayed to show the effects of the modifications.

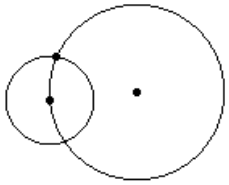
With defaults set, a locus is constructed with 30 (Macintosh) or 50 (Windows, DOS) objects equally spaced along the designated path. You can change this setting using **Preferences** in the **Options** menu. Choices for connecting locus points and constructing the envelope of a line are also available under **Preferences**. See "Options Menu" in the chapter "Using the Menus" for more information. As an alternate method for changing the number of objects that define the locus, you can select the locus and then press + or - to increase or decrease the number of objects that define the displayed locus.

Creating a locus

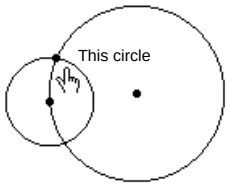
1. Select **Locus** from the **Construct** toolbox.

2. Select the object for the locus.

Preconstructed objects.



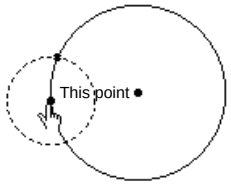
Select the object.



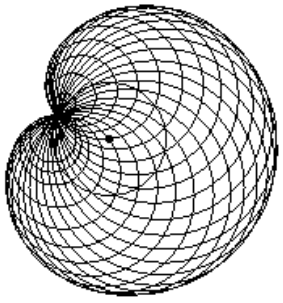
3. Select a point that lies on a path.

   Note: A path is any defined object on which a point can be placed**.**

Select a point on a path.



As its center travels around the first circle, the locus of a second circle through a point on a circle is constructed.



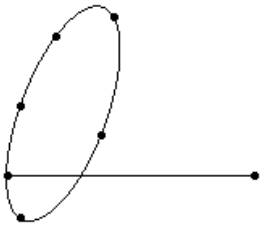
Modifying a locus

Modify a locus by changing its defining objects.

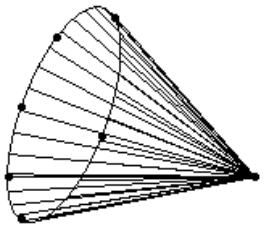
Example

Construct an ellipse (conic).

Attach a segment to a new point on the ellipse.



Take the locus of the segment as one of its endpoints travels around the ellipse.



Redefine Point (Macintosh and DOS only)

The **Redefine Point** tool modifies the current definition of any point, as long as the new definition does not create a circular reference.

A circular reference occurs when a point that defines an object is redefined to be on that object. An example is defining the center point of a circle to be a point on the circle. This is not allowed.

Redefining a point

1. Select **Redefine Point** from the **Construct** toolbox.

2. Press and hold the mouse down on any point.

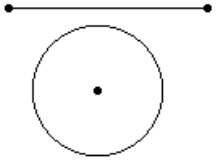
   A dialogue box appears with the following options:

   - **Point** – redefines the point as a basic point at the same location.
   - **Point on Object** – redefines the point to be on an object.
   - **Intersection Point(s)** – redefines the point to be at the intersection of two objects.
   - **Transfer to another point** – transfers the point to another existing point.

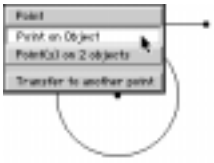
3. Select the desired option. If you selected **Point**, step 4 is not necessary.

4. Click to select an object compatible with the selected option and to assign its new definition.

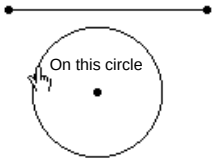
Attach an existing segment to a circle.



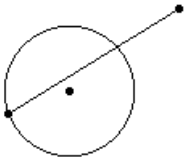
Select the endpoint.



Click to create a point on a circle.



The segment is attached to the circle.



Redefine Object (Windows only)

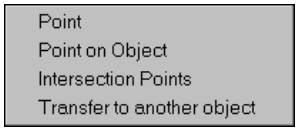
The **Redefine Object** tool modifies the current definition of any object. You can redefine a circle, arc, conic, triangle, segment, ray, vector, polygon, or regular polygon.

Redefining an object

1. Select **Redefine Object** from the **Construct** toolbox.

2a. If the object is a point, hold the mouse on the point, and then select the new definition.

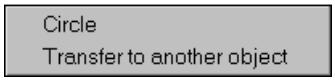
A pop-up menu appears with the following options:



- **Point** – redefines the point as a basic point.
- **Point on Object** – redefines the point to be on an object.
- **Intersection Point(s)** – redefines the point to be at the intersection of two objects.
- **Transfer to another object** – transfers and merges the point to another existing point.

2b. If the object is an object, hold the mouse on the object, and then select the new definition.

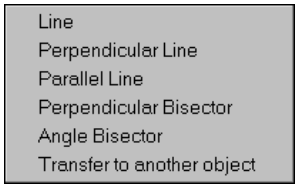
A pop-up menu appears with the following options:



- **Circle, Triangle, Segment, etc.** – lets you construct a new object of the same type and automatically transfer the original object to it.
- **Transfer to another object** – transfers and merges the object to another existing object of the same type.

2c. If the object is a line, hold the mouse on the line, and then select the new definition.

A pop-up menu appears with the following options:



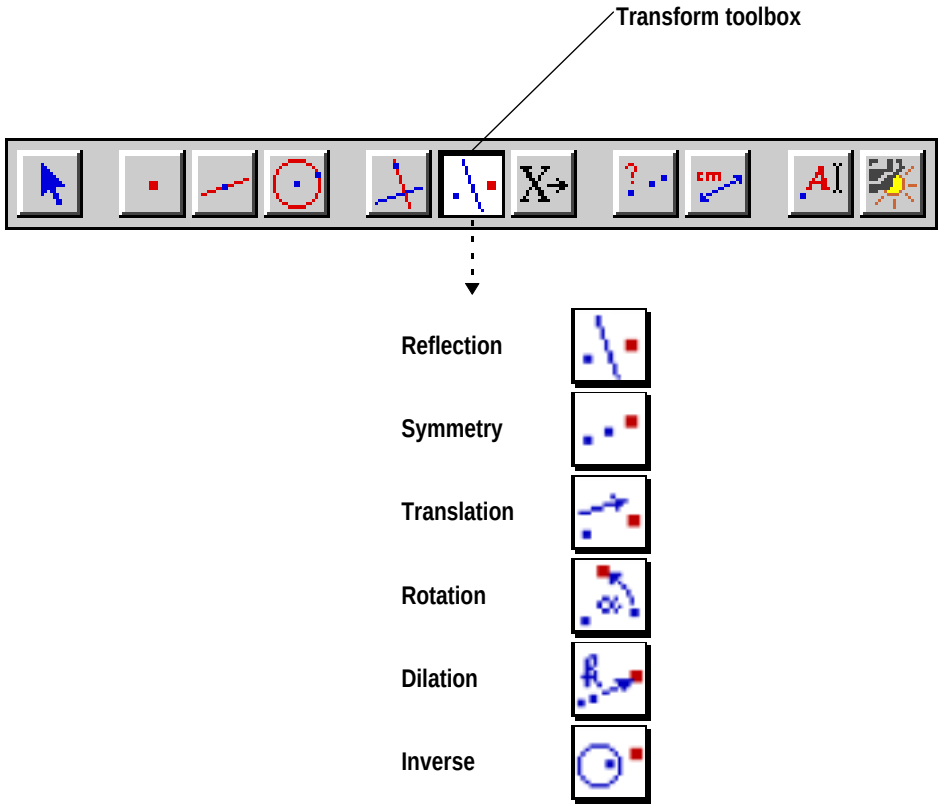
- **Line** – lets you construct a new line and automatically transfer the original line to it.
- **Perpendicular** – redefines the line to be perpendicular to another object.
- **Parallel Line** – redefines the line to be parallel to another object.
- **Perpendicular Bisector** – redefines the line to be the perpendicular bisector of another object.
- **Angle Bisector** – redefines the line to bisect an angle determined by three points.
- **Transfer to another object** – transfers and merges the line to another existing line.

3. Click to select an object compatible with the selected option and to assign its new definition.

Chapter 8: Using the Transform Toolbox

The **Transform** toolbox contains the tools associated with Cabri Geometry II transformation features. These features allow you to translate, reflect, rotate, and dilate objects according to specified factors and angular values.

The illustration below shows the location of the **Transform** toolbox on the Cabri Geometry II toolbar, along with its pull-down menu. Procedures for using **Transform** tools, including examples, are presented in this chapter in the order in which the tools appear on the pull-down menu.



Reflection

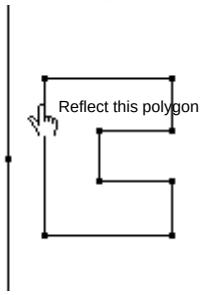
The **Reflection** tool creates the mirror image of an object reflected across a line, segment, ray, vector, axis, or side of a polygon.

Creating a reflection

1. Select **Reflection** from the **Transform** toolbox.

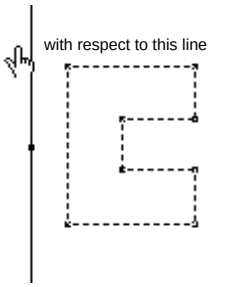
2. Select the object to reflect.

Select the object to reflect.

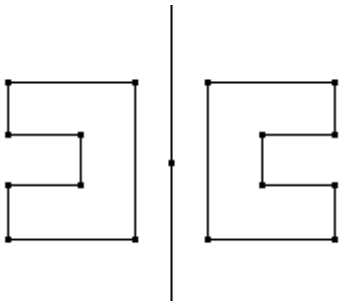


3. Select the line, segment, ray, vector, axis, or side of a polygon to reflect the object across.

Select the linear object.



The reflected object is created.



Modifying a reflection

Change the reflected image by changing the original object or by modifying the line of reflection. Because it is a dependent object, you cannot change the reflected image directly.

Symmetry

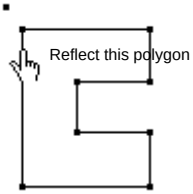
The **Symmetry** tool reflects the image of an object 180-degree with respect to a point.

Creating a symmetrical image

1. Select **Symmetry** from the **Transform** toolbox.

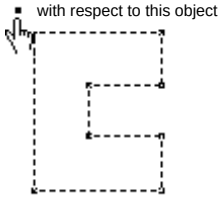
2. Select the object to reflect 180 degrees.

Select the object to reflect

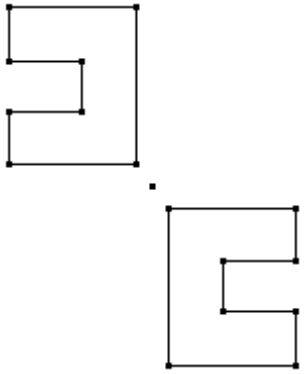


3. Select the point of symmetry.

Select a point.



The symmetric image is created.



Modifying a symmetrical image

Change a symmetrical image by changing the original object or by moving the point of symmetry. Because it is a dependent object, you cannot change a symmetrical image directly.

Translation

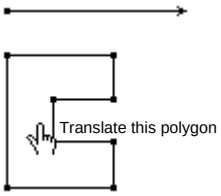
The **Translation** tool creates the image of an object translated by a specified, previously defined vector.

Translating an object

1. Select **Translation** from the **Transform** toolbox.

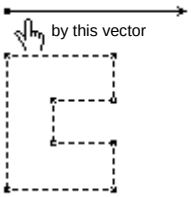
2. Select the object to translate.

Select the object to translate.

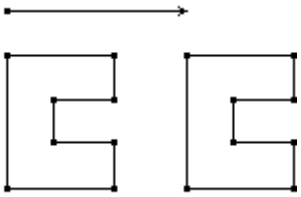


3. Select the vector that defines the translation direction and distance.

Select the translation vector.



The translated image is created.



Modifying a translation

Move a translated image by dragging the vector head or tail to a new location. The translated image changes according to the changes of the vector or changes to the original object. Because it is a dependent object, you cannot change the translated image directly.

Rotation

The **Rotation** tool rotates an object by a specified angular value with respect to a point.

Note: The angular value may be any measurement or numerical value, regardless of units. The units are presumed to be degrees by the software. A positive angular value rotation is performed in a counter-clockwise direction.

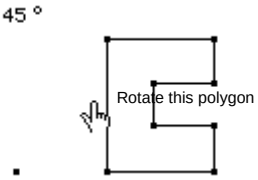
To create specific angles of rotation, please refer to "**Numerical Edit**" in the chapter "Using the Display Toolbox."

Rotating an object

1. Select **Rotation** from the **Transform** toolbox.

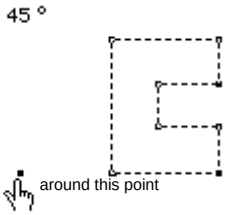
2. Select the object to rotate.

Select the object to rotate.



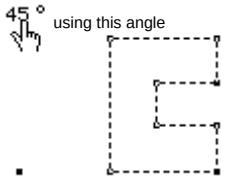
3. Select the point of rotation.

Select the rotation point.

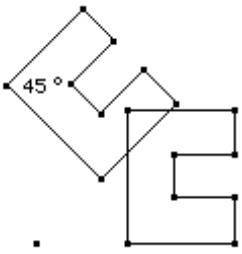


4. Select the angular value of rotation.

Select the angular value of rotation.



The rotated image is created.



Modifying a rotation

Change the rotated image by either modifying the figure that defines the angle of rotation, editing the value created by **Numerical Edit**, moving the rotation point, or changing the original object. Because it is a dependent object, you cannot change the rotated image directly.

Dilation

The **Dilation** tool dilates an object by a specified factor with respect to a specified point.

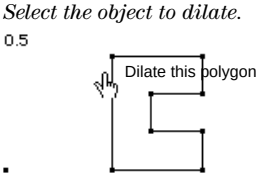
Note: This factor may be any measurement or numerical value, regardless of units. The value is presumed to be unit-less.

To create specific factors of dilation, please refer to "**Numerical Edit**" in the chapter "Using the Display Toolbox."

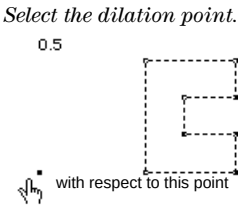
Dilating an object

1. Select **Dilation** from the **Transform** toolbox.

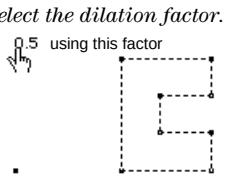
2. Select the object to dilate.

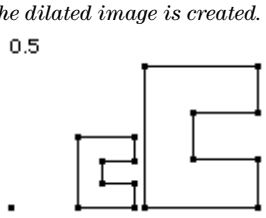


3. Select the point of dilation.



4. Select the factor of dilation.





Modifying a dilation

Change the dilated image by either modifying the figure that defines the factor, editing the value created by **Numerical Edit**, moving the dilation point, or changing the original object. Because it is a dependent object, you cannot change the dilated image directly.

Inverse

The **Inverse** tool constructs an inverse point with respect to a circle and a point, according to the equation $OM \cdot O M' = r^2$

where:

M and M' are points that lie on a ray with endpoint O.

O	=	center of circle.
M	=	selected point.
M'	=	inverse point.
*	=	radius of selected circle.

As the selected point approaches the center point, the inverse point approaches a point at infinity. If M is defined to be on a line passing through the circle, the locus of M' constructs a circle that passes through the center of the circle.

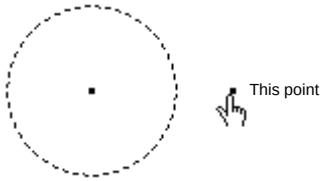
If the original point lies in the interior of the circle, the inverse point is constructed in the exterior, and vice versa. The inverse point lies on a ray with the center point as the endpoint.

Creating an inverse point

1. Select **Inverse** from the **Transform** toolbox.

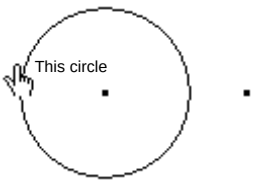
2. Create or select a point as the original point.

Select a point.

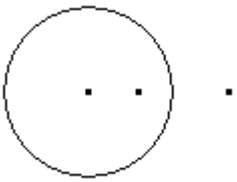


3. Select a circle.

Select a circle.



An inverse point is created.



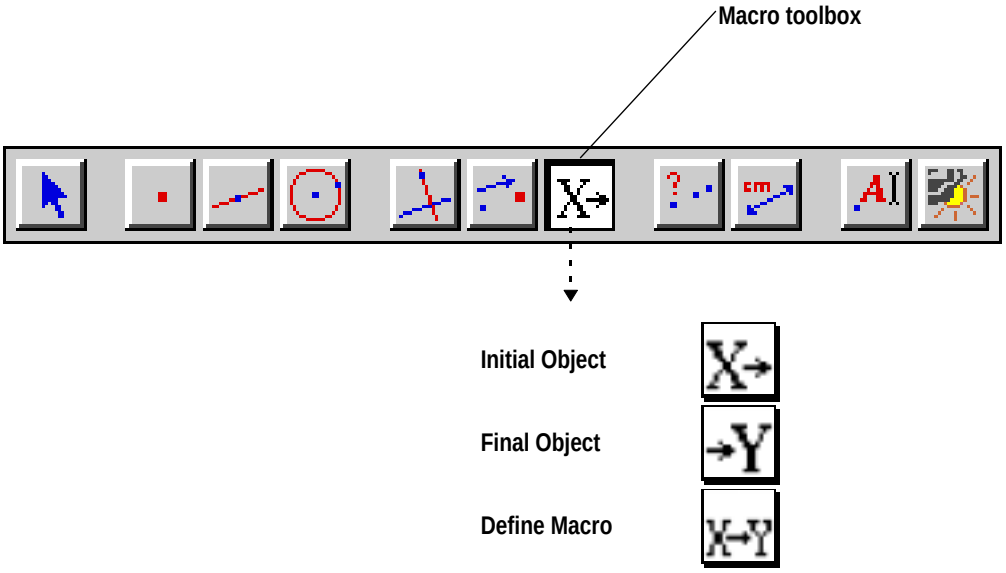
Modifying an inverse point

Move an inverse point by dragging the point or modifying the circle that defines it. You cannot manipulate an inverse point directly because it is a dependent point.

Chapter 9: Using the Macro Toolbox

The **Macro** toolbox contains the tools associated with constructing macros in Cabri Geometry II. A macro is a sequence of interdependent constructions. Macros are useful for creating new tools that construct unique objects or perform repetitive tasks.

The illustration below shows the location of the **Macro** toolbox on the Cabri Geometry II toolbar, along with its pull-down menu. Procedures for creating macros, including rules and examples, are presented in this chapter in the order in which macros must be created.



How to create a macro

A macro constructs “final” objects based on “initial” objects. Intermediate objects are not constructed. This feature allows easy construction of complex figures and is the primary method for constructing fractals. You can save macros on disk for later use. Macros are automatically saved with any file in which they are used.

To create a macro:

1. Select the initial objects required to define the final object(s).
2. Select the final object(s), and then, if necessary, change the attributes of the object(s) as they will appear in the final construction.
3. Define the macro for inclusion in the **Macro** toolbox. The macro is then available for use.

Read the following rules, and then refer to the step-by-step procedures that follow them.

Rules for creating macros

- Initial objects must allow the construction of all final objects. Final objects must be determined by the initial objects. A macro must respect the logical structure of the figure as it was constructed.
- An object cannot exist without the points that define it. For example, a triangle cannot exist without its vertices. Therefore, when you select an object as an initial object, the macro is able to refer to the points that define the object.
- When you select **Define Macro**, a macro generates its final objects with the object’s existing attributes. You can change these attributes during an intermediate step before you select **Define Macro**. In this way, you can hide objects (using **Hide/Show** in the **Display** toolbox) that were selected as initial objects.
- Because macros are intended as general purpose construction tools, like those in the **Construct** toolbox, comments and labels cannot be defined as final objects. You can select measurements and numerical values as final objects, but any text attached will not be duplicated when the macro executes.
- The location of an arbitrary point on an object is determined by a random-number generation. Therefore, the position of the point will be uncertain if it is selected as a final object.
- If the initial objects are different types (for example, lines and circles are different types), they are not used in any order. If the initial objects are the same type, the macro uses them in the order in which they were selected as initial objects.
- The number of objects created by a macro is limited only by available system memory.
- Macros are automatically saved with any construction in which they are used. You can also save macros in a tool configuration file (see **Options Menu** in the chapter "Using the Menus").
- The first final object you select is considered the primary object of the macro. If a name is entered in the **Name for first final object** field, it will be the cursor message when the cursor is in the vicinity of the primary object. For the Macintosh, the **Name for first final object** field is found under the **More** option in the **Macro** dialog box. For the Windows and DOS versions, the **Name for first final object** field is already visible in the dialog box.
- To save multiple definitions for a single macro, select the initial and final objects for the new definition, and save it with the same name. The dialog box generated in **Define Macro** allows you to select previous macros when saving a macro. For example, you may want to define a macro that constructs a triangle with vertices at the midpoints of an initial triangle, a polygon with vertices at the midpoints of a three-sided polygon, and a triangle with vertices at the midpoints of a three-sided regular polygon. A single macro can perform all of these operations if each case is identified with appropriate initial and final objects and saved to the same macro file.

Initial Object

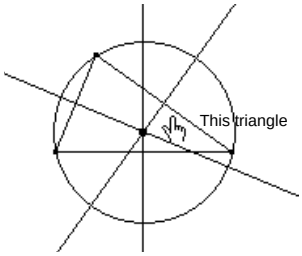
The **Initial Object** tool specifies the initial object(s) needed to define the given conditions for a macro. See “Rules for creating macros” for more information.

Specifying initial object(s)

1. Select **Initial Object** from the **Macro** toolbox.

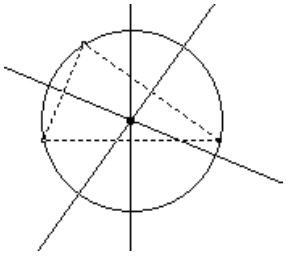
2. Click once to select an object.

Select initial objects.



The selected object displays in marquee outline.

Selected objects.



3. (*Optional*) Click again on the object to deselect it.

   The object returns to its original outline.

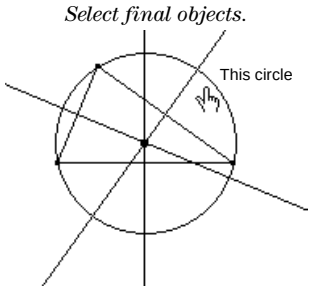
Final Object

The **Final Object** tool specifies the final object(s) that will result from the initial objects defined for a macro. See “Rules for creating macros” for more information.

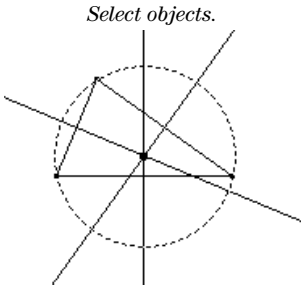
Specifying final object(s)

1. Select **Final Object** from the **Macro** toolbox.

2. Click once to select an object.



The selected object displays in marquee outline.



3. (*Optional*) Click again on the object to deselect it.

The object returns to its original outline.

Define Macro

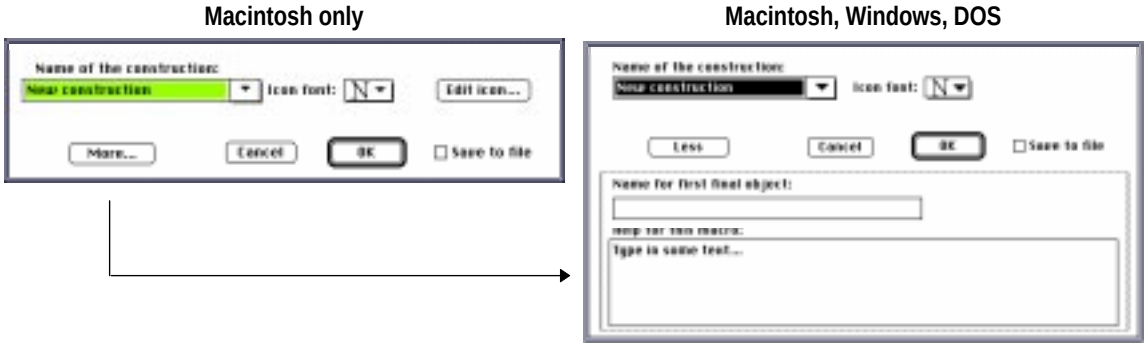
The **Define Macro** tool stores a macro in memory. A dialog box appears for you to name the macro. This dialog box is described below. Also see "Rules for creating macros" at the beginning of this chapter.

The Define Macro dialog box

The **Define Macro** dialog box appears (Macintosh version illustrated) when you select **Define Macro** after defining valid initial and final objects. Each field is defined below.

Note: The **Define Macro** dialog box for the Windows and DOS versions is slightly different from the Macintosh version. The first screen is displayed only in the Macintosh version. In the next screen, the **Icon font** option is different in the Windows and DOS versions.

Macintosh only **Macintosh, Windows, DOS**



Name of the construction — Enter a name for your construction or select a previously named macro. To access a previously named macro, point to the arrow on the right-hand side of this field and press and hold the mouse button. The name entered here will appear in the **Macro** toolbox when you select **OK** or **OK and save**.

Icon font: (Macintosh only) — The first letter of the construction name entered above appears in this field. This letter will be used for the icon of the macro in the toolbar. You may select the font of this letter from Roman, Old English, or Fraktur.

Cancel — Click on this button to cancel or disregard the macro definition. Initial and final objects will be deselected.

More/Less: (Macintosh only) — This button is a toggle. Click on it to show **More** or **Less** options.

Name for first final object — Enter the name that you want to appear as a cursor message when the cursor is in the vicinity of the first object created by the macro.

Help for this macro — Enter the message that you want to appear in the help window when the macro is selected.

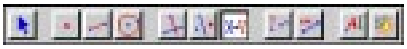
Save to file This button is a toggle. Click on it to change the **OK** to **OK and save**, and vice versa.

OK / OK and save Click on **OK** to save the macro for use in your construction. The macro is not saved to a separate file but is saved with your construction. Once saved, the macro can be used in future Cabri Geometry II sessions.

Click on **OK and save** to generate a save file dialog that allows you to save the macro to a file you specify. Macros saved to individual files can be recalled in future constructions by using **Open** in the **File** menu to open the macro file.

Specifying a macro

1. Select **Define Macro** from the **Macro** toolbox.



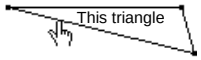
2. Enter the requested information into the dialog box to save your macro.

   If you receive a warning message instead of the dialog box, a problem exists in the definition of initial and final objects. Review "Rules for creating macros" at the beginning of this chapter, and redefine your initial and final objects.

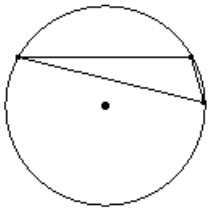
Define Macro dialog box.

Select a new macro.

Select an appropriate object.



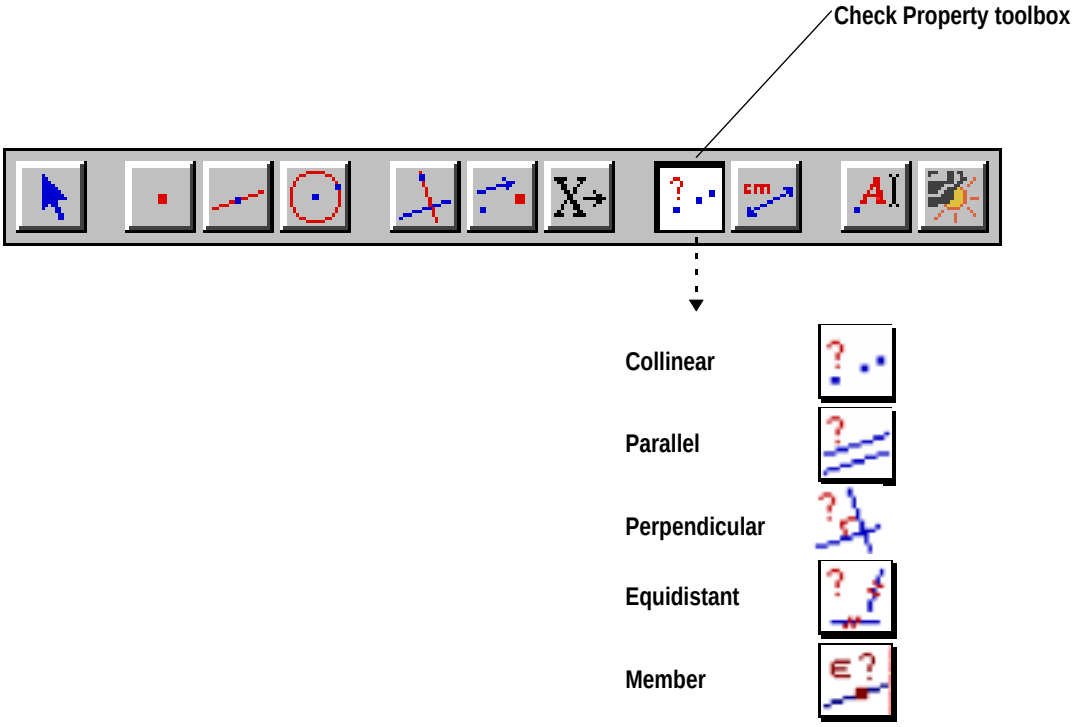
Click to apply the macro.



Chapter 10: Using the Check Property Toolbox

The **Check Property** toolbox contains the tools associated with Cabri Geometry II property features. These features allow you to check the validity of geometric properties in general. Results are reported in text, which can be edited with the **Comments** tool located in the **Display** toolbox.

The illustration below shows the location of the **Check Property** toolbox on the Cabri Geometry II toolbar, along with its pull-down menu. Procedures for using **Check Property** tools, including examples, are presented in this chapter in the order in which the tools appear on the pull-down menu.



Collinear

The **Collinear** tool evaluates *three* selected points to determine whether or not they lie on the same line. The results are reported in text.

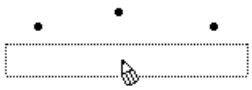
Checking collinearity

1. Select **Collinear** from the **Check Property** toolbox.

2. Select any three existing points.

   A marquee box appears after the last selection.

Select three points.



3. Move the pointer to move this box anywhere in the drawing window, and click to display the result.

   If you change the points so that the property changes, the displayed text changes accordingly.

Click to place the marquee box.

Points are not collinear

The result changes with the construction.

Points are collinear

Parallel

The **Parallel** tool evaluates any combination of *two* selected lines, segments, rays, vectors, axes, or sides of a polygon to determine whether or not they are parallel. The results are reported in text.

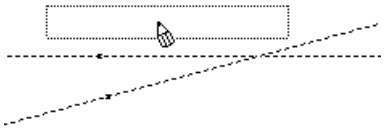
Check parallelism

1. Select **Parallel** from the **Check Property** toolbox.

2. Select any combination of two lines, segments, rays, vectors, axes, or sides of a polygon.

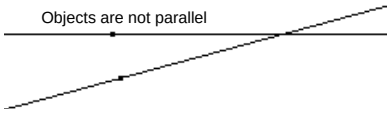
   A marquee box appears after the last selection.

Select two linear objects.



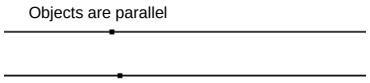
3. Move the pointer to move this box anywhere in the drawing window, and click to display the result.

Click to place the marquee box.



   If you change the objects so that the property changes, the displayed text changes accordingly.

The result changes with the construction.



Perpendicular

The **Perpendicular** tool evaluates any combination of *two* selected lines, segments, rays, vectors, axes, or sides of a polygon to determine whether or not they are perpendicular. The results are reported in text.

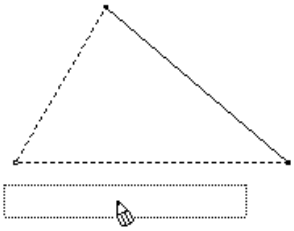
Checking perpendicularity

1. Select **Perpendicular** from the **Check Property** toolbox.

2. Select any combination of two lines, segments, rays, vectors, axes, or sides of a polygon.

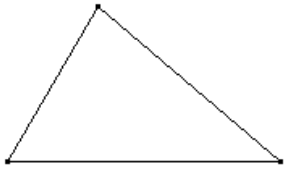
   A marquee box appears after the last selection.

Select two linear objects.



Click to place the marquee box.

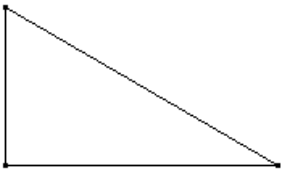
3. Move the pointer to move this box anywhere in the drawing window, and click to display the result.



Objects are not perpendicular

If you change the objects so that the property changes, the displayed text changes accordingly.

The result changes with the construction.



Objects are perpendicular

Equidistant

The **Equidistant** tool evaluates any *three* points to determine whether or not the first point is equidistant from the two remaining points. (If a point is equidistant from the endpoints of a segment, then the point lies on the perpendicular bisector of the segment.) The results are reported in text.

Checking equidistant property

1. Select **Equidistant** from the **Check Property** toolbox.

2. Select any three points. (The first point selected is checked relative to the two remaining points.)

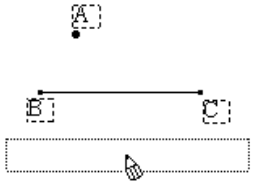
   A marquee box appears after the last selection.

3. Move the pointer to move this box anywhere in the drawing window, and click to display the result.

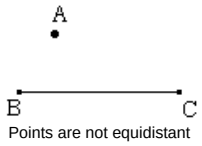
   The text states whether or not the first point selected is equidistant from the second and third points.

   If you change the objects so that the property changes, the displayed text changes accordingly.

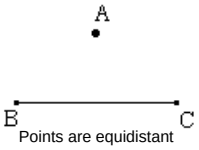
Select, in order, points A, B, and C.



Click to place marquee box.



The result changes with the construction.



Member

The **Member** tool evaluates a point to determine whether or not it lies on an object. The results are reported in text.

Checking membership

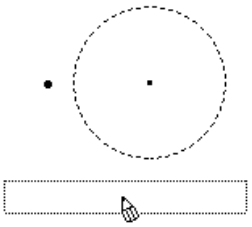
1. Select **Member** from the **Check Property** toolbox.

2. Select a point.

Select a point and an object.

3. Select any object.

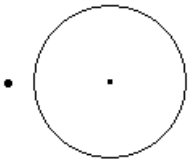
   A marquee box appears after the selection.



Click to place the marquee box.

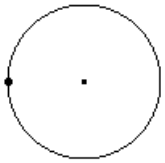
4. Move the pointer to move this box anywhere in the drawing window, and click to display the result.

   If you change the objects so that the property changes, the displayed text changes accordingly.



This point does not lie on the object

The result changes with the construction.

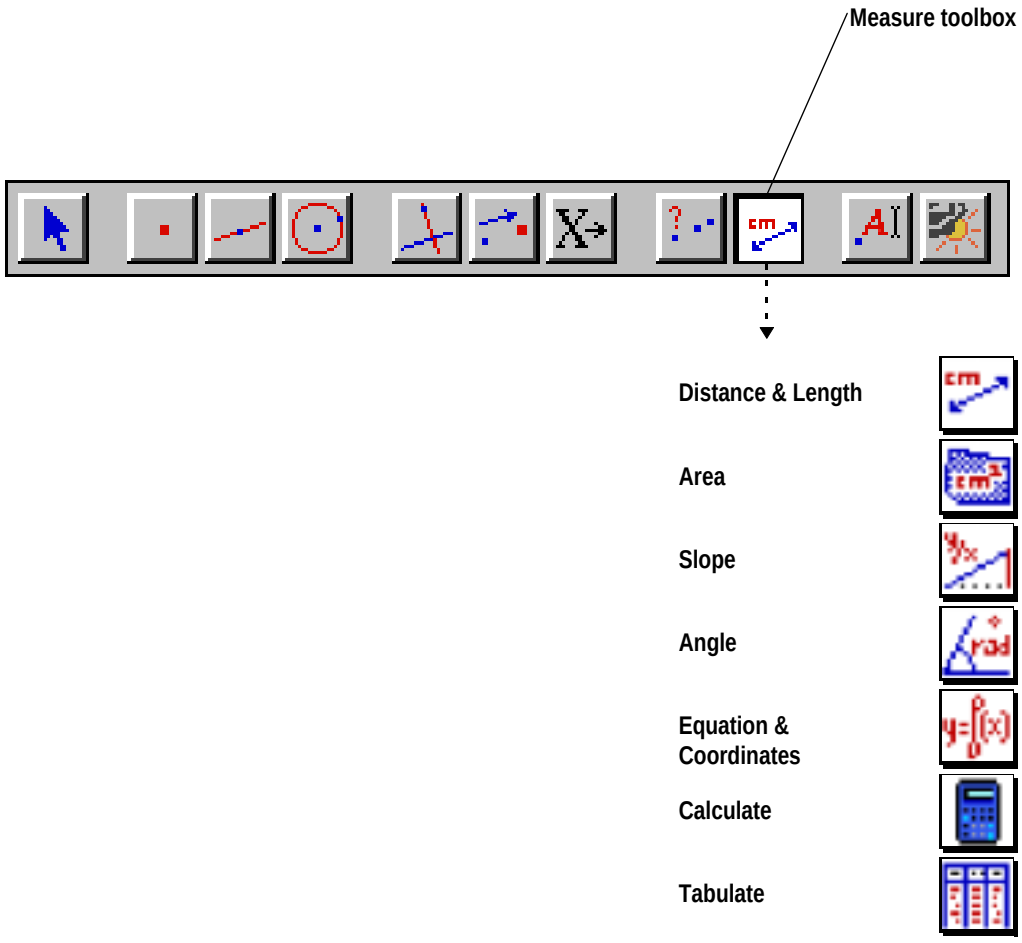


This point lies on the object

Chapter 11: Using the Measure Toolbox

The **Measure** toolbox contains the tools associated with measurement features in Cabri Geometry II. These features allow you to perform different measurements and calculations.

The illustration below shows the location of the **Measure** toolbox on the Cabri Geometry II toolbar, along with its pull-down menu. Procedures for using **Measure** tools, including examples, are presented in this chapter in the order in which the tools appear on the pull-down menu.



Distance & Length

The **Distance & Length** tool calculates and displays distance, length, perimeter, circumference, and radius.

The default measurement is displayed in centimetres. You can change its precision by using **Numerical Edit** in the **Display** toolbox. **Numerical Edit** also allows you to change the font, size, style, colour, and units.

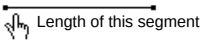
You can add a comment to the measurement immediately after creating it by typing the text. See "**Comments**" in the chapter "Using the Display Toolbox" for more information on adding a comment to a numerical value.

Measuring objects

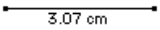
1. Select **Distance & Length** from the **Measure** toolbox.

2. To measure:
   - length, perimeter, or circumference – select an object.
   - distance – select two points.
   - radius – select the center point and then the circumference.

Select an object.



The result is displayed.



Moving measurements

Reposition the measurement by selecting it with the **Pointer** tool and dragging it to a new position.

The measurement moves with the object it measures unless you pull it away. When you pull it away from the object, the measurement momentarily resists before pulling away.

Area

The **Area** tool calculates and displays the area of a selected polygon, circle, or ellipse.

The default measurement is displayed in square centimetres. You can change its precision by using **Numerical Edit** in the **Display** toolbox.

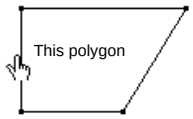
You can add a comment to the measurement immediately after creating it by typing the text. See "**Comments**" in the chapter "Using the Display Toolbox" for more information on adding a comment to a numerical value.

Checking area

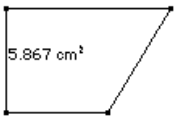
1. Select **Area** from the **Measure** toolbox.

2. Select the polygon, circle, or ellipse whose area you want to measure.

Select the object.



The result is displayed.



Moving measurements

Reposition the measurement by selecting it with the **Pointer** tool and dragging it to a new position.

The measurement moves with the object it measures unless you pull it away. When you pull it away from the object, the measurement momentarily resists before pulling away.

Slope

The **Slope** tool calculates and displays the slope of a selected segment, ray, vector, or line.

You can change the precision of the slope by using **Numerical Edit** in the **Display** toolbox.

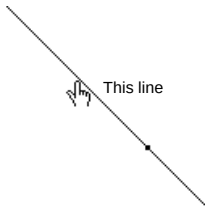
You can add a comment to the measurement immediately after creating it by typing the text. See "**Comments**" in the chapter "Using the Display Toolbox" for more information on adding a comment to a numerical value.

Checking slope

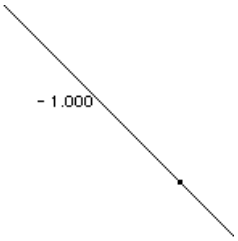
1. Select **Slope** from the **Measure** toolbox.

2. Select the segment, ray, vector, or line whose slope you want to measure.

Select the object.



The result is displayed.



Moving measurements

Reposition the measurement by selecting it with the **Pointer** tool and dragging it to a new position.

The measurement moves with the object it measures unless you pull it away. When you pull it away from the object, the measurement momentarily resists before pulling away.

Angle

The **Angle** tool calculates and displays the measurement of an angle defined by an angle mark or three selected points. The second point must be the vertex.

If you use **Angle** to select three points, angle measurements default to angles from 0 to 180 degrees (interior angles). If you want measurements greater than 180 degrees (reflex angles), you must first mark the angle with **Mark Angle** in the **Display** toolbox. The default measurement is displayed in degrees. You can change its precision by using **Numerical Edit** in the **Display** toolbox.

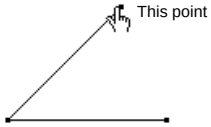
You can add a comment to the measurement immediately after creating it by typing the text. See "**Comments**" in the chapter "Using the Display Toolbox" for more information on adding a comment to a numerical value.

Checking angles

1. Select **Angle** from the **Measure** toolbox.

2. If an angle mark is displayed on the angle, select the angle mark to measure the angle. Otherwise, select three points to specify the angle. The second point must be the vertex.

Select three points.



The result is displayed.

Moving measurements

Reposition the measurement by selecting it with the **Pointer** tool and dragging it to a new position.

The measurement moves with the object it measures unless you pull it away. When you pull it away from the object, the measurement momentarily resists before pulling away.

Equation & Coordinates

The **Equation & Coordinates** tool displays the equation of a line, circle, conic, or coordinates of a point with respect to a default coordinate system.

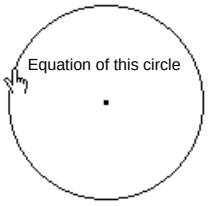
You can change the precision by using **Numerical Edit** in the **Display** toolbox. You can change the form of the equation by using the options under **Preferences** in the **Options** menu or by selecting the equation and pressing TAB.

Checking equation or coordinates

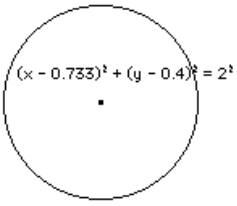
1. Select **Equation & Coordinates** from the **Measure** toolbox.

2. Select the point, line, circle, or conic whose equation you want to find. If multiple coordinate systems are present, you must select the coordinate system before the equation is displayed.

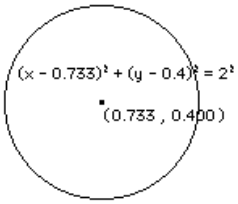
Select an object.



The result is displayed.



Select a point to display its coordinates.



Modifying the equation or coordinates

The equation is updated as you modify the object. The values composing the equation are based on the coordinate system.

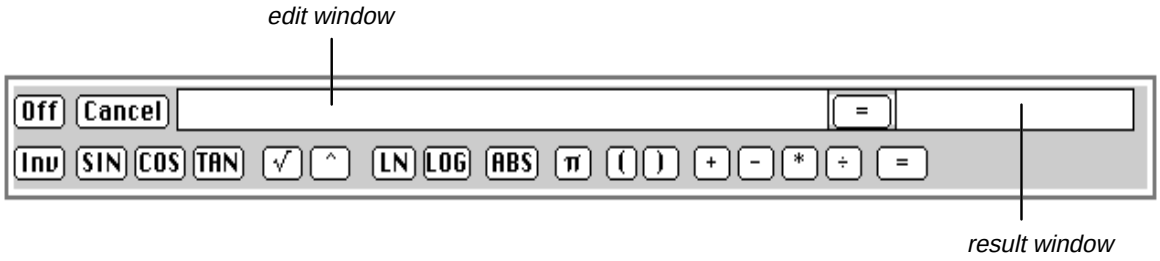
Reposition the equation by selecting it with the **Pointer** tool and dragging it to a new position.

The equation moves with the object it measures unless you pull it away. When you pull it away from the object, the equation momentarily resists before pulling away.

Calculate

The **Calculate** tool opens a calculator at the bottom of the screen. You can perform calculations using measurements, numerical values, calculation results, and numerical inputs from the keyboard. When you change the components of a calculation, the result is updated.

The calculator shown below is displayed at the bottom of your computer screen. It cannot be moved from this position. Once selected, the calculator remains **ON** (visible) until you press the **OFF** button. The calculator becomes active as soon as you select the **Calculate** tool. It becomes inactive when you perform any action not directly associated with a calculation. To reactivate the calculator, you can either select the **Calculate** tool or click in the calculator edit window.



Calculations are entered in the edit window. See the procedure “Entering a calculation” in this section for how to enter a calculation. A measurement or numerical value from the Cabri Geometry II drawing window is represented in the edit window as a variable *a*, *b*, *c*, ..., *z*. This variable is also shown next to the value in the Cabri Geometry II drawing window. The value's full precision will be used in the calculation. All parentheses must be closed when entering a calculation.

You can extract the abscissa and ordinate from any coordinate set by clicking on each value individually.

The calculation result is displayed in the result window. You can drag the result to the Cabri Geometry II drawing window. When you drag the result to the drawing window, a tag identifying it as a calculation result is dragged along with it. See the step for copying the result to the drawing window in the procedure “Entering a calculation” on page 11-10.

You cannot modify values in the result window. However, on the Macintosh and Windows versions, you can edit results using **Numerical Edit** once they are in the drawing window. In addition to using the standard **Numerical Edit** features, you can display and change the composition of the result by selecting the **Calc** option in the **Numerical Edit** window. For the DOS version, select the **Calculate** tool, and double-click on the result to get the original formula back in the edit window. If you change the composition of a calculation, its result is automatically updated in the drawing window. (See “**Numerical Edit**” in the chapter "Using the Display Toolbox" for more details.)

If two different but compatible units are involved in a calculation, the result is displayed with the default units specified in **Preferences** under the **Options** menu (for example, 2 cm + 4 mm = 2.4 cm).

The calculator gives three types of warnings:

- **division by zero**
- **parentheses not closed**
- **incompatible units**

Both **division by zero** and **parentheses not closed** must be corrected before the calculation can be performed. For **incompatible units**, Cabri Geometry II offers the option to disregard the units and to perform the calculation as if the values were without units.

Function buttons on the calculator contain mathematical functions. Click on a function button to display its operation in the edit window. The following table describes the functions available from the calculator function buttons.

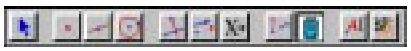
Function Button	Operation	Syntax
Off	Turns off calculator. Calculator disappears.	*none*
Cancel	Clears last entry.	*none*
Inv	Generates the inverse of the following functions:	*none*
Inv-SIN	Calculates the arcsine.	arcsin(*value*)
Inv-COS	Calculates the arccosine.	arccos(*value*)
Inv-TAN	Calculates the arctangent.	arctan(*value*)
Inv-√	Calculates square of a number (x^2).	sqr(*value*)
Inv-LN	Calculates the natural antilogarithm (e^x).	exp(*value*)
Inv-LOG	Calculates the common antilogarithm (10^x).	10^(*value*)
SIN	Calculates the sine.	sin(*value*)
COS	Calculates the cosine.	cos(*value*)
TAN	Calculates the tangent.	tan(*value*)
√	Calculates the square root (**(**$\sqrt{x}$).	sqrt(*value*)
^	Raises a number to a power (y^x).	*value1^value2*
LN	Calculates the natural logarithm (base e). (The value used for e is 2.718281828.)	Ln(*value*)
LOG	Calculates the common logarithm.	Log(*value*)
ABS	Calculates the absolute value.	Abs(*value*)
π	Includes the value of π (pi) — 3.141592654. (On the Macintosh, OPTION+p may also be used for π.)	π
( )	Adds parentheses. The keys ( ) may also be used.	(*value*)
+, –, *, ÷	Adds mathematical operators addition, subtraction, multiplication, and division. The keyboard may also be used: + for addition, – for subtraction, ∗ for multiplication, and / for division (÷).	+, –, *, ÷
=	Performs the calculation. Pressing the *return* key also performs the calculation.	=

You can also enter mathematical functions from the keyboard. The following table lists the syntax for the mathematical functions supported by the calculator.

Function	Syntax
Absolute Value	ABS(*value*), abs(*value*), Abs(*value*)
Square	SQR(*value*), sqr(*value*), Sqr(*value*), Sq(*value*)
Square Root	SQRT(*value*), sqrt(*value*), Sqrt(*value*), SqRt(*value*), √*(value)*
Logarithm base 10	log10(*value*), Log10(*value*), lg(*value*)
Natural Logarithm	LN(*value*), ln(*value*), Ln(*value*)
Exponential ex	EXP(*value*), exp(*value*), Exp(*value*)
Lowest Integer, Floor	FLOOR(*value*), floor(*value*), Floor(*value*)
Greatest Integer, Ceiling	CEIL(*value*), ceil(*value*), Ceil(*value*)
Round (to nearest integer)	ROUND(*value*), round(*value*), Round(*value*)
Sine	SIN(*value*), sin(*value*), Sin(*value*)
Cosine	COS(*value*), cos(*value*), Cos(*value*)
Tangent	TAN(*value*), tan(*value*), Tan(*value*)
Arc Sine	ARCSIN(*value*), arcsin(*value*), asin(*value*), ArcSin(*value*)
Arc Cosine	ARCCOS(*value*), arccos(*value*), acos(*value*), ArcCos(*value*)
Arc Tangent	ARCTAN(*value*), arctan(*value*), atan(*value*), ArcTan(*value*)
Hyperbolic Sin	SINH(*value*), sinh(*value*), SinH(*value*), sh(*value*)
Hyperbolic Cos	COSH(*value*), cosh(*value*), CosH(*value*), ch(*value*)
Hyperbolic Tan	TANH(*value*), tanh(*value*), TanH(*value*), th(*value*)
Arc Hyperbolic Sine	ARCSH(*value*), arcsh(*value*), ArcSh(*value*)
Arc Hyperbolic Cosine	ARCCH(*value*), arcch(*value*), ArcCh(*value*)
Arc Hyperbolic Tangent	ARCTH(*value*), arcth(*value*), ArcTh(*value*)
Minimum of (n1, n2)	MIN(*value1*, *value2*), min(*value1*, *value2*), Min(*value1*, *value2*)
Maximum of (n1, n2)	MAX(*value1*, *value2*), max(*value1*, *value2*), Max(*value1*, *value2*)
Pi (π)	π, Π, PI, pi, Pi
Exponent	10^(*value*)

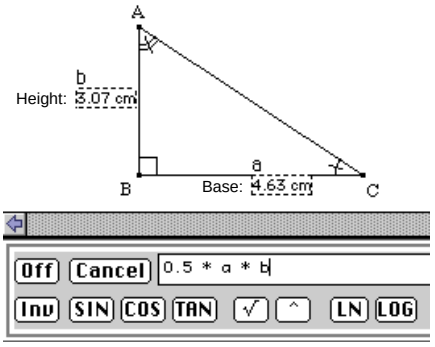
Entering a calculation

1. Select **Calculate** from the **Measure** toolbox.



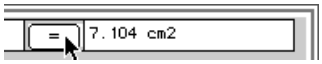
2. Enter an expression in the edit window using any combination of the following methods:
   - Click on any of the function buttons.
   - Point to any numerical value in the drawing window, and click to copy it.
   - Type in a function or a number.

Enter an expression.



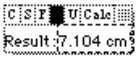
3. Click the = button (or press ENTER) to perform the calculation and display the result in the result window.
4. Click in the result window to copy the result to the drawing window. Click again in the drawing window to place the result.

Select the = button to display the result.



Editing a calculation

1. Select the result with the **Numerical Edit** tool. (On the Macintosh, click on the **Calc** button. You must point to the number.) You can also select the **Calculate** tool and double-click the result composition to the edit window.

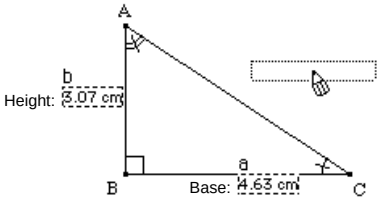


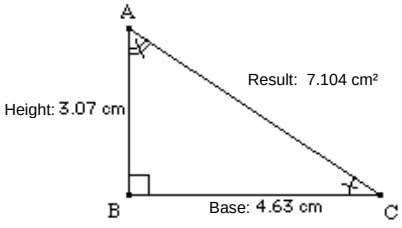
The composition of the result is displayed in the calculator edit window.

Note: The display attributes options in the Windows version are determined in the Options/Preferences/Default Styles dialog box. These options are not available in the DOS version.

2. Edit the composition as described above in "Entering a calculation."

Click to place the result.





Tabulate

The **Tabulate** tool collects selected measurements, calculations, and numerical values into a single data table. You must define the table before values can be entered.

When you select values for tabulation, they are entered into the next available column of the table. If the value has a label comment, it is copied into the first row of the column and the value is copied into the next available row. If the value does not have a label comment, the first row will be empty for that column. Comments that you later add to tabulation values are copied into the first row in that value's column. See "**Comments**" in the chapter "Using the Display Toolbox" for instructions on adding a comment to a numerical value.

The values in a column are not displayed unless the full width of the column is visible. Each row of the table is numbered sequentially in the first column on the left. You can enter single values into the table when at least one object changes and you press the TAB key.

You can collect data automatically by selecting the table, and then using **Animation**. Data is stored in the table for each of the defined tabulation values at a rate relative to the animation.

You can delete columns or rows, and change column width (see page 11-13). The maximum number of rows is 999. The number of columns is limited by memory.

You can make only one table for each Cabri Geometry II drawing. You can copy the values in a table to another program (such as a spreadsheet program). First, select the table with the **Pointer** tool, and use **Copy** from the **Edit** menu. Then go to the target program, and paste the data.

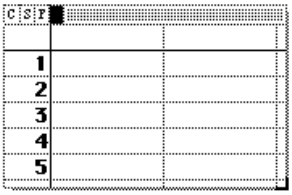
Note: The example tables shown on the following pages are for the Macintosh version using the Chicago font. The display attributes options are not available for the Windows and DOS versions; therefore, the fonts displayed on your screen will be different.

Using Tabulate

1. Select **Tabulate** from the **Measure** menu.

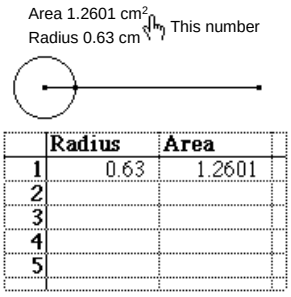
2. Define the table by dragging the marquee rectangle to size the table. You can resize the table by dragging the lower right corner.

Drag rectangle to size the table.



3. Point to a numerical value, and click to enter it into the table.

Click on each value to be tabulated.



4. Press TAB to record new values.

Press the TAB *key to tabulate entries.*

Note: At least one value must change before a new row is entered.

To tabulate values automatically, first select the table, and then animate the construction using **Animation** or **Multiple Animation** (in the **Display** toolbox).

When selected, the table displays with a marquee rectangle around it.

	Radius	Area
1	0.63	1.2601
2	1.00	3.1416
3	1.50	7.0686
4	2.00	12.5664
5	3.00	28.2743

Adding values

1. Select **Tabulate**, and then point to the value and click.

   The new value is added in the next available column and row. Blank cells in the new column will be filled with a hyphen (-).

2. Press TAB to record new values.

	Radius	Area	Circum
1	0.63	1.2601	-
2	1.00	3.1416	-
3	1.50	7.0686	-
4	2.00	12.5664	-
5	3.00	28.2743	-
6	0.50	0.7854	3.14
7			

Sizing a table and deleting columns and rows

Sizing a table:

1. Click on the table.

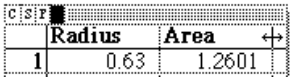
   An edit window is displayed around the table.

2. Point to any column divider in the first row.

   The cursor changes to the **column width** + cursor.

3. Drag the column to modify its width.

Point to the column divider and drag.



	Radius	Area
1	0.63	1.2601

New column width.

	Radius	Area
1	0.63	1.2601
2	1.00	3.1416

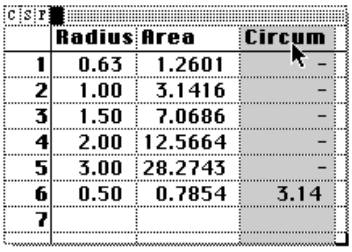
Deleting a column:

1. Click in the first row of a column (the title column) to select the column.

   The column is highlighted.

2. Press DELETE or select **Clear** in the **Edit** menu to delete the column.

Point and click in the first row of a column.



	Radius	Area	Circum
1	0.63	1.2601	-
2	1.00	3.1416	-
3	1.50	7.0686	-
4	2.00	12.5664	-
5	3.00	28.2743	-
6	0.50	0.7854	3.14
7			

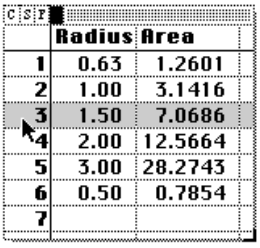
Deleting a row:

1. Click in a row of the first column (the sequentially numbered column) to select the row.

   The row is highlighted.

2. Press DELETE or select **Clear** in the **Edit** menu to delete the row.

Point and click in a row of the first column.

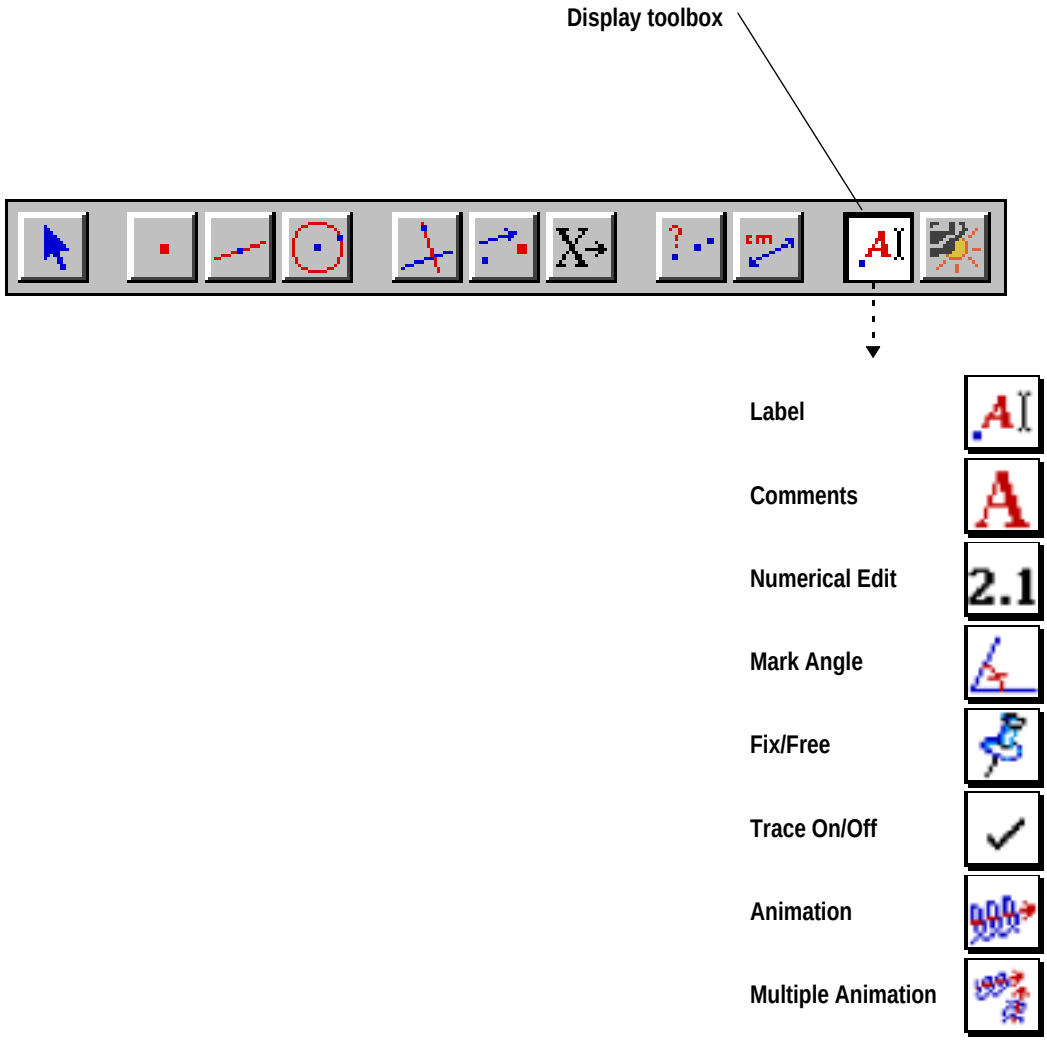


	Radius	Area
1	0.63	1.2601
2	1.00	3.1416
3	1.50	7.0686
4	2.00	12.5664
5	3.00	28.2743
6	0.50	0.7854
7		

Chapter 12: Using the Display Toolbox

The **Display** toolbox contains the tools associated with display features in Cabri Geometry II. These features allow you to annotate your constructions or animate objects.

The illustration below shows the location of the **Display** toolbox on the Cabri Geometry II toolbar, along with its pull-down menu. Procedures for using **Display** tools, including examples, are presented in this chapter in the order in which the tools appear on the pull-down menu.



Label

The **Label** tool attaches a label to a point, line, or circle. When you select an object with the **Label** tool, an edit box appears in which you can enter the label text. The edit box contains pull-down menus that allow you to specify the attributes of the text (Macintosh only).

You can also attach a label to a point immediately after it is created. This method limits text to five characters, and you cannot edit when entering the text.

To set attribute defaults for font, size, and style of the text, use the **Font**, **Size**, and **Style** c*ommands in the **Options** menu in the Macintosh version, or the **Options/Preferences** menu in the Windows version.

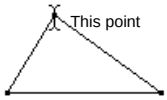
Creating a label

1. Select **Label** from the **Display** toolbox.

2. Click to select a point, line, or circle.

   An edit box appears.

Select a point, line, or circle.

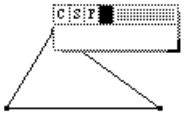


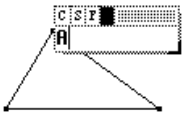
Enter a label.

3. If the attributes are already as you desire, continue to step 4. If not, select the font, size, style, and color of the text to be entered. Press and hold the mouse button while pointing to the small icon boxes at the top of the edit box.

   The **C**, **S**, **F**, and **color block** ■ change the character font, the character size, the font style, and the character color.

4. Type the label text on the keyboard.





Modifying a label

Move a label by dragging it to a desired location using the **Pointer** tool.

You can move the label within a fixed region from the object it labels. The label maintains its relative position to the object throughout any changes to the object.

Edit a label by selecting it with the **Label** tool. An edit box appears for editing the text. You must shade the text that you want to modify before making changes to its font, size, style, or color. Shade the text by dragging the I-beam cursor (I) across it. Then select the appropriate option.

Note: The DOS version lets you change the color of a label by selecting the label, and then selecting a color from the color palette, or by applying the **Color** tool.

Comments

The **Comments** tool allows you to create an edit box to enter a text comment. Dragging a marquee rectangle in the drawing window makes the edit box appear for you to enter your text . The edit box contains pull-down menus that allow you to specify the attributes of your comment text. The comment becomes a text object that you can move anywhere in the plane.

You can also add measurements and numerical values to comments. These values become a part of the comment, yet maintain their numerical characteristics.

To set attribute defaults for font, size, and style of the text, use the **Font**, **Size**, and **Style** commands in the **Options** menu in the Macintosh version, or the **Options/Preferences** menu in the Windows version. You can also frame and/or fill comments with a color by using the **Modify Appearance** tool in the **Draw** toolbox.

Creating a comment

1. Select **Comments** from the **Display** toolbox.

2. Drag a marquee rectangle to specify the location and line length of the comment in the drawing.

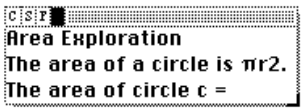
   An edit box appears when you release the mouse button.

Drag an appropriately sized box.

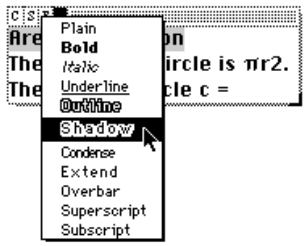
3. If the attributes are already as you desire, continue to step 4. If not, select the font, size, style, and color of the text that you want. Press and hold the mouse button while pointing to the small icon boxes at the top of the edit box.

   The **C**, **S**, **F**, and **color block** ■ change the character font, the character size, the font style, and the color of the character.

Enter a comment.



Highlight and change the text style.



4. Type the text on the keyboard.

   Text is confined within the box and automatically wraps to the next line when near the boundary. Create additional lines by pressing ENTER.

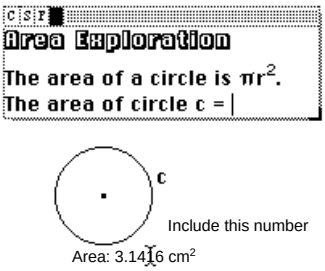
Area Exploration

The area of a circle is πr^2.
The area of circle c =

Note: For Macintosh and DOS versions, to access some commonly used special characters, turn on NUM LOCK on your keyboard. Then press the ALT key while entering the three-digit ASCII number to insert the desired character.

224	α	228	Σ	232	Φ	238	∈	241	±	246	÷	251	√
226	Γ	230	μ	234	Ω	239	∩	242	≥	247	≈	252	³
227	π	231	γ	236	∞	240	≡	243	≤	248	°	253	²

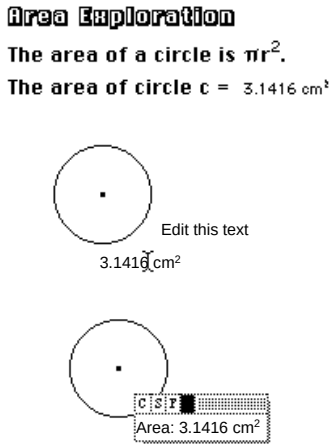
5. Point to a numerical value, and click to insert it at the location of the I in the edit box.



Adding a comment to a numerical value

1. Select the **Comments** tool, then the numerical value.
2. Type the text. Press ENTER if you need additional lines.

   Text is confined within the box and does not wrap to the next line. The comment is used as the column title if this value is tabulated in the table.



Modifying a comment

Move a comment by dragging it anywhere in the plane with the **Pointer** tool.

Edit a comment by selecting it with the **Comments** tool. An edit box appears. You must shade text that you want to modify before making changes to its font, size, style, or color. Shade the text by dragging the I across it. Then select the appropriate option.

Click directly on a numerical value within a comment to change its characteristics. The options in the edit box change to the options available in **Numerical Edit**. You can then modify the numerical value. See "**Numerical Edit**" in this chapter for specific details on editing a numerical value.

Resize the edit box by dragging its lower right-hand corner.

Note: The Windows and DOS versions let you change the color of a comment by selecting the comment, and then selecting a color from the color palette, or by applying the **Color** tool.

2.1 Numerical Edit

The **Numerical Edit** tool creates an edit box for editing numerical values, including interactive numbers or measurements. Interactive numbers can be modified interactively and used to define rotations, dilations, or measurement transfer values. The edit box contains pull-down menus that allow you to specify the attributes of the text.

Attribute defaults for font, size, and style of the text can be set using the **Font**, **Size**, and **Style** commands in the **Options** menu (Macintosh only).

Creating and editing numerical values

1. Select **Numerical Edit** from the **Display** toolbox.

2. Click to place an edit box anywhere in the drawing for creating an interactive number.

Click to place the edit box.

3. If the attributes are already as you desire, continue to step 4. If not, select the font, size, style, and color of the text that you want. Press and hold the mouse button while pointing to the small icon boxes at the top of the edit box.

   The **C**, **S**, **F**, and **color block** ■ change the character font, the character size, the font style, and the character color.

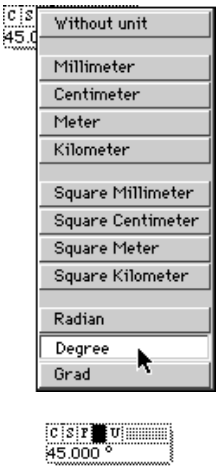
Enter a numerical value.

4. Type a numerical value.

5. Press and hold the mouse button while pointing to the **U** (Macintosh) in the edit box or press CTRL+U (Windows and DOS) to assign units to the interactive number.

   Note: The Windows and DOS versions let you change the color of a numerical value by selecting it, and then selecting a color from the color palette, or by applying the **Color** tool.

Add appropriate units.



Modifying a numerical value

Move the numerical value by dragging it anywhere in the plane with the **Pointer** tool.

You can modify numerical values interactively when the edit box is active. Using the arrow keys, place the I to the right of the digit you want to change. Use the **up**-arrow key to increase the digit by 1. Use the **down**-arrow key to decrease the digit by 1.

You can change these values automatically with animation. Using the **Animation** tool, select the number as you would select any object. The digit increases or decreases relative to the cursor position and to the direction indicated by the **Animation** tool.

You can change the units of a numerical value or its displayed precision. Using the **Numerical Edit** tool, select the numerical value. Select the **U** (Macintosh) in the edit box or press CTRL+U (Windows and DOS), and assign a unit to any number or change to the desired units.

Cabri Geometry II performs unit conversions based on the number's current unit assignment. Press the + key to increase the precision displayed by 1 digit. Press the – key to decrease the precision displayed by 1 digit.

Change the character attributes of a numerical value by selecting it using the **Numerical Edit** tool. An edit box appears for editing the number. You must shade the text that you want to modify before making changes to its font, size, style, or color. Shade the text by dragging the I across it. Then select the appropriate option from the icons in the edit box.

Mark Angle

The **Mark Angle** tool labels an angle specified by three points with an angle mark.

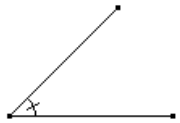
Creating a marked angle

1. Select **Mark Angle** from the **Display** toolbox.

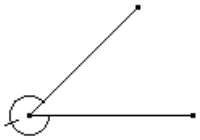
2. Specify the angle by selecting three points. The second point must be the vertex.

   Note: To measure an angle, just select the marked angle with the **Angle** tool in the **Measure** toolbox.

Select three points.



Drag the mark through the vertex to measure the reflex angle.



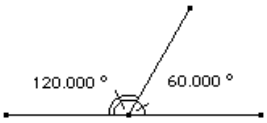
Modifying an angle mark

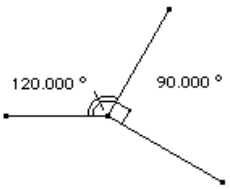
Using the **Pointer** tool, modify an angle mark by dragging it through the vertex to measure the opposite angle. The angle mark changes to ⌞ when the angle is 90 degrees.

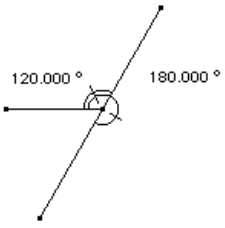
Using the **Modify Appearance** tool in the **Draw** toolbox, change the number of angle marks displayed by selecting the desired angle mark attribute, and then the angle mark.

Example

Mark two angles:







Fix/Free

The **Fix/Free** tool fixes the location of a free point or vice versa. Fixed points cannot be moved or deleted.

Fixing or freeing points

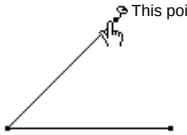
1. Select **Fix/Free** from the **Display** toolbox.

   All fixed points are displayed with a thumb tack next to them.

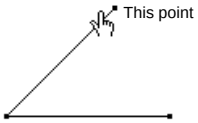
2. Select any free point to fix its location or any fixed point to free the location constraint.

   The **Fix/Free** tool works as a toggle function on a point. To free all fixed points simultaneously, click in free space while pressing SHIFT.

Select any point to fix its position.



Select any fixed point to free it.



Trace On/Off

The **Trace On/Off** tool traces the path of an object as it is translated. You may trace objects manually by dragging the object or automatically by using the **Animation** tool. Multiple objects can be selected for tracing.

To clear trace results, select **Refresh Drawing** in the **Edit** menu.

Tracing an object

1. Select **Trace On/Off** from the **Display** toolbox.

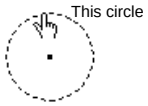
2. Select the object to trace.

   Selected objects are displayed in marquee outline.

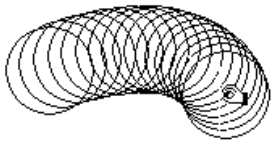
3. Disable the trace on an object by selecting the object displayed in marquee outline.

   The **Trace On/Off** tool works as a toggle function on an object. To disable a trace on all objects simultaneously, click in free space while pressing SHIFT.

Select any object.



Move the object to show the trace.



Modifying a trace

Use the **Pointer** tools (see **Pointer** toolbox) to modify the construction. As you move the object, its outline is displayed.

Animation

The **Animation** tool automatically moves an independent object along a specified path. Direction and speed are determined by the animation "spring." You can increase or decrease the animation speed by pressing + or – respectively, while the animation is active.

Objects defined by **Trace** are displayed at a specific interval relative to the length of the path. If the tabulation table is selected prior to the animation, animation automatically enters tabulation data into the table at a predetermined interval. (See "**Tabulate**" in the chapter "Using the Measure Toolbox.")

Animating an object

1. Select **Animation** from the **Display** toolbox.

2. Place the cursor on any object, and drag the animation spring in the *opposite* direction to the intended animation.

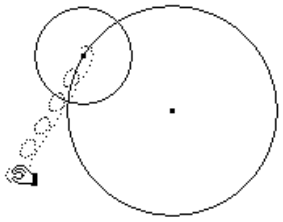
   The farther away the spring is pulled, the faster the object is animated. The animation begins when the mouse button is released and the spring collapses.

   If the **Pointer** tool is visible in the toolbar and the object does not lie on a defined path, the animated direction is 180 degrees from the spring. Otherwise, the object is animated along its defined path.

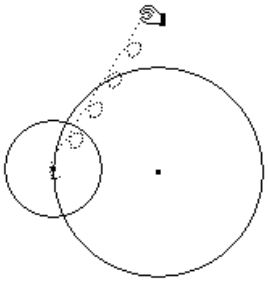
   If the **Rotate**, **Dilate**, or **Rotate and Dilate** tool is visible in the **Pointer** toolbox and the object can be transformed, the animation will be relative to the visible **Pointer** tool. For example, if the **Rotate** tool is visible, the object is rotated automatically.

3. Stop the animation by clicking anywhere on the drawing.

Drag the animation spring.



Release the mouse button to begin.



Multiple Animation

The **Multiple Animation** tool automatically moves multiple objects along specified paths. Direction and speed are determined by the objects' individual animation "spring." You can increase or decrease the speed of the total animation by pressing + or – , respectively, during the animation.

Objects defined by **Trace** are displayed at a specific interval relative to the length of the path. If the tabulation table is selected prior to the multiple animation, multiple animation automatically enters tabulation data into the table at a predetermined interval.(See "**Tabulate**" in the chapter "Using the Measure Toolbox.")

Using Multiple Animation

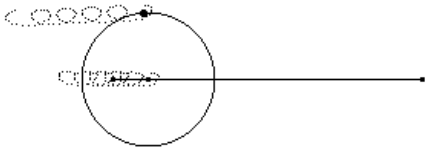
1. Select **Multiple Animation** from the **Display** toolbox.

2. Place the cursor on any object, and drag an animation spring in the *opposite* direction to the intended animation. Select as many objects as desired for the animation. Redefine any animation spring by selecting the object again.

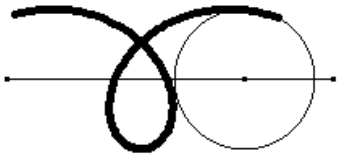
   The farther away the spring is pulled, the faster the object is animated. The animation spring remains in place after the mouse button is released.

   If the object does not lie on a defined path, the animated direction is 180 degrees from the spring. Otherwise, the object is animated relative to its defined path. **Multiple Animation** does not work with other **Pointer** tools as does **Animation**.

Drag the animation spring.



Press ENTER *to begin.*



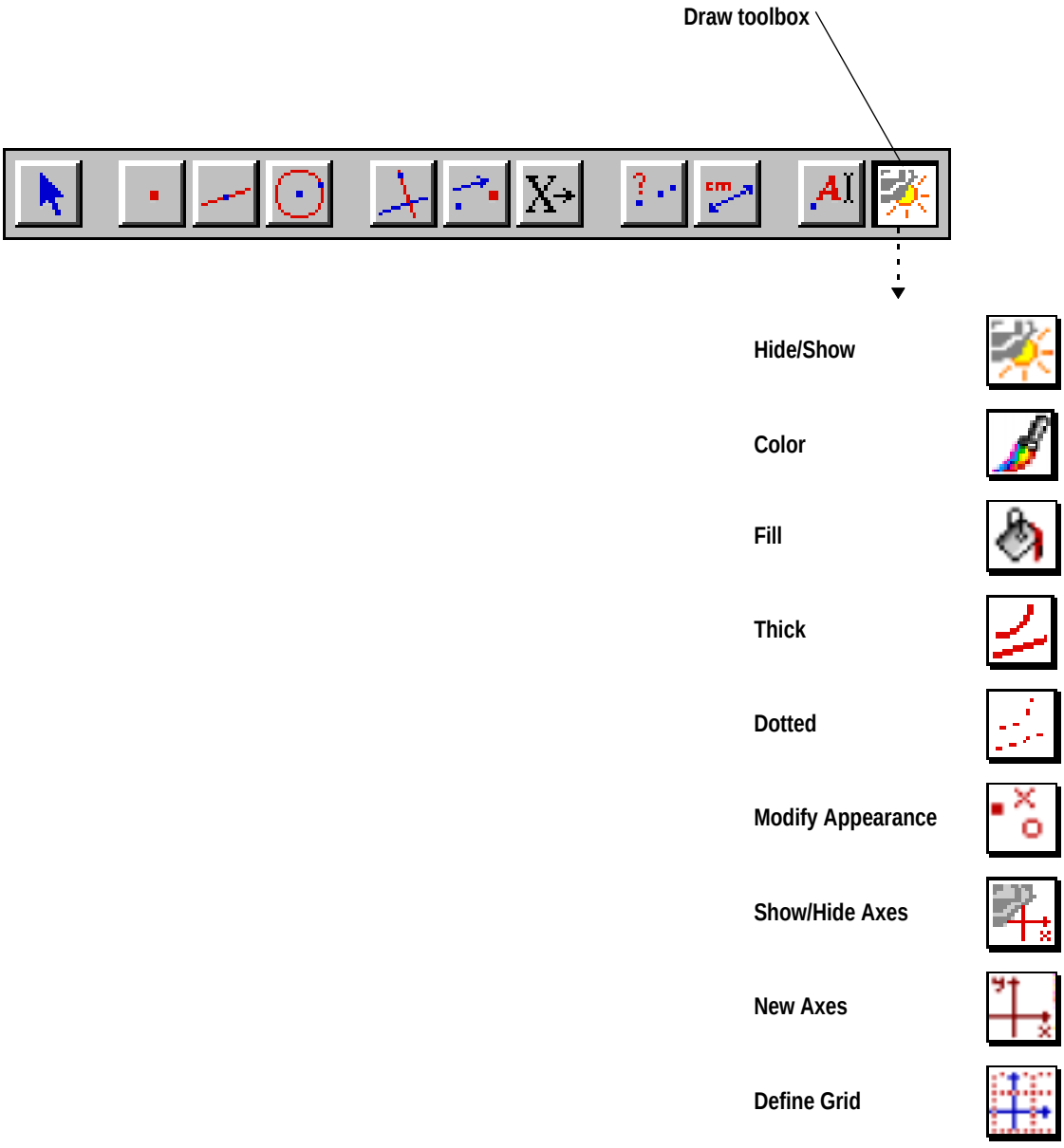
Note: The point on the circle was selected to trace.

3. Press ENTER to begin the animation.
4. Stop the animation by clicking anywhere on the drawing.

Chapter 13: Using the Draw Toolbox

The **Draw** toolbox contains the tools associated with drawing features in Cabri Geometry II. These features allow you to change the appearance of objects or display the coordinate system.

The illustration below shows the location of the **Draw** toolbox on the Cabri Geometry II toolbar, along with its pull-down menu. Procedures for using **Draw** tools, including examples, are presented in this chapter in the order in which the tools appear on the pull-down menu.



Hide/Show

The **Hide/Show** tool hides from view all selected objects and their accompanying labels and measurements. It also shows selected hidden objects. Hiding objects does not alter any of their attributes or geometric roles in a construction.

Hiding and showing objects

1. Select **Hide/Show** from the **Draw** toolbox.

2. Select the object you want to hide.

   Note: Hidden objects are shown in dotted outline when the **Hide/Show** tool is active; otherwise, they are invisible.

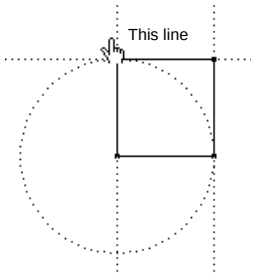
   Pressing the OPTION key (Macintosh) or the CTRL key (DOS) filters the cursor messages for all hidden objects, allowing easier access to visible objects.

3. Select a hidden object to make it visible again.

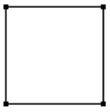
   Pressing SHIFT and clicking in free space makes *all* hidden objects visible.

   Pressing OPTION+SHIFT (Macintosh) or CTRL+SHIFT (DOS) filters the cursor messages for all visible objects, allowing easier access to hidden objects.

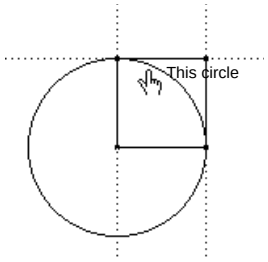
Click to hide visible objects.



Selected objects are hidden.



Click to display hidden objects.



Color

The **Color** tool changes the color of any object to one of 15 colors in the color palette. (This tool does not display on black and white systems.

Changing the color of an object

1. Select **Color** from the **Draw** toolbox.

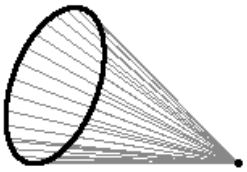
2. Select one of the colors in the color palette.

   The selected color appears outlined in the palette.

Select a color from the palette.

3. Select any object to change its color to the color you selected.

Select object to change its color.



Fill

The **Fill** tool fills an object such as a triangle, polygon, circle, or label with a color (or pattern for black and white systems) that you choose from 15 selections available in the color palette.

Filling an object with color

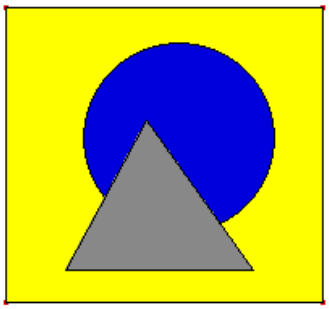
1. Select **Fill** from the **Draw** toolbox.

2. Select one of the colors (patterns appear on black and white systems) in the color palette.

Select a fill color from the palette.

3. Select an object.

Select object to fill with color.



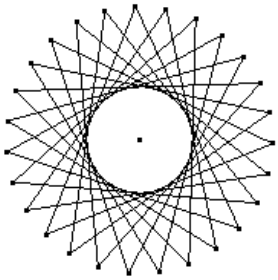
Modifying a filled object

Select an object a second time with the same color to change the color to transparent white (the original fill color).

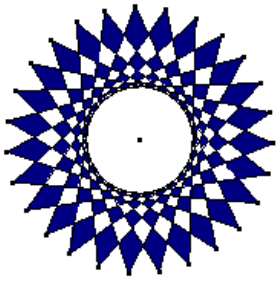
Select an object a second time while pressing the OPTION key (Macintosh) or the ALT key (Windows, DOS) to change the color to opaque white.

Example

Construct a star polygon with the **Regular Polygon** *tool.*



Fill the star polygon with color.

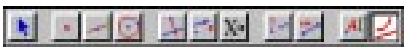


Thick

The **Thick** tool changes the outline thickness of an object.

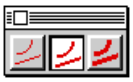
Changing outline thickness

1. Select **Thick** from the **Draw** toolbox.



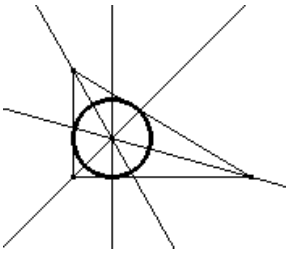
2. Select the thickness for the outline.

Select the thickness attributes.



3. Select the object to be outlined.

Select an object.

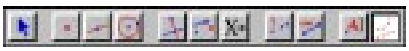


Dotted

The **Dotted** tool changes the outline pattern of an object.

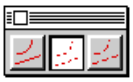
Changing outline pattern

1. Select **Dotted** from the **Draw** toolbox.



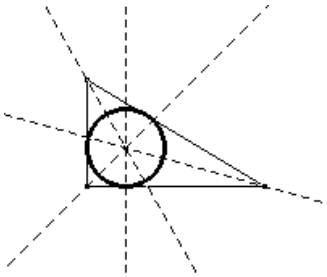
2. Select the pattern for the outline.

Select the outline attribute.



3. Select the object to be outlined.

Select an object.



Modify Appearance

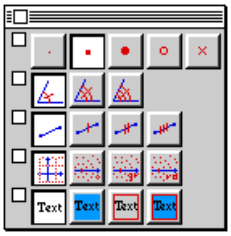
The **Modify Appearance** tool changes the appearance of a point, the tick marks of an angle or a segment, the type of coordinate system, or the style of a comment.

Modifying appearances

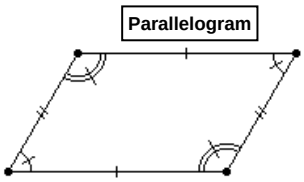
1. Select **Modify Appearance** from the **Draw** toolbox.

2. Select the appropriate option:
   - Points: small, medium, large, circular, or cross.
   - Angle marks: one, two, or three tick marks.
   - Segments: zero, one, two, or three tick marks.
   - Coordinate system: Cartesian or polar coordinates. Polar coordinates can be represented in degrees, gradients, or radians.
   - Comments: transparent without border, opaque without border, transparent with border, or opaque with border.
3. Select the object you want to appear with the selected attribute.

Select attributes to modify.

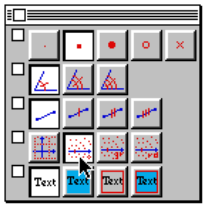


Select corresponding objects.

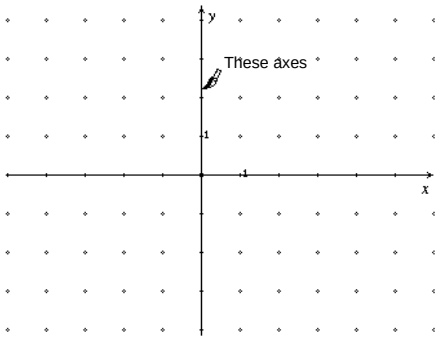


Example

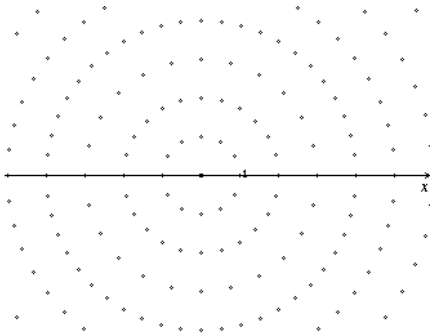
1. *Select the polar coordinate attribute.*



2. *Select the xy-coordinate system.*



3. *Coordinate system changes to polar.*



Show/Hide Axes

The **Show/Hide Axes** tool displays the default axes. This command toggles between **Show Axes** and **Hide Axes**. If the axes are visible, the **Hide Axes** tool appears in the toolbox; if not, the **Show Axes** tool appears.

Equations and coordinates adhere to the specified coordinate system. Measurements of length, area, slope, and angle are given relative to their physical measure. The default coordinate system is defined in one centimeter increments, which corresponds to the physical measure you see. The coordinate system may be either Cartesian or polar. You can change the system by using the **Modify Appearance** tool, setting the defaults in the **Options** menu, or selecting the axes and pressing TAB.

Specifying axes

1. Select **Show/Hide Axes** from the **Draw** toolbox.

Axes are displayed when you choose this tool.

2. Coordinate system translation:

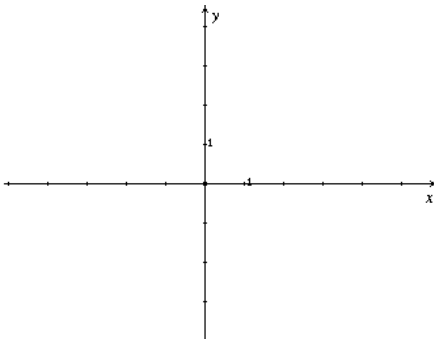
   Drag the origin to translate the axes to a new location.

3. Axes rotation:

   Rotate both axes simultaneously by grabbing the x-axis beyond the first scale mark and dragging in a circular manner.

   Rotate the y-axis separately by grabbing the y-axis beyond the first scale mark and dragging in a circular manner.

   Note: Pressing the SHIFT key while dragging rotates the axes in 15-degree increments.



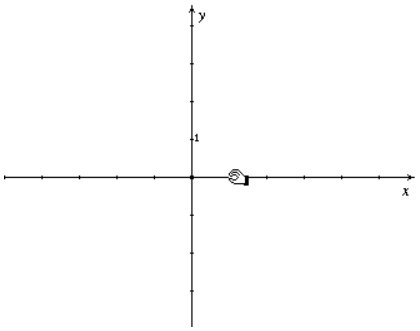
Drag the first scale mark to change the scale.

4. Changing scale:

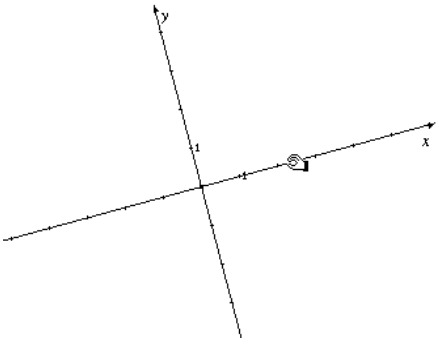
   Change the scale of both axes simultaneously by dragging the first scale mark on the x-axis to the desired location. The small number next to the first scale mark indicates the value of each division.

   Change the scale of the y-axis separately by dragging the first scale mark on the y-axis to the desired location.

   Note: Pressing the shift key while dragging returns the scale to the 1-centimeter increment default scale.



Drag x- or y-axis to rotate the coordinate system.



New Axes

The **New Axes** tool creates a new x-y axis defined by three points. The first point defines the origin, the second point defines the location of the x-axis, and the third point defines the location of the y-axis. If the axes are defined using existing points, the points determine the scale of the axes. Otherwise, the scale is defined in one-centimeter increments.

You can define multiple coordinate systems. Equations and coordinates and grids must be specified relative to a specific coordinate system if multiple coordinate systems are defined.

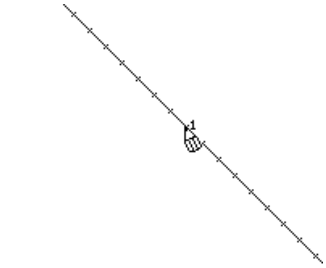
After defining a new coordinate system, you can manipulate it in the same manner as the default coordinate system documented in the previous tool, **Show/Hide Axes**.

Creating axes

1. Select **New Axes** from the **Draw** toolbox.

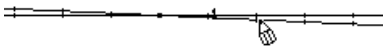
2. Designate a point for the origin.

Click to place the origin point.



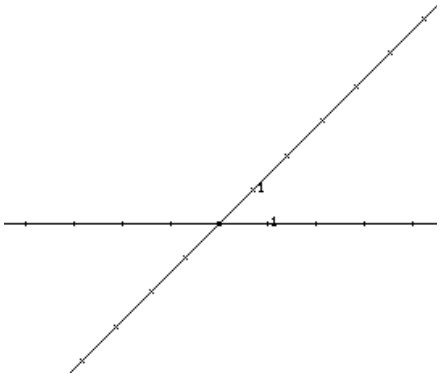
3. Click to specify the location of the x-axis.

Click to place the x-axis.



4. Click to specify the location of the y-axis.

Click to place the y-axis.

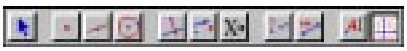


Define Grid

The **Define Grid** tool displays the grid of a defined coordinate system.

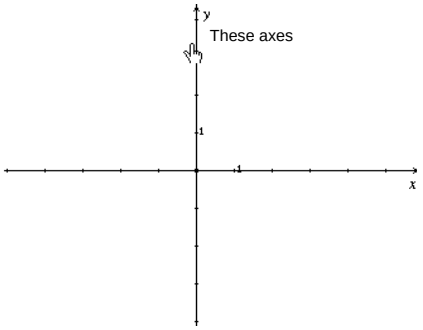
Defining and deleting a grid

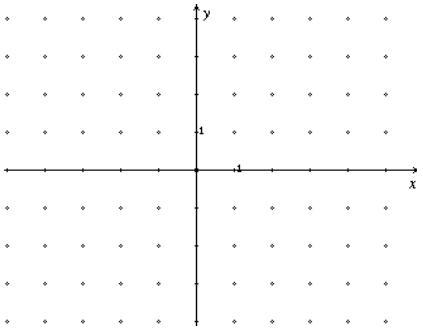
1. Select **Define Grid** from the **Draw** toolbox.



2. Select the coordinate system to display the grid.
3. Delete the grid by selecting one of the grid points and pressing DELETE.

Click to select the coordinate system.





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