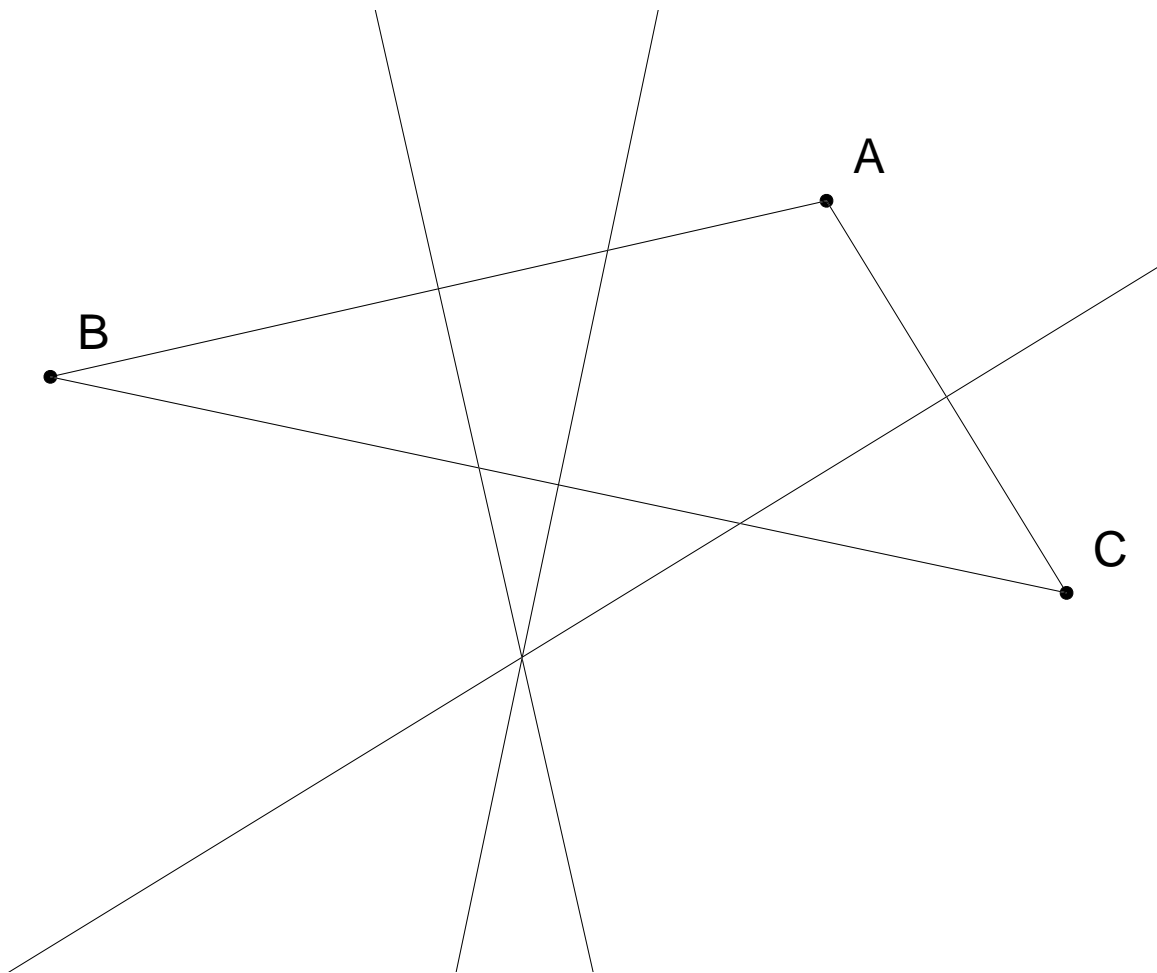


Cabrioleet for RISC OS

a dynamic geometry program



Version 2.5

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Upgrades to Cabriolet (as a zip'd archive) and the latest version of this guide (in TechWriter and PDF format) are available from:
<http://www.borcherds.co.uk/>

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Cabriolet was written by Michael Borchers.

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About this Guide

This guide is about Cabriolet a dynamic geometry package for that has been designed both to be easy to use and to run at a good speed even on low specification machines.

The manual is divided into three chapters:

Chapter one describes how Cabriolet works.

Chapter two is a tutorial.

Chapter three is a reference section detailing all the Tools that Cabriolet has.

Conventions used

Dragging the mouse between two points means to press the appropriate mouse button, moving the mouse and then finally releasing the button again. where 'click' is used on its own it refers to the left hand mouse button.

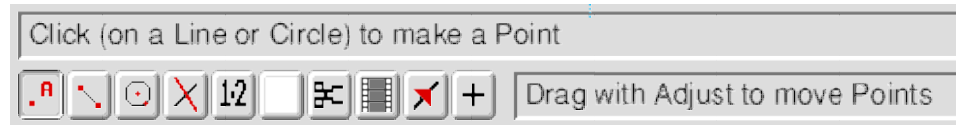
Geometrical objects that Cabriolet uses are referred to in italic, for example *Perpendicular Bisector*.

Tools are referred to in bold, for example, **Perpendicular Bisector Tool**.

Chapter one Using Cabriolet

Cabriolet To load Cabriolet, double-click on it from a filer window. Cabriolet's icon will then appear on the icon bar. Click on this icon each time you wish to open a new Cabriolet document.

The Toolbar The toolbar is at the top of every Cabriolet window.



It consists of two parts: the buttons on the bottom left are for selecting different tools and on the top and right are two panes which display helpful information.

The Buttons As you move the mouse over the buttons, the top pane tells you what each Tool is. Clicking with *Select* (the left mouse button) will then activate that tool (see *Chapter three* for a thorough description of each Tool).

Tool Menus Each button can be used to select more than one Tool. To select a different Tool to the one displayed in the pane, press the middle mouse button *Menu* as instructed in the lower pane. This brings up a menu of other available Tools which can be chosen. This will then be the default Tool for that button, until another Tool is chosen from its menu.

The Panes The two panes display different information depending upon where the mouse pointer is.

- When the mouse pointer is over the buttons on the Tool Bar, the top pane gives you the name of each Tool.
- When the mouse pointer is over the main window, the top pane tells you how to use the current Tool. The bottom pane will usually give some information about the object that the mouse pointer is over.

Menus Apart from the menus used to select different Tools, there are two other menus available. The first is obtained by pressing *Menu* (the middle mouse button) over Cabriolet's icon on the icon bar. This allows you to either quit Cabriolet or view some information about Cabriolet, including the version number and who is licensed to use it.

The second is obtained by pressing *Menu* over Cabriolet's main window. This allows you to:

- Save a file, so that it can be reloaded on a future occasion (also *F3*).
- Export a file in Draw format so that it can be used in other programs.
- Save a locus out as a CSV file.
- Show any objects that may have been hidden.
- Undelete any objects that may have been deleted.
- Turn the grid on or off, and set its size.
- Undo or Redo the last action (also *F8*).

The Mouse Buttons	<p><i>Select</i>, the left button, is generally used for selecting an object, or the position for an object (depending on the Tool selected). For example when using the Line Segment Tool, you click and drag from where you want the line to start. If you click near a point, the Line Segment will start at this point. However if you click nowhere near a point then a starting point will be automatically created.</p> <p>Similarly if you place the mouse near a Point when the left hand mouse button is pressed, the Line Segment will “snap” onto that Point. If you release the mouse button here, the Line Segment will have this Point as its endpoint.</p> <p>The right button can always be used for dragging points and labels around (although not all points and labels can be moved).</p>
The Mouse Pointer	<p>The mouse pointer will change depending on what object it is near. This is useful when two objects are close together and you need to know which one you are clicking on. If you press and hold <i>Alt</i> when dragging the mouse, it will confine the point being dragged to a grid. You can also turn the grid on permanently (see ‘Menu’ section, above).</p>
Reconfiguring the Menus	<p>All the the Tool menus obtained by pressing <i>Menu</i> over the Tool buttons can be reconfigured, as can the buttons themselves. To change them, load the file ‘!Cabriolet.Default.Menus’ into a text editor such as Edit or Zap. Each line of the file defines the menu for a button. It consists of names of Tools as they appear in the menus, separated by commas. Up to fifteen buttons can be defined.</p> <p>When the file has been altered it should be saved in the appropriate directory for your configured country (e.g. !Cabriolet.Default.UK) which you can find out by pressing <i>F12</i> and typing:</p> <pre>Show Cabriolet\$Country</pre> <p>If the menus are reconfigured then they will obviously not be as described in the manual!</p>

Chapter two Tutorial

Introduction

This chapter is a short tutorial that shows you, step by step, how to create the following examples:

- Circumcircle of a Triangle
- Incircle of a Triangle
- Tracing a Point

Circumcircle of a Triangle

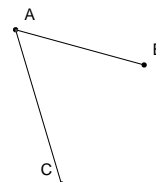
The circumcircle of a triangle always passes through all its corners.

1 Open a new document (after loading CabriJet) by clicking on its icon on the icon bar.

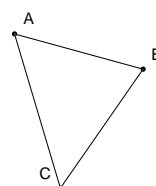
2 Now construct *Line Segment AB*. Press the right hand mouse button over the second button on the Toolbar, which will bring up a menu. Choose **Line Segment** from this. Then, over the main window, hold down the left mouse button and move the mouse before releasing it.



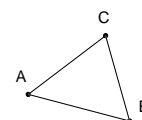
3 Then construct a triangle. Move the mouse to the *Point A* (the mouse pointer changes to say 'This Point'). Then hold down the left hand mouse button and move the mouse to where you wish the *Point C* to be, before releasing the mouse button.



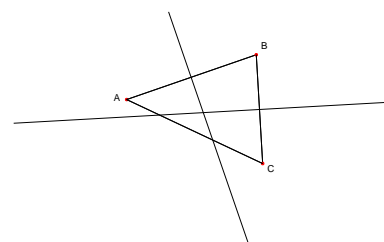
4 Now complete the triangle. Move the mouse to *Point B*, press the left hand mouse button-, move the mouse to *Point C* and release the mouse button.



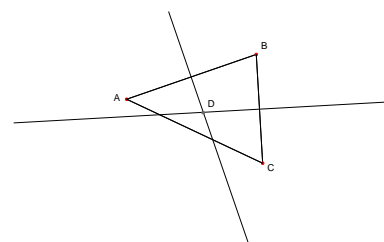
Before proceeding, check that the Line Segments 'join up'. Hold down the right hand mouse button over any of *A*, *B* or *C* and then move the mouse around: the *Point* that you have clicked on should follow the mouse around, as should the *Line Segments* joined to that *Point*.



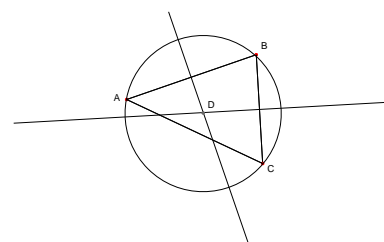
1 Now construct two *Perpendicular Bisectors*. Click the right hand mouse button over the fourth button from the left on the Toolbar. Choose **Perpendicular Bisector** from the menu. Then simply click on *Line Segment AC* and then on *Line Segment BC*.



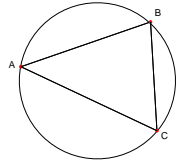
2 Now construct the *Intersection* of the *Perpendicular Bisectors*. Click the right hand mouse button over the leftmost button and choose **Intersection**. Then click on both the *Perpendicular Bisectors* in turn.



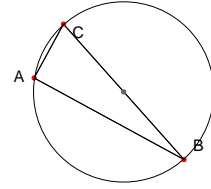
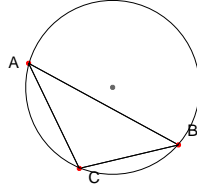
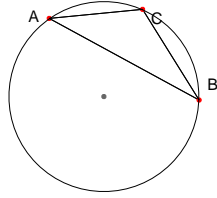
3 Now construct the circumcircle itself. Choose **Circle** from the Toolbar (it is the default tool for the third button, so simply click on it, or you can choose it from the menu obtained by clicking the right hand mouse button). Then move the mouse pointer to *Point D*, hold down the left hand mouse button, move the mouse to *Point A* and then release the mouse button.



4 If you wish you can now hide the construction lines.
Choose **Hide Object** (seventh button) and then click on
any lines, points or labels that you don't want to be
shown.



5 Now check that the circumcircle always goes through *Points A, B and C*
by dragging these three points round with the right hand mouse button.

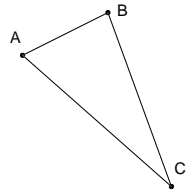


Incircle of a Triangle

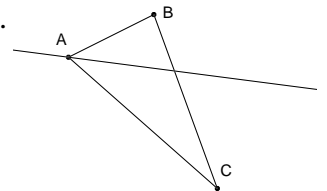
The incircle of a triangle always touches the edges of the triangle.

1 Start off by opening up a new document.

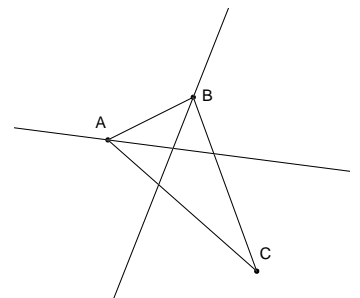
2 As before, start off by constructing a triangle from three *Line Segments*.



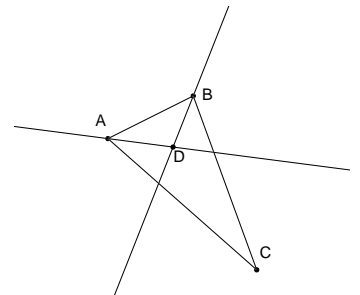
3 Next construct the *Angle Bisector* of angle *BAC*. Choose **Angle Bisector** (from the menu on the fourth button) then click on the three *Points B, A, C in that order*.



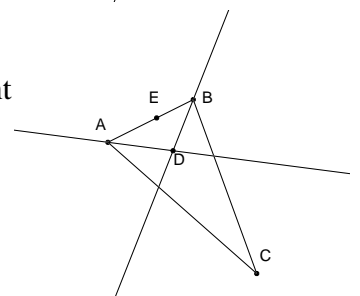
4 Then construct the *Angle Bisector* of angle *CBA*. Still using the **Angle Bisector Tool** click on the three *Points C, B, A in that order*.



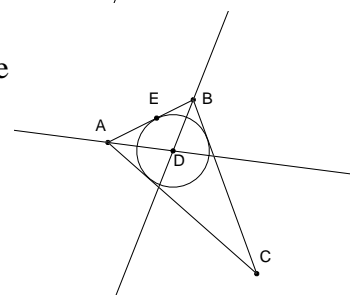
5 Then choose **Intersection** (from the first button) to construct the *Intersection* of the *Angle Bisectors* by clicking on each one in turn.



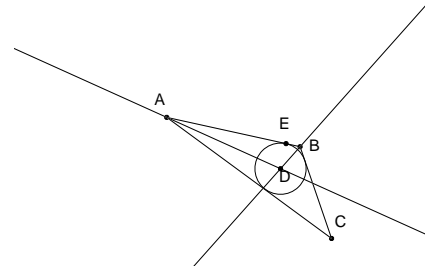
6 Now to construct a Point on the Line Segment *AB* that is on the radius of the incircle, we use the **Perpendicular Point Tool** (from the menu of the first button). Click on Point *D* and then on Line Segment *AB*.



7 Finally we can construct the incircle using the **Circle Tool** (third button). Click over Point *D* (the centre of the Circle), move the mouse pointer to Point *E* (the radius point) and then release the mouse button.



8 Check that the incircle always touches all three sides of the triangle by dragging the corners around with the right hand mouse button.



Tracing a Point

Here we will construct a Point whose locus is an ellipse (i.e. it will trace out an ellipse when we move another point).

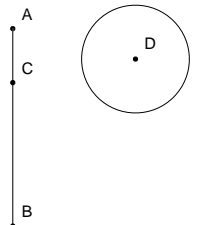
1 First use the **Line Segment Tool** (second button's menu) to make *Line Segment AB*.



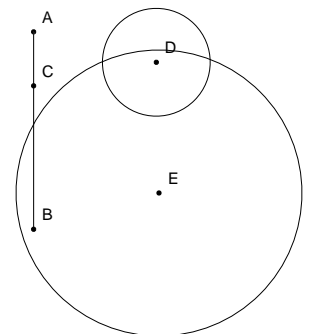
2 Next use the **Point and Label Tool** (first button) to construct *Point on Line C*. Check by dragging it with the right hand mouse button that it cannot move off *Line Segment AB*.



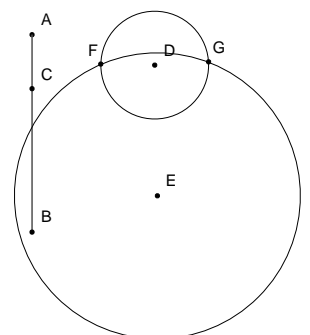
3 To construct the *Circle* centre *D* we use the **Circle Given Radius Tool** (third button's menu). To use it, first click where you wish *Point D* to be, then click on *Point A*, then on *Point C*. Now the Circle's radius will always be the same length as the line joining *A* and *C*. Check this by dragging *Point C* with the right hand mouse button: the *Circle* should change size as *Point C* moves.



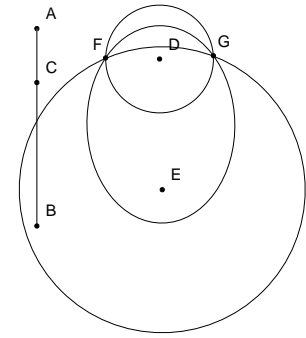
4 Similarly, still using the **Circle Given Radius Tool**, construct the second *Circle* by clicking where you wish *Point E* to be, then on *Point B* and then on *Point C*.



5 Now use the **Intersection Tool** (first button's menu) to construct *Points F* and *G*. Simply click on the first *Circle*, and then the second.



6 Now as *Point C* is moved along Line Segment *AB* (with the right hand mouse button) Points *F* and *G* will both trace out half an ellipse.



To see this, choose **Static Locus** (seventh button's menu). Then click on, say, *Point F*. Then drag *Point C* with the right hand mouse button. The trail left will be traced out in Green. To see the path traced out by *Point G*, click on *Point G* with the left hand mouse button and drag *Point C* with the right hand mouse button.

Another way to check this (as shown) is to actually construct the *Ellipse*. To do this, choose **Ellipse** (third button's menu) and then click on *Points D, E* and *F* in that order (so that *D* and *E* are the foci of the *Ellipse* and *F* is a Point on its edge). Then *Points F* and *G* will stay on the *Ellipse* as *Point C* is moved.

Chapter three Reference

Tools

The tools can be chosen from the *Button bar*. Pressing the right hand mouse button over a button will reveal additional tools. This brings up a menu of other available Tools which can be chosen. This will then be the default Tool for that button, until another Tool is chosen from its menu.

Point and Label Tool

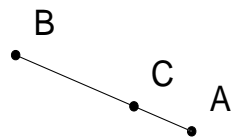


To create a Basic Point, click anywhere away from other objects. The Point can then be dragged to where it is required with the right hand mouse button. A Label is automatically created next to the Point. It can also be moved with the right hand mouse button.

To create a *Point on Circle* or a *Point on Line*, move the mouse until the pointer changes to indicate that you are near enough to a Circle or any sort of line (*Line, Line Segment, Angle Bisector, Parallel Line, Perpendicular Line* or *Perpendicular Bisector*) and click with the left hand mouse button. When you then try to move one of these with the right hand mouse button, it will be constrained to move only along the circle or line.

Example

C is a Point on Line on Line Segment AB



Mathematical Definition

A point is a geometrical object with zero dimension.

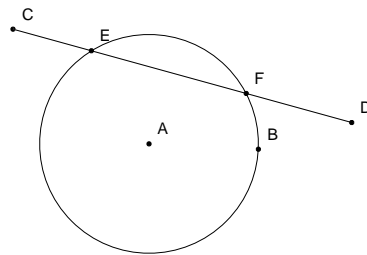
Intersection Tool



To create the *Point(s)* at the intersection of two objects, simply click on them. Suitable such objects are *Circles* and any sort of *Line*, for example *Line Segments, Angle Bisectors, Perpendicular Bisectors*.

Example

E and F are the intersections of Line Segment CD and the Circle centre A,



Mathematical Definition

The intersections of two objects are the points which satisfy the conditions for both objects simultaneously.

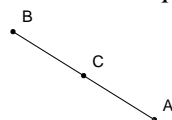
Midpoint Tool



To create the *Midpoint* of two *Points* either click on both *Points* or, if it exists, click on a *Line Segment* joining them.

Example

C is the Midpoint of Line Segment AB



Mathematical Definition

The midpoint of two points is exactly half way in between them.

Perpendicular Point

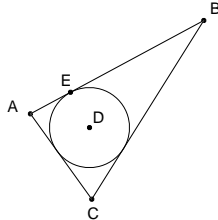
Tool



To create the nearest *Point* on a line to a given *Point*, click on both the *Point* and the line.

Example

E is the *Perpendicular Point* obtained by clicking on *Point D* and *Line Segment AB*. It has been used to construct the incircle of triangle *ABC*. (*D* is the Intersection of the Angle Bisectors of the triangle)



Mathematical Definition

The perpendicular point is such that the line joining the two points is at right angles to the original line.

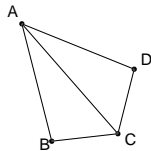
Mirror Point Tool



To create a *Mirror Point* that is the reflection of another point in a line click on both the point and the line.

Example

D is the *Mirror Point* of *B* in the line *AC*. Hence *ABCD* will always be a kite.



Rotate Point Tool



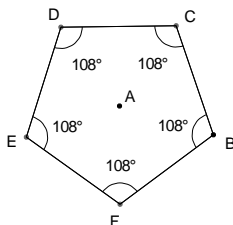
The Rotate Point Tool can be used to rotate a *Point* through a fixed angle. To rotate a whole shape each *Point* that determines the shape can be rotated and then the shape redrawn.

It can also be used to create an angle of a fixed size.

To rotate a *Point* by a fixed angle, first click on the *Point* to be rotated then click on the *Point* that is to be the centre of the rotation. A window will then appear, into which you should type an angle in degrees. This will be the size of the rotation (anti-clockwise). A negative angle can be entered for a clockwise rotation.

Example

Point B has been rotated through 72° about *Point A* to make *Point C*.
Point C has been rotated through 72° about *Point A* to make *Point D*.
Point D has been rotated through 72° about *Point A* to make *Point E*.
Point E has been rotated through 72° about *Point A* to make *Point F*.



Hence shape *BCDEF* is a regular pentagon.

Vector Point Tool

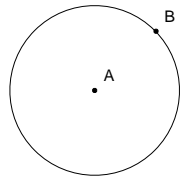


To create a *Vector Point*, click on a *Point* and, while still holding the mouse button, move the mouse to where you want the *Vector Point* and then release the mouse button.

The *Vector Point* will then always remain the same distance and direction from the original *Point*.

Example

B is a *Vector Point* depending upon *Point A*. The *Circle* has centre *A* and radius point *B*. When *Point A* is moved, *Vector Point B* will also move and so the *Circle* will stay the same size, rather than growing or shrinking.



Note:

This tool was called the Vector Tool with a different icon in some previous releases of Cabriolet. The Vector Tool is similar but can automatically create the initial point and draw a *Line Segment*.

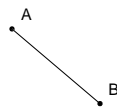
Line Segment Tool



To create a *Line Segment*, drag the mouse with the left hand mouse button pressed from the start point to the end point. If you wish it to start and/or end on a *Point*, simply start and/or end your drag on the appropriate *Point(s)*.

Example

Line Segment AB



Mathematical Definition

A line segment is a finite section of a line, as opposed to an infinite (unending) line which is normally just referred to as a 'line'.

Related Tools

Line Tool, Point and Label Tool

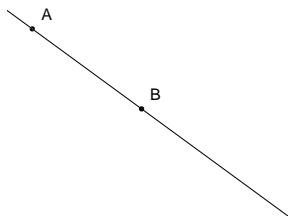
Line Tool



To create a *Line*, drag the mouse, with the left hand button pressed, from one point you wish to be on the line to another point on the line. If you wish it to go through one or two existing *Points*, simply start and/or end your drag on the appropriate *Point(s)*.

Example

Line AB produced.

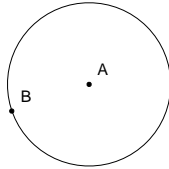


Circle Tool

To draw a *Circle*, drag the mouse from where you want the centre to be to where you want the edge of the *Circle* to be. While you drag the mouse, the *Circle* will be shown in the position according to the current mouse position.

If you want the *Circle* either to have a particular *Point* at its centre or to have a particular *Point* on its radius, simply start or finish the mouse drag on the appropriate *Point(s)*.

Example A *Circle* with radius *A* and radius point *B*.



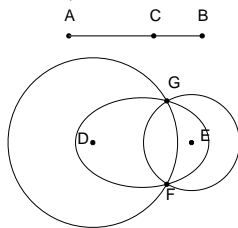
Mathematical Definition

A circle is the set of points equidistant from the centre point.

Circle Given Radius Tool

To create a *Circle* whose radius is the same length as a *Line Segment*, firstly click on the *Point* you wish to be the centre then click on the two endpoints of the *Line Segment*. As with the Circle Tool, if you click where there is no point, one will be automatically created.

Example *C* is a *Point* on *Line Segment AB*. *Circle* centre *D* has its radius set to *Line Segment AC*. *Circle* centre *E* has its radius set to *Line Segment BC*. *F* and *G* are the Intersections of the two *Circles*. As *Point C* is moved along *Line Segment AB*, each of *F* and *G* trace out half an ellipse (whose foci are *D* and *E*).



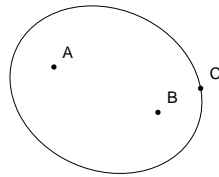
This is because the length $DG + GE$ is always the same (and is equal to length $AC + CB = AB$), and it is equivalent to the mechanical construction of an ellipse by putting two pins in a piece of paper (at *D* and *E*), tying a piece of string to them (length *AB*) and moving a pencil round (at *Point F* or *G*) keeping the string taut.

Ellipse Tool



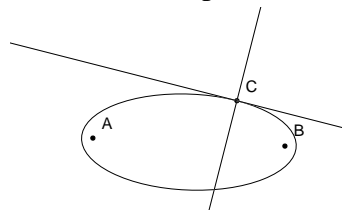
To create an Ellipse, click on three points: two foci and a point that is to be on the circumference. As with the Circle Tool, if you click where there is no point, one will be automatically created.

Example A and B are the foci of the ellipse, C defines where the circumference of the ellipse is.



Mathematical Definition

An ellipse is a stretched circle. Ellipses have the property that if A and B are the foci and C is any point on the edge then the angle bisector of ACB is perpendicular to the tangent to the ellipse at C . Hence if a snooker ball is hit in *any* direction from one focus, it will always go through the other focus, where a pocket can be cunningly placed!

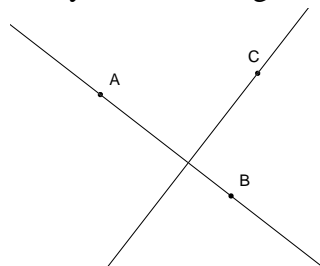


Perpendicular Line Tool



To create a line that is perpendicular (at right angles to) another line, click (in either order) on the line you wish to be at right angles to and a *Point* which you want your new *Perpendicular Line* to go through.

Example The *Perpendicular Line* through C will always go through C and will always remain at right angles to *Line AB*.

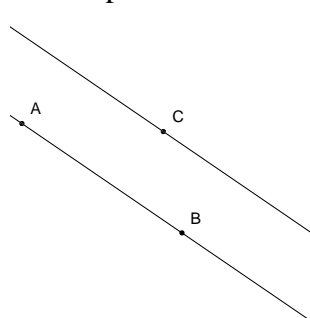


Parallel Line Tool



To create a line that is parallel to another line, click (in either order) on the line you wish to be a parallel to and a *Point* which you want your new *Parallel Line* to go through.

Example The *Parallel Line* through C will always go through C and will always remain parallel to *Line AB*.

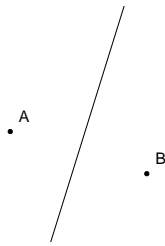


Perpendicular Bisector Tool



- To create the perpendicular bisector of two *Points*, click on the first *Point* (which will turn red) then click on the second *Point*.
- To create the *Perpendicular Bisector* of a *Line Segment*, just click on the *Line Segment*.

Example The *Perpendicular Bisector* of *AB*.



Mathematical Definition

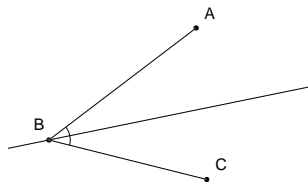
A perpendicular bisector of two points is a line, each point of which is the same distance (equidistant) from the two original points. In practice this is a line that cuts the *Line Segment AB* at right angles exactly half way in between the two points.

Angle Bisector Tool



To create an *Angle Bisector*, either click on an *Angle* that has already been marked with the *Mark Angle Tool*, or click on three *Points* that define the angle to be bisected.

Example The *Angle Bisector* of *Angle ABC*.

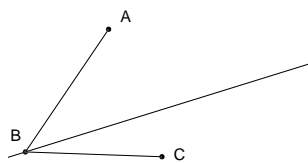


Angle Trisector Tool



To create an *Angle Trisector*, either click on an *Angle* that has already been marked with the *Mark Angle Tool*, or click on three *Points* that define the angle to be trisected.

Example The *Angle Trisector* of angle *ABC*.



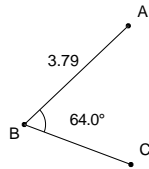
Measurement Tool

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- To measure the distance between two *Points*, click on them or, if it exists, click on a *Line Segment* joining them.
- To Measure an angle, it must first have been marked with the *Mark Angle* tool. Then simply click on the angle.
- To Measure an area, use the *Measure Area* tool.

Calculations can be performed on *Measurements* using various other *Tools* (see *Addition Tool*).

Example Length $AB = 3.79\text{cm}$, angle $ABC = 64.0^\circ$

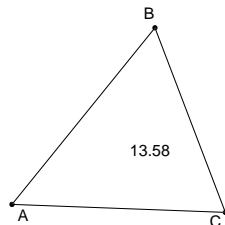


Measure Area Tool



To measure the area of a triangle, click on all three corners.

Example The area of triangle ABC is 13.58 cm^2 .

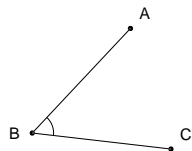


Mark Angle Tool



To mark an acute angle click on three *Points* that specify the angle with the second *Point* being the *Point* at the angle.

Example Angle ABC has been marked.



Uses This is necessary for specifying an angle to measure and also allows you to specify an angle more quickly for the *Angle Bisector Tool*. It also makes clear which angle is being bisected or measured.

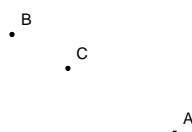
Hide Object Tool











To hide an object, simply click on it. Unlike *Deleting* an object, hiding it does not affect any objects that it depends upon (for example if you hide a *Line*, any *Points* on that *Line* will not disappear).

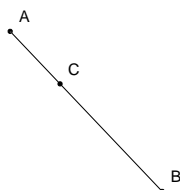
To unhide objects, choose **Show Hidden** from the main menu.

Example *Point C* is a *Point* on *Line* on *Line Segment AB*, but *Line Segment AB* has been hidden.



Thicken Line Tool	 <p>The Thicken Line Tool can be used to draw Lines and Circles with a thicker (bolder) line.</p> <ul style="list-style-type: none"> • To thicken a Line or a Circle, simply click on it. • To revert to normal, simply click again.
Colour Red Tool	 <p>To colour an object red, simply click on it.</p>
Colour Grey Tool	 <p>To colour an object grey, simply click on it.</p>
Colour Black Tool	 <p>To colour an object black, simply click on it.</p>
Colour Purple Tool	 <p>To colour an object purple, simply click on it.</p>
Colour Blue Tool	 <p>To colour an object blue, simply click on it.</p>
Delete Object Tool	 <p>To delete an object, simply click on it.</p> <p>This will also delete all the objects that depend upon the deleted object. The Hide Object Tool can be used if you simply want an object not to be displayed.</p> <p>All the objects that have been deleted previously can be recreated by choosing Undelete from the main menu. This works even after a file has been saved and reloaded.</p> <p>Also note that if an object is inadvertently deleted, the Undo/Redo menu option (or pressing <i>F8</i>) can be used to bring back only the just-deleted objects.</p>
Set Ratio Tool	 <p>The Set Ratio Tool can be used to set precisely how far along a <i>Line Segment</i> a <i>Point on Line</i> is. To set this, click on a <i>Point on Line</i>. A window will appear into which you should type a decimal value between 0 and 1.</p> <p>This ratio is always preserved, unless the <i>Point on Line</i> is dragged by the mouse.</p>

Example Point on Line C has been set to be 0.33 along Line Segment AB.



Link Objects Tool



This Tool can be used to change any point into a *Point on Line* or a *Point on Circle*. It can even be used to move a *Point On Circle/Line* to a different circle/line.

To achieve this, simply click on the desired point to change, and then click on the line or circle that you wish it to lie on.

Note that if the *Point* originally depended upon some other objects, these dependencies will be lost when the *Point* is redefined.

Animate Tool



The Animate Tool can be used to create simple animations.

To use it, either click on a *Point on Line* or a *Point on Circle*. The Point clicked upon will then move smoothly around the *Circle* or back and forth along the *Line*.

Simpler but more general animations can be created by pressing or holding down *F8* to repeatedly undo and then redo the last action taken.

Static Locus Tool



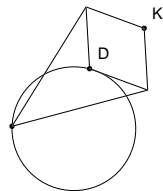
To create the *Locus* of a *Point* (i.e. to trace its path), click on a Point (which will turn red). Then simply drag any other Points about with the right hand mouse button. If the original *Point* moves, its path will be traced out by green dots. If the mouse is moved slowly and carefully (press *Shift* before dragging to facilitate this) then the green dots will be closer together so that the Locus will look like a curve.

Only one *Locus* is allowed (including in different windows) at a time. To clear a *Locus*, select a different Tool and then reselect the Locus Tool.

It is possible to save out the coordinates of all the points in the *Locus* as a Comma Separated Variable (CSV) file from the menu which is obtained by pressing the middle mouse button over the main window.

Example

Peaucellier's Cell is a mechanical construction that will draw a line without a straight edge. All the Line Segments in the diagram have been arranged to have a fixed length (representing rods). As *Point D* moves around the *Circle*, *Point K* traces out a line (i.e. the locus of *K* is a line).



Mathematical Definition

The locus of a point is the path traced out by it as it moves under certain constraints.

Vector Tool



The Vector Tool lets you create a *Vector*!

In Cabriolet, this consists of a *Vector Point* (see separate Vector Point Tool) joined to any other sort of *Point* with a *Line Segment*.

Such a construction has the property that the *Vector Point* end of the *Vector* will always stay in exactly the same position relative to the other end (in both distance and direction).

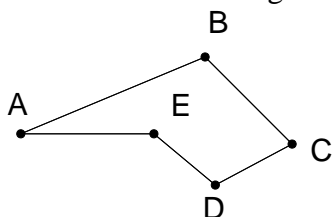
In operation, the Vector Point Tool is similar in operation to the Line Segment Tool: press the left hand mouse button, move the mouse and then release. If you click near to a *Point*, then this will become one end of the *Vector*, otherwise another *Point* will be created automatically.

However, unlike the Line Segment Tool, if you release the mouse near a *Point*, the *Vector* will not attach itself to it.

Example

Lines AB , BC , CD and DE are all Vectors.

Line EA is a Line Segment.



If Point A is moved, the whole shape is preserved and moves with A. If any other Point is moved the shape is altered accordingly.

Mathematical Definition

Geometrically, a vector is something with both distance and direction. So, for instance, a vector is a measure of the relative position of two points. See Vector Sum Tool for some more detail.

Vector Sum Tool



The Vector Sum Tool can be used to create the *Vector* that is the sum (also known as the resultant) of two other *Vectors*.

To use this tool, first select two *Vectors*. This can be done either by clicking on a *Vector* or by clicking on a *Vector Point* (the endpoint of a *Vector*).

Then click on a *Point* that you wish the new *Vector* to start at. If you do not click on a *Point* then one will be created automatically.

Mathematical Definition

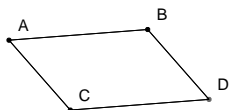
A vector can be thought of as an instruction to move a certain distance in a certain direction. The resultant (or sum) of two vectors is defined to be a single distance and direction instruction that will move you to the same place as if you had carried out the instructions relating to the two original vectors one after the other. i.e. the route taken does not matter; vectors are added “as the crow flies”.

Copy Vector Tool

The Copy Vector Tool can be used in two related ways. Firstly it can be used to simply make a copy of a *Vector* but with a different starting point. Secondly it can be used to make a *Vector* that can be defined by any two *Points*.

To use this Tool, first click either on a *Line Segment* (which may be a *Vector*) or on any two *Points* (these can be the start and end *Points* of a *Vector*). Then click on a *Point* that you wish the new *Vector* to start at (if you do not click on a *Point*, a new one will be created automatically).

Example AB is a *Vector*. CD is a *Vector Copy* of AB .
Hence $ABCD$ is a parallelogram.

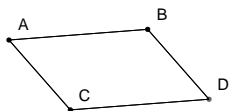


If *Point A* is moved, *Point B* also moves.

If *Point B* is moved, *Point C* also moves.

If *Point C* is moved, *Point D* also moves.

Example 2 AB is a *Line Segment*. CD is a *Vector Copy* of AB .
Hence $ABCD$ is a parallelogram.



If *Point A* is moved, *Point D* also moves.

If *Point B* is moved, *Point D* also moves.

If *Point C* is moved, *Point D* also moves.

Addition Tool

This Tool can be used to add up any two *Measurements* and then display the result. This can then be treated like any other *Measurement*; it can be moved around and it can have other calculations performed upon it. The same is true of the other Tools on this page.

To use it, simply click on any two *Measurements*.

Subtraction Tool

This Tool can be used to find the difference between any two *Measurements*.

To use it, simply click on any two *Measurements*.

Multiplication Tool

This Tool can be used to find the product of any two *Measurements*.

To use it, simply click on any two *Measurements*.

Square Tool


This Tool can be used to find the square of any *Measurement*.


To use it, simply click on any *Measurement*.

Square Root Tool

This Tool can be used to find the square root of any *Measurement*.

To use it, simply click on any *Measurement*.

X Coordinate Tool  This Tool can be used to display the ordinate of any *Point*.
To use it, simply click on a *Point*.

Y Coordinate Tool  This Tool can be used to display the abscissa of any *Point*.
To use it, simply click on a *Point*.