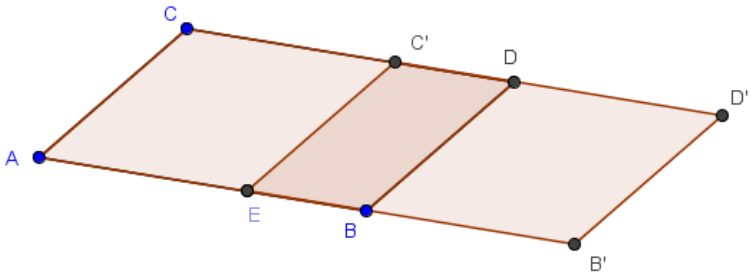
Using Logic Operators to hide or show objects

Preparations

- Open a new GeoGebra file.
- Hide the Algebra View and coordinate axes (*View* menu).
- Show the Input Bar (*View* menu).
- Set the number of decimal places to 0 (menu *Options* – *Decimal places*).

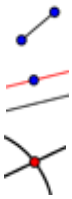


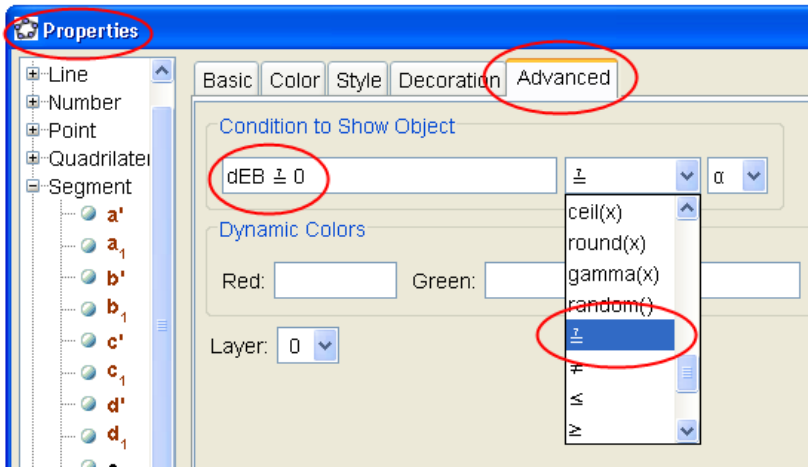
Introduction of new tools

 **Angle Bisector tool,**  **Check Box to Show/Hide Objects**	

Hints: Don't forget to read the toolbar help if you don't know how to use a tool. Try out new tools before you start the construction.

Instructions

1		Create a parallelogram ABCD by any means using the **Segment between Two Points** tool, the **Parallel Line** tool and the **Intersect Two Objects** tool. (Orient AB so that it is roughly horizontal with A to the left of B)
2		Use the **New Point** tool to place a random point E on the side AB
3		Use the **Polygon** tool to create a parallelogram object ("poly1") within the vertices ABCD
4		Use the **Vector between Two Points** tool to create a vector from point A to point E
5		Use the **Translate Object by Vector** tool and first click on the "poly1", the shaded parallelogram polygon, then click on the vector **u**, between A and B. This should have the effect of creating a new, congruent parallelogram with its corner on point E rather than point A. Now slide point E along AB.
6		Right-click on the vector **u** between A and B and de-select **Show Object** to hide the vector.

7		In the Input Bar type: dEB=distance[E,B] and press return. Press CTRL + SHIFT + A to see the Algebra View if not already visible. Slide point E along AB and observe the value of "dEB" change in the Algebra View window.
8		Draw in the diagonal B'C' in the translated parallelogram.
9		Right-click on the diagonal between B' and C' and select Properties from the list. Fill in the Advanced Condition as shown in the picture below:  Note that simply typing an equal sign from the keyboard will not suffice, the Logic equality symbol must be chosen from the drop-down list in order for the condition to work. Click "Close" in the properties box What do you now notice as point E is slid along AB?
10		Use the **Angle Bisector** tool to bisect angles B'C'D' and C'D'B'. You may find it helpful to have a small gap between E and B for these constructions here and for some of the stages below too.
11		Use the **Intersect Two Objects** tool to create a point on the intersection of the above two angle bisectors, point F, say. Right-click on both angle bisectors in-turn and de-select **Show Object** to hide them.
12	 	Use the **Perpendicular Line** tool to drop a perpendicular from the angle bisector intersection point F onto the line segment C'D'. Use the **Intersect Two Objects** tool to create a point on the intersection of this perpendicular with C'D', point G, say. Right-click on the perpendicular line and de-select **Show Object** to hide it.
13		Use the **Circle with Centre through Point** to draw a circle centred on F having radius FG. Right-click on the points F and G and de-select **Show Object** to hide them in turn. Now slide point E along AB – what do you notice?

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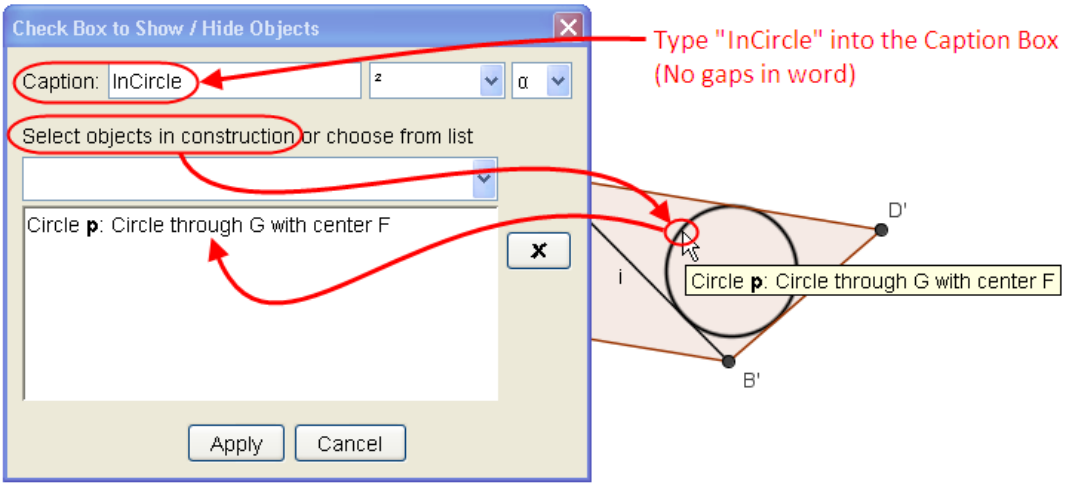
Click on the **Check Box to Show/Hide Objects** icon and then click just above your diagram in an area of free space in the Geogebra screen. This will open up its dialogue box. As shown below give this checkbox the name "InCircle" – don't put gaps between any letters.

Next just click the mouse on the circle to select it and then click the **Apply** button to close the dialogue box.



You should now see the Checkbox called **InCircle** on your screen: ☑ InCircle

What do you notice when this box is checked and un-checked?

15 Right-click on the InCircle Checkbox, make a note of its name. It may have written down something like "**Boolean Value m**", this just means its name is just **m**.

Once again using the Advanced Tab write dEB $\stackrel{?}{=}$ 0 into the **Conditions** text box, entering the logical equal symbol as in step 9 above. Click on close

16 Experiment moving point E along AB, sometimes with the InCircle Checkbox checked, sometimes not. What do you notice and how can it logically be remedied? Answer on next page!

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	The problem is that the incircle only vanishes as points E and B are separated if the InCircle Checkbox is unchecked
17	To remedy this right-click on the incircle and from the Advanced Tab in its Properties you need to have the logical statement stating that the condition to show the incircle is that its Checkbox, **m**, must be checked (m=1) AND the distance between points E and B is zero (dEB=0). This translates to the formal logical statement: $m \stackrel{?}{=} 1 \wedge dEB \stackrel{?}{=} 0$ Therefore, type this into the Condition text box for the incircle and experiment again sliding point E along AB to see if it does as expected.