Cabri Jr. Activity: Construction of a Kite and Investigating its Properties

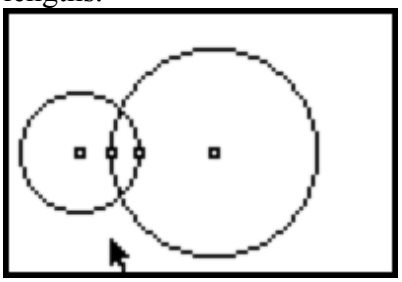
First Turn on your TI-84 Plus and press the APPS key. Arrow down until you see Cabri Jr and press ENTER. You should now see this introduction screen.

To begin the program, press any key. If a drawing comes up on the screen, press the Y= key (note the F1 above and to the right of the key-this program uses F1, F2, F3, F4, F5 names instead of the regular key names) and arrow down to NEW. It will ask you if you would like to save changes. Press the 2nd key and then enter to not save the changes.

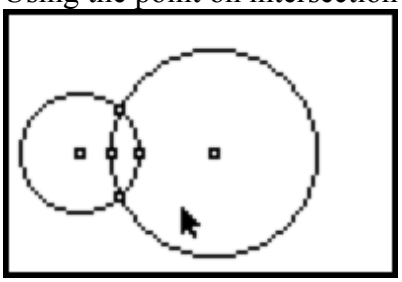
We are now ready to begin.

A kite is a special type of quadrilateral with two distinct pairs of consecutive congruent sides. Can you explain what makes a kite unique?

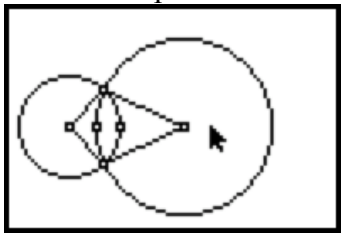
First select the circle tool under F2 and draw two circles that intersect and have different radii lengths.



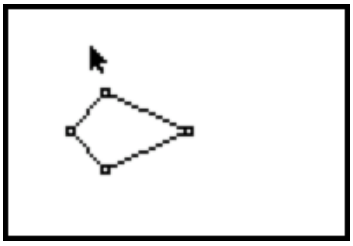
Using the point on intersection tool under F2 construct the two points where the circles intersect.

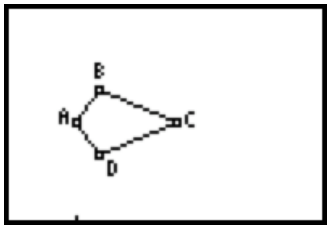


Using the segment tool under F2 construct two segments from the center of each circle to the two intersection points.



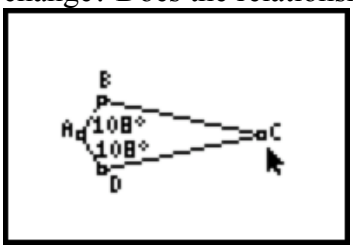
Using the hide/show tool under F5 hide the two circles and the two points used to construct the circles.





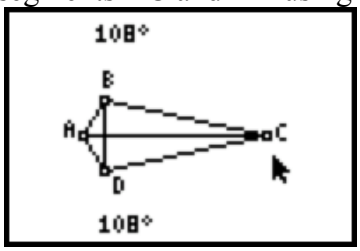
Label the vertices of the kite A, B, C, D like it is shown in the picture. This construction is valid for a kite because the radii of a circle are congruent and the radii of the two circles are independent of each other.

Begin to explore the properties of a kite by first measuring <ABC and <ADC with the measure angle tool under F5. What do you notice about the two angles? If you drag point C, do the angles change? Does the relationship between the angles change?

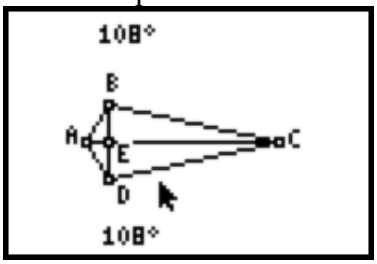


You should notice that the two angles are always congruent.

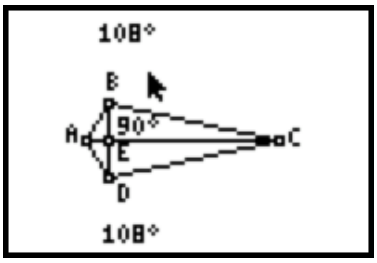
In order to explore the rest of the properties you need to construct the diagonals of the kite segments AC and BD using the segment tool under F2.



Construct point E where the two diagonals intersect using the point on intersection tool under F2.

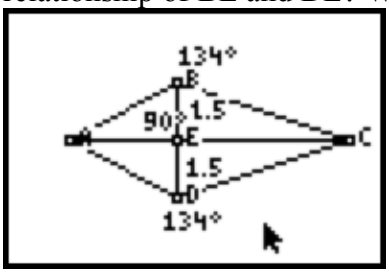


Measure <BEC using the measure angle tool under F5. What does this measure tell you about the other three angles, <BEA, <DEC, and <DEA? What can you conclude about the diagonals of a kite?



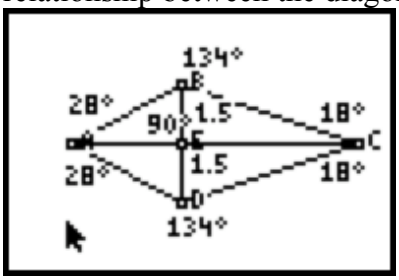
You should notice that the diagonals always form right angles.

Measure the length of segments BE and DE using the measure distance and length tool under F5. What do you notice about these lengths? Move either point A or point C, how does this effect the relationship of BE and DE? What can you conclude about segments BE and DE?



You should notice that diagonal AC splits diagonal BD in half through point E.

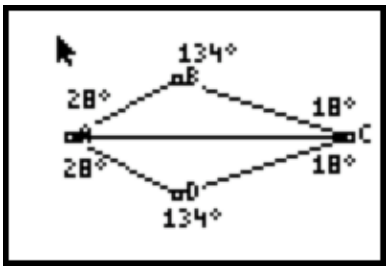
Measure the degree measure of <BAE, <DAE, <BCE, and <DCE using the measure angle tool under F5. What do you notice about the four angles? What can you conclude about the relationship between the diagonal AC and <BAD and <BCD?



You should notice that diagonal AC bisects <BAD and <BCD.

The diagonals break kite ABCD into four right triangles. Using the angle-angle-side theorem of triangle congruence it is apparent that Δ ABE and Δ ADE are congruent and Δ CBE and Δ CDE are congruent. So the diagonals of a kite break the kite into two sets of congruent right triangles. Identify which angles and which side were used to justify the triangle congruence. Can you complete a proof showing that Δ ABE and Δ ADE are congruent and Δ CBE and Δ CDE are congruent?

Next use the hide/show tool under F5 to hide diagonal DB, point E with its label, the 90 degree measurement, and the measurements of BE and DE. Now observe the relationship between Δ ABC and Δ ADC. What conclusions can you make about these two triangles?



You should notice that Δ ABC is congruent to Δ ADC by the side-side-side postulate of triangle congruence. Can you identify the congruent pairs of sides and angles between the two triangles?