Square Investigation   Name_____

Use this GeoGebra applet to help you complete the following investigation. **BE SURE to move the vertices and sides of this square around after completing each step in order to help you make more informed conjectures:**

1) Measure and display the lengths of all 4 sides. What, if anything, do you notice?

2) Construct the midpoint of $\overline{AC}$ (even though you haven't constructed $\overline{AC}$ yet.) Label this point "E".

3) Construct segments with lengths *AE, BE, CE, & DE*. Then measure and display their lengths. What do you notice? Describe in detail.

4) Measure & display the measures of the following angles: *BAE, EAD, ADE, EDC, DCE, ECB, CBE, EBA*. What do you notice? Describe.

5) Measure just one of the four angles you see with vertex *E*. What is the measure of the angle at which these diagonals intersect? After doing this, hide this angle measure. (You can easily do this by right clicking on the angle itself and uncheck the "Show Object" box.)

6) Construct polygon (triangle) *ABC*. Then reflect this polygon about $\overline{AC}$. What do you notice?

7) Use GeoGebra to "UNDO" BOTH ACTIONS in step (6).

8) Now construct polygon (triangle) *DBA*. Then reflect this polygon about diagonal $\overline{DB}$. What do you notice?

9) Use your observations in this investigation to answer the following questions:

Are opposite sides of a square congruent?

Are opposite angles (ENTIRE ANGLES—like angle *DAB* & angle *DCB*) of a square congruent?

Do the diagonals of a square bisect EACH OTHER?

Does a diagonal of a square bisect a pair of opposite angles?
If so, how many diagonals do this?

Are the diagonals of a square perpendicular?

Are the diagonals of a square congruent?

Does either diagonal of a square serve as a line of symmetry?
If so, how many?

Is a square a parallelogram? If so, WHY is it a parallelogram?
(Provide at least 3 reasons to verify your answer.)