Name _____ Date _____

7.3 Investigate: Are there patterns in the angles of polygons?

Principles of Mathematics 9

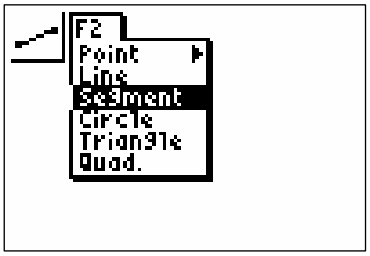
Method 3: Use a Graphing Calculator

1. Set up a table like the one shown. Enter the results of your previous investigations of angles in polygons. Use the table to record your results during this investigation.

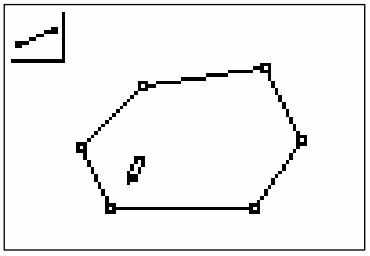
Polygon	Number of Sides	Sum of Interior Angles	Sum of Exterior Angles
triangle	3	180°	360°
quadrilateral			
pentagon			
hexagon			
heptagon			

2. Press APPS, then select **CabriJr**. Press ENTER when the title screen appears. If you need to clear a previous drawing from the screen, press Y= to display the **F1** menu and select **New**.

3. Construct a hexagon. Press WINDOW to display the **F2** menu. Select **Segment**. Use the cursor keys to move the pencil cursor to the location for the first vertex. Press ENTER and move the cursor to position the second vertex. Press ENTER to complete the first line segment; then, press ENTER again to start the next line segment. Construct the rest of the sides in the same way, ending back at the first vertex.



4. Measure the interior angles of the hexagon. Press GRAPH to display the **F5** menu, highlight **Measure**, and press ▶. Select **Angle** from the submenu. For each angle, select three points that define the angle by pressing ENTER at each point.



5. Find the sum of the interior angles. Press GRAPH to display the **F5** menu and select **Calculate**. Select three of the angle measures by moving the cursor to each one and pressing ENTER when the measurement is underlined. Then, press + and drag the subtotal to an empty part of the screen. Select this subtotal and the fourth angle measure; then, press +. Add the other two angle measures to the total in the same way.

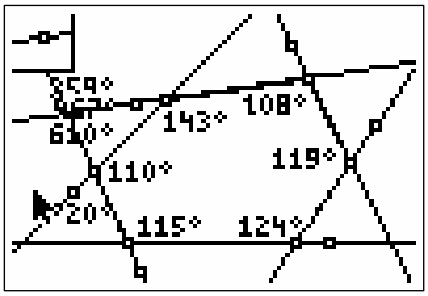
6. Check whether moving any of the vertices affects the sum of the interior angles. Press CLEAR. Move the cursor to one of the vertices, then press ALPHA. Use the cursor keys to drag the vertex to various new locations. Try moving the other vertices as well.

7. **Reflect** What can you conclude about the sum of the interior angles in any hexagon? Explain your reasoning.

8. Press WINDOW to display the **F2** menu and select **Line**. Move the cursor to a point on one side of the hexagon and press ENTER. Then, move the cursor to another point on the side and press ENTER again. Use the same method to extend the other five sides.

Name _____ Date _____

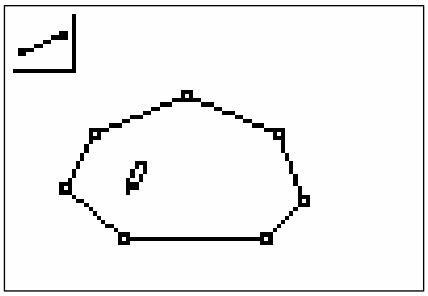
9. Press WINDOW to display the **F2** menu. With the cursor on **Point**, press ▶. Select **Point on** from the submenu. To place a point for an exterior angle, move the cursor onto the portion of a line outside the quadrilateral and press ENTER. Place similar points on the other five lines.



10. Use the Measure and Calculate functions to find the sum of the exterior angles. Then, test whether moving the vertices affects this sum.

11. Reflect What can you conclude about the sum of the exterior angles of any hexagon? Explain your reasoning.

12. Use the **Segment** option from the **F2** menu to construct a heptagon.



13. Use the Measure and Calculate functions to find the sum of the interior angles of your heptagon. Check whether moving any of the vertices affects this sum.

14. Reflect What can you conclude about the sum of the interior angles in any heptagon?

15. Use the **Line** and **Point** functions to construct an exterior angle at each vertex of your heptagon.

16. Use the **Measure** and **Calculate** functions to find the sum of the exterior angles of your heptagon. Check whether moving any of the vertices affects this sum.

17. Reflect What can you conclude about the sum of the exterior angles in any heptagon?

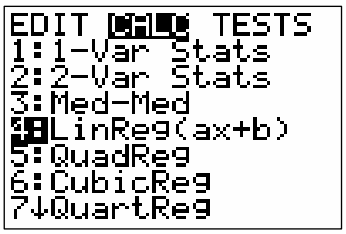
18. Press Y= to display the **F1** menu, and select **Quit** to exit from Cabri Jr.

19. Clear all lists. Then, enter the numbers of sides from the second column of your table into list **L1,** and the sums of the interior angles into list **L2**. Create a scatter plot of the data.

20. Reflect What type of relationship does your scatter plot show?

21. Use the LinReg function to find an equation relating the sum of the interior angles to the number of sides of a polygon. Press STAT and cursor over to display the **CALC** menu. Then, select **4:LinReg(ax+b)** and press ENTER.

22. The calculator displays the equation of the line of best fit for the data in lists **L1** and **L2**. On the display, **y** represents the sum of the interior angles and **x** represents the number of sides. In geometry, the number of sides is usually represented by the letter *n*. Write the equation in this form: Angle Sum = $an + b$. Is this equation equivalent to the formula Angle Sum = $180(n - 2)$?



23. Reflect How does the sum of the interior angles of a polygon change with the number of sides? Describe how you can use the equation for this relation to find the sum of the interior angles in any polygon.

