ACTIVITY 9
Inscribed Stars

Before doing this activity...

- you should review inscribed angle, central angle, interior angle, and inscribed figure.
- edit the program’s preferences so that labels are shown automatically for all new points (select Preferences from the Edit menu)

ACTIVITY:

Step 1. Using the Circle tool, construct circle AB.

Step 2. Starting anywhere on the circle, use the Segment tool to construct segments to make a five-pointed star. (Be each point is on the circle. Check by dragging each point. If a point is not on the circle then undo and repeat this step.)

Step 3. Note that there are five interior angles in the star. These angles also happen to be inscribed angles which intercept the entire circle.

Measure each inscribed angle by selecting the points that determine that angle (be sure the vertex is the second point selected) and choose Angle from the Measure menu.

m∠CDE = 53.38°
m∠DEF = 30.72°
m∠EFG = 44.75°
m∠FGC = 23.72°
m∠GCD = 27.43°
Step 4. What is the sum of the measures of the angles of a five-pointed star inscribed in a circle? To determine this, select all of the angle measurements, choose Calculate from the Measure menu, choose each angle measurement from the Values menu followed by +, and then finally click on OK.

![Image showing angle measurements and calculation](image)

Is it always the same sum? Investigate this by dragging the points on the circle and changing the size of the circle. (Be sure that the figure remains a star.)

Step 5. Using the Text tool, double-click and type your answer to the following question. **What is the sum of the measures of the angles of a five-pointed star inscribed in a circle?**

Step 6. Now we need to investigate why this is true.

Create the central angles which have the same intercepted arcs as your inscribed angles of the five-pointed star. (You may want to select the segments and choose Dashed under Line Width from the Display menu.)
Step 7. Measure each central angle by selecting the points that determine that angle (be sure the vertex is the second point selected) and choose \textit{Angle} from the \textit{Measure} menu.

\[
\begin{align*}
\measuredangle \text{DAG} &= 54.85^\circ \\
\measuredangle \text{GAE} &= 89.50^\circ \\
\measuredangle \text{EAC} &= 106.76^\circ \\
\measuredangle \text{CAF} &= 47.45^\circ \\
\measuredangle \text{FAD} &= 61.44^\circ
\end{align*}
\]

Step 8. What is the sum of the measures of the central angles of a circle? To determine this, select all of the angle measurements, choose \textit{Calculate} from the \textit{Measure} menu, choose each angle measurement from the \textit{Values} menu followed by $+$, and then finally click on \textit{OK}.

Is it always the same sum? Investigate this by dragging the points on the circle and changing the size of the circle. (Be sure that the figure remains a star.)

Step 9. Using what we "discovered" in \textit{Activity 6: Inscribed Angles and Central Angles}, we can now explain why.

Using the Text tool $\textbf{A}$, double-click and type your answer to the following question. \textbf{Why is the sum of the angles of an inscribed star 180 degrees?}
LOOKING BACK:
In this activity, you "discovered" that sum of the angles of an inscribed star is always a 180 degrees. You dragged points around the circle and changed the size of the circle but it always remained the same. The second important item of this activity was being able to explain why. As you explained, since the sum of the central angles of the star (or the circle since the angles intercept the entire circle) is 360 degrees and the measurement of an inscribed angle is half the measurement of a central angle when subtended by the same arc, it follows that the sum of the measurements of the inscribed angles of the star should be 180 degrees (half of 360 degrees).