4. [12 pts] Compute the interior angle total for a 57-gon, then thoroughly explain why the formula you used is true.

\[(57 - 2) \cdot 180^\circ = 55 \cdot 180^\circ = 9900^\circ\]

When you draw diagonals all starting at the same single vertex of the 57-gon, you can draw 54 diagonals. It's only 54 diagonals because you cannot connect your starting vertex to itself nor to the two adjacent vertices with a diagonal.

Now each diagonal you draw cuts off one triangular slice inside the polygon, and there's one extra triangle at the end:

55 triangles at 180° apiece is our answer.

5. [8 pts] Find the measurement of \(\angle DBE\) using this diagram of a regular polygon, in which \(AE\) bisects \(\angle CBD\). Show clear work, but you need not explain.

Regular octagon:
interior angle total \(= 6 \cdot 180^\circ = 1080^\circ\)
shared equally, each angle is worth \(1080^\circ \div 8 = 135^\circ\).

\(m(\angle CBD) = 135^\circ\)
\(m(\angle ABD) = 135^\circ \div 2 = 67.5^\circ\) because \(AE\) bisects \(\angle CBD\).

Then the linear pair \(m(\angle DBE) = 180^\circ - 67.5^\circ = 112.5^\circ\).

6. [6 pts - 2 each] Name a type of quadrilateral that satisfies each statement below. You may reuse a name if you wish. If not possible, say so.

(a) They always have diagonals that are congruent.

Square, rectangle, isosceles trapezoid

(b) You can draw one having exactly three sides the same length.

Trapezoid:

(c) They always have at least two adjacent sides that are the same length.

Kite, Rhombus, Square