

GOGEO718ANS

Draw chord BC, radii OB, OC, and OQ and extend OQ to E on the smaller circle. Extend ADQ to E' on the smaller circle. Draw chords BQ and CQ. Finally draw chords CE, EB, CE' and BE'.

$$\angle QOB = \angle QOC = 40^{\circ}51'16''$$

In triangles OQC and OQB,

$$\angle OBQ = \angle OQB = \angle OQC = \angle OCQ = \frac{180^{\circ} - 40^{\circ}51'16''}{2} = 69^{\circ}34'22''$$

$$\angle BQC = 139^{\circ}08'44'' \text{ so } \angle BE'C = \angle BEC = 69^{\circ}34'22''$$

($\angle BQC$ could have been derived from quadrilateral ABQC being cyclic, too)

Quadrilaterals CDBE' and CDBE are cyclic quadrilaterals, so

$$\angle BDC = 180^{\circ} - 69^{\circ}34'22'' = 110^{\circ}25'38''$$