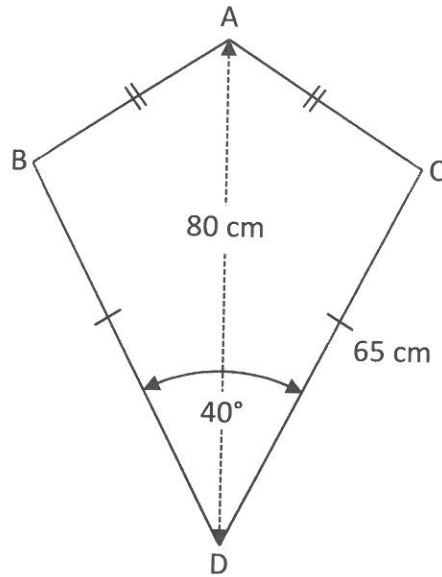


Example 6

The kite shown in the diagram below is going to be made out of fabric. The person cutting the fabric needs to know the length of the short edge of the kite (side \overline{AC}). Determine the size of side \overline{AC} , given that $\overline{AD} = 80$ cm, $\overline{CD} = 65$ cm, and $\angle BDC = 40^\circ$.



Focus on the right-hand triangle (triangle ACD). The two given sides are 80 cm and 65 cm. The angle (at D) is HALF of the angle that spans both triangles; it is 20° . There are no partners, so this is a cosine law question.

(Note that we are calling side \overline{AC} 'x' in this example:

$$\begin{aligned}
 a^2 &= b^2 + c^2 - 2bc \cos A \\
 x^2 &= 80^2 + 65^2 - 2(80)(65) \cos 20^\circ \\
 x^2 &= 852.1967438 \\
 \sqrt{x^2} &= \sqrt{852.1967438}
 \end{aligned}$$

$$x = 29.19 \text{ cm}$$