Math Computing

NCERT 9.7.1.6

This question is from class 9 NCERT chapter 7.triangles

1. **AC** = **AE** , **AB** = **AD** and $\angle BAD = \angle EAC$. Show that**BC** = **DE**

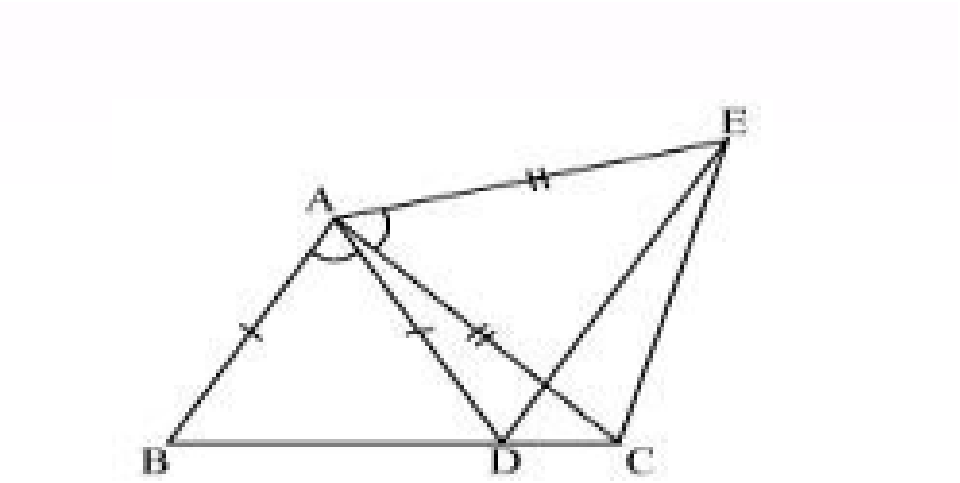

Figure 1: $\triangle$**ABC** *and* $\triangle$**ADE**

Construction steps:

(i) Let assume, the input parameters are,

Parameter	Value	Description
θ	$60°$	$\angle\mathbf{BAD} = \angle\mathbf{CAE}$
B	$\begin{pmatrix}0\\0\end{pmatrix}$	Reference point at origin
D	$\begin{pmatrix}6\\0\end{pmatrix}$	point **D** on the same axis of **B**
C	$\begin{pmatrix}8\\0\end{pmatrix}$	point **C** on the same axis of **B**

Table 1: Input Parameters

$\therefore$ the output can be calculated as,

Parameter	Value	Description
BD	$\|B - D\|$	Length of **BD**
CD	$\|C - D\|$	Length of **CD**
α	$\frac{180-\theta}{2}$	Angle **ABD**
AB	$\mathbf{BD}\frac{\sin\alpha}{\sin\theta}$	Length of **AB**
A	$\mathbf{B} + \begin{pmatrix}\mathbf{AB}\cos\alpha\\\mathbf{AB}\sin\alpha\end{pmatrix}$	point **B** makes an angle α with line $(\mathbf{AB}, \mathbf{BD})$
AD	$\|A - D\|$	Length of **AD**
AC	$\|A - C\|$	Length of **AC**
$\beta 1$	$\cos^{-1}\frac{\mathbf{AC^2}+\mathbf{CD^2}-\mathbf{AD^2}}{\mathbf{2ACAD}}$	Angle **ACD**
CE	$\mathbf{AC}\frac{\sin\theta}{\sin\alpha}$	Length of **CE**
β	$\alpha + \beta 1$	Angle **ECB**
E	$\mathbf{C} + \begin{pmatrix}-\mathbf{CE}\cos\beta\\\mathbf{CE}\sin\beta\end{pmatrix}$	point **C** makes an angle β with line $(\mathbf{BC}, \mathbf{CE})$

Table 2: Output Parameters

$\therefore$ By, joining these points forms the required figure

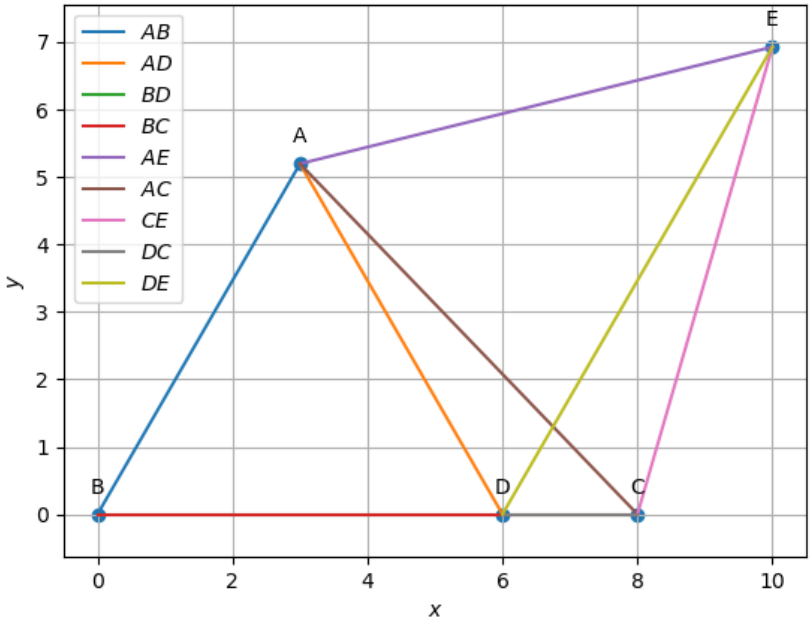

Figure 2: $\triangle$**ABC** *and* $\triangle$**ADE**