Consider a triangle with vertices

$$\mathbf{A} = \begin{pmatrix} -6 \\ -3 \end{pmatrix}, \mathbf{B} = \begin{pmatrix} -4 \\ -6 \end{pmatrix}, \mathbf{C} = \begin{pmatrix} -5 \\ -3 \end{pmatrix} \quad (1)$$

TABLE 1: Vectors.

Parameters	Values	Description
$\mathbf{m_1}$	$\begin{pmatrix} 2 \\ -3 \end{pmatrix}$	AB
$\mathbf{m_2}$	$\begin{pmatrix} -1 \\ 3 \end{pmatrix}$	BC
$\mathbf{m_3}$	$\begin{pmatrix} -1 \\ 0 \end{pmatrix}$	CA
$\|A - B\|$	3.6	Length of AB
$\|B - C\|$	3.16	Length of BC
$\|C - A\|$	1	Length of CA
$\text{rank}\begin{pmatrix} 1 & 1 & 1 \\ \mathbf{A} & \mathbf{B} & \mathbf{C} \end{pmatrix}$	3	Non-collinear
$\mathbf{n_1}$	$\begin{pmatrix} -3 \\ -2 \end{pmatrix}$	AB
c_1	24	
$\mathbf{n_2}$	$\begin{pmatrix} 3 \\ 1 \end{pmatrix}$	BC
c_2	-18	
$\mathbf{n_3}$	$\begin{pmatrix} 0 \\ 1 \end{pmatrix}$	CA
c_3	-3	
Area	1.5	Area of triangle
$\angle A$	56.31°	
$\angle B$	15.25°	Angles
$\angle C$	108.44°	

TABLE 2: Median.

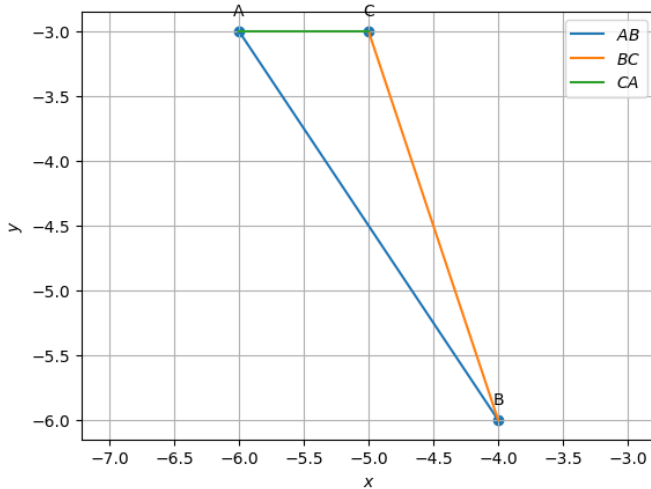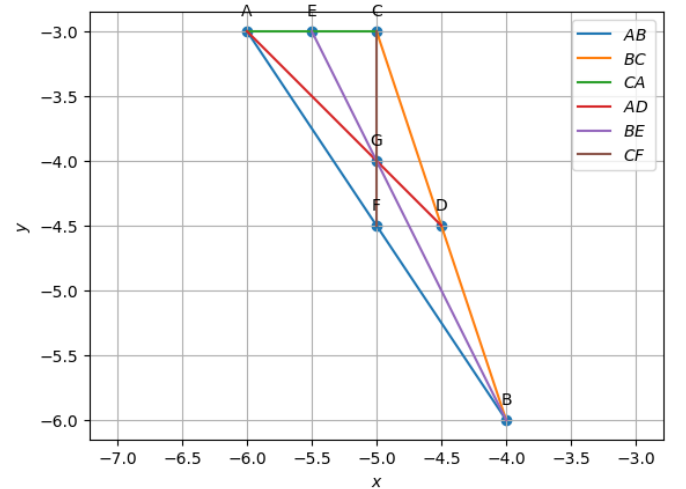| Parameters	Values	Description
$\mathbf{D}$	$\begin{pmatrix} -4.5 \\ -4.5 \end{pmatrix}$	Midpoint of BC
$\mathbf{E}$	$\begin{pmatrix} -5.5 \\ -3 \end{pmatrix}$	Midpoint of CA
$\mathbf{F}$	$\begin{pmatrix} -5 \\ -4.5 \end{pmatrix}$	Midpoint of AB
$\mathbf{m_4}$	$\begin{pmatrix} 1.5 \\ -1.5 \end{pmatrix}$	AD
$\mathbf{n_4}$	$\begin{pmatrix} 1.5 \\ 1.5 \end{pmatrix}$	
c_4	-13.5	
$\mathbf{m_5}$	$\begin{pmatrix} -1.5 \\ 3 \end{pmatrix}$	BE
$\mathbf{n_5}$	$\begin{pmatrix} -3 \\ -1.5 \end{pmatrix}$	
c_5	21	
$\mathbf{m_6}$	$\begin{pmatrix} 0 \\ -1.5 \end{pmatrix}$	CF
$\mathbf{n_6}$	$\begin{pmatrix} 1.5 \\ 0 \end{pmatrix}$	
c_6	7.5	
$\mathbf{G}$	$\begin{pmatrix} -5 \\ -4 \end{pmatrix}$	Centroid
$\frac{BG}{GE}$ $\frac{CG}{GF}$ $\frac{AG}{GD}$	2	Division ratio by $\mathbf{G}$
$\text{rank}\begin{pmatrix} 1 & 1 & 1 \\ \mathbf{A} & \mathbf{D} & \mathbf{G} \end{pmatrix}$ $\text{rank}\begin{pmatrix} 1 & 1 & 1 \\ \mathbf{B} & \mathbf{E} & \mathbf{G} \end{pmatrix}$ $\text{rank}\begin{pmatrix} 1 & 1 & 1 \\ \mathbf{C} & \mathbf{F} & \mathbf{G} \end{pmatrix}$	2	Collinear

Fig. 1: Triangle plotted using python

Fig. 2: Medians plotted using python

TABLE 3: Altitude.

Parameters	Values	Description
$\mathbf{D_1}$	$\begin{pmatrix} -5.1 \\ -2.7 \end{pmatrix}$	Foot of altitude from A
$\mathbf{E_1}$	$\begin{pmatrix} -4 \\ -3 \end{pmatrix}$	Foot of altitude from B
$\mathbf{F_1}$	$\begin{pmatrix} -5.7 \\ -3.5 \end{pmatrix}$	Foot of altitude from C
$\mathbf{m_7}$	$\begin{pmatrix} 0.9 \\ 0.3 \end{pmatrix}$	AD_1
$\mathbf{n_7}$	$\begin{pmatrix} -1 \\ 3 \end{pmatrix}$	
c_7	-3	
$\mathbf{m_8}$	$\begin{pmatrix} 0 \\ 3 \end{pmatrix}$	BE_1
$\mathbf{n_8}$	$\begin{pmatrix} -1 \\ 0 \end{pmatrix}$	
c_8	4	
$\mathbf{m_9}$	$\begin{pmatrix} -0.7 \\ -0.5 \end{pmatrix}$	CF_1
$\mathbf{n_9}$	$\begin{pmatrix} 2 \\ -3 \end{pmatrix}$	
c_9	-1	
$\mathbf{H}$	$\begin{pmatrix} -4 \\ -2.33 \end{pmatrix}$	Orthocentre

TABLE 4: Perpendicular Bisector.

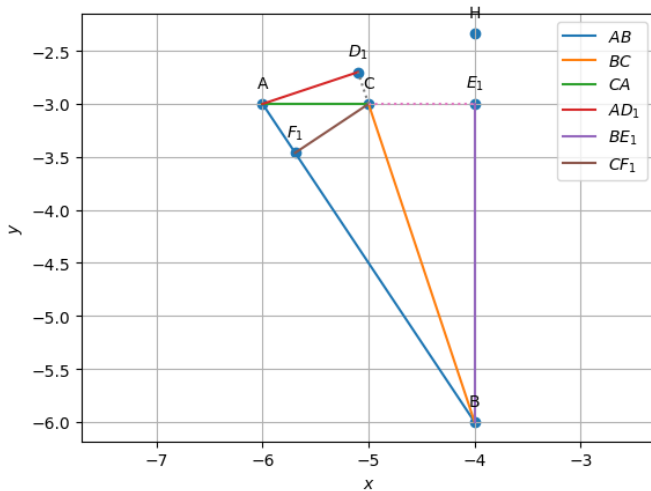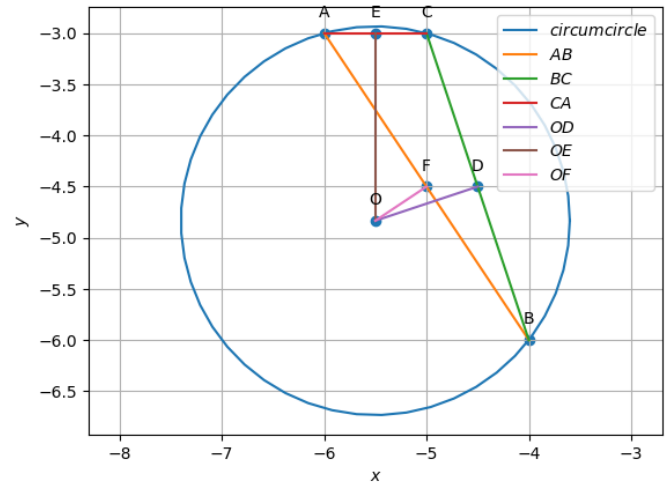| Parameters	Values	Description
$\mathbf{m_{10}}$	$\begin{pmatrix} 3 \\ 1 \end{pmatrix}$	AD_2
$\mathbf{n_{10}}$	$\begin{pmatrix} -1 \\ 3 \end{pmatrix}$	
c_{10}	-9	
$\mathbf{m_{11}}$	$\begin{pmatrix} 0 \\ -1 \end{pmatrix}$	BE_2
$\mathbf{n_{11}}$	$\begin{pmatrix} 1 \\ 0 \end{pmatrix}$	
c_{11}	-5.5	
$\mathbf{m_{12}}$	$\begin{pmatrix} 3 \\ 2 \end{pmatrix}$	CF_2
$\mathbf{n_{12}}$	$\begin{pmatrix} -2 \\ 3 \end{pmatrix}$	
c_{12}	-3.5	
$\mathbf{O}$	$\begin{pmatrix} -5.5 \\ -4.83 \end{pmatrix}$	Circumcentre
$\|\mathbf{O} - \mathbf{A}\|$	1.9	$OA = OB = OC = R$
$\|\mathbf{O} - \mathbf{B}\|$	1.9	
$\|\mathbf{O} - \mathbf{C}\|$	1.9	
R	1.9	
$\angle BOC$	112.62°	$\angle BOC = 2\angle BAC$
$\angle BAC$	56.31°	
$\angle AOC$	30.51°	$\angle AOC = 2\angle ABC$
$\angle ABC$	15.25°	
$\angle AOB$	216.87°	$\angle AOB = 2\angle BCA$
$\angle BCA$	108.43°	

Fig. 3: Altitudes plotted using python

Fig. 4: Perpendicular bisectors plotted using python

TABLE 5: Angular Bisector.

| Parameters	Values	Description
$\mathbf{m_{13}}$	$\begin{pmatrix} -1.56 \\ 0.83 \end{pmatrix}$	AI
$\mathbf{n_{13}}$	$\begin{pmatrix} 0.83 \\ 1.56 \end{pmatrix}$	
c_{13}	-9.66	
$\mathbf{m_{14}}$	$\begin{pmatrix} -0.87 \\ 1.78 \end{pmatrix}$	BI
$\mathbf{n_{14}}$	$\begin{pmatrix} -1.78 \\ -0.87 \end{pmatrix}$	
c_{14}	12.35	
$\mathbf{m_{15}}$	$\begin{pmatrix} 0.68 \\ 0.95 \end{pmatrix}$	CI
$\mathbf{n_{15}}$	$\begin{pmatrix} -0.95 \\ 0.68 \end{pmatrix}$	
c_{15}	2.69	
$\mathbf{I}$	$\begin{pmatrix} -5.28 \\ -3.39 \end{pmatrix}$	Incentre
$\mathbf{D_3}$	$\begin{pmatrix} -4.91 \\ -3.26 \end{pmatrix}$	Point of contact with BC
$\mathbf{E_3}$	$\begin{pmatrix} -5.28 \\ -3 \end{pmatrix}$	Point of contact with AC
$\mathbf{F_3}$	$\begin{pmatrix} -5.6 \\ -3.6 \end{pmatrix}$	Point of contact with AB
$\|\mathbf{I-D_3}\|$	0.386	$ID_3 = IE_3 = IF_3 = r$
$\|\mathbf{I-E_3}\|$	0.386	
$\|\mathbf{I-F_3}\|$	0.386	
r	0.386	
$\angle BAI$	28.15°	$\angle BAI = \angle CAI$
$\angle CAI$	28.15°	
$\angle ABI$	7.63°	$\angle ABI = \angle CBI$
$\angle CBI$	7.63°	
$\angle ACI$	54.22°	$\angle ACI = \angle BCI$
$\angle BCI$	54.22°	
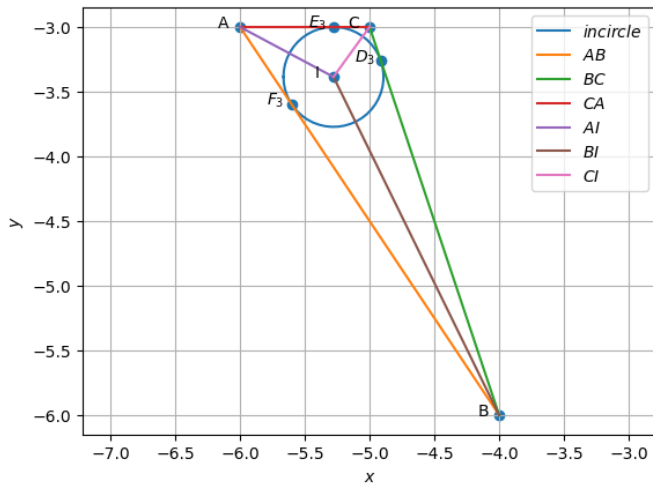
Fig. 5: Angle bisectors plotted using python