Consider a triangle with vertices

$$\mathbf{A} = \begin{pmatrix} -4 \\ -3 \end{pmatrix} \tag{1}$$

$$\mathbf{B} = \begin{pmatrix} -6 \\ 1 \end{pmatrix} \tag{2}$$

$$\mathbf{C} = \begin{pmatrix} -5 \\ -5 \end{pmatrix} \tag{3}$$

TABLE I
TRIANLE

parameters	values	description
$\mathbf{m_1}$	$\begin{pmatrix} -2 \\ 4 \end{pmatrix}$	AB
$\mathbf{m_2}$	$\begin{pmatrix} -1 \\ -6 \end{pmatrix}$	BC
$\mathbf{m_3}$	$\begin{pmatrix} 1 \\ 2 \end{pmatrix}$	CA
$\|\|A-B\|\|$	4.47	length of AB
$\|\|B-C\|\|$	6.0827	length of BC
$\|\|C-A\|\|$	2.236	length of CA
$\text{rank}\begin{pmatrix} 1 & 1 & 1 \\ \mathbf{A} & \mathbf{B} & \mathbf{C} \end{pmatrix}$	3	non collinear
$\mathbf{n_1}$	$\begin{pmatrix} 6 \\ 1 \end{pmatrix}$	AB
c_1	-35	
$\mathbf{n_2}$	$\begin{pmatrix} -2 \\ 1 \end{pmatrix}$	BC
c_2	5	
$\mathbf{n_3}$	$\begin{pmatrix} -4 \\ -2 \end{pmatrix}$	CA
c_3	22	
Area	4	Area of Triangle
$\angle A$	126.86°	Angles
$\angle B$	17.10°	
$\angle C$	36.02°	

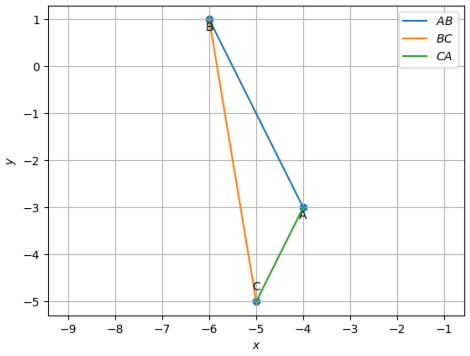

Fig. 1. Sides

TABLE II
MEDIANS

parameters	value	description
$\mathbf{D}$	$\begin{pmatrix} 3 \\ 2 \end{pmatrix}$	BC midpoint
$\mathbf{E}$	$\begin{pmatrix} 2 \\ 0 \end{pmatrix}$	CA midpoint
$\mathbf{F}$	$\begin{pmatrix} 3 \\ 1 \end{pmatrix}$	AB midpoint
$\mathbf{m_4}$	$\begin{pmatrix} 1 \\ 3 \end{pmatrix}$	AD
$\mathbf{n_4}$	$\begin{pmatrix} 3 \\ -1 \end{pmatrix}$	
c_4	7	
$\mathbf{m_5}$	$\begin{pmatrix} -2 \\ -3 \end{pmatrix}$	BE
$\mathbf{n_5}$	$\begin{pmatrix} -3 \\ 2 \end{pmatrix}$	
c_5	-6	
$\mathbf{m_6}$	$\begin{pmatrix} 1 \\ 0 \end{pmatrix}$	CF
$\mathbf{n_6}$	$\begin{pmatrix} 0 \\ -1 \end{pmatrix}$	
c_6	-1	
$\mathbf{G}$	$\begin{pmatrix} 2.67 \\ 1 \end{pmatrix}$	Centroid
$\frac{BG}{GE}$	2	Division ratio by $\mathbf{G}$
$\frac{CG}{GF}$		
$\frac{AG}{GD}$		
$\text{rank}\begin{pmatrix} 1 & 1 & 1 \\ \mathbf{A} & \mathbf{D} & \mathbf{G} \end{pmatrix}$	2	collinear
$\text{rank}\begin{pmatrix} 1 & 1 & 1 \\ \mathbf{B} & \mathbf{E} & \mathbf{G} \end{pmatrix}$		
$\text{rank}\begin{pmatrix} 1 & 1 & 1 \\ \mathbf{C} & \mathbf{F} & \mathbf{G} \end{pmatrix}$		

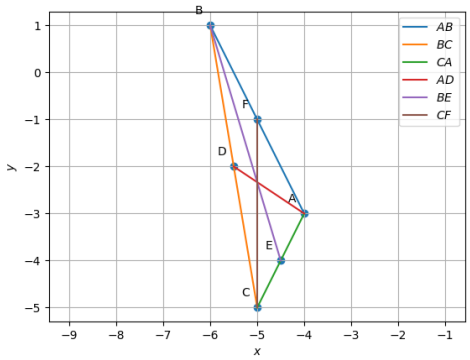

Fig. 2. Medians

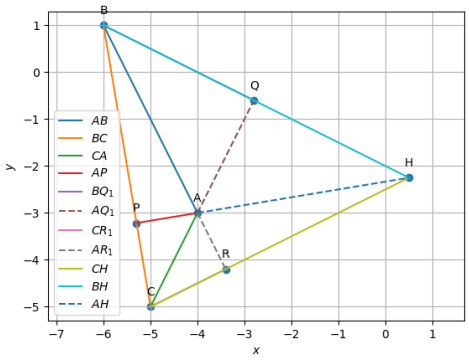

Fig. 3. Altitudes

TABLE III
MEDIANS

parameters	value	description
P	$\begin{pmatrix}1\\0\end{pmatrix}$	Foot of altitude from **A**
Q	$\begin{pmatrix}2\\3\end{pmatrix}$	Foot of altitude from **B**
R	$\begin{pmatrix}2.8\\0.6\end{pmatrix}$	Foot of altitude from **C**
$\mathbf{m_7}$	$\begin{pmatrix}-6\\-1\end{pmatrix}$	AP
$\mathbf{n_7}$	$\begin{pmatrix}-1\\6\end{pmatrix}$	
c_7	-14	
$\mathbf{m_8}$	$\begin{pmatrix}2\\-1\end{pmatrix}$	BQ
$\mathbf{n_8}$	$\begin{pmatrix}-1\\-2\end{pmatrix}$	
c_8	4	
$\mathbf{m_9}$	$\begin{pmatrix}4\\2\end{pmatrix}$	CR
$\mathbf{n_9}$	$\begin{pmatrix}2\\-4\end{pmatrix}$	
c_9	10	
H	$\begin{pmatrix}\frac{1}{2}\\\frac{9}{4}\end{pmatrix}$	Orthocentre

TABLE IV
PERPENDICULAR BISECTORS

parameters	value	description
$\mathbf{m_{10}}$	$\begin{pmatrix}-6\\-1\end{pmatrix}$	AD_1
$\mathbf{n_{10}}$	$\begin{pmatrix}1\\-6\end{pmatrix}$	
c_{10}	$\frac{13}{2}$	
$\mathbf{m_{11}}$	$\begin{pmatrix}2\\1\end{pmatrix}$	BE_1
$\mathbf{n_{11}}$	$\begin{pmatrix}-1\\2\end{pmatrix}$	
c_{11}	$\frac{-25}{2}$	
$\mathbf{m_{12}}$	$\begin{pmatrix}4\\2\end{pmatrix}$	CF_1
$\mathbf{n_{12}}$	$\begin{pmatrix}-2\\4\end{pmatrix}$	
c_{12}	6	
O	$\begin{pmatrix}\frac{31}{4}\\\frac{-119}{50}\end{pmatrix}$	Circumcentre
$\|\mathbf{O}-\mathbf{A}\|$	3.801	$OA = OB = OC = R$
$\|\mathbf{O}-\mathbf{B}\|$		
$\|\mathbf{O}-\mathbf{C}\|$		
R		
$\angle BOC$	253.73°	$\angle BOC = 2\angle BAC$
$\angle BAC$	126.86°	

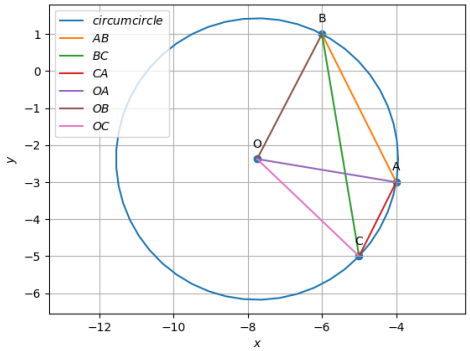

Fig. 4. Perpendicular bisectors

TABLE V
ANGULAR BISECTORS

parameters	value	description
$\mathbf{m_{13}}$	$\begin{pmatrix}0.89\\0\end{pmatrix}$	AI
$\mathbf{n_{13}}$	$\begin{pmatrix}0\\0.89\end{pmatrix}$	
c_{13}	-2.68	
$\mathbf{m_{14}}$	$\begin{pmatrix}-1.88\\-0.61\end{pmatrix}$	BI
$\mathbf{n_{14}}$	$\begin{pmatrix}1.88\\-0.61\end{pmatrix}$	
c_{14}	10.67	
$\mathbf{m_{15}}$	$\begin{pmatrix}-0.28\\-1.88\end{pmatrix}$	CI
$\mathbf{n_{15}}$	$\begin{pmatrix}1.88\\-0.28\end{pmatrix}$	
c_{15}	-7.99	
$\mathbf{I}$	$\begin{pmatrix}-4.7\\-3\end{pmatrix}$	Incentre
$\mathbf{D_3}$	$\begin{pmatrix}-5.32\\-3.1\end{pmatrix}$	Point of contact with BC
$\mathbf{E_3}$	$\begin{pmatrix}-4.14\\-3.28\end{pmatrix}$	Point of contact with AC
$\mathbf{F_3}$	$\begin{pmatrix}-4.14\\-2.72\end{pmatrix}$	Point of contact with AB
$\|\mathbf{I}-\mathbf{D_3}\|$	0.625	$ID_3 = IE_3 = IF_3 = r$
$\|\mathbf{I}-\mathbf{E_3}\|$		
$\|\mathbf{I}-\mathbf{F_3}\|$		
r		
$\angle BAI$	13.28°	$\angle BAI = \angle CAI$
$\angle CAI$		
$\angle ABI$	9.21°	$\angle ABI = \angle CBI$
$\angle CBI$		
$\angle ACI$	67.5°	$\angle ACI = \angle BCI$
$\angle BCI$		

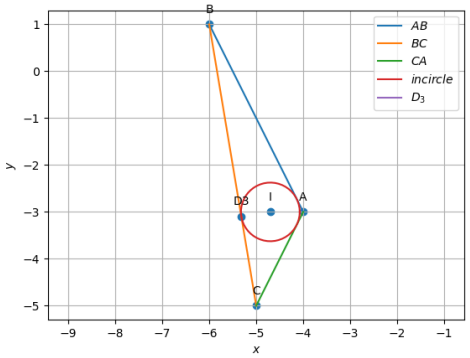

Fig. 5. Angular bisectors