

Consider a triangle with vertices

$$\mathbf{A} = \begin{pmatrix} -4 \\ -3 \end{pmatrix} \quad (1)$$

$$\mathbf{B} = \begin{pmatrix} -6 \\ 1 \end{pmatrix} \quad (2)$$

$$\mathbf{C} = \begin{pmatrix} -5 \\ -5 \end{pmatrix} \quad (3)$$

TABLE I  
TRIANGLE

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
$\angle A$	$126.86^\circ$	Angles
$\angle B$	$17.10^\circ$	
$\angle C$	$36.02^\circ$	

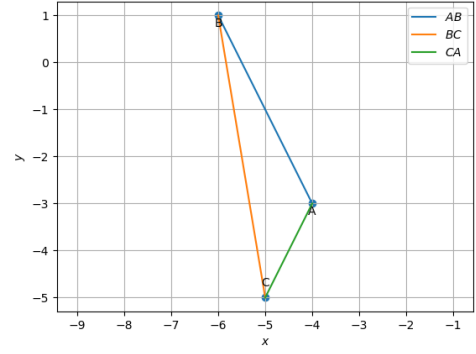


Fig. 1. Sides

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
$\text{rank}\begin{pmatrix} 1 & 1 & 1 \\ \mathbf{B} & \mathbf{E} & \mathbf{G} \end{pmatrix}$		
$\text{rank}\begin{pmatrix} 1 & 1 & 1 \\ \mathbf{C} & \mathbf{F} & \mathbf{G} \end{pmatrix}$		

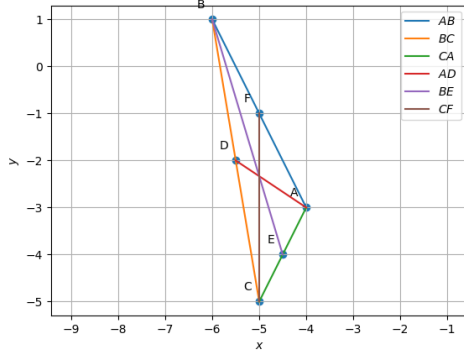


Fig. 2. Medians

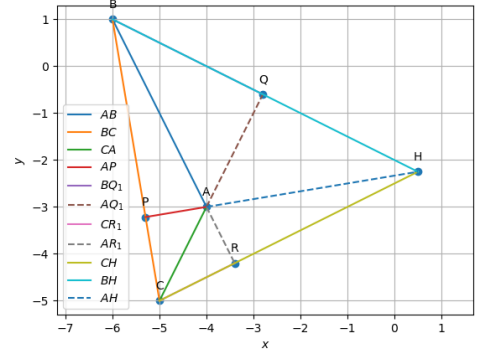


Fig. 3. Altitudes

TABLE III  
MEDIANES

parameters	value	description
<b>P</b>	$\begin{pmatrix} 1 \\ 0 \end{pmatrix}$	Foot of altitude from <b>A</b>
<b>Q</b>	$\begin{pmatrix} 2 \\ 3 \end{pmatrix}$	Foot of altitude from <b>B</b>
<b>R</b>	$\begin{pmatrix} 2.8 \\ 0.6 \end{pmatrix}$	Foot of altitude from <b>C</b>
<b>m<sub>7</sub></b>	$\begin{pmatrix} -6 \\ -1 \end{pmatrix}$	<i>AP</i>
<b>n<sub>7</sub></b>	$\begin{pmatrix} -1 \\ 6 \end{pmatrix}$	
<i>c<sub>7</sub></i>	-14	
<b>m<sub>8</sub></b>	$\begin{pmatrix} 2 \\ -1 \end{pmatrix}$	<i>BQ</i>
<b>n<sub>8</sub></b>	$\begin{pmatrix} -1 \\ -2 \end{pmatrix}$	
<i>c<sub>8</sub></i>	4	
<b>m<sub>9</sub></b>	$\begin{pmatrix} 4 \\ 2 \end{pmatrix}$	<i>CR</i>
<b>n<sub>9</sub></b>	$\begin{pmatrix} 2 \\ -4 \end{pmatrix}$	
<i>c<sub>9</sub></i>	10	
<b>H</b>	$\begin{pmatrix} 1/2 \\ 9/4 \end{pmatrix}$	Orthocentre

TABLE IV  
PERPENDICULAR BISECTORS

parameters	value	description
<b>m<sub>10</sub></b>	$\begin{pmatrix} -6 \\ -1 \end{pmatrix}$	<i>AD<sub>1</sub></i>
<b>n<sub>10</sub></b>	$\begin{pmatrix} 1 \\ -6 \end{pmatrix}$	
<i>c<sub>10</sub></i>	$\frac{13}{2}$	<i>BE<sub>1</sub></i>
<b>m<sub>11</sub></b>	$\begin{pmatrix} 2 \\ 1 \end{pmatrix}$	
<b>n<sub>11</sub></b>	$\begin{pmatrix} -1 \\ 2 \end{pmatrix}$	
<i>c<sub>11</sub></i>	$-\frac{25}{2}$	<i>CF<sub>1</sub></i>
<b>m<sub>12</sub></b>	$\begin{pmatrix} 4 \\ 2 \end{pmatrix}$	
<b>n<sub>12</sub></b>	$\begin{pmatrix} -2 \\ 4 \end{pmatrix}$	
<i>c<sub>12</sub></i>	6	Circumcentre
<b>O</b>	$\begin{pmatrix} 31/4 \\ -119/50 \end{pmatrix}$	
$\ \mathbf{O} - \mathbf{A}\ $	3.801	<i>OA = OB = OC = R</i>
$\ \mathbf{O} - \mathbf{B}\ $		
$\ \mathbf{O} - \mathbf{C}\ $		
<i>R</i>		
$\angle BOC$	253.73°	$\angle BOC = 2\angle BAC$
$\angle BAC$	126.86°	

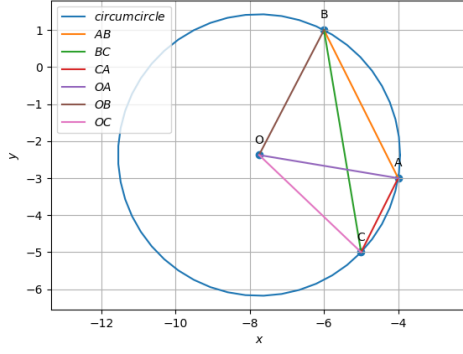


Fig. 4. Perpendicular bisectors

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°	$\angle ACI = \angle BCI$
$\angle BCI$		

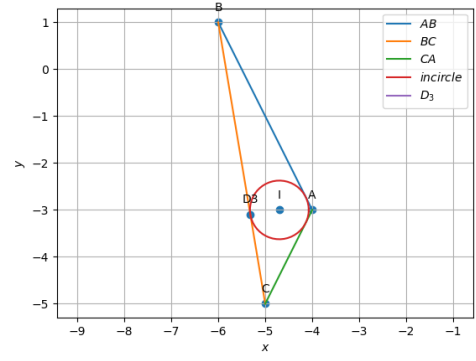


Fig. 5. Angular bisectors