Triangle Assignment

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Consider a triangle with vertices:

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

$$\mathbf{B} = \begin{pmatrix} 3 \\ 2 \end{pmatrix} \tag{2}$$

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

I. VECTORS

parameter	value	description
$\mathbf{m_{AB}}$	$\begin{pmatrix} 6 \\ 1 \end{pmatrix}$	Direction vector of AB
$\mathbf{n_{AB}^{\top}}$	$\begin{pmatrix} 1 & -6 \end{pmatrix}$	Normal vector of AB
$\|\mathbf{B}-\mathbf{A}\|$	6.083	Length of AB
$\mathbf{m_{BC}}$	$\begin{pmatrix} -2 \\ -6 \end{pmatrix}$	Direction vector of BC
$\mathbf{n_{BC}^{\top}}$	$\begin{pmatrix} -6 & 2 \end{pmatrix}$	Normal vector of BC
$\|\mathbf{C}-\mathbf{B}\|$	6.325	Length of BC
$\mathbf{m_{CA}}$	$\begin{pmatrix} -4 \\ 5 \end{pmatrix}$	Direction vector of CA
$\mathbf{n_{CA}^{\top}}$	$\begin{pmatrix} 5 & 4 \end{pmatrix}$	Normal vector of CA
$\|\mathbf{A}-\mathbf{C}\|$	6.403	Length of CA
$\operatorname{rank}\begin{pmatrix} 1 & 1 & 1 \\ A & B & C \end{pmatrix}$	3	Non Collinear
area	17	Area of Triangle
$\angle A$	60.80	angle between AB and AC
$\angle B$	62.10	angle between BA and BC
$\angle C$	57.10	angle between CB and CA

TABLE I.1
VECTORS

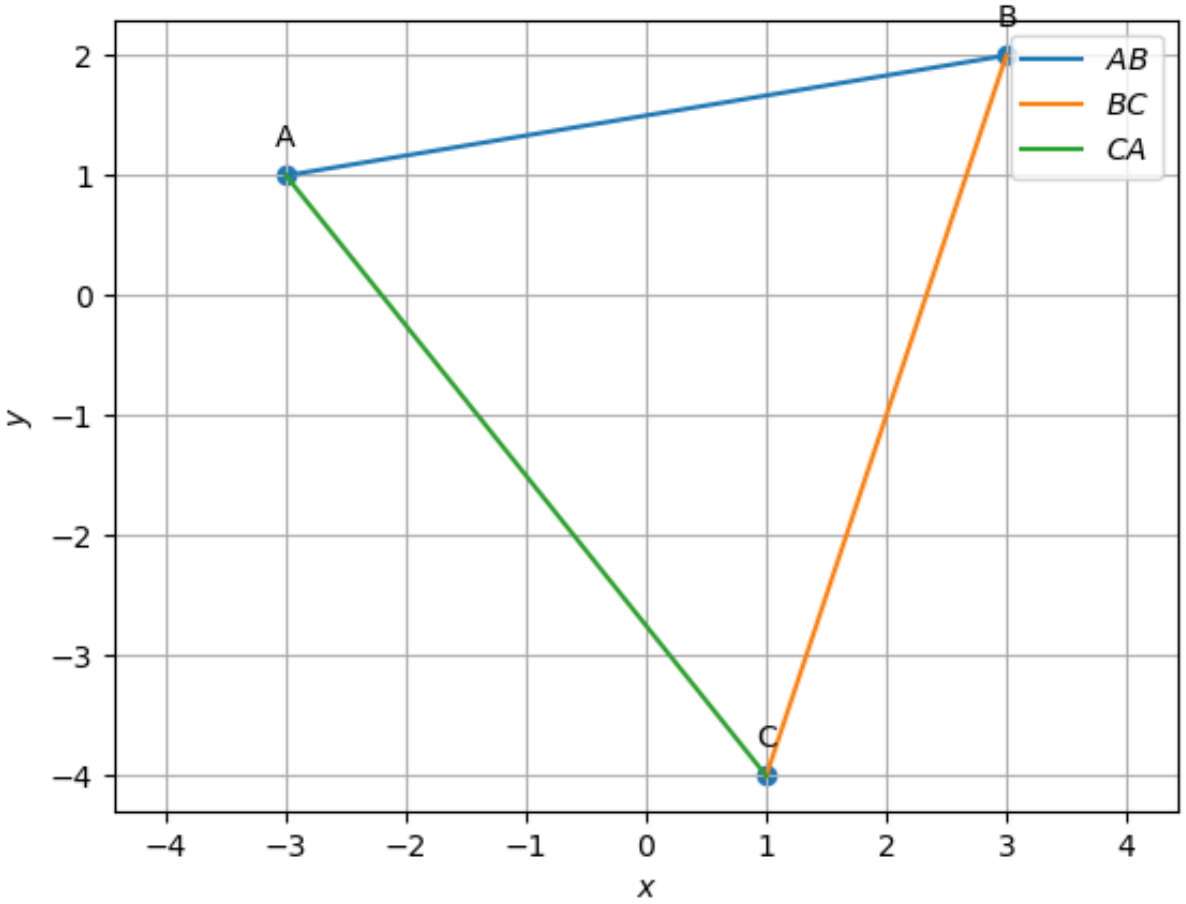

Fig. I.1. Triangle generated using python

II. MEDIAN

parameter	value	description
D	$\begin{pmatrix} 0.5 \\ 2 \end{pmatrix}$	Midpoint of AD
E	$\begin{pmatrix} 3 \\ 0 \end{pmatrix}$	Midpoint of BE
F	$\begin{pmatrix} -1.5 \\ -3 \end{pmatrix}$	Midpoint of CF
$\mathbf{n_1}^\top$	$\begin{pmatrix} 7 & 0.5 \end{pmatrix}$	normal form of AD
c_1	4.5	
$\mathbf{n_2}^\top$	$\begin{pmatrix} 1 & 7 \end{pmatrix}$	normal form of BE
c_2	3	
$\mathbf{n_3}^\top$	$\begin{pmatrix} -8 & 6.5 \end{pmatrix}$	normal form of CF
c_3	-7.5	
G	$\begin{pmatrix} 0.66 \\ -0.33 \end{pmatrix}$	Centroid of the triangle

TABLE II.1
MEDIAN

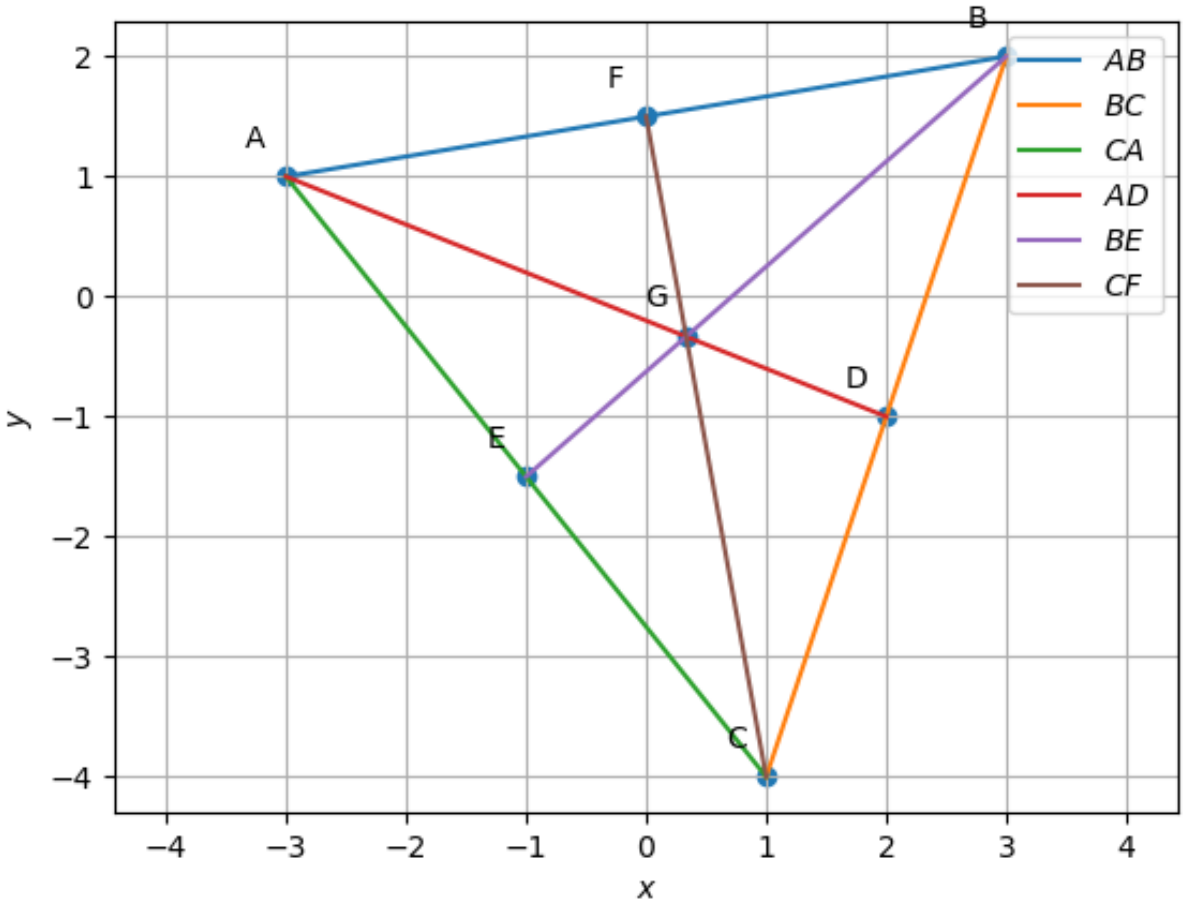

Fig. II.1. Triangle generated using python

III. ALTITUDE

parameter	value	description
$\mathbf{n_1}^\top$	$\begin{pmatrix}9 & 6\end{pmatrix}$	normal form of AD_1
c_1	-21	
$\mathbf{n_2}^\top$	$\begin{pmatrix}-4 & -10\end{pmatrix}$	normal form of BE_1
c_2	26	
$\mathbf{n_3}^\top$	$\begin{pmatrix}-5 & 4\end{pmatrix}$	normal form of CF_1
c_3	-5	
H	$\begin{pmatrix}2.833\\-0.833\end{pmatrix}$	Orthocentre of Triangle

TABLE III.1
ALTITUDE

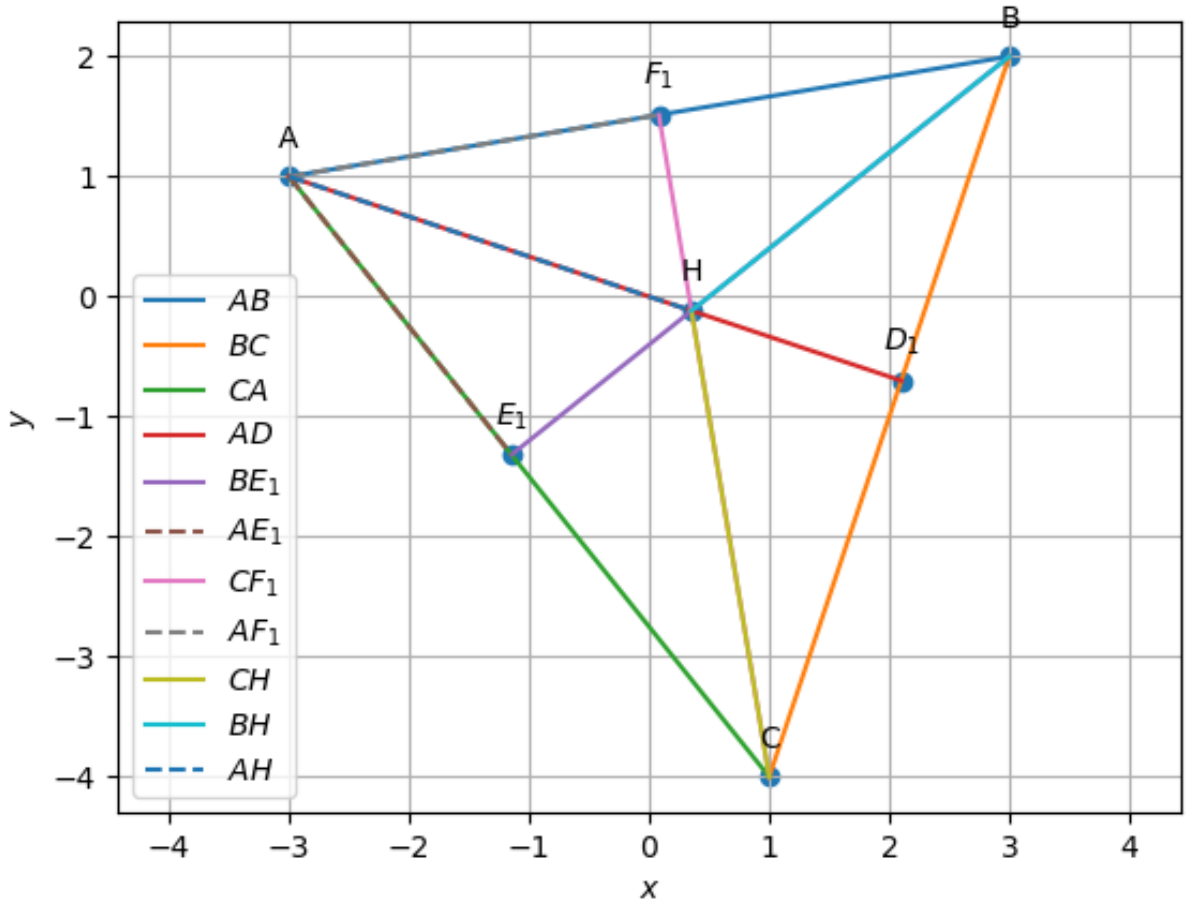

Fig. III.1. Triangle generated using python

IV. PERPENDICULAR BISECTOR

parameter	value	description
$\mathbf{n_1}^\top$	$\begin{pmatrix}5 & -4\end{pmatrix}$	Perpendicular bisector of AB
c_1	4.5	
$\mathbf{n_2}^\top$	$\begin{pmatrix}-9 & -16\end{pmatrix}$	Perpendicular bisector of BC
c_2	-16.5	
$\mathbf{n_3}^\top$	$\begin{pmatrix}4 & 10\end{pmatrix}$	Perpendicular bisector of CA
c_3	12	
$\mathbf{O}$	$\begin{pmatrix}1.40\\0.63\end{pmatrix}$	Circumcircle and Circumradius
radius	5.65	

TABLE IV.1
PERPENDICULAR BISECTOR

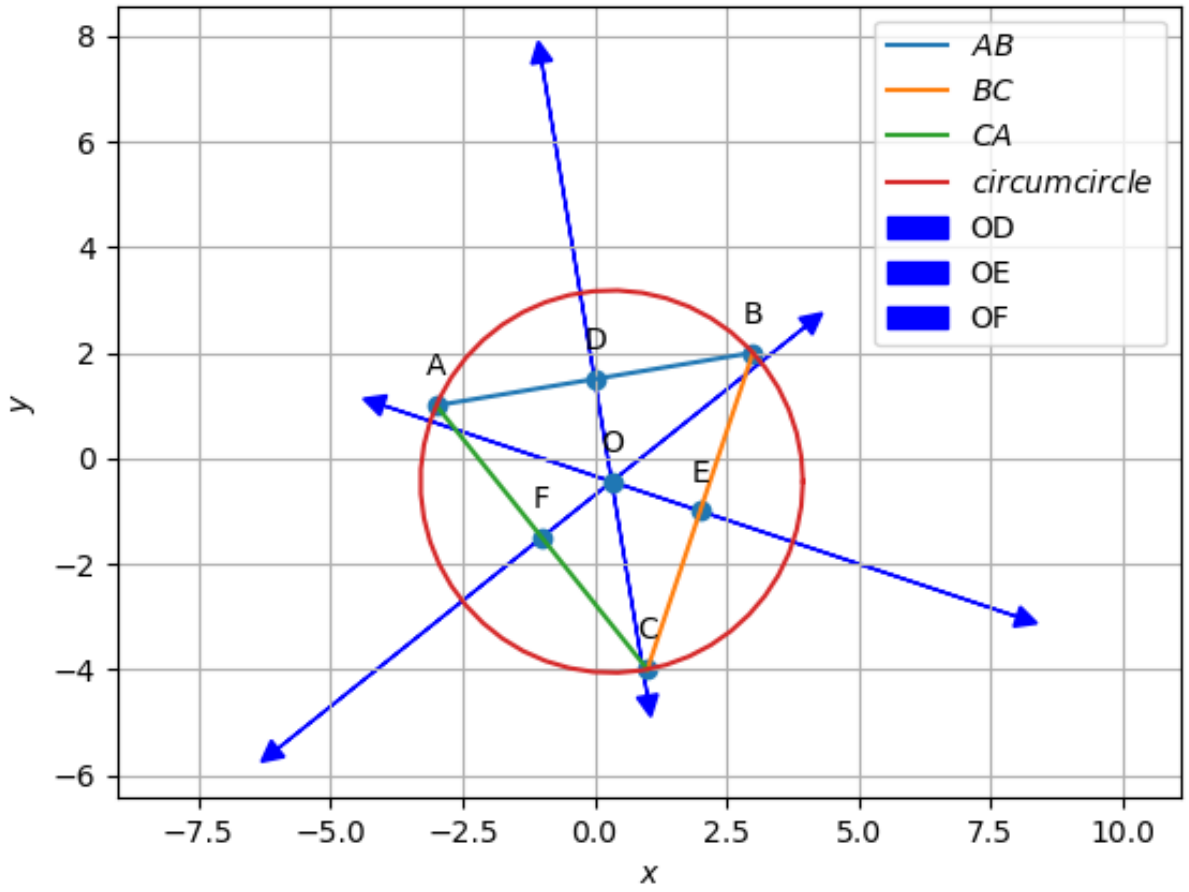

Fig. IV.1. Triangle generated using python

V. ANGLE BISECTOR

parameter	value	description
$\mathbf{n_1^\top}$	$\begin{pmatrix}1.55 & 0.40\end{pmatrix}$	Angular bisector of $\angle A$
c_1	-0.49	
$\mathbf{n_2^\top}$	$\begin{pmatrix}-0.06 & -1.61\end{pmatrix}$	Angular bisector of $\angle B$
c_2	1.89	
$\mathbf{n_3^\top}$	$\begin{pmatrix}-1.48 & 1.20\end{pmatrix}$	Angular bisector of $\angle C$
c_3	-1.39	
$\mathbf{I}$	$\begin{pmatrix}-0.008 \\ -1.173\end{pmatrix}$	Incircle and Inradius
radius	2.35	

TABLE V.1
ANGLE BISECTOR

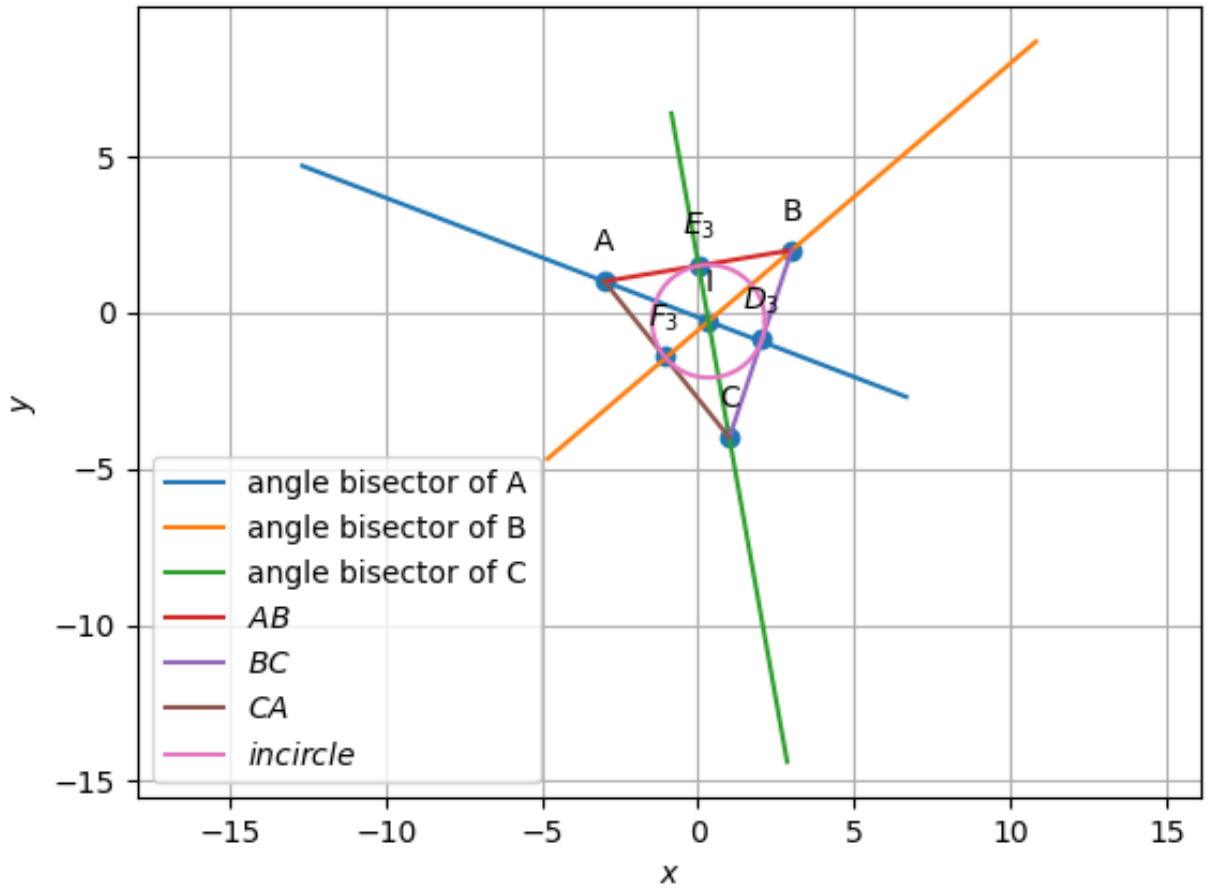

Fig. V.1. Triangle generated using python