Random Number Assignment

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Consider the vertices,

$$\mathbf{A} = \begin{pmatrix} -6 \\ -3 \end{pmatrix} \tag{1}$$

$$\mathbf{B} = \begin{pmatrix} -1 \\ 0 \end{pmatrix} \tag{2}$$

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

I. VECTORS

Parameter	Value	Description
$\mathbf{m_1}$	$\begin{pmatrix} -1 \\ -5 \end{pmatrix}$	Direction vector of AB
$\mathbf{m_2}$	$\begin{pmatrix} 4 \\ -6 \end{pmatrix}$	Direction vector of BC
$\mathbf{m_3}$	$\begin{pmatrix} -1 \\ -1 \end{pmatrix}$	Direction vector of CA
$\|\mathbf{B}-\mathbf{A}\|$	5.1	Length of AB
$\|\mathbf{C}-\mathbf{B}\|$	7.07	Length of BC
$\|\mathbf{A}-\mathbf{C}\|$	4	Lenght of CA
$\operatorname{rank}\begin{pmatrix} 1 & 1 & 1 \\ \mathbf{A} & \mathbf{B} & \mathbf{C} \end{pmatrix}$	3	Collinearity test
$\mathbf{n}^\top$	$\begin{pmatrix} -1 & -5 \end{pmatrix}$	AB
c	26	
$\mathbf{n}^\top$	$\begin{pmatrix} 5 & 5 \end{pmatrix}$	BC
c	-10	
$\mathbf{n}^\top$	$\begin{pmatrix} -4 & 0 \end{pmatrix}$	CA
c	4	
Ar(ABC)	10	Area of triangle ABC
$\angle\mathbf{A}$	101.31°	Angle A
$\angle\mathbf{B}$	33.69°	Angle B
$\angle\mathbf{C}$	45°	Angle C

TABLE 0
TABLE 1

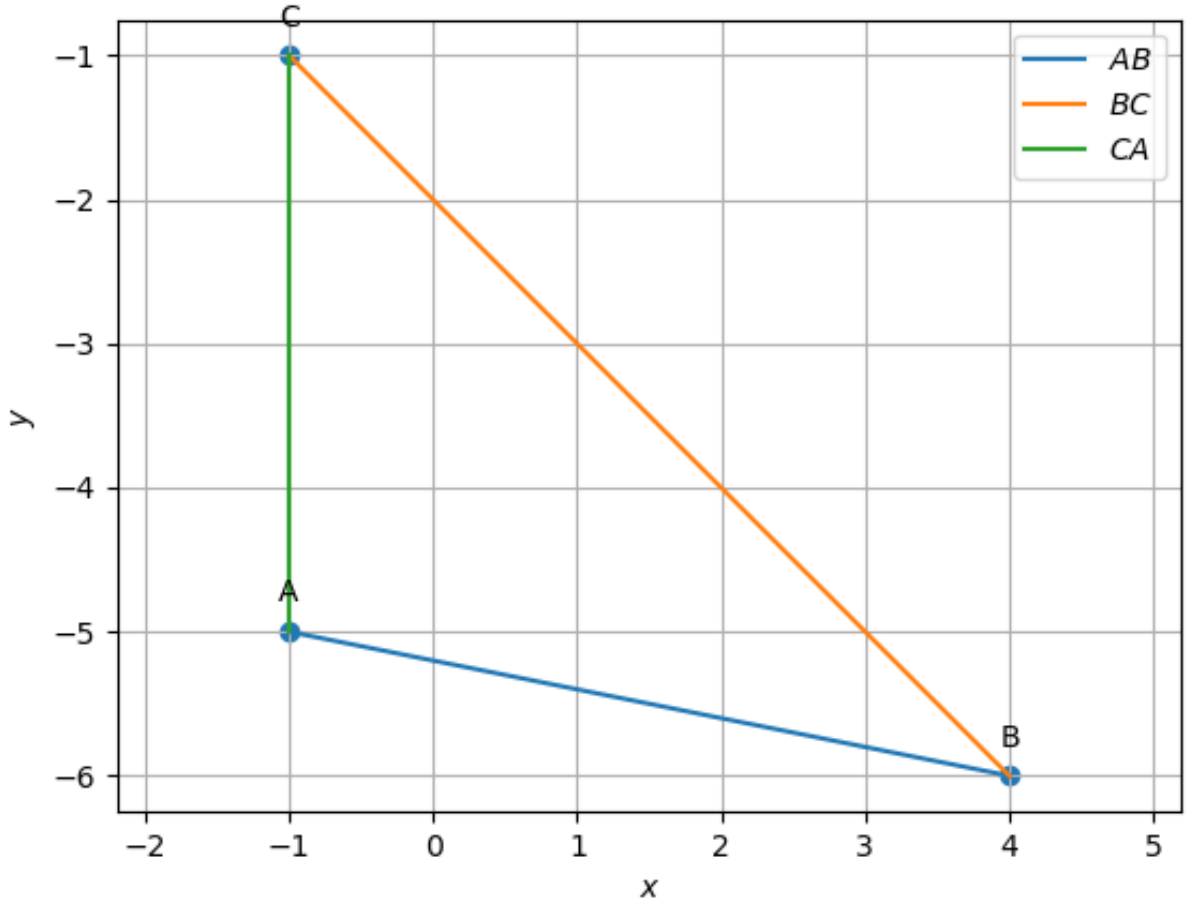

Fig. 0. Triangle ABC

II. MEDIANS

Parameter	Value	Description
D	$\begin{pmatrix} 1.5 \\ -3.5 \end{pmatrix}$	Midpoint of AB
E	$\begin{pmatrix} -1 \\ -3 \end{pmatrix}$	Midpoint of BC
F	$\begin{pmatrix} 1.5 \\ -5.5 \end{pmatrix}$	Midpoint of CA
$\mathbf{n}^\top$	$\begin{pmatrix} 1.5 & -2.5 \end{pmatrix}$	AD
c	11	
$\mathbf{n}^\top$	$\begin{pmatrix} 3 & 5 \end{pmatrix}$	BE
c	-18	
$\mathbf{n}^\top$	$\begin{pmatrix} -4.5 & -2.5 \end{pmatrix}$	CF
c	7	
G	$\begin{pmatrix} (0.67 \\ -4 \end{pmatrix}$	Orthocentre

TABLE 0
TABLE 2

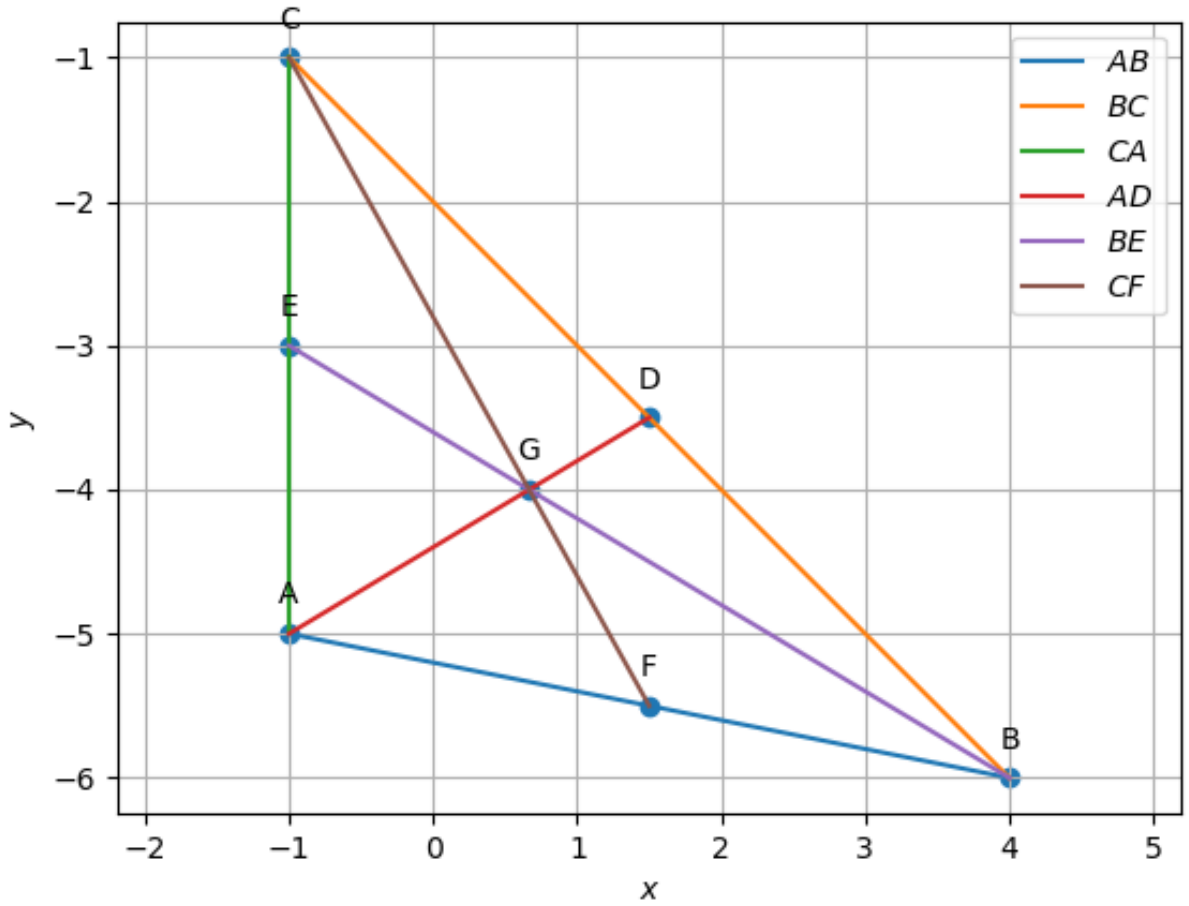

Fig. 0. Triangle ABC with medians AD, BE and CF

III. ALTITUDES

Parameter	Value	Description
n	$\begin{pmatrix} 5 \\ -5 \end{pmatrix}$	Normal Vector of AD_1
$\mathbf{n}^\top$	$\begin{pmatrix} -5 & 5 \end{pmatrix}$	AD_1
c	-20	
$\mathbf{n}^\top$	$\begin{pmatrix} 0 & -4 \end{pmatrix}$	BE_1
c	24	
$\mathbf{n}^\top$	$\begin{pmatrix} 5 & -1 \end{pmatrix}$	CF_1
c	-4	
H	(-2 -6)	Intersection of BE_1 and CF_1 (Orthocentre)

TABLE 0
TABLE 3

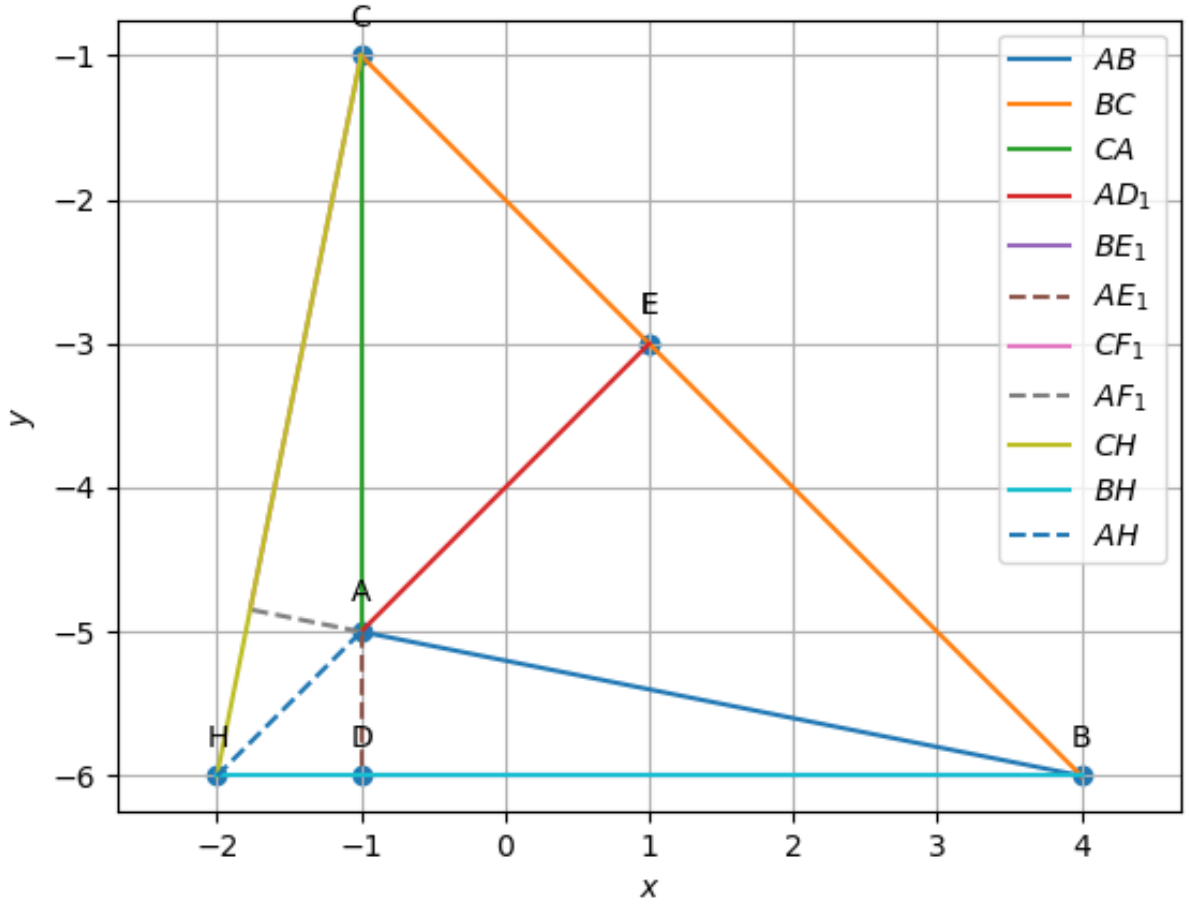

Fig. 0. Triangle ABC with altitudes AD_1, BE_1 and CF_1

IV. PERPENDICULAR BISECTOR

Parameter	Value	Description
$\mathbf{n}^\top$	$\begin{pmatrix}-5 & 1\end{pmatrix}$	OF (Perpendicular Bisector of AB)
c	-13	
$\mathbf{n}^\top$	$\begin{pmatrix}5 & -5\end{pmatrix}$	OD (Perpendicular Bisector of BC)
c	25	
$\mathbf{n}^\top$	$\begin{pmatrix}0 & 4\end{pmatrix}$	OE (Perpendicular Bisector of CA)
c	-12	
O	$\begin{pmatrix}2\\-3\end{pmatrix}$	Circumcentre
r	3.6	Radius of circumcircle
$\angle BOC$	202.6°	Angle BOC
$\angle BAC$	101.3°	Angle BAC

TABLE 0
TABLE 4

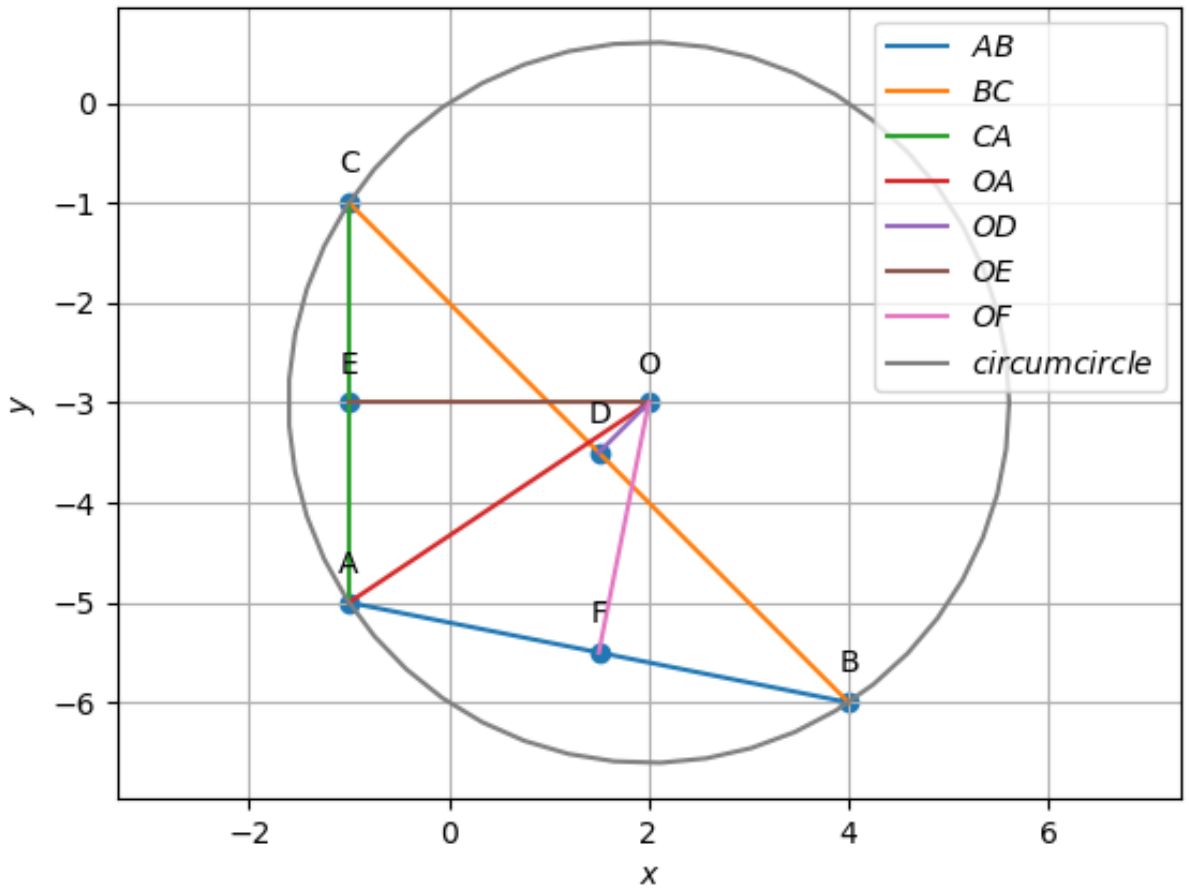

Fig. 0. circumcircle of triangle ABC with circumcentre O

V. ANGULAR BISECTOR

Parameter	Value	Description
$\mathbf{n}^\top$	$\begin{pmatrix}0.8 & -0.98\end{pmatrix}$	AI (Angle Bisector of **A**)
c	4.1	
$\mathbf{n}^\top$	$\begin{pmatrix}0.9 & 1.69\end{pmatrix}$	BI (Angle Bisector of **B**)
c	-6.51	
$\mathbf{n}^\top$	$\begin{pmatrix}-1.71 & -0.71\end{pmatrix}$	CI (Angle Bisector of **C**)
c	5.24	
I	$\begin{pmatrix}0.24\\-3.98\end{pmatrix}$	Circumcentre
r	1.24	Radius of Incircle
$\mathbf{D_3}$	$\begin{pmatrix}1.11\\-3.11\end{pmatrix}$	Point of contact of incircle with BC
$\mathbf{E_3}$	$\begin{pmatrix}-0.005\\-5.19\end{pmatrix}$	Point of contact of incircle with AB
$\mathbf{F_3}$	$\begin{pmatrix}-1\\-3.98\end{pmatrix}$	Point of contact of incircle with AC
m	1.01	Length of AE_3
n	4.08	Length of BD_3
p	2.99	Length of CD_3

TABLE 0
TABLE 5

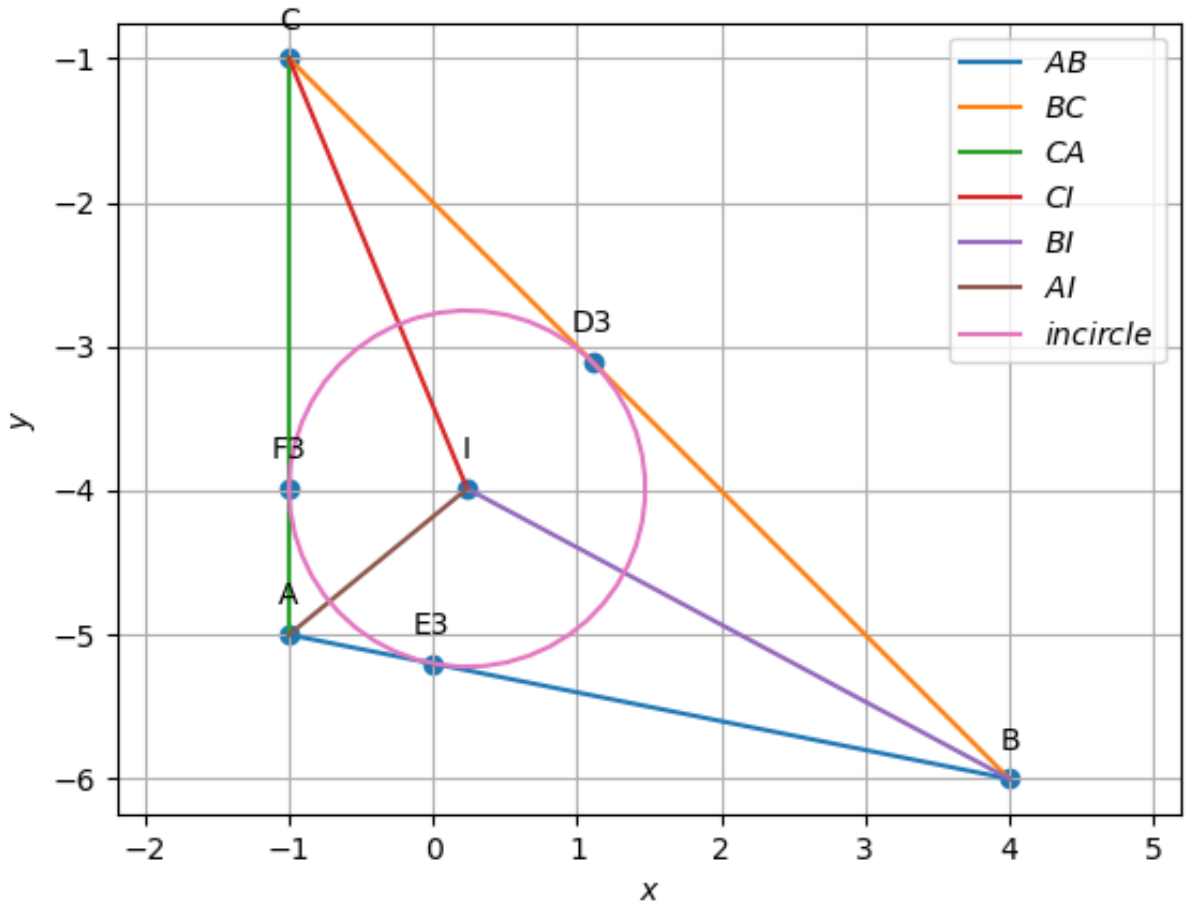

Fig. 0. incircle of triangle ABC with incentre I