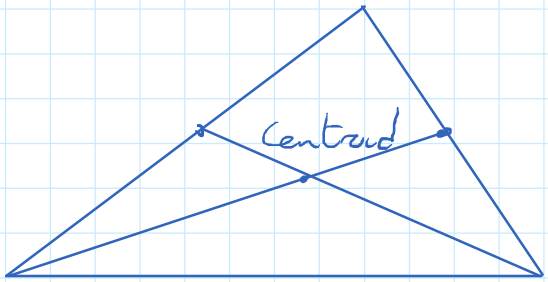



# Centroid

= balance point of a triangle.

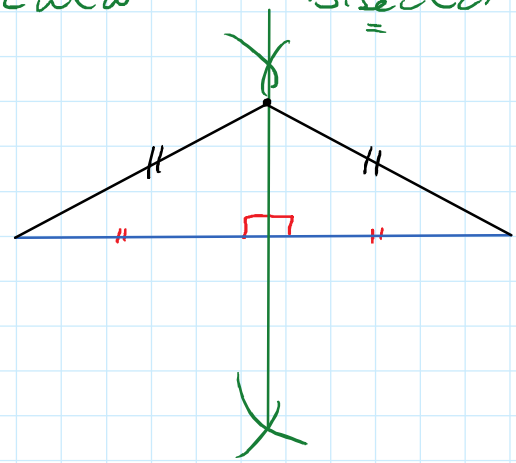
Intersection of Medians.

Median is a line from a vertex to midpoint of opposite line.

$$\text{Centroid} = \left( \frac{x_1 + x_2 + x_3}{3} , \frac{y_1 + y_2 + y_3}{3} \right)$$

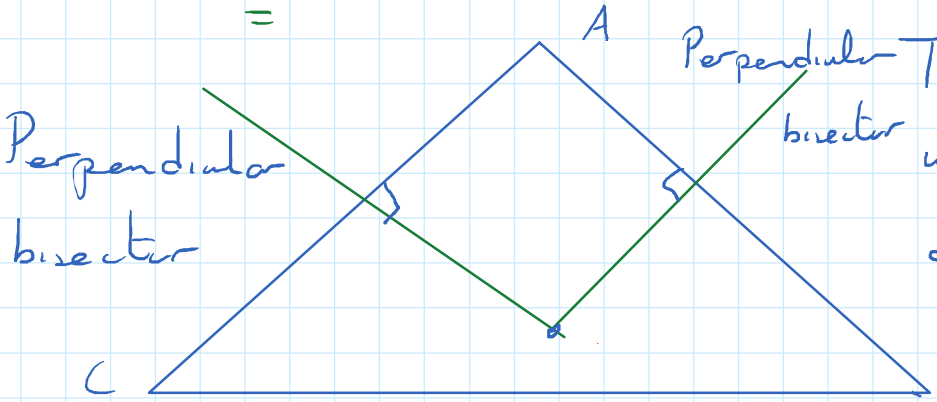
Construct a midpoint is the perpendicular bisector go to maths open reference.

## Perpendicular Bisector.

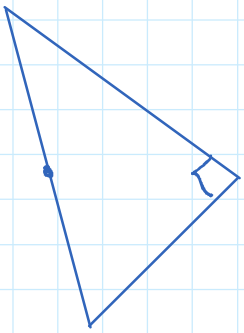


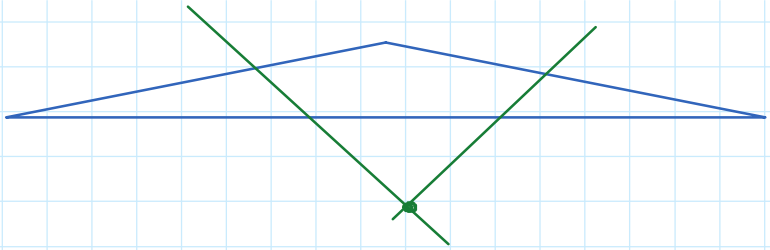
Any point on a perpendicular bisector is equidistant to the end points of line segment

## Circumcentre.

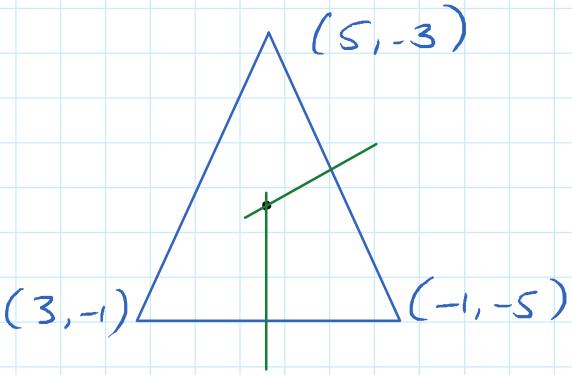



This is the point which is equidistance to A, B and C.





Find circumcentre of (5, -3) (3, -1) and (-1, -5).




(5, -3) (3, -1) (-1, -5)

Bisector = midpoint

$$\left(\frac{3-1}{2}, \frac{-1-5}{2}\right) = (1, -3)$$

$$m = \frac{-5+1}{-1-3} = -\frac{4}{-4} = 1$$

Pt (1, -3) $m = -1$

$$y - y_1 = m(x - x_1)$$

$$y + 3 = -1(x - 1)$$

$$y + 3 = -x + 1$$

$$x + y = -2 \quad \text{--- (1)}$$

(5, -3) (-1, -5)

$$m = \frac{-5+3}{-1-5} = \frac{-2}{-6} = \frac{1}{3}$$

Midpoint (2, -4)

$m = -3$ Pt (2, -4)

$$y + 4 = -3(x - 2)$$

$$y + 4 = -3x + 6$$

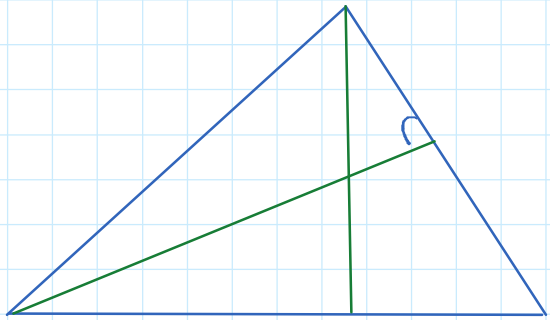
$$3x + y = 2$$

$$x + y = -2$$
$$-3x + y = -2$$
$$-2x = -4$$
$$x = 2 \qquad y = -4$$

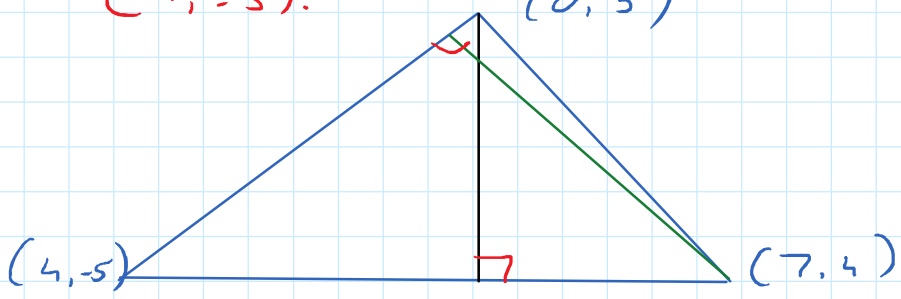
The perpendicular bisectors are also known as mediators.

## Orthocentre

Intersection of altitudes. These are lines from vertex perpendicular to opposite line



Find orthocentre of (0,3), (7,4) and (4,-5).




(4,-5) (7,4)

$$m = \frac{4+5}{7-4} = \frac{9}{3} = +3$$

$m = -\frac{1}{3}$ $(0, 3)$

$$y - y_1 = m(x - x_1)$$

$$y - 3 = -\frac{1}{3}(x - 0)$$

$$3y - 9 = -x$$

$$x + 3y = 9$$

$(4, -5)$ $(0, 3)$

$$m = \frac{3+5}{0-4} = -2$$

Required $m = \frac{1}{2}$ Pt $(7, 4)$

$$y - 4 = \frac{1}{2}(x - 7)$$

$$2y - 8 = x - 7$$

$$-x + 2y = 1$$

$$x - 2y = -1$$

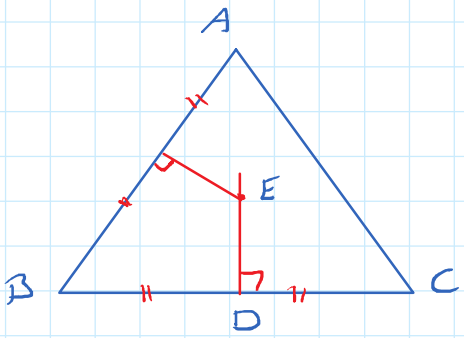
$$\begin{array}{r} x + 3y = 9 \\ -x + 2y = +1 \\ \hline 5y = 10 \end{array}$$

$$y = 2$$

$$x + 6 = 9 \qquad x = 3$$

$$(3, 2)$$

## Circumcentre

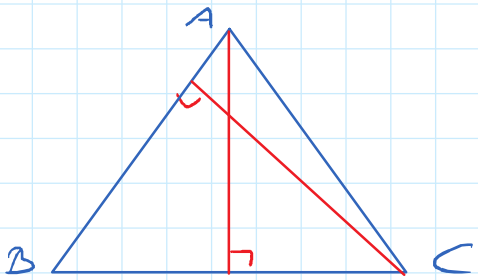



D = midpoint BC

Slope of BC

Use D perp slope in Eq of Line

## Orthocentre




Slope of BC

Use A perp slope in equation of Line