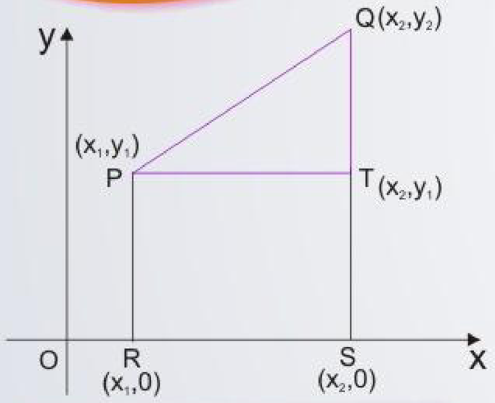
COORDINATE GEOMETRY

Distance formula



RS = $(x_2 - x_1)$ = PT

SQ = y_2 ; ST = y_1 ; QT = $(y_2 - y_1)$

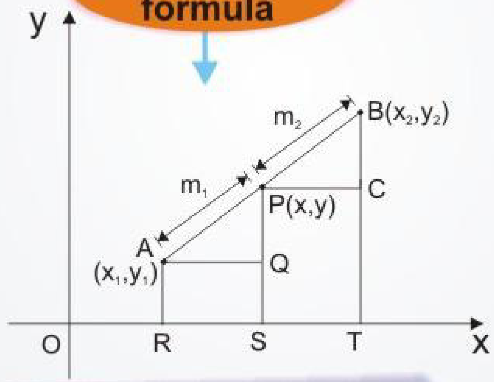
Applying Pythagoras in ΔPTQ

$PQ^2 = PT^2 + QT^2 = (x_2 - x_1)^2 + (y_2 - y_1)^2$

$PQ = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$

(Distance formula)

Section formula



Coordinates of P(x,y) =

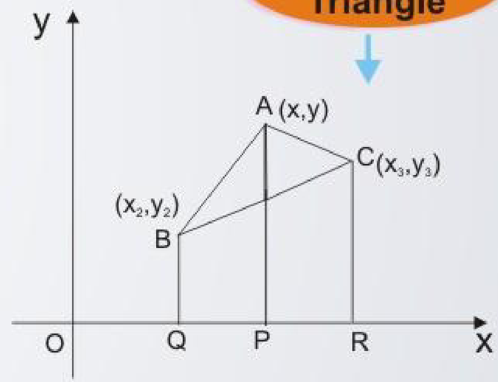
($m_1 : m_2$ Internally)

$$\left\{\frac{m_1x_2 + m_2x_1}{m_1 + m_2}, \frac{m_1y_2 + m_2y_1}{m_1 + m_2}\right\}$$

($m_1 : m_2$ externally)

$$\left\{\frac{m_1x_2 - m_2x_1}{m_1 - m_2}, \frac{m_1y_2 - m_2y_1}{m_1 - m_2}\right\}$$

Area of Triangle



$A(x_1,y_1)$ $B(x_2,y_2)$ $C(x_3,y_3)$

Area = $\frac{1}{2} \left| x_1(y_2 - y_3) + x_2(y_3 - y_1) + x_3(y_1 - y_2) \right|$

If Area = 0,

then points are **collinear**

Applications

Verifying collinearity

$A(x_1,y_1)$, $B(x_2,y_2)$, $C(x_3,y_3)$

→ Find AB,BC,CA using distance formula

→ If AB + BC = CA

or BC + CA = AB

or AB + CA = BC

→ Then 3 points are collinear

(i) For an equilateral triangle – Prove that three sides are equal.

(ii) For a right-angled triangle – Prove that the sum of the squares of two sides is equal to the square of the third side.

(iii) For a square – Prove that the four sides are equal, two diagonals are equal.

(iv) For a rhombus – Prove that four sides are equal.

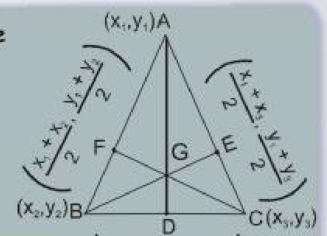
(v) For a rectangle – Prove that the opposite sides are equal and two diagonals are equal.

(vi) For a parallelogram – Prove that the opposite sides are equal

Centroid of Triangle

Coordinates of the centroid of the triangle whose vertices are (x_1, y_1), (x_2, y_2) and (x_3, y_3) are

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



$$\left(\frac{x_2 + x_3}{2}, \frac{y_2 + y_3}{2}\right)$$