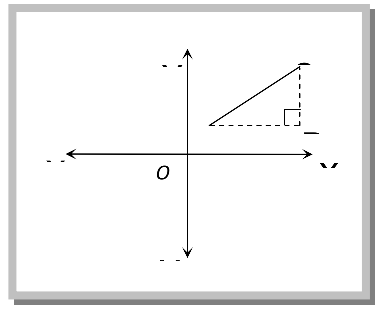
Distance Formula

The distance between two points $P(x_1, y_1)$ and $Q(x_2, y_2)$ is given by

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



Note: ❑ The distance of a point $M(x_0, y_0)$ from origin $O(0, 0)$

$$OM = \sqrt{(x_0^2 + y_0^2)}.$$

If distance between two points is given then use $\pm$ sign.

When the line PQ is parallel to the y-axis, the abscissa of point P and Q will be equal i.e, $x_1 = x_2$;

$$\therefore PQ = |y_2 - y_1|$$

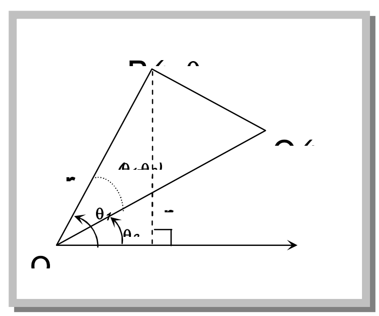
When the segment PQ is parallel to the x-axis, the ordinate of the points P and Q will be equal i.e., $y_1 = y_2$. Therefore $PQ = |x_2 - x_1|$

(1) **Distance between two points in polar co-ordinates**: Let O be the pole and OX be the initial line. Let P and Q be two given points whose polar co-ordinates are (r_1, θ_1) and (r_2, θ_2) respectively.

Then $OP = r_1, OQ = r_2$

$\angle POX = \theta_1$ and $\angle QOX = \theta_2$

Then $\angle POQ = (\theta_1 - \theta_2)$



In ΔPOQ, from cosine rule $\cos(\theta_1 - \theta_2) = \dfrac{(OP)^2 + (OQ)^2 - (PQ)^2}{2OP.OQ}$

$$\therefore (PQ)^2 = r_1^2 + r_2^2 - 2r_1 r_2 \cos(\theta_1 - \theta_2)$$

$$\therefore PQ = \sqrt{r_1^2 + r_2^2 - 2r_1 r_2 \cos(\theta_1 - \theta_2)}$$

Note: Always taking θ_1 and θ_2 in radians.