[T11-05-08-21]

Symmetry

Symmetry is a quality that will frequently simplify your work this year.You will often need to say something about the coordinates of points that are symmetric. The somewhat formal account that follows will help you do that.

■ Symmetry with respect to a line

Two points, P and Q, are symmetric with respect to a line ℓ iff

1. $\overline{PQ}$ is perpendicular to ℓ, and
2. the midpoint of $\overline{PQ}$ is on ℓ.

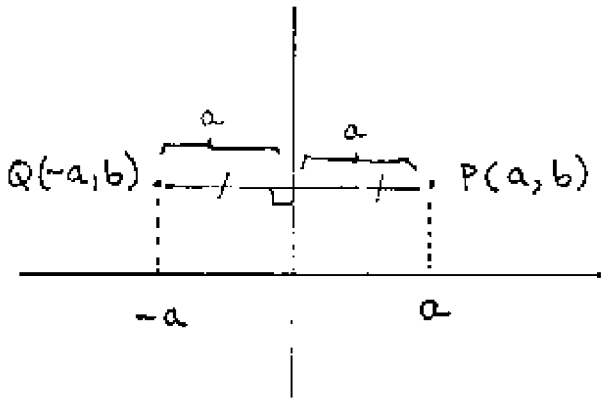
■ Symmetry with respect to the origin

Two points, P and Q, are symmetric with respect to the origin iff

1. the midpoint of $\overline{PQ}$ is the origin.

■ Symmetry with respect to the y-axis.

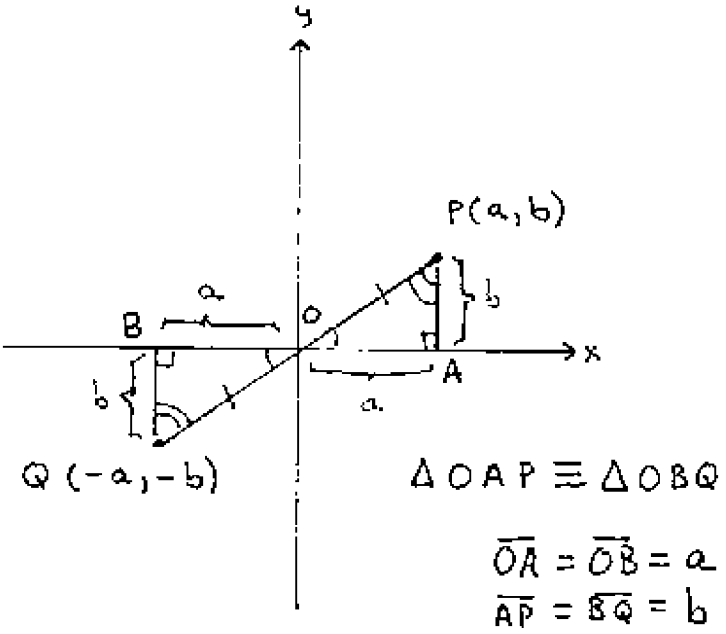
When P and Q are symmetric with respect to the y-axis, their coordinates are $P(a, b)$, $Q(-a, b)$.



Notice that $\overline{PQ}$ is perpenicular to the line $x = 0$, which is the y-axi, and that the midpoint of $\overline{PQ}$ is on the y-axis.

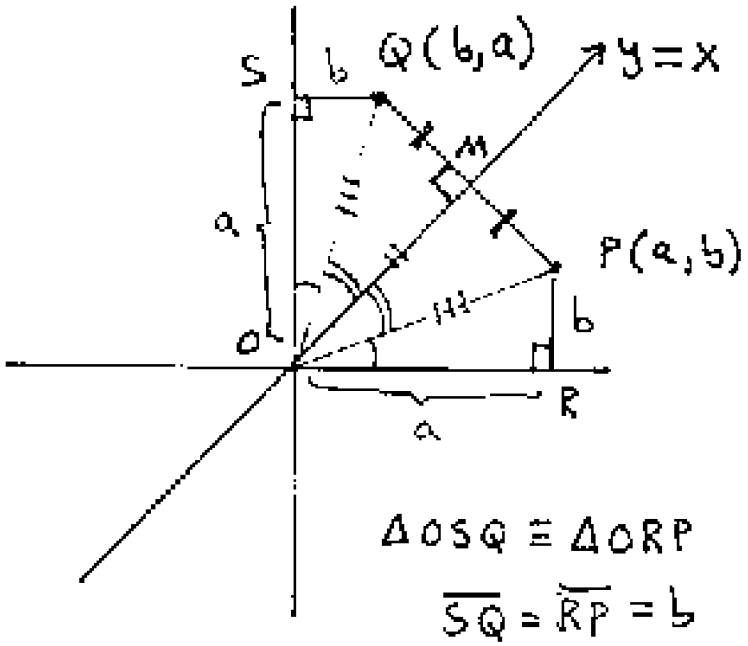
■ **Symmetry with respect to the origin.**

When P and Q are symmetric with respect to the origin, their coordinates are $P(a, b)$, $Q(-a, -b)$.



■ **Symmetry with respect to the line $y = x$.**

When P and Q are symmetric with respect to the line $y = x$, their coordinates are $P(a, b)$, $Q(b, a)$.



$\Delta OSQ \cong \Delta ORP$

$\overline{SQ} = \overline{RP} = b$

$\overline{OR} = \overline{OS} = a$