Solution

The point is (x, y, 0) because it is located on (x,y)-plane.

Let's consider PA and PB as vectors. Hence, $\overrightarrow{PA}$ is (1 – x, 2 – y, 3),

$\overrightarrow{PB}$ is (7 – x, 6 – y, 5).

$\overrightarrow{PA}$ is orthogonal to $\overrightarrow{PB}$, if their dot product equals zero.

$$(1 - x)(7 - x) + (2 - y)(6 - y) + 15 = 0.$$
$$7 - x - 7x + x^2 + 12 - 2y - 6y + y^2 + 15 = 0.$$
$$x^2 - 8x + 16 + y^2 - 8y + 16 + 2 = 0.$$
$$(x - 4)^2 + (y - 4)^2 = -2.$$

Hence, there's no point that satisfies the condition, so

    (a) S is an empty set.

    Answer: (a) S is an empty set.