Step-1

The rotation matrix is given by $\begin{bmatrix} \cos\theta & -\sin\theta \\ \sin\theta & \cos\theta \end{bmatrix}$.

As matrix has the effect of rotating every vector through 90 degrees, the matrix becomes,

$$R = \begin{bmatrix} \cos 90 & -\sin 90 \\ \sin 90 & \cos 90 \end{bmatrix}$$
$$= \begin{bmatrix} 0 & -1 \\ 1 & 0 \end{bmatrix}$$

Step-2

Next every vector (x, y) is transforming to $(-y, x)$ and $P = \begin{bmatrix} 1 & 0 \\ 0 & 0 \end{bmatrix}$ is the matrix that represents the projection onto *x* â€“ axis followed by projection onto the *y*-axis.

Now the required matrix is given as,

$$PR = \begin{bmatrix} 1 & 0 \\ 0 & 0 \end{bmatrix} \cdot \begin{bmatrix} 0 & -1 \\ 1 & 0 \end{bmatrix}$$
$$= \boxed{\begin{bmatrix} 0 & -1 \\ 0 & 0 \end{bmatrix}}$$

Step-3

Next it is required to find the matrix that represents projection onto the x-axis followed by projection onto the *y*-axis.

Note the following:

Every vector will be mapped into the zero vector.

If a vector is projected onto the *x*-axis, its *y*-component will be removed (becomes 0).

Now the required matrix is given as,

$\boxed{\begin{bmatrix} 0 & 0 \\ 0 & 0 \end{bmatrix}}$.