$$\begin{matrix} \frac{1}{2} & \frac{1}{2} \\ 0 & \frac{1}{2} \end{matrix} \cdot \begin{matrix} \frac{1}{2} & \frac{1}{2} \\ 0 & \frac{1}{2} \end{matrix} = \begin{matrix} \frac{1}{2} & \frac{1}{2} \\ 0 & \frac{1}{2} \end{matrix}^2 = \begin{matrix} \frac{1}{4} & \frac{1}{2} \\ 0 & \frac{1}{4} \end{matrix}$$

$$(\tfrac{1}{\sqrt{2}}) \begin{matrix} 1 & 0 \\ \frac{1}{2} & 0 \end{matrix}$$

$(1-\frac{1}{2})(\frac{1}{\sqrt{2}})(\frac{1}{\sqrt{2}}) = \frac{1}{4}$

$(1+\frac{1}{2})(\frac{1}{\sqrt{2}})(\frac{1}{\sqrt{2}}) = \frac{3}{4}$

$$\begin{matrix} \frac{3}{4} & \frac{1}{2} \\ \frac{1}{4} & -\frac{1}{2} \end{matrix} \cdot \begin{matrix} \frac{3}{4} & \frac{1}{2} \\ \frac{1}{4} & -\frac{1}{2} \end{matrix} = \begin{matrix} \frac{3}{4} & \frac{1}{2} \\ \frac{1}{4} & -\frac{1}{2} \end{matrix}^2 = \begin{matrix} \frac{11}{16} & \frac{1}{8} \\ \frac{1}{16} & \frac{3}{8} \end{matrix}$$

$a = (\frac{1}{\sqrt{2}})(\frac{7}{16} + \frac{5}{16}) = \frac{3}{8}\sqrt{2}$

$b = (\frac{1}{\sqrt{2}})(\frac{7}{16} - \frac{5}{16}) = \frac{1}{16}\sqrt{2}$

$c = (\frac{1}{\sqrt{2}})(-\frac{5}{8} + \frac{1}{8}) = -\frac{1}{4}\sqrt{2}$

$d = (\frac{1}{\sqrt{2}})(-\frac{5}{8} - \frac{1}{8}) = -\frac{3}{8}\sqrt{2}$

$(\frac{\sqrt{2}}{2})(b-d) = \frac{7}{16} = \frac{7}{16}$

$(\frac{\sqrt{2}}{2})(b+d) = -\frac{5}{16} = -\frac{5}{16}$

$\frac{1}{\sqrt{2}}(a-c) = \frac{5}{8} = \frac{5}{8}$

$\frac{1}{\sqrt{2}}(a+c) = \frac{1}{8} = \frac{1}{8}$

$$\frac{1}{2} \begin{matrix} x+y+w+z & x-y+w-z \\ x+y-w-z & x-y-w+z \end{matrix} \cdot \frac{1}{2} \begin{matrix} x+y+w+z & x-y+w-z \\ x+y-w-z & x-y-w+z \end{matrix} = \begin{matrix} \frac{1}{2}x^2+\frac{1}{2}xy+\frac{1}{2}xw+yw+\frac{1}{2}yz+\frac{1}{2} \\ \frac{1}{2}x^2+\frac{1}{2}xy-\frac{1}{2}wz-\frac{1}{2}z^2-\frac{1}{2}xw \end{matrix}$$

$\frac{(\frac{1}{2}x^2+\frac{1}{2}xy+\frac{1}{2}xw+yw+\frac{1}{2}yz+\frac{1}{2}wz+\frac{1}{2}z^2)-(\frac{1}{2}x^2+\frac{1}{2}xy-\frac{1}{2}wz-\frac{1}{2}z^2-\frac{1}{2}xw+\frac{1}{2}yz)}{\sqrt{2}} = \frac{1}{2}\left(xw+yw+wz+z^2\right)\sqrt{2}$

$\frac{(\frac{1}{2}x^2+\frac{1}{2}xy+\frac{1}{2}xw+yw+\frac{1}{2}yz+\frac{1}{2}wz+\frac{1}{2}z^2)+(\frac{1}{2}x^2+\frac{1}{2}xy-\frac{1}{2}wz-\frac{1}{2}z^2-\frac{1}{2}xw+\frac{1}{2}yz)}{\sqrt{2}} = \frac{1}{2}\left(x^2+xy+yw+yz\right)\sqrt{2}$

$\frac{(\frac{1}{2}x^2+\frac{1}{2}xw-\frac{1}{2}yz-\frac{1}{2}z^2-\frac{1}{2}xy+\frac{1}{2}wz)-(\frac{1}{2}x^2+yw+\frac{1}{2}z^2-\frac{1}{2}xy-\frac{1}{2}xw-\frac{1}{2}yz-\frac{1}{2}wz)}{\sqrt{2}} = \frac{1}{2}\left(xw-z^2+wz-yw\right)\sqrt{2}$

$\frac{(\frac{1}{2}x^2+\frac{1}{2}xw-\frac{1}{2}yz-\frac{1}{2}z^2-\frac{1}{2}xy+\frac{1}{2}wz)+(\frac{1}{2}x^2+yw+\frac{1}{2}z^2-\frac{1}{2}xy-\frac{1}{2}xw-\frac{1}{2}yz-\frac{1}{2}wz)}{\sqrt{2}} = \frac{1}{2}\left(x^2-yz-xy+yw\right)\sqrt{2}$

$\frac{(\frac{1}{2}\left(xw+yw+wz+z^2\right)\sqrt{2})-(\frac{1}{2}\left(xw-z^2+wz-yw\right)\sqrt{2})}{\sqrt{2}} = yw+z^2 = \frac{1}{4}$

$\frac{(\frac{1}{2}\left(xw+yw+wz+z^2\right)\sqrt{2})+(\frac{1}{2}\left(xw-z^2+wz-yw\right)\sqrt{2})}{\sqrt{2}} = w\left(x+z\right) = 0$

$\frac{(\frac{1}{2}\left(x^2+xy+yw+yz\right)\sqrt{2})-(\frac{1}{2}\left(xw-z^2+wz-yw\right)\sqrt{2})}{\sqrt{2}} = \frac{1}{2}x^2+\frac{1}{2}xy+yw+\frac{1}{2}yz-\frac{1}{2}xw+$
$\frac{1}{2}z^2-\frac{1}{2}wz = \frac{1}{2}$

$\frac{(\frac{1}{2}\left(x^2+xy+yw+yz\right)\sqrt{2})+(\frac{1}{2}\left(xw-z^2+wz-yw\right)\sqrt{2})}{\sqrt{2}} = \frac{1}{2}x^2+\frac{1}{2}xy+\frac{1}{2}yz+\frac{1}{2}xw-\frac{1}{2}z^2+$
$\frac{1}{2}wz = \frac{1}{4}$

$x = \frac{1}{2}$

$y = \frac{1}{2}$

$z = \frac{1}{2}$

$w = 0$

$$\begin{matrix} \frac{1}{2}x^2+\frac{1}{2}xy+\frac{1}{2}xw+yw+\frac{1}{2}yz+\frac{1}{2}wz+\frac{1}{2}z^2 & \frac{1}{2}x^2+\frac{1}{2}xw-\frac{1}{2}yz-\frac{1}{2}z^2-\frac{1}{2}xy+\frac{1}{2}wz \\ \frac{1}{2}x^2+\frac{1}{2}xy-\frac{1}{2}wz-\frac{1}{2}z^2-\frac{1}{2}xw+\frac{1}{2}yz & \frac{1}{2}x^2+yw+\frac{1}{2}z^2-\frac{1}{2}xy-\frac{1}{2}xw-\frac{1}{2}yz-\frac{1}{2}wz \end{matrix}$$
$$= \begin{matrix} \frac{1}{2} & -\frac{1}{4} \\ \frac{1}{4} & 0 \end{matrix}$$

$$\frac{1}{2}\begin{matrix} x+y+w+z & x-y+w-z \\ x+y-w-z & x-y-w+z \end{matrix} = \begin{matrix} \frac{3}{4} & -\frac{1}{4} \\ \frac{1}{4} & \frac{1}{4} \end{matrix}$$