Coordinates with respect to Basis

$\vec{x} = \begin{bmatrix} 3 \\ 2 \end{bmatrix}$

$R^2 = span\{ \begin{bmatrix} 1 \\ 0 \end{bmatrix} (named\ b_1), \begin{bmatrix} 0 \\ 1 \end{bmatrix} (named\ b_2) \} = span\{ \begin{bmatrix} 1 \\ 1 \end{bmatrix} (named\ d_1), \begin{bmatrix} -1 \\ 1 \end{bmatrix} (named\ d_2) \}$

$\vec{x} = \beta_1(\vec{b_1}) + \beta_2(\vec{b_2}) = \delta_1(\vec{d_1}) + \delta_2(\vec{d_2}) = \begin{bmatrix} \beta_1 \\ \beta_2 \end{bmatrix} WRT\ B = \begin{bmatrix} \delta_1 \\ \delta_2 \end{bmatrix} WRT\ D$

$B = (\vec{b_1}, \vec{b_2})$
$D = (\vec{d_1}, \vec{d_2})$

$b_1 = 0.5(d_1 - d_2)$
$b_2 = 0.5(d_1 + d_2)$

$\vec{x} = \begin{bmatrix} 3 \\ 2 \end{bmatrix} WRT\ B = \begin{bmatrix} 3/2 + 2/2 \\ 3/2 - 2/2 \end{bmatrix} = \begin{bmatrix} 5/2 \\ 1/2 \end{bmatrix} WRT\ D$