Find the Cartesian equation of the plane that is perpendicular to the plane 2x - y + z = 8 and contains the points A(4,2,-3) and B(6,1,-1).

$$\vec{AB} = \begin{pmatrix} 6 \\ 1 \\ -1 \end{pmatrix} - \begin{pmatrix} 4 \\ 2 \\ -3 \end{pmatrix} = \begin{pmatrix} 2 \\ -1 \\ 2 \end{pmatrix}$$

$$\text{normal to plane} = \begin{pmatrix} 2 \\ -1 \\ 1 \end{pmatrix}$$

Normal to required plane is perpendicular to $\begin{pmatrix} 2 \\ -1 \\ 2 \end{pmatrix}$ and $\begin{pmatrix} 2 \\ -1 \\ 1 \end{pmatrix}$

Find vector product

$$\begin{pmatrix} 2 \\ -1 \\ 2 \end{pmatrix} \times \begin{pmatrix} 2 \\ -1 \\ 1 \end{pmatrix} = \begin{pmatrix} (-1)\cdot 1 - 2\cdot(-1) \\ -(2\cdot 1 - 2\cdot 2) \\ 2\cdot(-1) - (-1)\cdot 2 \end{pmatrix}$$

$$= \begin{pmatrix} 1 \\ 2 \\ 0 \end{pmatrix}$$

$$\mathbf{r}\cdot\mathbf{n} = \mathbf{a}\cdot\mathbf{n}$$

$$\begin{pmatrix} x \\ y \\ z \end{pmatrix} \cdot \begin{pmatrix} 1 \\ 2 \\ 0 \end{pmatrix} = \begin{pmatrix} 4 \\ 2 \\ -3 \end{pmatrix} \cdot \begin{pmatrix} 1 \\ 2 \\ 0 \end{pmatrix}$$

$$1\cdot x + 2\cdot y + 0\cdot z = 4\cdot 1 + 2\cdot 2 - 3\cdot 0$$

$$x + 2y = 8$$