Exercise 1

Paper 1 style · No calculator

1 6 marks AHL 3.17 ●●○ Typical

The points $A(2, 1, 0)$, $B(3, 0, 1)$ and $C(1, 3, 1)$ lie in the plane Π.

(a) Find $\overrightarrow{AB}$ and $\overrightarrow{AC}$. **[2]**

(b) Hence find a vector normal to Π. **[2]**

(c) Find the Cartesian equation of Π. **[2]**

The markscheme is on the next page: try the question first. Written and verified by a practising IB mathematics teacher, produced with AI assistance; solved twice and recomputed by software. Not affiliated with or endorsed by the International Baccalaureate Organization.
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MARKSCHEME (a)

$\overrightarrow{AB} = \begin{pmatrix} 1 \\ -1 \\ 1 \end{pmatrix}$ A1

$\overrightarrow{AC} = \begin{pmatrix} -1 \\ 2 \\ 1 \end{pmatrix}$ A1

Total 2 marks

MARKSCHEME (b)

$\overrightarrow{AB} \times \overrightarrow{AC} = \begin{pmatrix} -1-2 \\ -1-1 \\ 2-1 \end{pmatrix}$ M1

$\mathbf{n} = \begin{pmatrix} -3 \\ -2 \\ 1 \end{pmatrix}$, or $\begin{pmatrix} 3 \\ 2 \\ -1 \end{pmatrix}$ A1

Total 2 marks

Note Or any non-zero multiple.

MARKSCHEME (c)

$3 \times 2 + 2 \times 1 - 1 \times 0 = 8$ M1

$3x + 2y - z = 8$ A1

Total 2 marks