Exercise 1

Paper 1 style · No calculator

1 7 marks AHL 3.18 · 1.16 ●●○ Typical

The plane Π has equation $2x - y + z = 7$ and the line L has equation $\mathbf{r} = \begin{pmatrix} 1 \\ 2 \\ -1 \end{pmatrix} + \lambda \begin{pmatrix} 1 \\ 1 \\ 1 \end{pmatrix}$.

(a) Find the coordinates of the point where L meets Π. **[4]**

(b) Find the sine of the acute angle between L and Π. **[3]**

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)

$2(1+\lambda) - (2+\lambda) + (-1+\lambda) = 7$ **M1**

$2\lambda - 1 = 7$ **A1**

$\lambda = 4$ **A1**

$(5, 6, 3)$ **A1**

Total 4 marks

MARKSCHEME (b)

$\mathbf{b} \cdot \mathbf{n} = 2 - 1 + 1 = 2$ **A1**

$|\mathbf{b}| = \sqrt{3},\ |\mathbf{n}| = \sqrt{6}$ **A1**

$\sin\theta = \dfrac{2}{\sqrt{18}} = \dfrac{\sqrt{2}}{3}$ **A1**

Total 3 marks