Marked example 2

Paper 1 style · No calculator

2 7 marks AHL 3.14 · 3.15 ●●○ Typical

The lines L_1 and L_2 have equations $\mathbf{r} = \begin{pmatrix}1\\0\\2\end{pmatrix} + \lambda\begin{pmatrix}1\\-1\\1\end{pmatrix}$ and $\mathbf{r} = \begin{pmatrix}2\\3\\-1\end{pmatrix} + \mu\begin{pmatrix}0\\2\\-2\end{pmatrix}$.

(a) Show that L_1 and L_2 intersect, and find the coordinates of their point of intersection. **[5]**

(b) Find the cosine of the acute angle between L_1 and L_2. **[2]**

MARKSCHEME (a)

$1+\lambda = 2,\ -\lambda = 3+2\mu,\ 2+\lambda = -1-2\mu$ **M1**

$\lambda = 1$ **A1**

$\mu = -2$ **A1**

z: $2+1=3$ and $-1+4=3$: the third equation holds, so the lines meet **R1**

$(2,\ -1,\ 3)$ **A1**

Total 5 marks

Note Equate the components.

MARKSCHEME (b)

$\dfrac{|0-2-2|}{\sqrt{3}\times\sqrt{8}}$ **M1**

$\cos\theta = \dfrac{4}{\sqrt{24}} = \dfrac{\sqrt{6}}{3}$ **A1**

Total 2 marks

Note The directions only.

Written and verified by a practising IB mathematics teacher, produced with AI assistance; solved twice and recomputed by software.
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