Exercise 1

Paper 1 style · No calculator

1 6 marks AHL 3.12 · 3.13 ●○○ Routine

The points A, B and C have coordinates $A(1, 3, -2)$, $B(7, 3, 6)$ and $C(0, -1, 4)$.

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

(b) Find a unit vector in the direction of $\overrightarrow{AB}$. **[2]**

(c) $ABCD$ is a parallelogram. Find the coordinates of D. **[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)

$\overrightarrow{AB} = \begin{pmatrix} 6 \\ 0 \\ 8 \end{pmatrix}$ **A1**

$\left|\overrightarrow{AB}\right| = \sqrt{36+0+64} = 10$ **A1**

Total 2 marks

MARKSCHEME (b)

$\frac{1}{10}\begin{pmatrix} 6 \\ 0 \\ 8 \end{pmatrix}$ **M1**

$\begin{pmatrix} \frac{3}{5} \\ 0 \\ \frac{4}{5} \end{pmatrix}$ **A1**

Total 2 marks

MARKSCHEME (c)

$\overrightarrow{AD} = \overrightarrow{BC} = \begin{pmatrix} -7 \\ -4 \\ -2 \end{pmatrix}$ **M1**

$D(-6,\ -1,\ -4)$ **A1**

Total 2 marks

Note $\mathbf{d} = \mathbf{a} + \mathbf{c} - \mathbf{b}$.