Marked example 3

Paper 2 style · Graphic display calculator

3 6 marks AHL 3.16 ●●● Demanding

The points $P(1.5, -2, 0)$, $Q(4, 1, 2.5)$ and $R(-1, 3, 1)$ are the vertices of a triangle.

(a) Find $\overrightarrow{PQ} \times \overrightarrow{PR}$. **[2]**

(b) Find the area of the triangle PQR. **[2]**

(c) Find the shortest distance from R to the line PQ. **[2]**

MARKSCHEME (a)

$\overrightarrow{PQ} = \begin{pmatrix} 2.5 \\ 3 \\ 2.5 \end{pmatrix}$, $\overrightarrow{PR} = \begin{pmatrix} -2.5 \\ 5 \\ 1 \end{pmatrix}$ **M1**

$\begin{pmatrix} -9.5 \\ -8.75 \\ 20 \end{pmatrix}$ **A1**

Total 2 marks

MARKSCHEME (b)

$\frac{1}{2}\left|\overrightarrow{PQ} \times \overrightarrow{PR}\right| = \frac{1}{2} \times 23.807\ldots$ **M1**

11.9 $(11.9039\ldots)$ **A1**

Total 2 marks

MARKSCHEME (c)

$\frac{23.807\ldots}{\sqrt{21.5}}$ **M1**

5.13 $(5.13452\ldots)$ **A1**

Total 2 marks

Note Area of the parallelogram over the base $\left|\overrightarrow{PQ}\right|$.

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