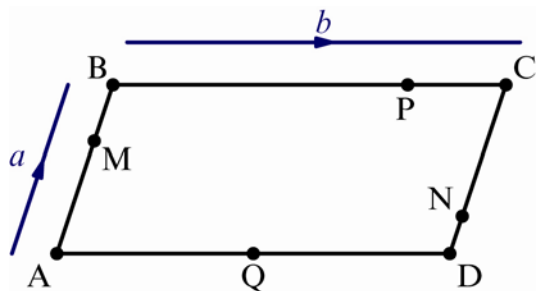


Self-assessment: 13 Vectors

1. In the diagram below, $\overrightarrow{AB} = \overrightarrow{DC} = \mathbf{a}$ and $\overrightarrow{BC} = \overrightarrow{AD} = \mathbf{b}$. Q is the midpoint of AD and points M, N, P and Q are such that $AM : MB = 2 : 1$, $DN : NC = 2 : 7$, $BP : PC = 3 : 1$.



- (a) Express \overrightarrow{MP} and \overrightarrow{QN} in terms of \mathbf{a} and \mathbf{b} .
- (b) Hence show that (MP) and (QN) are parallel.

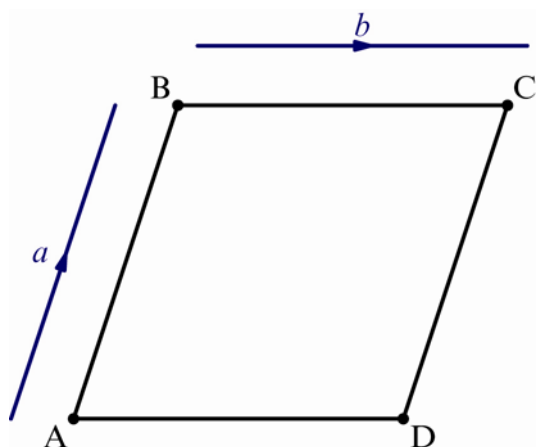
(accessible to students on the path to grade 3 or 4) [5 marks]

2. A triangle has vertices with coordinates A(3, 6, 1), B(9, 7, 3) and C(−1, 0, 2).

- (a) Find the length of the side BC.
- (b) Calculate the size of the angle \hat{ACB} .

(accessible to students on the path to grade 3 or 4) [6 marks]

3. The diagram shows a rhombus ABCD with $\overrightarrow{AB} = \mathbf{a}$, $\overrightarrow{BC} = \mathbf{b}$ and $|\mathbf{a}| = |\mathbf{b}|$.



- (a) Express \overrightarrow{AC} and \overrightarrow{BD} in terms of \mathbf{a} and \mathbf{b} .

(b) Evaluate $\overrightarrow{AC} \cdot \overrightarrow{BD}$.

(c) Explain how your answer shows that the diagonals of a rhombus are perpendicular to each other.

(accessible to students on the path to grade 5 or 6) [7 marks]

4. Given the points $A(3, -1, 2)$, $B(1, 1, 5)$ and $C(-3, -3, 7)$:

(a) Evaluate $\overrightarrow{AB} \times \overrightarrow{AC}$.

(accessible to students on the path to grade 5 or 6)

(b) Find the area of the triangle ABC.

(accessible to students on the path to grade 3 or 4)

Point D has coordinates $(5, p, q)$ and AD is perpendicular to AB and AC.

(c) Find the values of p and q .

(d) Calculate the volume of the tetrahedron DABC.

(accessible to students on the path to grade 5 or 6)

[12 marks]