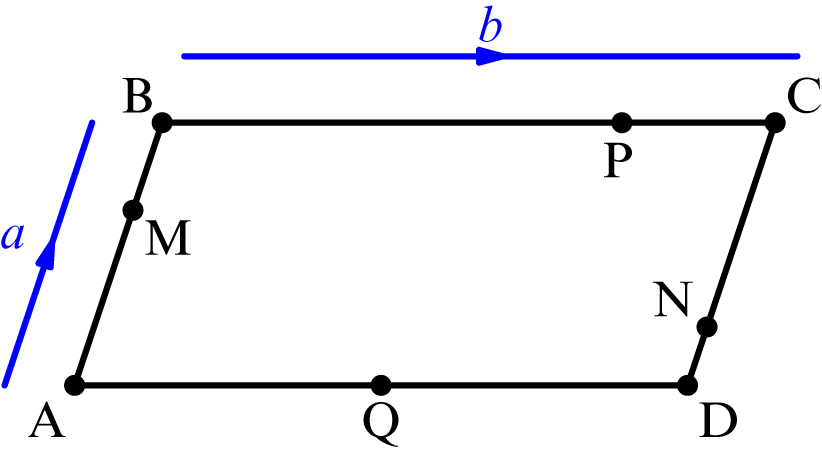
**Self-assessment: 13 Vectors**

**1.** In the diagram below,  and . 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  and  in terms of ***a*** and ***b***.

(b) Hence show that (MP) and (QN) are parallel.

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

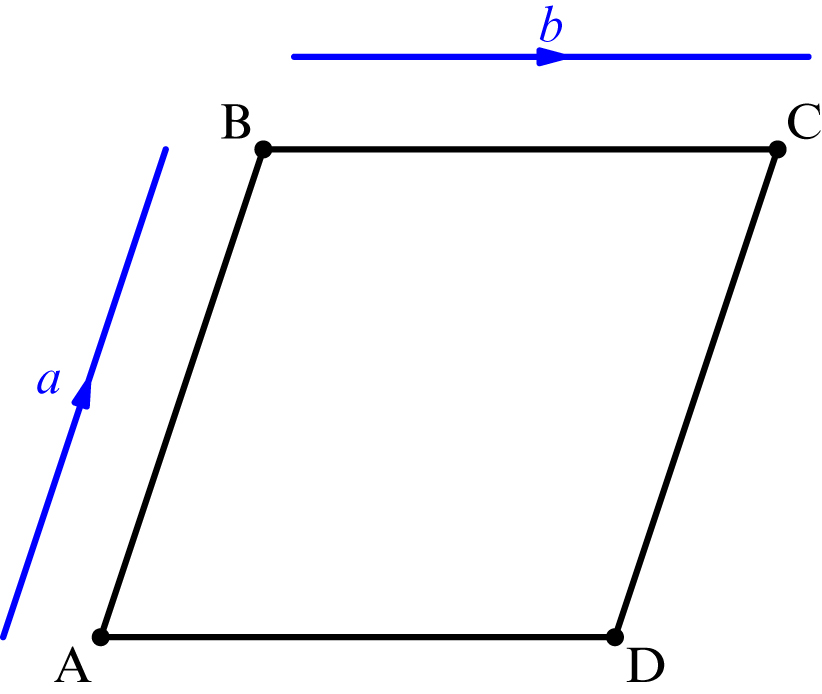
**2.** A triangle has vertices with coordinates A(3, 6, 1), B(9, 7, 3) and C( −1, 0, 2).

(a) Find the length of the side BC.

(b) Calculate the size of the angle .

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

**3.** The diagram shows a rhombus ABCD with  and |***a***| = |***b***|.



(a) Express  and  in terms of ***a*** and ***b***.

(b) Evaluate .

(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 .

*(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]*