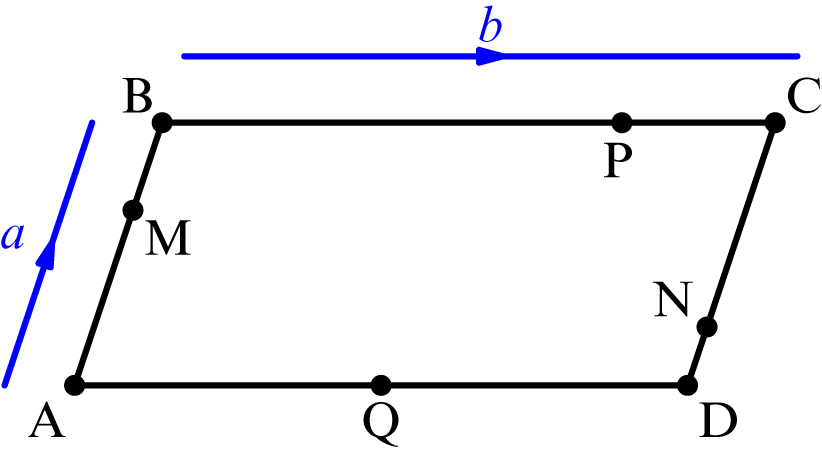
**Self-assessment: 11 Vectors**

**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) [6 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) [7 marks]*

**3.** Line l1 passes through points with coordinates (4, 0, 3) and (5, −1, 1). Line l2 has equation 

(a) Find the equation of l1.

(b) Determine whether l1 and l2 intersect, and if so, at what point.

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

**4.** Car *A* starts from the origin and moves with velocity ***vA*** = (3***i*** + 4.5***j***) kmh−1.

(a) Write down the position vector of car *A* after *t* hours.

Car *B* starts from the position (16***i*** + 23***j***) km and moves with velocity ***vB*** = (−5***i*** – ***j***) kmh−1.

(b) Find an expression for .

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

(c) Find the distance between the cars after 2.5 hours.

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

(d) Show that the cars never meet.

*(accessible to students on the path to grade 7)*

*[10 marks]*