collinear points
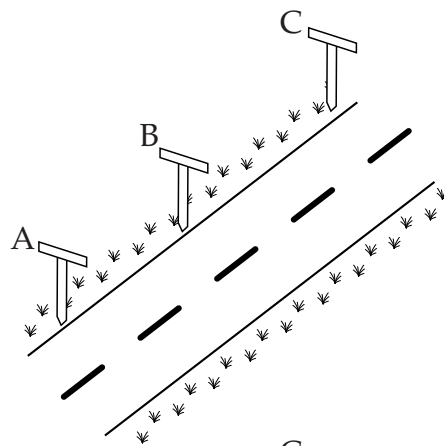
1. (*a*) Roadmakers look along the tops of a set of T-rods to ensure that straight sections of road are being created. Relative to suitable axes the top left corners of the T-rods are the points $A(-8, -10, -2)$, $B(-2, -1, 1)$ and $C(6, 11, 5)$.
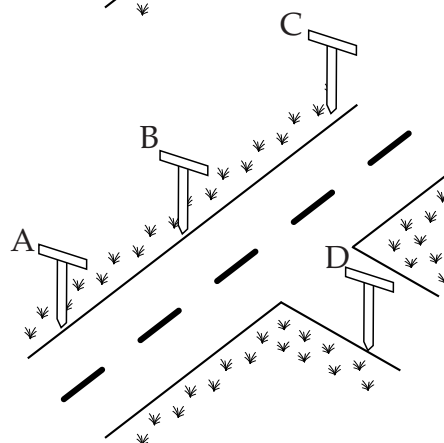
Determine whether or not the section of road ABC has been built in a straight line.

3

(*b*) A further T-rod is placed such that D has coordinates $(1, -4, 4)$.
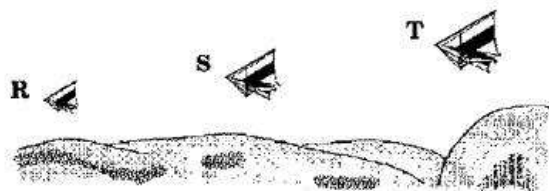
Show that DB is perpendicular to AB.

3

2. (a) Show that the points L(–5, 6, –5), M(7, –2, –1) and N(10, –4, 0) are collinear.

4

(b) Find the ration in which M divides LN.

1
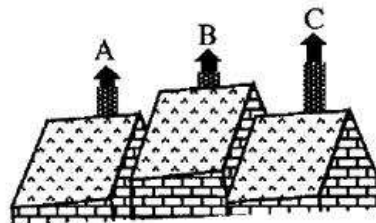
3. Relative to the top of a hill, three gliders have positions given by R(–1, –8, –2), S(2, –5, 4) and T(3, –4, 6).
Prove that R, S and T are collinear.

3

4. Relative to a suitable set of axes, the tops of three chimneys have coordinates given by A(1, 3, 2), B(2, –1, 4) and C(4, –9, 8).
Show that A, B and C are collinear.

3

5. Show that $P(2,2,3)$, $Q(4,4,1)$ and $R(5,5,0)$ are collinear and find the ratio in which Q divides PR. **4**

6. A is the point $(2,-5,6)$, B is $(6,-3,4)$ and C is $(12,0,1)$. Show that A, B and C are collinear and determine the ratio in which B divides AC. **4**

7. D, E and F have coordinates $(10,-8,-15)$, $(1,-2,-3)$ and $(-2,0,1)$ respectively.

    (*a*)   (i) Show that D, E and F are collinear.

         (ii) Find the ratio in which E divides DF. **4**

    (*b*) G has coordinates $(k,1,0)$.

        Given that DE is perpendicular to GE, find the value of k. **4**

8. ABCD is a quadrilateral with vertices $A(4,-1,3)$, $B(8,3,-1)$, $C(0,4,4)$ and $D(-4,0,8)$.

    (*a*) Find the coordinates of M, the midpoint of AB. **1**

    (*b*) Find the coordinates of the point T, which divides CM in the ratio $2:1$. **3**

    (*c*) Show that B, T and D are collinear and find the ratio in which T divides BD. **4**

[END OF QUESTIONS]