Math Academy Vectors Test 2

Name:

Marks: / 21

Time: 38 mins

1. The line l has equation $\frac{x-1}{-2} = y = \frac{z+7}{4}$, and the plane p has equation $x - z = 2$.

   i. Find the acute angle between l and p. [3]

   ii. Find the coordinates of the point at which l intersects p. [3]

   iii. The perpendicular to p from the point with coordinates $(1, 0, -7)$ meets p at the point N. Find the position vector of N. [4]

   iv. Find a vector equation of the line which is a reflection of l in p. [3]

2. Referred to the origin O, the points A and B are such that $\overrightarrow{OA} = \mathbf{a}$ and $\overrightarrow{OB} = b$. The point C on OA is such $OC : OA = 1 : 3$. The line l passes through the points A and B. It is given that angle $BOA = 60^\circ$ and $|\mathbf{a}| = 3|\mathbf{b}|$.

   i. By considering $(\mathbf{b} - \mathbf{a}) \cdot (\mathbf{b} - \mathbf{a})$, or otherwise, express $|\mathbf{b} - \mathbf{a}|$ in the form $k|\mathbf{b}|$, where k is a constant to be found in exact form. [3]

   ii. Find, in terms of $|\mathbf{b}|$, the shortest distance from C to l. [5]