7. Relative to a fixed origin O the points A, B and C have position vectors

$\mathbf{a} = -\mathbf{i} + \frac{4}{3}\mathbf{j} + 7\mathbf{k}$, $\mathbf{b} = 4\mathbf{i} + \frac{4}{3}\mathbf{j} + 2\mathbf{k}$ and $\mathbf{c} = 6\mathbf{i} + \frac{16}{3}\mathbf{j} + 2\mathbf{k}$ respectively.

(a) Find the cosine of angle ABC.

(3)

The quadrilateral $ABCD$ is a kite K.

(b) Find the area of K.

(3)

A circle is drawn inside K so that it touches each of the 4 sides of K.

(c) Find the radius of the circle, giving your answer in the form $p\sqrt{(q)} - q\sqrt{(p)}$, where p and q are positive integers.

(5)

(d) Find the position vector of the point D.

(7)