6. The points A, B and C have coordinates (3, 2, 2), (–1, 1, 3) and (–2, 4, 2) respectively.

The plane Π_1 contains the points A, B and C

(a) Determine a Cartesian equation of Π_1

(4)

Given that

- point D has coordinates (–1, 1, –2)
- line l passes through D and is perpendicular to Π_1
- plane Π_2 has equation $\mathbf{r}.(14\mathbf{i} - \mathbf{j} - 17\mathbf{k}) = -66$
- l meets Π_2 at the point E

(b) show that $DE = p\sqrt{22}$ where p is a rational number to be determined.

(5)

The point F has coordinates (4, 3, q) where q is a constant.

Given that A, B, C and F are the vertices of a tetrahedron of volume 12

(c) determine the possible values of q

(3)

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Question 6 continued

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Question 6 continued

(Total for Question 6 is 12 marks)