7. The point P has coordinates $(6, 1, -2)$

The plane Π has vector equation

$$\mathbf{r} = \begin{pmatrix} 6 \\ 1 \\ -2 \end{pmatrix} + s \begin{pmatrix} 2 \\ 3 \\ -1 \end{pmatrix} + t \begin{pmatrix} 4 \\ -1 \\ 2 \end{pmatrix}$$

where s and t are scalar parameters.

(a) Determine a Cartesian equation for Π

(3)

The point Q has coordinates $(0, 9, 32)$

The point R is the reflection of Q in Π

(b) Determine the coordinates of R

(4)

(c) Show that the exact area of the triangle PQR is $4\sqrt{k}$ where k is an integer to be determined.

(3)

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Question 7 continued

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Question 7 continued

(Total for Question 7 is 10 marks)