

## STEP II, 2017, Q8

8 All vectors in this question lie in the same plane.

The vertices of the non-right-angled triangle  $ABC$  have position vectors  $\mathbf{a}$ ,  $\mathbf{b}$  and  $\mathbf{c}$ , respectively. The non-zero vectors  $\mathbf{u}$  and  $\mathbf{v}$  are perpendicular to  $BC$  and  $CA$ , respectively.

Write down the vector equation of the line through  $A$  perpendicular to  $BC$ , in terms of  $\mathbf{u}$ ,  $\mathbf{a}$  and a parameter  $\lambda$ .

The line through  $A$  perpendicular to  $BC$  intersects the line through  $B$  perpendicular to  $CA$  at  $P$ . Find the position vector of  $P$  in terms of  $\mathbf{a}$ ,  $\mathbf{b}$ ,  $\mathbf{c}$  and  $\mathbf{u}$ .

Hence show that the line  $CP$  is perpendicular to the line  $AB$ .



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