Question 6

(9 marks)

(a) Figure 4 shows the triangle \overrightarrow{ABC} , where $\overrightarrow{CA} = a$ and $\overrightarrow{CB} = b$.

Points P and Q lie on CA and AB respectively, such that

$$CP = kPA$$

$$BQ = kQA$$

where k is a positive constant.

Write the following vectors in terms of a and b.

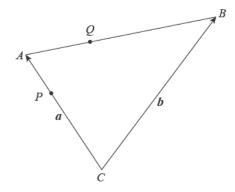


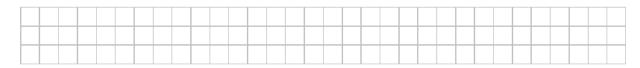
Figure 4

(i) \overrightarrow{AB}



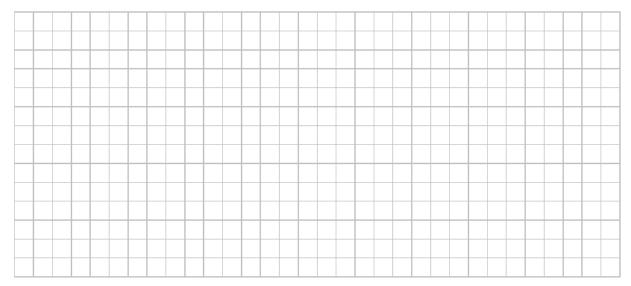
(1 mark)

(ii) \overrightarrow{PA}



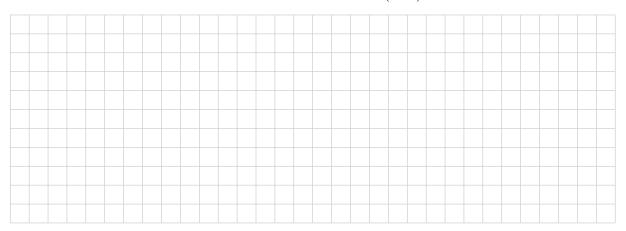
(1 mark)

(b) (i) Using vectors, show that PQ is parallel to CB.



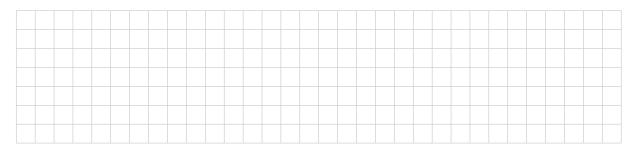
(2 marks)

(ii) Using vectors, show that the area of triangle APQ is $\frac{1}{2(k+1)^2}|\boldsymbol{a}\times\boldsymbol{b}|$.



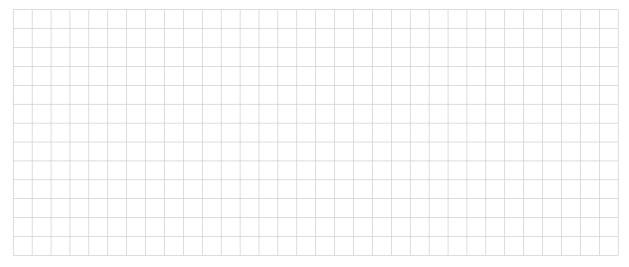
(2 marks)

- (c) If $|\boldsymbol{a} \times \boldsymbol{b}| = 9$ and k = 4:
 - (i) find the area of triangle APQ



(1 mark)

(ii) find the area of quadrilateral PQBC.



(2 marks)