

The diagram shows a three-dimensional shape OABCDEFG. The base OABC and the upper surface DEFG are identical horizontal rectangles. The parallelograms OAED and CBFG both lie in vertical planes. Points P and Q are the mid-points of OD and GF respectively. Unit vectors  $\mathbf{i}$  and  $\mathbf{j}$  are parallel to  $\overrightarrow{OA}$  and  $\overrightarrow{OC}$  respectively and the unit vector  $\mathbf{k}$  is vertically upwards. The position vectors of A, C and D are given by  $\overrightarrow{OA} = 6\mathbf{i}$ ,  $\overrightarrow{OC} = 8\mathbf{j}$  and  $\overrightarrow{OD} = 2\mathbf{i} + 10\mathbf{k}$ .

(i)	Express each of the vectors $\overrightarrow{PB}$ and $\overrightarrow{PQ}$ in terms of $\mathbf{i}$ , $\mathbf{j}$ and $\mathbf{k}$ .	[4]
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(ii)	Determine whether $P$ is nearer to $Q$ or to $B$ .	[2]
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(;;;)	Use a scalar product to find angle <i>BPQ</i> .	[3]
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