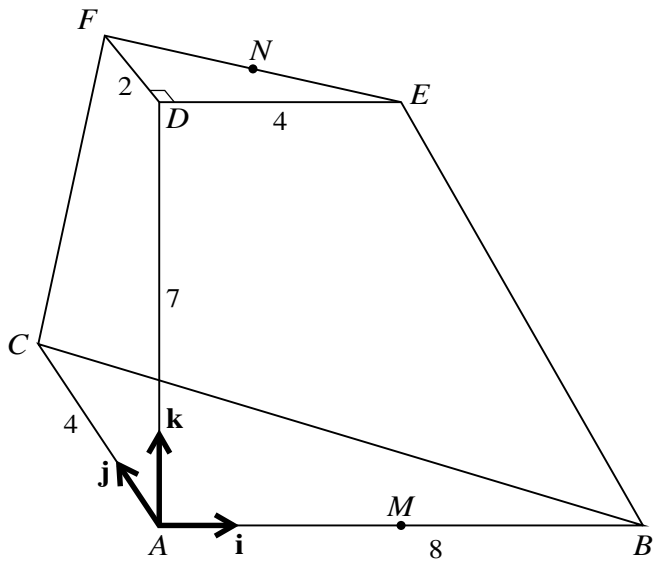
6



The diagram shows a solid figure $ABCDEF$ in which the horizontal base ABC is a triangle right-angled at A. The lengths of AB and AC are 8 units and 4 units respectively and M is the mid-point of AB. The point D is 7 units vertically above A. Triangle DEF lies in a horizontal plane with DE, DF and FE parallel to AB, AC and CB respectively and N is the mid-point of FE. The lengths of DE and DF are 4 units and 2 units respectively. Unit vectors **i**, **j** and **k** are parallel to $\overrightarrow{AB}$, $\overrightarrow{AC}$ and $\overrightarrow{AD}$ respectively.

(i) Find $\overrightarrow{MF}$ in terms of **i**, **j** and **k**. [1]

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(ii) Find $\overrightarrow{FN}$ in terms of **i** and **j**. [1]

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(iii) Find $\overrightarrow{MN}$ in terms of **i**, **j** and **k**. [1]

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(iv) Use a scalar product to find angle FMN. [4]