5

GCSE VECTORS

24 $OACB$ is a parallelogram.

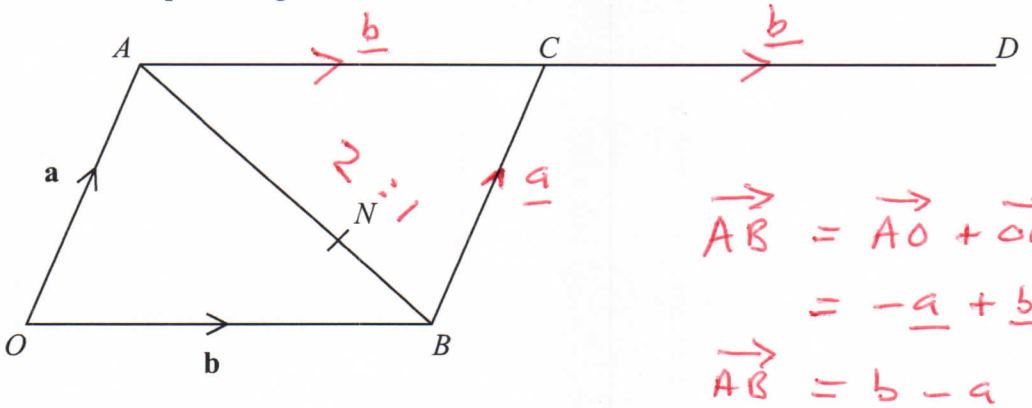

Diagram **NOT** accurately drawn

$\overrightarrow{OA} = \mathbf{a}$ and $\overrightarrow{OB} = \mathbf{b}$

D is the point such that $\overrightarrow{AC} = \overrightarrow{CD}$

The point N divides AB in the ratio 2 : 1

(a) Write an expression for $\overrightarrow{ON}$ in terms of **a** and **b**.

$\overrightarrow{AB} = \overrightarrow{AO} + \overrightarrow{OB}$

$= -\underline{a} + \underline{b}$

$\overrightarrow{AB} = \underline{b} - \underline{a}$

$\overrightarrow{ON} = \overrightarrow{OA} + \overrightarrow{AN}$

$= \overrightarrow{OA} + \frac{2}{3}\overrightarrow{AB}$

$= \underline{a} + \frac{2}{3}(\underline{b} - \underline{a})$

$= \underline{a} + \frac{2}{3}\underline{b} - \frac{2}{3}\underline{a}$

$\overrightarrow{ON} = \frac{1}{3}\underline{a} + \frac{2}{3}\underline{b}$

$= \frac{1}{3}(\underline{a} + 2\underline{b})$

(3)

*(b) Prove that OND is a straight line.

$\overrightarrow{OD} = \overrightarrow{OA} + \overrightarrow{AD}$

$= \underline{a} + 2\underline{b} \quad = 3\overrightarrow{ON}$

$\therefore$ $\overrightarrow{OD}$ is in same direction as $\overrightarrow{ON}$

so OND is a straight line.

(3)

(Total for Question 24 is 6 marks)

TOTAL FOR PAPER IS 100 MARKS