Question	Scheme	Marks	AOs
5(a)(i)	$\overrightarrow{BD} = -\mathbf{b} + \mathbf{d}$	B1	1.1b
(ii)	Attempts $\overrightarrow{BN} = -\frac{1}{2}\mathbf{b} + \frac{3}{5}\overrightarrow{MC} = -\frac{1}{2}\mathbf{b} + \frac{3}{5}\left(\frac{1}{2}\mathbf{b} + \frac{1}{3}\mathbf{d}\right)$	M1	3.1a
	$\overrightarrow{BN} = -\frac{1}{5}\mathbf{b} + \frac{1}{5}\mathbf{d}$	A1	1.1b
		(3)	
(b)	$\overrightarrow{BD} = -\mathbf{b} + \mathbf{d}$ and $\overrightarrow{BN} = -\frac{1}{5}\mathbf{b} + \frac{1}{5}\mathbf{d}$ $\overrightarrow{BD} = 5\overrightarrow{BN}$ hence *B*, *N* and *D* are collinear.*	B1*	2.1
		(1)	
			(4 marks)

Notes:

(a)(i)

B1: $\overrightarrow{BD} = -\mathbf{b} + \mathbf{d}$ o.e.

(a)(ii)

M1: Attempts $\overrightarrow{BN} = -\frac{1}{2}\mathbf{b} + \frac{3}{5}\overrightarrow{AC} = -\frac{1}{2}\mathbf{b} + \frac{3}{5}"\left(\frac{1}{2}\mathbf{b} + \frac{1}{3}\mathbf{d}\right)"$

A1: Reaches $\overrightarrow{BN} = -\frac{1}{5}\mathbf{b} + \frac{1}{5}\mathbf{d}$

(b)

B1*: Requires

- $\overrightarrow{BD} = -\mathbf{b} + \mathbf{d}$ and $\overrightarrow{BN} = -\frac{1}{5}\mathbf{b} + \frac{1}{5}\mathbf{d}$ correct
- a correct equation relating the two vectors, e.g., $\overrightarrow{BD} = 5\overrightarrow{BN}$
- a minimal conclusion: "hence collinear"

Useful vectors:

$\overrightarrow{AM} = \frac{1}{2}\mathbf{b}$ $\overrightarrow{MC} = \frac{1}{2}\mathbf{b}$ $\overrightarrow{MC} = \frac{1}{2}\mathbf{b} + \frac{1}{3}\mathbf{d}$