

a M is the midpoint. Find $\overrightarrow{MN}$ $-\frac{1}{2}\mathbf{a} + \frac{2}{3}\mathbf{b}$ between points on two sides	b $\overrightarrow{OA} = 2\mathbf{a} + \mathbf{b}$, $\overrightarrow{OB} = 8\mathbf{a} + 4\mathbf{b}$. P is on AB with $AP:PB = 1:2$. Find $\overrightarrow{OP}$ $4\mathbf{a} + 2\mathbf{b}$ a ratio point from position vectors	c Find $\overrightarrow{CP}$ $\mathbf{a} - \frac{2}{3}\mathbf{c}$ a ratio on a side, then across	d Find p and q if $(p+2)\mathbf{a} + 3\mathbf{b} = 5\mathbf{a} + (q-1)\mathbf{b}$ $p = 3, q = 4$ equating coefficients
e Show that MN is parallel to OB $\overrightarrow{MN} = \frac{1}{2}\mathbf{b} = \frac{1}{2}\overrightarrow{OB}$ proof: a midpoint line is parallel	f Show that O, P and Q are collinear $\overrightarrow{OQ} = 3\overrightarrow{OP}$ proof: collinear through a ratio point	g $\overrightarrow{OA} = \mathbf{a} + \mathbf{b}$, $\overrightarrow{OB} = 3\mathbf{a} + 2\mathbf{b}$, $\overrightarrow{OC} = 7\mathbf{a} + 4\mathbf{b}$. Show A, B, C are collinear. $\overrightarrow{BC} = 2\overrightarrow{AB}$, and B is shared proof: collinear from position vectors	h $\overrightarrow{OA} = 2\mathbf{a} - \mathbf{b}$, $\overrightarrow{OB} = 3\mathbf{a} + \mathbf{b}$, $\overrightarrow{OC} = 6\mathbf{a} + 7\mathbf{b}$. Find $AB:BC$ $1:3$ a ratio of collinear points
i $\overrightarrow{OA} = \mathbf{a}$, $\overrightarrow{OB} = \mathbf{b}$, $\overrightarrow{OC} = 3\mathbf{a} + k\mathbf{b}$. A, B and C are collinear. Find k $k = -2$ on line AB: coefficients add to 1	j $\overrightarrow{OC} = \mathbf{a} + 2\mathbf{b}$. Find $\overrightarrow{OX}$ $\frac{1}{3}\mathbf{a} + \frac{2}{3}\mathbf{b}$ where two lines cross	k $\overrightarrow{OC} = \mathbf{a} + 2\mathbf{b}$. Find $OX:XC$ $1:2$ the ratio along the crossing line	l $k\mathbf{a} + 2\mathbf{b}$ is parallel to $8\mathbf{a} + k\mathbf{b}$. Find both values of k $k = 4$ or $k = -4$ a parallel condition as a quadratic

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