

## Solutions to Past Paper Questions – Vectors

$$\begin{aligned}
 16) \text{ (a) (i) } \vec{KN} &= \vec{KA} + \vec{AN} = -\mathbf{a} + \mathbf{b} \\
 \text{(ii) } \vec{AC} &= 2\mathbf{b} + 2\mathbf{c} \\
 \text{(iii) } \vec{BC} &= \vec{BA} + \vec{AD} + \vec{DC} = -2\mathbf{a} + 2\mathbf{b} + 2\mathbf{c} \\
 \text{(iv) } \vec{LM} &= \vec{LC} + \vec{CM} \\
 &= \frac{1}{2}\vec{BC} + \vec{CM} \\
 &= \frac{1}{2}(-2\mathbf{a} + 2\mathbf{b} + 2\mathbf{c}) + -\mathbf{c} \\
 &= -\mathbf{a} + \mathbf{b} + \mathbf{c} - \mathbf{c} \\
 &= -\mathbf{a} + \mathbf{b}
 \end{aligned}$$

(b) KN and LM are parallel and equal in length

$$17) \text{ (a) } \vec{PB} = \vec{PO} + \vec{OB} = -\frac{1}{2}\mathbf{a} + \mathbf{b}$$

$$\text{(b) } \vec{AC} = \vec{AO} + \vec{OC} = -\mathbf{a} + 2\mathbf{b} \quad \text{So } \vec{AC} = 2\vec{PB} \quad \text{and hence AC is parallel to PB}$$

(c) From (b), AC = 16cm

$$19) \text{ (a) } \vec{PQ} = \vec{PO} + \vec{OQ} = -\mathbf{a} + \mathbf{b} \quad \text{or} \quad \mathbf{b} - \mathbf{a}$$

$$\begin{aligned}
 \text{(b) } \vec{OT} &= \vec{OP} + \vec{PT} \\
 &= \vec{OP} + \frac{2}{3}\vec{PQ} \\
 &= \mathbf{a} + \frac{2}{3}(\mathbf{b} - \mathbf{a}) \\
 &= \mathbf{a} + \frac{2}{3}\mathbf{b} - \frac{2}{3}\mathbf{a} \\
 &= \frac{1}{3}\mathbf{a} + \frac{2}{3}\mathbf{b}
 \end{aligned}$$

$$21) \text{ (a) } \vec{PT} = \mathbf{a} + \mathbf{b}$$

$$\text{(b) } \vec{TU} = \mathbf{b} - \mathbf{a}$$