

4.4 Answers

4.4.1 Solution to 4.2 Example (Teaching Video)

$$(i) \quad \overrightarrow{EB} = 2a$$

$$(ii) \quad \overrightarrow{CD} = -a$$

$$(iii) \quad \overrightarrow{AB} = -a + b$$

$$(iv) \quad \overrightarrow{BC} = -2a + b$$

$$(v) \quad \overrightarrow{AD} = -4a + 2b$$

$$(vi) \quad \overrightarrow{BD} = -3a + b$$

[6 marks]

4.4.2 Solution to 4.3 Exercise

Answer 1

$$(a) \quad (i) \quad \overrightarrow{BC} = a$$

$$(ii) \quad \overrightarrow{AC} = b$$

$$(iii) \quad \overrightarrow{BO} = -b$$

$$(iv) \quad \overrightarrow{CY} = -\frac{1}{2}a$$

$$(v) \quad \overrightarrow{AB} = -a + b$$

$$(vi) \quad \overrightarrow{OX} = a + \frac{1}{2}b$$

$$(vii) \quad \overrightarrow{AX} = \frac{1}{2}b$$

$$(viii) \quad \overrightarrow{XY} = -\frac{1}{2}a + \frac{1}{2}b$$

[8 marks]

(b) C rhombus

[1 mark]

Answer 2

$$(a) \quad (i) \quad \overrightarrow{BG} = \frac{1}{2}a + b$$

$$(ii) \quad \overrightarrow{GO} = -\frac{1}{2}a - 2b$$

$$(iii) \quad \overrightarrow{AC} = -a + 2b$$

$$(iv) \quad \overrightarrow{GE} = \frac{1}{2}a - b$$

$$(v) \quad \overrightarrow{GA} = \frac{1}{2}a - 2b$$

$$(vi) \quad \overrightarrow{HO} = -a - \frac{3}{2}b$$

[6 marks]

(b) (i)

$$\overrightarrow{AC} = -a + 2b \quad \text{and} \quad \overrightarrow{GE} = \frac{1}{2}a - b$$

$$\therefore \overrightarrow{AC} = -2 \overrightarrow{GE}$$

$$\text{i.e. } \lambda = -2$$

[1 mark]

(ii) D parallel

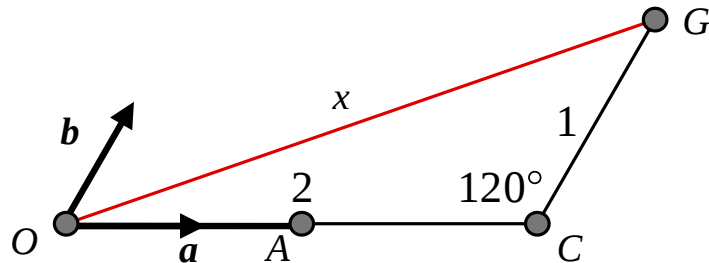
[1 mark]

Answer 3

$$\begin{array}{ll}
 \text{(a)} & \text{(i)} \quad \overrightarrow{OH} = a + 2b \qquad \text{(ii)} \quad \overrightarrow{BE} = 3a - b \\
 & \text{(iii)} \quad \overrightarrow{ED} = -3a + 2b \qquad \text{(iv)} \quad \overrightarrow{DA} = a - 2b
 \end{array}$$

[4 marks]

(b)



By the cosine rule...

$$\begin{aligned}
 x^2 &= 2^2 + 1^2 - 2 \times 2 \times 1 \times \cos 120^\circ \\
 &= 4 + 1 + 2 \\
 &= 7
 \end{aligned}$$

$$\text{Thus } |\overrightarrow{OG}| = \sqrt{7} \text{ units}$$

[2 marks]

Answer 4

$$\begin{array}{ll}
 \text{(a)} & \text{(i)} \quad \overrightarrow{TP} = a + b \\
 & \text{(ii)} \quad \overrightarrow{PO} = -a \\
 & \text{(iii)} \quad \overrightarrow{UO} = -a + b
 \end{array}$$

$$\text{(b)} \quad |\overrightarrow{UR}| = 5 \text{ cm}$$

[4 marks]

Answer 5

$$\begin{aligned}
 \text{(a)} \quad \text{(i)} \quad \vec{PR} &= \mathbf{a} + \mathbf{b} \\
 \text{(ii)} \quad \vec{SQ} &= 3\mathbf{a} - \mathbf{b} \\
 \text{(iii)} \quad \vec{PT} &= \vec{PS} + \vec{ST} \\
 &= \vec{PS} + \frac{1}{4} \vec{SQ} \\
 &= \mathbf{b} + \frac{1}{4} (3\mathbf{a} - \mathbf{b}) \\
 &= \frac{3}{4} \mathbf{a} + \frac{3}{4} \mathbf{b} \\
 &= \frac{3}{4} (\mathbf{a} + \mathbf{b})
 \end{aligned}$$

[3 marks]

$$\begin{aligned}
 \text{(b)} \quad \text{(i)} \quad P, T \text{ and } R \text{ are parallel with } P \text{ in common.} \\
 \therefore \text{ They are all on a straight line.} \\
 \text{(ii)} \quad \vec{PT} = \frac{3}{4} (\mathbf{a} + \mathbf{b}) \quad \vec{PR} = \mathbf{a} + \mathbf{b} \\
 \therefore \vec{PT} = \frac{3}{4} \vec{PR}
 \end{aligned}$$

[2 marks]**Answer 6**

$$\begin{aligned}
 \text{(i)} \quad \vec{PS} &= 4\mathbf{b} \\
 \text{(ii)} \quad \vec{PR} &= \mathbf{a} + \mathbf{b} \\
 \text{(iii)} \quad \vec{RS} &= -\mathbf{a} + 3\mathbf{b} \\
 \text{(iv)} \quad \vec{QT} &= -\frac{1}{2} \mathbf{a} + \frac{1}{2} \mathbf{b} \\
 \text{(v)} \quad \vec{TS} &= -\frac{1}{2} \mathbf{a} + \frac{5}{2} \mathbf{b}
 \end{aligned}$$

[5 marks]**Answer 7**

$$\begin{aligned}
 \text{(i)} \quad \vec{OQ} &= 3\mathbf{a} + 3\mathbf{b} \\
 \text{(ii)} \quad \vec{OE} &= 2\mathbf{a} + 2\mathbf{b} \\
 \text{(iii)} \quad \vec{DE} &= \mathbf{a} + 2\mathbf{b}
 \end{aligned}$$

[3 marks]