

Vectors

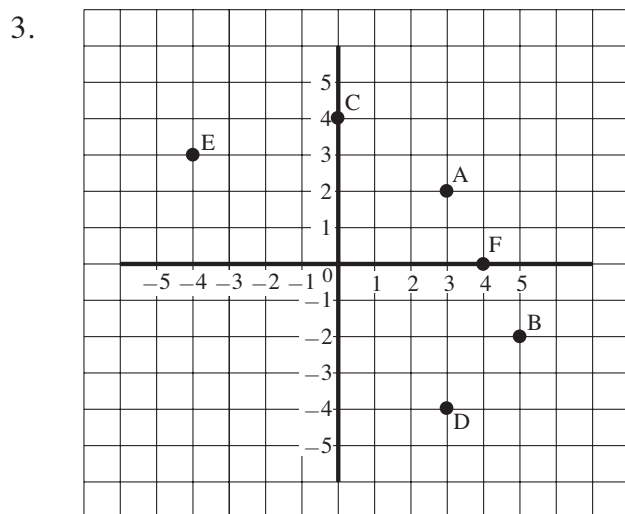
Answers

1 Vectors and Scalars

1. Vectors: (b), (d), (e) scalars: (a), (c), (f)

2. (a) $\begin{pmatrix} 6 \\ 0 \end{pmatrix}$ (b) $\begin{pmatrix} 6 \\ -3 \end{pmatrix}$ (c) $\begin{pmatrix} -3 \\ 2 \end{pmatrix}$ (d) $\begin{pmatrix} -6 \\ -3 \end{pmatrix}$

(e) $\begin{pmatrix} 6 \\ 3 \end{pmatrix}$ (f) $\begin{pmatrix} 3 \\ -5 \end{pmatrix}$ (g) $\begin{pmatrix} -3 \\ -2 \end{pmatrix}$ (h) $\begin{pmatrix} 3 \\ 2 \end{pmatrix}$ $\vec{AC} = -\vec{CA}$



$$\vec{EF} = \begin{pmatrix} 8 \\ -3 \end{pmatrix}$$

4. (a) $\begin{pmatrix} 7 \\ 2 \end{pmatrix}$ (b) $\begin{pmatrix} 3 \\ -1 \end{pmatrix}$ (c) $\begin{pmatrix} 4 \\ 11 \end{pmatrix}$ (d) $\begin{pmatrix} 1 \\ 12 \end{pmatrix}$

(e) $\begin{pmatrix} -1 \\ -12 \end{pmatrix}$ (f) $\begin{pmatrix} -4 \\ -3 \end{pmatrix}$ (g) $\begin{pmatrix} 12 \\ 21 \end{pmatrix}$ (h) $\begin{pmatrix} -6 \\ 10 \end{pmatrix}$

(i) $\begin{pmatrix} 0 \\ 16 \end{pmatrix}$ (j) $\begin{pmatrix} 17 \\ -1 \end{pmatrix}$ (k) $\begin{pmatrix} -12 \\ -1 \end{pmatrix}$ (l) $\begin{pmatrix} 12 \\ -28 \end{pmatrix}$

5. (a) $\begin{pmatrix} 14 \\ 1 \end{pmatrix}$ (b) $\begin{pmatrix} 2 \\ -8 \end{pmatrix}$ (c) $\begin{pmatrix} 0 \\ 9 \end{pmatrix}$ (d) $\begin{pmatrix} -4 \\ -14 \end{pmatrix}$

(e) $\begin{pmatrix} -10 \\ -14 \end{pmatrix}$ (f) $\begin{pmatrix} 24 \\ 21 \end{pmatrix}$

6. (a) $\begin{pmatrix} 1 \\ -3 \end{pmatrix}$ (b) $\begin{pmatrix} 6 \\ -2 \end{pmatrix}$ (c) $\begin{pmatrix} 1 \\ -1 \end{pmatrix}$ (d) $\begin{pmatrix} \frac{1}{2} \\ \frac{3}{-2} \end{pmatrix}$ (e) $\begin{pmatrix} -1 \\ -3 \end{pmatrix}$

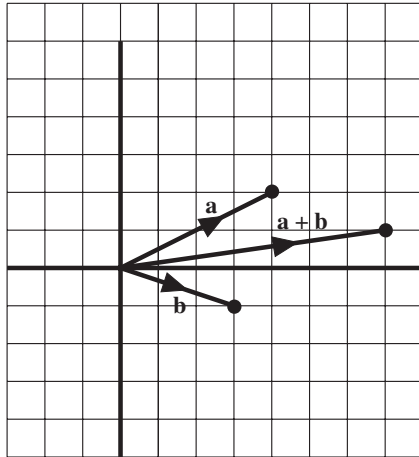
(f) $\begin{pmatrix} 4 \\ 7 \end{pmatrix}$ (g) $\begin{pmatrix} \frac{3}{11} \\ -\frac{2}{2} \end{pmatrix}$ (h) $\begin{pmatrix} -7 \\ \frac{13}{2} \end{pmatrix}$ (i) $\begin{pmatrix} -5 \\ \frac{2}{3} \\ \frac{2}{2} \end{pmatrix}$

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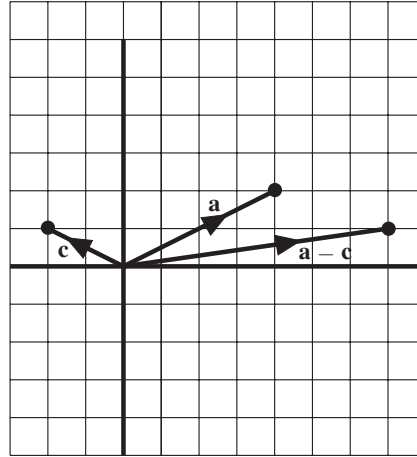
Answers

1

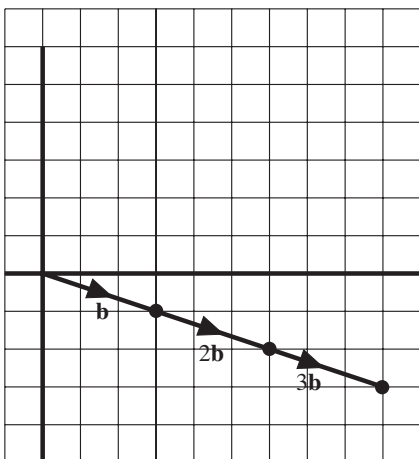
7. (a)



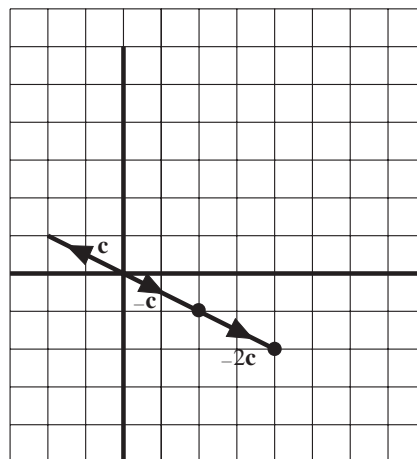
(b)



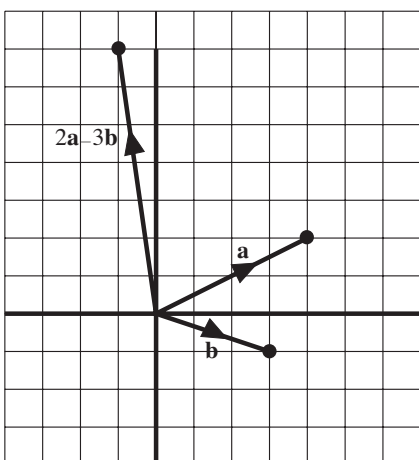
(c)



(d)



(e)



Vectors

Answers

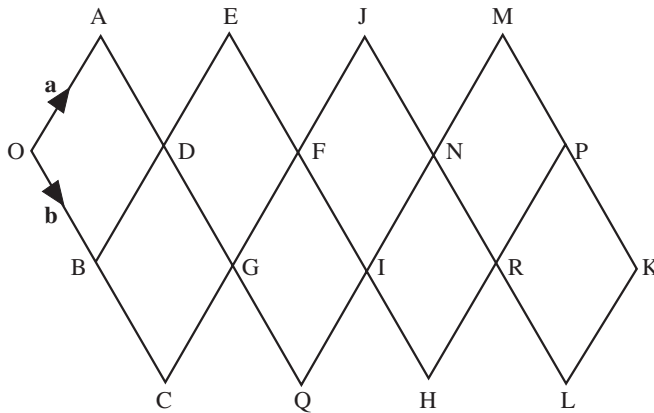
1

8. (a) (i) $\begin{pmatrix} 4 \\ 2 \end{pmatrix}$ (ii) $\begin{pmatrix} 4 \\ 2 \end{pmatrix}$
- (b) $\sqrt{4^2 + 2^2} = \sqrt{20}$
- (c) Equal in length and in same direction
9. (a) $\vec{RP} = \begin{pmatrix} -b \\ 2b \end{pmatrix}$, $\vec{RS} = \begin{pmatrix} 2b \\ 3b + 1 \end{pmatrix}$
- (b) 2

2 Vectors and Geometry

1. (a) $4\mathbf{a}$ (b) $\mathbf{a}$ (c) $\mathbf{b}$ (d) $-\mathbf{a} + 2\mathbf{b}$
- (e) $\mathbf{b}$ (f) $3\mathbf{a} + 2\mathbf{b}$ (g) $3\mathbf{b}$ (h) $3\mathbf{b}$
- (i) $\mathbf{a} - \mathbf{b}$ (j) $2\mathbf{a} - 2\mathbf{b}$ (k) $-\mathbf{a} - 2\mathbf{b}$ (l) $-3\mathbf{a} - 2\mathbf{b}$
- (m) $-3\mathbf{a} + 3\mathbf{b}$ (n) $-2\mathbf{a}$ (o) $-4\mathbf{a} + \mathbf{b}$ (p) $-3\mathbf{a} - 3\mathbf{b}$

2.



3. (a) (i) $\mathbf{c}$ (ii) $\mathbf{a}$ (iii) $-\mathbf{a}$ (iv) $-\mathbf{a} + \mathbf{c}$ (v) $\mathbf{a} + \mathbf{c}$ (vi) $\mathbf{a} - \mathbf{c}$
- (b) (i) $\frac{1}{2}\mathbf{c}$ (ii) $\mathbf{a} + \frac{1}{2}\mathbf{c}$ (iii) $\frac{1}{2}\mathbf{a}$ (iv) $\mathbf{c} + \frac{1}{2}\mathbf{a}$ (v) $-\frac{1}{2}\mathbf{a} + \frac{1}{2}\mathbf{c}$
4. (a) $\frac{1}{2}(\mathbf{q} + \mathbf{p})$ (b) $\frac{1}{2}(\mathbf{p} + \mathbf{q})$ (c) M and N are coincident
5. (a) $\vec{AD} = 6\mathbf{i}$, $\vec{OD} = 6\mathbf{i} + 6\mathbf{j}$ (b) $\vec{CE} = 4\mathbf{j}$, $\vec{OE} = 8\mathbf{i} + 4\mathbf{j}$
- (c) $\vec{OM} = 7\mathbf{i} + 5\mathbf{j}$
6. (a) $\frac{1}{2}(\mathbf{p} + \mathbf{q})$, $\frac{1}{2}\mathbf{p} + \frac{5}{2}\mathbf{q}$ (b) $2\mathbf{q}$

Vectors

Answers

2

8. (a) $2\mathbf{a} + \mathbf{b} + \mathbf{c}$ (b) $\mathbf{a} + \frac{1}{2}\mathbf{b} + \frac{1}{2}\mathbf{c}$ (c) $-\mathbf{a}$
- (d) $\mathbf{a} + \frac{1}{2}\mathbf{b} - \frac{1}{2}\mathbf{c}$ (e) $\frac{1}{2}(\mathbf{c} - \mathbf{b})$
10. (a) $\frac{1}{3}\mathbf{b} - \mathbf{d}$ (b) $\mathbf{b} + \mathbf{d}$ (c) $\alpha = \beta = 3$
11. $\vec{AQ} = \frac{1}{3}(\mathbf{a} + \mathbf{b})$
12. (a) $\vec{AC} = 2\mathbf{p} + 8\mathbf{q}$
13. (a) (i) $-\mathbf{a} + \frac{1}{2}\mathbf{c}$ (ii) $\mathbf{c} - 2\mathbf{a}$ (b) $1 : 2$
14. (a) $\begin{pmatrix} 7 \\ 5 \end{pmatrix}$ (b) $\vec{KH} = \begin{pmatrix} 2.5 \\ 4 \end{pmatrix}$ $\vec{LH} = \begin{pmatrix} -1.5 \\ 4 \end{pmatrix}$
- (c) $\vec{LN} = \begin{pmatrix} -3 \\ 8 \end{pmatrix} = 2\vec{LH}$ so H is the midpoint of LN .
15. (a) $\vec{BD} = 2\mathbf{b} - \mathbf{a}$, $\vec{BX} = \frac{3}{5}(2\mathbf{b} - \mathbf{a})$
- (b) $\vec{XC} = \vec{BC} - \vec{BX} = \mathbf{b} - \frac{3}{5}(2\mathbf{b} - \mathbf{a}) = \frac{1}{5}(3\mathbf{a} - \mathbf{b})$