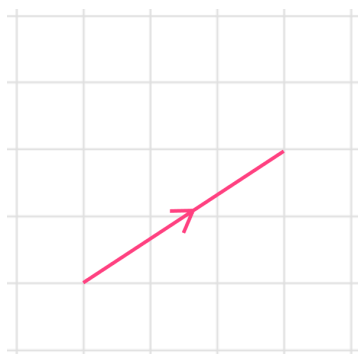THIRD SPACE
LEARNING

Vectors - Worksheet

Skill

Group A - Column vectors

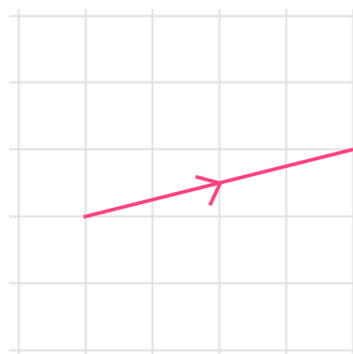Write these vectors as column vectors:
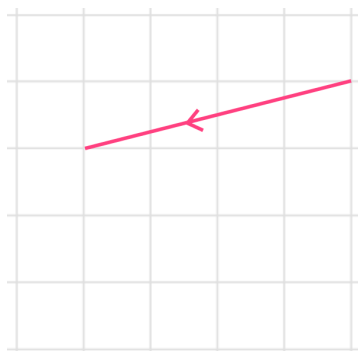
1)

2)
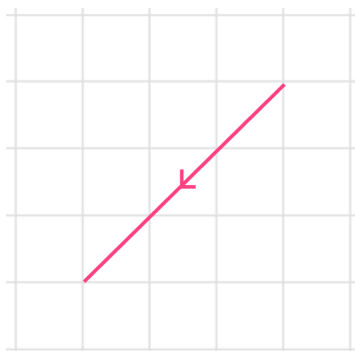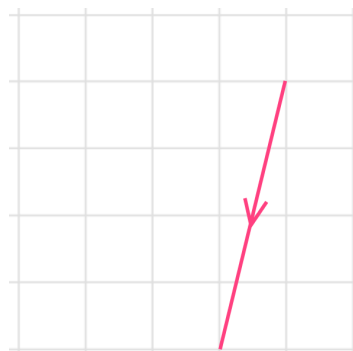
3)

4)

5)

6)

7)

8)

9)

10)

11)

12)

THIRD SPACE
LEARNING

Vectors - Worksheet

Group B - Magnitude of a vector

Work out the magnitude of these vectors:

(Give your answer to 3 s.f. where necessary).

1) $\begin{pmatrix} 3 \\ 2 \end{pmatrix}$

2) $\begin{pmatrix} 2 \\ 3 \end{pmatrix}$

3) $\begin{pmatrix} 4 \\ 1 \end{pmatrix}$

4) $\begin{pmatrix} 3 \\ -2 \end{pmatrix}$

5) $\begin{pmatrix} 2 \\ -2 \end{pmatrix}$

6) $\begin{pmatrix} 1 \\ -3 \end{pmatrix}$

7) $\begin{pmatrix} -4 \\ 2 \end{pmatrix}$

8) $\begin{pmatrix} -3 \\ 1 \end{pmatrix}$

9) $\begin{pmatrix} -4 \\ 3 \end{pmatrix}$

10) $\begin{pmatrix} -4 \\ -1 \end{pmatrix}$

11) $\begin{pmatrix} -3 \\ -3 \end{pmatrix}$

12) $\begin{pmatrix} -1 \\ -4 \end{pmatrix}$

Group C - Vector addition

Work out:

1) $\begin{pmatrix} 4 \\ 5 \end{pmatrix} + \begin{pmatrix} 1 \\ 3 \end{pmatrix}$

2) $\begin{pmatrix} 4 \\ 5 \end{pmatrix} + \begin{pmatrix} 1 \\ -3 \end{pmatrix}$

3) $\begin{pmatrix} 4 \\ 5 \end{pmatrix} + \begin{pmatrix} -1 \\ 3 \end{pmatrix}$

4) $\begin{pmatrix} 5 \\ -3 \end{pmatrix} + \begin{pmatrix} 2 \\ -4 \end{pmatrix}$

5) $\begin{pmatrix} 5 \\ -3 \end{pmatrix} + \begin{pmatrix} -2 \\ -4 \end{pmatrix}$

6) $\begin{pmatrix} 5 \\ -3 \end{pmatrix} + \begin{pmatrix} -2 \\ 4 \end{pmatrix}$

7) $\begin{pmatrix} 4 \\ -1 \end{pmatrix} + \begin{pmatrix} 2 \\ 5 \end{pmatrix}$

8) $\begin{pmatrix} -4 \\ -1 \end{pmatrix} + \begin{pmatrix} 2 \\ 5 \end{pmatrix}$

9) $\begin{pmatrix} -4 \\ -1 \end{pmatrix} + \begin{pmatrix} 2 \\ -5 \end{pmatrix}$

10) $\begin{pmatrix} -2 \\ 3 \end{pmatrix} + \begin{pmatrix} 4 \\ 1 \end{pmatrix}$

11) $\begin{pmatrix} -2 \\ 3 \end{pmatrix} + \begin{pmatrix} -4 \\ 1 \end{pmatrix}$

12) $\begin{pmatrix} -2 \\ -3 \end{pmatrix} + \begin{pmatrix} -4 \\ 1 \end{pmatrix}$

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Vectors - Worksheet

Group D - Vector subtraction

Work out:

1) $\begin{pmatrix} 4 \\ 5 \end{pmatrix} - \begin{pmatrix} 1 \\ 3 \end{pmatrix}$ 2) $\begin{pmatrix} 4 \\ 5 \end{pmatrix} - \begin{pmatrix} 1 \\ -3 \end{pmatrix}$ 3) $\begin{pmatrix} 4 \\ 5 \end{pmatrix} - \begin{pmatrix} -1 \\ 3 \end{pmatrix}$

4) $\begin{pmatrix} 5 \\ -3 \end{pmatrix} - \begin{pmatrix} 2 \\ -4 \end{pmatrix}$ 5) $\begin{pmatrix} 5 \\ -3 \end{pmatrix} - \begin{pmatrix} -2 \\ -4 \end{pmatrix}$ 6) $\begin{pmatrix} 5 \\ -3 \end{pmatrix} - \begin{pmatrix} -2 \\ 4 \end{pmatrix}$

7) $\begin{pmatrix} 4 \\ -1 \end{pmatrix} - \begin{pmatrix} 2 \\ 5 \end{pmatrix}$ 8) $\begin{pmatrix} -4 \\ -1 \end{pmatrix} - \begin{pmatrix} 2 \\ 5 \end{pmatrix}$ 9) $\begin{pmatrix} -4 \\ -1 \end{pmatrix} - \begin{pmatrix} 2 \\ -5 \end{pmatrix}$

10) $\begin{pmatrix} -2 \\ 3 \end{pmatrix} - \begin{pmatrix} 4 \\ 1 \end{pmatrix}$ 11) $\begin{pmatrix} -2 \\ 3 \end{pmatrix} - \begin{pmatrix} -4 \\ 1 \end{pmatrix}$ 12) $\begin{pmatrix} -2 \\ -3 \end{pmatrix} - \begin{pmatrix} -4 \\ 1 \end{pmatrix}$

Group E - Vector multiplication

Work out:

1) $2 \begin{pmatrix} 1 \\ 3 \end{pmatrix}$ 2) $3 \begin{pmatrix} 4 \\ 2 \end{pmatrix}$ 3) $4 \begin{pmatrix} 1 \\ 3 \end{pmatrix}$

4) $2 \begin{pmatrix} 3 \\ -1 \end{pmatrix}$ 5) $3 \begin{pmatrix} 4 \\ -5 \end{pmatrix}$ 6) $4 \begin{pmatrix} 2 \\ -3 \end{pmatrix}$

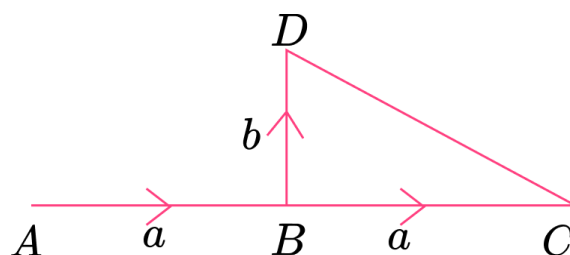7) $2 \begin{pmatrix} -1 \\ 4 \end{pmatrix}$ 8) $3 \begin{pmatrix} -2 \\ 5 \end{pmatrix}$ 9) $4 \begin{pmatrix} -4 \\ 2 \end{pmatrix}$

10) $2 \begin{pmatrix} -1 \\ -4 \end{pmatrix}$ 11) $3 \begin{pmatrix} -2 \\ -4 \end{pmatrix}$ 12) $4 \begin{pmatrix} -1 \\ -5 \end{pmatrix}$

Vectors - Worksheet

Applied

1)

(a) Find, in terms of a, the vector $\overrightarrow{CA}$

(b) Find, in terms of a and b the vector $\overrightarrow{DC}$
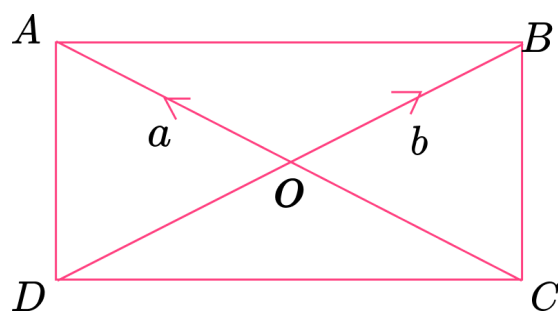
2) Here are two vectors:

$$\mathbf{c} = \begin{pmatrix} 4 \\ 1 \end{pmatrix} \text{ and } \mathbf{d} = \begin{pmatrix} -3 \\ 4 \end{pmatrix}$$

(a) Work out $3c + 2d$

(b) Work out $4d - 2c$
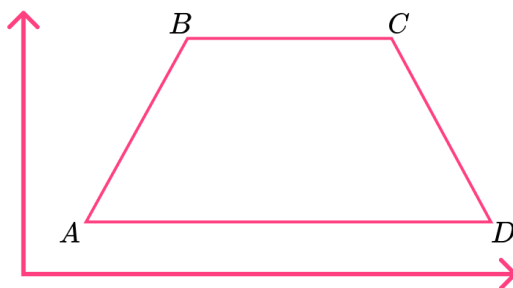
3) Here is a rectangle. The diagonals meet at 0.

$\overrightarrow{OA} = a, \overrightarrow{OB} = b$

(a) Find, in terms of b, the vector $\overrightarrow{DB}$

(b) Find, in terms of a and b, the vector $\overrightarrow{AB}$

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Vectors - Worksheet

4) Given that $\overrightarrow{AB} = \begin{pmatrix} 2 \\ 5 \end{pmatrix}$ and $\overrightarrow{CB} = \begin{pmatrix} -6 \\ 0 \end{pmatrix}$, write $\overrightarrow{AC}$ as a column vector.

Vectors - Exam Questions

1)   Here is a vector:
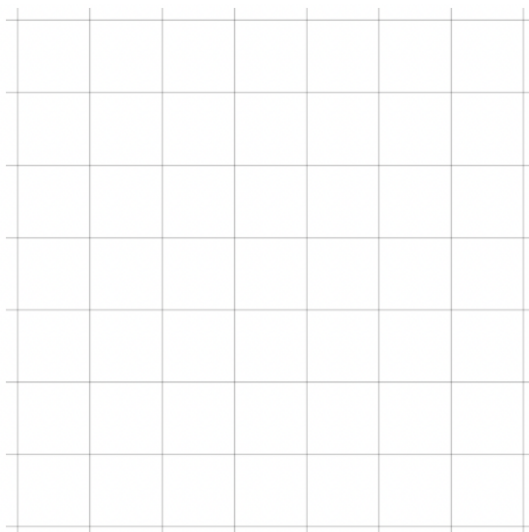

What is this vector as a column vector?

A   **B**   **C**   **D**

$$\begin{pmatrix} 5 \\ 4 \end{pmatrix} \qquad \begin{pmatrix} 5 \\ -4 \end{pmatrix} \qquad \begin{pmatrix} -5 \\ -4 \end{pmatrix} \qquad \begin{pmatrix} -5 \\ 4 \end{pmatrix}$$

....

(1 mark)

---

2)   Here are two column vectors:

$$\mathbf{a} = \begin{pmatrix} 4 \\ -1 \end{pmatrix} \text{ and } \mathbf{b} = \begin{pmatrix} 3 \\ -4 \end{pmatrix}$$
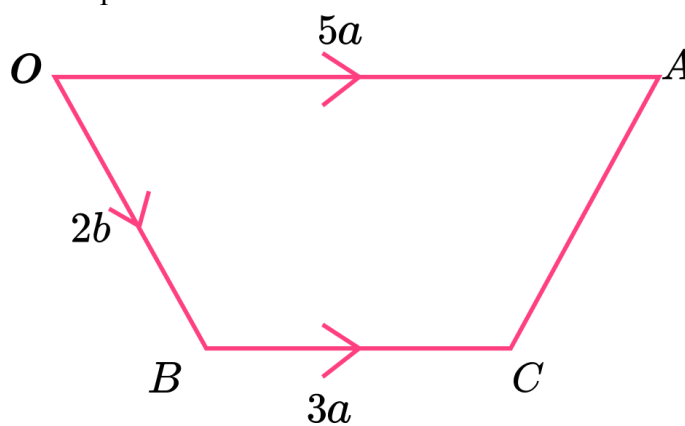
On the grid, draw the and label the vector 2*a* - *b*

(3 marks)

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Vectors - Exam Questions

3)   OABC is a trapezium.

(a)   Find, in terms of b the vector $\overrightarrow{BO}$

....
(1)

(b)   Find, in terms of a and b the vector $\overrightarrow{OC}$

....
(1)

(c)   Find, in terms of a and b the vector $\overrightarrow{CA}$

....
(2)
(4 marks)

Vectors - Exam Questions

4)   ABCD is a kite.
The diagonals of the kite cross at O.
The length OD is 4 times the length of OB.
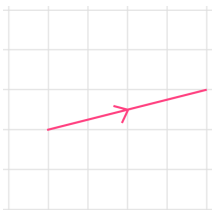
(a)   Find, in terms of a the vector $\overrightarrow{AO}$

....

(1)

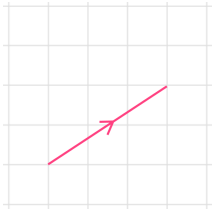**(b)**   Find, in terms of a and b the vector $\overrightarrow{BA}$

....

(1)

(c)   Find, in terms of a and b the vector $\overrightarrow{DC}$

....

(2)
(4 marks)

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8
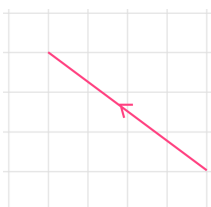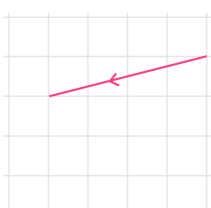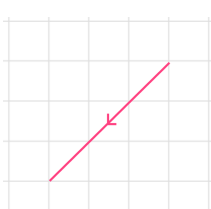
Vectors - Answers

	Question	Answer
	Skill Questions	
Group A	Write these vectors as column vectors: 1) 2) 3) 4) 5) 6)	1) $\begin{pmatrix} 3 \\ 2 \end{pmatrix}$ 2) $\begin{pmatrix} 2 \\ 3 \end{pmatrix}$ 3) $\begin{pmatrix} 4 \\ 1 \end{pmatrix}$ 4) $\begin{pmatrix} 3 \\ -2 \end{pmatrix}$ 5) $\begin{pmatrix} 2 \\ -2 \end{pmatrix}$ 6) $\begin{pmatrix} 1 \\ -3 \end{pmatrix}$

Vectors - Answers

Group A contd		
7)	**7)**	$\begin{pmatrix} -4 \\ 2 \end{pmatrix}$
8)	**8)**	$\begin{pmatrix} -3 \\ 1 \end{pmatrix}$
9)	**9)**	$\begin{pmatrix} -4 \\ 3 \end{pmatrix}$
10)	**10)**	$\begin{pmatrix} -4 \\ -1 \end{pmatrix}$
11)	**11)**	$\begin{pmatrix} -3 \\ -3 \end{pmatrix}$
12)	**12)**	$\begin{pmatrix} -1 \\ -4 \end{pmatrix}$

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Vectors - Answers

Group B	Work out the magnitude of these vectors: (Give your answer to 3sf where necessary).	
	1) $\begin{pmatrix} 3 \\ 2 \end{pmatrix}$	**1)** 3.61
	2) $\begin{pmatrix} 2 \\ 3 \end{pmatrix}$	**2)** 3.61
	3) $\begin{pmatrix} 4 \\ 1 \end{pmatrix}$	**3)** 4.12
	4) $\begin{pmatrix} 3 \\ -2 \end{pmatrix}$	**4)** 3.61
	5) $\begin{pmatrix} 2 \\ -2 \end{pmatrix}$	**5)** 2.83
	6) $\begin{pmatrix} 1 \\ -3 \end{pmatrix}$	**6)** 3.16
	7) $\begin{pmatrix} -4 \\ 2 \end{pmatrix}$	**7)** 4.47
	8) $\begin{pmatrix} -3 \\ 1 \end{pmatrix}$	**8)** 3.16
	9) $\begin{pmatrix} -4 \\ 3 \end{pmatrix}$	**9)** 5
	10) $\begin{pmatrix} -4 \\ -1 \end{pmatrix}$	**10)** 4.12
	11) $\begin{pmatrix} -3 \\ -3 \end{pmatrix}$	**11)** 4.24
	12) $\begin{pmatrix} -1 \\ -4 \end{pmatrix}$	**12)** 4.12

Vectors - Answers

Group C	Work out:	
	1) $\begin{pmatrix} 4 \\ 5 \end{pmatrix} + \begin{pmatrix} 1 \\ 3 \end{pmatrix}$	**1)** $\begin{pmatrix} 5 \\ 8 \end{pmatrix}$
	2) $\begin{pmatrix} 4 \\ 5 \end{pmatrix} + \begin{pmatrix} 1 \\ -3 \end{pmatrix}$	**2)** $\begin{pmatrix} 5 \\ 2 \end{pmatrix}$
	3) $\begin{pmatrix} 4 \\ 5 \end{pmatrix} + \begin{pmatrix} -1 \\ 3 \end{pmatrix}$	**3)** $\begin{pmatrix} 3 \\ 8 \end{pmatrix}$
	4) $\begin{pmatrix} 5 \\ -3 \end{pmatrix} + \begin{pmatrix} 2 \\ -4 \end{pmatrix}$	**4)** $\begin{pmatrix} 7 \\ -7 \end{pmatrix}$
	5) $\begin{pmatrix} 5 \\ -3 \end{pmatrix} + \begin{pmatrix} -2 \\ -4 \end{pmatrix}$	**5)** $\begin{pmatrix} 3 \\ -7 \end{pmatrix}$
	6) $\begin{pmatrix} 5 \\ -3 \end{pmatrix} + \begin{pmatrix} -2 \\ 4 \end{pmatrix}$	**6)** $\begin{pmatrix} 3 \\ 1 \end{pmatrix}$
	7) $\begin{pmatrix} 4 \\ -1 \end{pmatrix} + \begin{pmatrix} 2 \\ 5 \end{pmatrix}$	**7)** $\begin{pmatrix} 6 \\ 4 \end{pmatrix}$
	8) $\begin{pmatrix} -4 \\ -1 \end{pmatrix} + \begin{pmatrix} 2 \\ 5 \end{pmatrix}$	**8)** $\begin{pmatrix} -2 \\ 4 \end{pmatrix}$
	9) $\begin{pmatrix} -4 \\ -1 \end{pmatrix} + \begin{pmatrix} 2 \\ -5 \end{pmatrix}$	**9)** $\begin{pmatrix} -2 \\ -6 \end{pmatrix}$
	10) $\begin{pmatrix} -2 \\ 3 \end{pmatrix} + \begin{pmatrix} 4 \\ 1 \end{pmatrix}$	**10)** $\begin{pmatrix} 2 \\ 4 \end{pmatrix}$
	11) $\begin{pmatrix} -2 \\ 3 \end{pmatrix} + \begin{pmatrix} -4 \\ 1 \end{pmatrix}$	**11)** $\begin{pmatrix} -6 \\ 4 \end{pmatrix}$
	12) $\begin{pmatrix} -2 \\ -3 \end{pmatrix} + \begin{pmatrix} -4 \\ 1 \end{pmatrix}$	**12)** $\begin{pmatrix} -6 \\ -2 \end{pmatrix}$

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Vectors - Answers

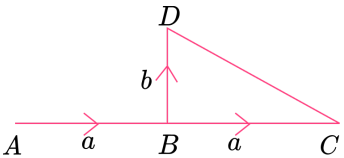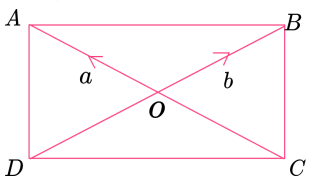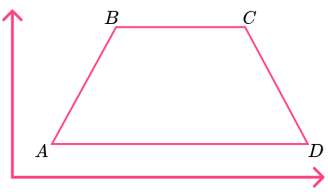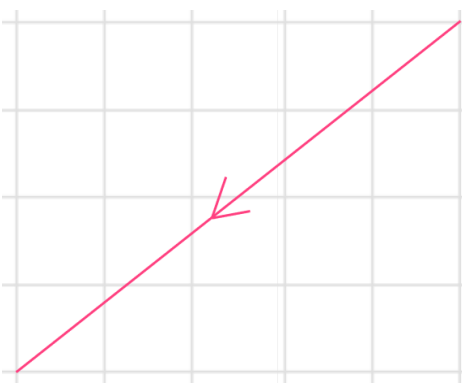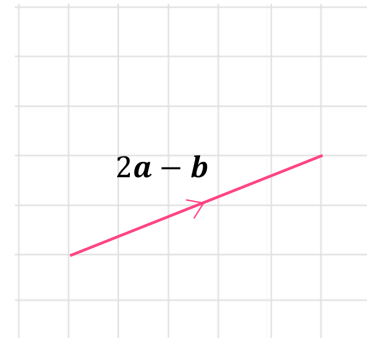| Group D	Work out:	
	1) $\begin{pmatrix} 4 \\ 5 \end{pmatrix} - \begin{pmatrix} 1 \\ 3 \end{pmatrix}$	**1)** $\begin{pmatrix} 3 \\ 2 \end{pmatrix}$
	2) $\begin{pmatrix} 4 \\ 5 \end{pmatrix} - \begin{pmatrix} 1 \\ -3 \end{pmatrix}$	**2)** $\begin{pmatrix} 3 \\ 8 \end{pmatrix}$
	3) $\begin{pmatrix} 4 \\ 5 \end{pmatrix} - \begin{pmatrix} -1 \\ 3 \end{pmatrix}$	**3)** $\begin{pmatrix} 5 \\ 2 \end{pmatrix}$
	4) $\begin{pmatrix} 5 \\ -3 \end{pmatrix} - \begin{pmatrix} 2 \\ -4 \end{pmatrix}$	**4)** $\begin{pmatrix} 3 \\ 1 \end{pmatrix}$
	5) $\begin{pmatrix} 5 \\ -3 \end{pmatrix} - \begin{pmatrix} -2 \\ -4 \end{pmatrix}$	**5)** $\begin{pmatrix} 7 \\ 1 \end{pmatrix}$
	6) $\begin{pmatrix} 5 \\ -3 \end{pmatrix} - \begin{pmatrix} -2 \\ 4 \end{pmatrix}$	**6)** $\begin{pmatrix} 7 \\ -7 \end{pmatrix}$
	7) $\begin{pmatrix} 4 \\ -1 \end{pmatrix} - \begin{pmatrix} 2 \\ 5 \end{pmatrix}$	**7)** $\begin{pmatrix} 2 \\ -6 \end{pmatrix}$
	8) $\begin{pmatrix} -4 \\ -1 \end{pmatrix} - \begin{pmatrix} 2 \\ 5 \end{pmatrix}$	**8)** $\begin{pmatrix} -6 \\ -6 \end{pmatrix}$
	9) $\begin{pmatrix} -4 \\ -1 \end{pmatrix} - \begin{pmatrix} 2 \\ -5 \end{pmatrix}$	**9)** $\begin{pmatrix} -6 \\ 4 \end{pmatrix}$
	10) $\begin{pmatrix} -2 \\ 3 \end{pmatrix} - \begin{pmatrix} 4 \\ 1 \end{pmatrix}$	**10)** $\begin{pmatrix} -6 \\ 2 \end{pmatrix}$
	11) $\begin{pmatrix} -2 \\ 3 \end{pmatrix} - \begin{pmatrix} -4 \\ 1 \end{pmatrix}$	**11)** $\begin{pmatrix} 2 \\ 2 \end{pmatrix}$
	12) $\begin{pmatrix} -2 \\ -3 \end{pmatrix} - \begin{pmatrix} -4 \\ 1 \end{pmatrix}$	**12)** $\begin{pmatrix} 2 \\ -4 \end{pmatrix}$

Vectors - Answers

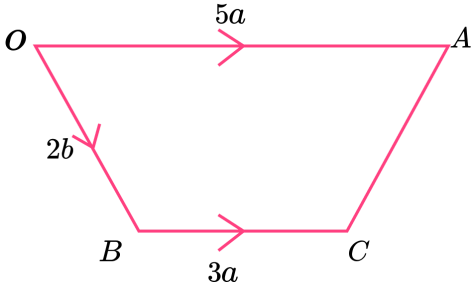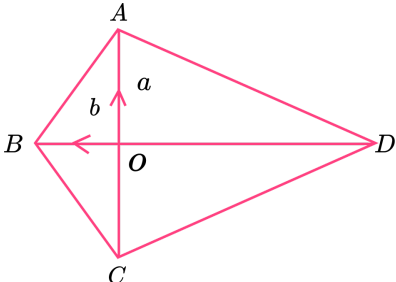| Group E	Work out:	
	1) $2\begin{pmatrix} 1 \\ 3 \end{pmatrix}$	**1)** $\begin{pmatrix} 2 \\ 6 \end{pmatrix}$
	2) $3\begin{pmatrix} 4 \\ 2 \end{pmatrix}$	**2)** $\begin{pmatrix} 12 \\ 6 \end{pmatrix}$
	3) $4\begin{pmatrix} 1 \\ 3 \end{pmatrix}$	**3)** $\begin{pmatrix} 4 \\ 12 \end{pmatrix}$
	4) $2\begin{pmatrix} 3 \\ -1 \end{pmatrix}$	**4)** $\begin{pmatrix} 6 \\ -2 \end{pmatrix}$
	5) $3\begin{pmatrix} 4 \\ -5 \end{pmatrix}$	**5)** $\begin{pmatrix} 12 \\ -15 \end{pmatrix}$
	6) $4\begin{pmatrix} 2 \\ -3 \end{pmatrix}$	**6)** $\begin{pmatrix} 8 \\ -12 \end{pmatrix}$
	7) $2\begin{pmatrix} -1 \\ 4 \end{pmatrix}$	**7)** $\begin{pmatrix} -2 \\ 8 \end{pmatrix}$
	8) $3\begin{pmatrix} -2 \\ 5 \end{pmatrix}$	**8)** $\begin{pmatrix} -6 \\ 15 \end{pmatrix}$
	9) $4\begin{pmatrix} -4 \\ 2 \end{pmatrix}$	**9)** $\begin{pmatrix} -16 \\ 8 \end{pmatrix}$
	10) $2\begin{pmatrix} -1 \\ -4 \end{pmatrix}$	**10)** $\begin{pmatrix} -2 \\ -8 \end{pmatrix}$
	11) $3\begin{pmatrix} -2 \\ -4 \end{pmatrix}$	**11)** $\begin{pmatrix} -6 \\ -12 \end{pmatrix}$
	12) $4\begin{pmatrix} -1 \\ -5 \end{pmatrix}$	**12)** $\begin{pmatrix} -4 \\ -20 \end{pmatrix}$

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Vectors - Answers

	Question	Answer
	Applied Questions	
1)	**a)** Find, in terms of a, the vector $\overrightarrow{CA}$ **b)** Find, in terms of a and b the vector $\overrightarrow{DC}$	**a)** $-2a$ **b)** $a-b$
2)	Here are two vectors: $\mathbf{c} = \begin{pmatrix} 4 \\ 1 \end{pmatrix}$ and $\mathbf{d} = \begin{pmatrix} -3 \\ 4 \end{pmatrix}$ **a)** Work out $3c + 2d$ **b)** Work out $4d - 2c$	**a)** $\begin{pmatrix} 6 \\ 11 \end{pmatrix}$ **b)** $\begin{pmatrix} -20 \\ 14 \end{pmatrix}$
3)	Here is a rectangle. The diagonals meet at O. **a)** Find, in terms of b, the vector $\overrightarrow{DB}$ **b)** Find, in terms of a and b, the vector $\overrightarrow{AB}$	**a)** $2b$ **b)** $b - a$
4)	Given that $\overrightarrow{AB} = \begin{pmatrix} 2 \\ 5 \end{pmatrix}$ and $\overrightarrow{CB} = \begin{pmatrix} -6 \\ 0 \end{pmatrix}$, write $\overrightarrow{AC}$ as a column vector.	$\begin{pmatrix} 8 \\ 5 \end{pmatrix}$

Vectors - Mark Scheme

	Question	Answer	
	Exam Questions		
1)	Here is a vector: What is this vector as a column vector? $$\begin{array}{cccc} \mathbf{A} & \mathbf{B} & \mathbf{C} & \mathbf{D} \end{array}$$ $$\begin{pmatrix} 5 \\ 4 \end{pmatrix} \begin{pmatrix} 5 \\ -4 \end{pmatrix} \begin{pmatrix} -5 \\ -4 \end{pmatrix} \begin{pmatrix} -5 \\ 4 \end{pmatrix}$$	**C** $$\begin{pmatrix} -5 \\ -4 \end{pmatrix}$$	**(1)**
2)	Here are two column vectors: $$\mathbf{a} = \begin{pmatrix} 4 \\ -1 \end{pmatrix} \text{ and } \mathbf{b} = \begin{pmatrix} 3 \\ -4 \end{pmatrix}$$ On the grid, draw the and label the vector $2\boldsymbol{a} \text{ - } \boldsymbol{b}$	$$2\mathbf{a} = \begin{pmatrix} 8 \\ -2 \end{pmatrix}$$ $$2\mathbf{a} - \mathbf{b} = \begin{pmatrix} 5 \\ 2 \end{pmatrix}$$	**(1)** **(1)** **(1)**

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Vectors - Mark Scheme

3)	OABC is a trapezium		
(a)	Find, in terms of b the vector $\overrightarrow{BO}$	**(a)** $-2b$	**(1)**
(b)	Find, in terms of a and b the vector $\overrightarrow{OC}$	**(b)** $2b + 3a$	**(1)**
(c)	Find, in terms of a and b the vector $\overrightarrow{CA}$	**(c)** $-3a -2b + 5a$	**(1)**
		$2a - 2b$	**(1)**
4)	ABCD is a kite. The diagonals of the kite cross at O. The length OD is 4 times the length of OB.		
(a)	Find, in terms of a the vector $\overrightarrow{AO}$	**(a)** $-a$	**(1)**
(b)	Find, in terms of a and b the vector $\overrightarrow{BA}$	**(b)** $a - b$	**(1)**
(c)	Find, in terms of a and b the vector $\overrightarrow{DC}$	**(c)** $\overrightarrow{DO} = 4b$ $4b - a$	**(2)**

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