

## Column Vectors

Video 353a on [www.corbettmaths.com](http://www.corbettmaths.com)

**Examples**



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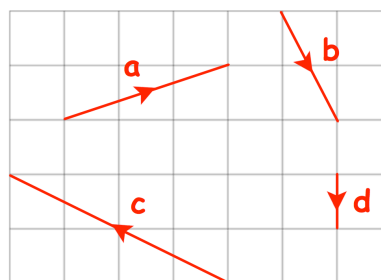


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**Workout**

Question 1: The vectors **a**, **b**, **c** and **d** are shown on the grid.

- (a) Write **a** as a column vector
- (b) Write **b** as a column vector
- (c) Write **c** as a column vector
- (d) Write **d** as a column vector



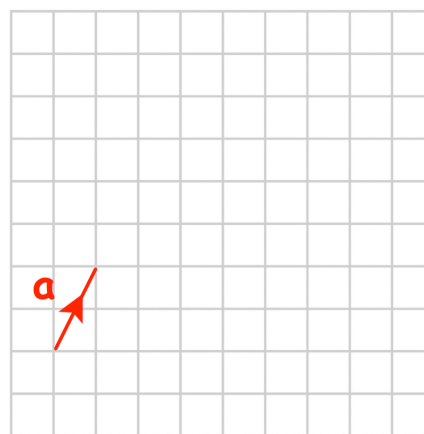
Question 2: On a grid, draw and label the following vectors.

- (a)  $\mathbf{a} = \begin{pmatrix} 5 \\ 2 \end{pmatrix}$
- (b)  $\mathbf{b} = \begin{pmatrix} -1 \\ 3 \end{pmatrix}$
- (c)  $\mathbf{c} = \begin{pmatrix} -3 \\ -7 \end{pmatrix}$
- (d)  $\mathbf{d} = \begin{pmatrix} 0 \\ -6 \end{pmatrix}$
- (e)  $\mathbf{e} = \begin{pmatrix} 8 \\ -1 \end{pmatrix}$
- (f)  $\mathbf{f} = \begin{pmatrix} -4 \\ 0 \end{pmatrix}$

Question 3: Shown on the grid is the vector **a**

$$\mathbf{a} = \begin{pmatrix} 1 \\ 2 \end{pmatrix}$$

- (a) Draw the vector **2a** on the grid.
- (b) Write **2a** as a column vector
- (c) Draw the vector **3a** on the grid.
- (d) Write **3a** as a column vector
- (e) Write **5a** as a column vector



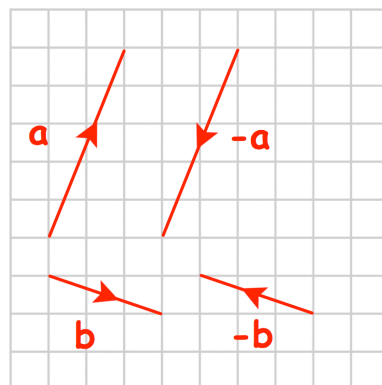
Question 4: Given  $\mathbf{a} = \begin{pmatrix} 6 \\ 4 \end{pmatrix}$ ,  $\mathbf{b} = \begin{pmatrix} 3 \\ -2 \end{pmatrix}$  and  $\mathbf{c} = \begin{pmatrix} -9 \\ -7 \end{pmatrix}$

Write the following as column vectors

- (a) **3a**
- (b) **2b**
- (c) **5c**
- (d)  $\frac{1}{2}\mathbf{a}$
- (e)  $\frac{1}{4}\mathbf{b}$

Question 5: Shown on the grid are vectors  $\mathbf{a}$ ,  $-\mathbf{a}$ ,  $\mathbf{b}$  and  $-\mathbf{b}$

- (a) Write  $\mathbf{a}$  as a column vector
- (b) Write  $-\mathbf{a}$  as a column vector
- (c) Write  $\mathbf{b}$  as a column vector
- (d) Write  $-\mathbf{b}$  as a column vector



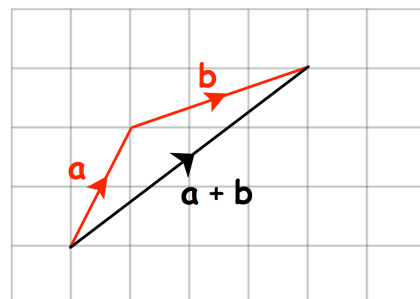
Question 6: Given  $\mathbf{a} = \begin{pmatrix} 2 \\ 11 \end{pmatrix}$   $\mathbf{b} = \begin{pmatrix} -8 \\ 3 \end{pmatrix}$  and  $\mathbf{c} = \begin{pmatrix} -4 \\ -6 \end{pmatrix}$

Write the following as column vectors

- (a)  $-\mathbf{a}$
- (b)  $-\mathbf{b}$
- (c)  $-\mathbf{c}$
- (d)  $-2\mathbf{a}$
- (e)  $-4\mathbf{b}$
- (f)  $-\frac{1}{2}\mathbf{b}$

Question 7: Shown on the grid are the vector  $\mathbf{a}$ ,  $\mathbf{b}$  and  $\mathbf{a} + \mathbf{b}$

- (a) Write  $\mathbf{a}$  as a column vector
- (b) Write  $\mathbf{b}$  as a column vector
- (c) Write  $\mathbf{a} + \mathbf{b}$  as a column vector



Question 8: Given  $\mathbf{a} = \begin{pmatrix} 3 \\ 0 \end{pmatrix}$   $\mathbf{b} = \begin{pmatrix} 2 \\ 7 \end{pmatrix}$   $\mathbf{c} = \begin{pmatrix} 1 \\ 4 \end{pmatrix}$   $\mathbf{d} = \begin{pmatrix} -4 \\ 3 \end{pmatrix}$  and  $\mathbf{e} = \begin{pmatrix} -1 \\ -2 \end{pmatrix}$

Work out the following as column vectors

- (a)  $\mathbf{a} + \mathbf{b}$
- (b)  $\mathbf{b} + \mathbf{c}$
- (c)  $\mathbf{a} + \mathbf{c}$
- (d)  $\mathbf{c} + \mathbf{d}$
- (e)  $\mathbf{b} + \mathbf{e}$
- (f)  $\mathbf{d} + \mathbf{a}$
- (g)  $\mathbf{e} + \mathbf{d}$
- (h)  $2\mathbf{a} + \mathbf{b}$
- (i)  $3\mathbf{c} + \mathbf{b}$
- (j)  $\mathbf{a} + 5\mathbf{b}$
- (k)  $4\mathbf{b} + 3\mathbf{c}$
- (l)  $7\mathbf{c} + \mathbf{d}$
- (m)  $\mathbf{a} + 2\mathbf{e}$
- (n)  $8\mathbf{e} + 3\mathbf{d}$
- (o)  $\mathbf{a} + \mathbf{c} + \mathbf{e}$
- (p)  $2\mathbf{b} + 3\mathbf{d} + 10\mathbf{e}$

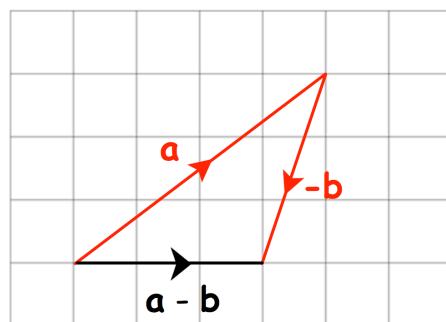
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Question 9:  $\mathbf{a} = \begin{pmatrix} 4 \\ 3 \end{pmatrix}$     $\mathbf{b} = \begin{pmatrix} 1 \\ 3 \end{pmatrix}$

Shown on the grid are the vector  $\mathbf{a}$ ,  $-\mathbf{b}$  and  $\mathbf{a} - \mathbf{b}$

Write down the vector  $\mathbf{a} - \mathbf{b}$  as a column vector.



Question 10: Given  $\mathbf{a} = \begin{pmatrix} 12 \\ 15 \end{pmatrix}$     $\mathbf{b} = \begin{pmatrix} 7 \\ 3 \end{pmatrix}$     $\mathbf{c} = \begin{pmatrix} 1 \\ 8 \end{pmatrix}$     $\mathbf{d} = \begin{pmatrix} 2 \\ -5 \end{pmatrix}$  and  $\mathbf{e} = \begin{pmatrix} -8 \\ -9 \end{pmatrix}$

Work out the following as column vectors

- |                                 |                                 |                                 |                                  |
|---------------------------------|---------------------------------|---------------------------------|----------------------------------|
| (a) $\mathbf{a} - \mathbf{b}$   | (b) $\mathbf{a} - \mathbf{c}$   | (c) $\mathbf{b} - \mathbf{c}$   | (d) $\mathbf{c} - \mathbf{b}$    |
| (e) $\mathbf{a} - \mathbf{d}$   | (f) $\mathbf{e} - \mathbf{b}$   | (g) $\mathbf{e} - \mathbf{d}$   | (h) $3\mathbf{a} - \mathbf{b}$   |
| (i) $2\mathbf{c} - 2\mathbf{b}$ | (j) $6\mathbf{b} - 4\mathbf{a}$ | (k) $3\mathbf{d} - 4\mathbf{b}$ | (l) $7\mathbf{e} - 10\mathbf{d}$ |

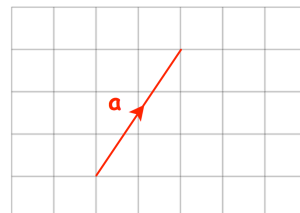
Question 11:  $\mathbf{a} = \begin{pmatrix} 3 \\ 5 \end{pmatrix}$     $\mathbf{b} = \begin{pmatrix} 8 \\ -1 \end{pmatrix}$

Work out  $2\mathbf{a} + \mathbf{b}$  as a column vector

### Apply

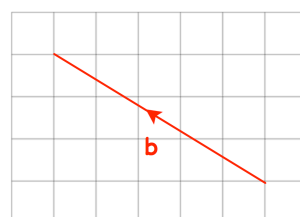
Question 1: Mark has been asked to draw the vector  $\mathbf{a} = \begin{pmatrix} 3 \\ 2 \end{pmatrix}$

What mistake(s) has Mark made?



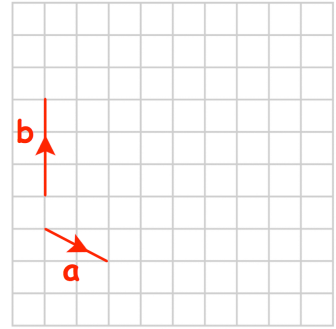
Question 2: Abby has been asked to draw the vector  $\mathbf{b} = \begin{pmatrix} 5 \\ -3 \end{pmatrix}$

What mistake(s) has Abby made?



Question 3: The vectors **a** and **b** are shown on the grid.

- (a) On the grid, draw the vector  $-2\mathbf{a}$
- (b) On the grid, draw the vector  $\mathbf{a} + \mathbf{b}$
- (c) Work out  $3\mathbf{a} + 4\mathbf{b}$  as a column vector



Question 4:  $\mathbf{a} = \begin{pmatrix} -5 \\ p \end{pmatrix}$      $\mathbf{b} = \begin{pmatrix} q \\ 1 \end{pmatrix}$

Given  $\mathbf{a} + \mathbf{b} = \begin{pmatrix} 1 \\ -7 \end{pmatrix}$

Work out the values of  $p$  and  $q$

Question 5:  $\mathbf{c} = \begin{pmatrix} -3 \\ q \end{pmatrix}$      $\mathbf{d} = \begin{pmatrix} p \\ 2 \end{pmatrix}$

Given  $4\mathbf{d} - \mathbf{c} = \begin{pmatrix} 1 \\ -7 \end{pmatrix}$

Work out the values of  $p$  and  $q$

Answers



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