

## Worksheet: Basic Operations with Vectors

This worksheet has questions on basic operations with vectors. Before attempting the questions below you could read the study guide: [Basic Operations with Vectors](#).

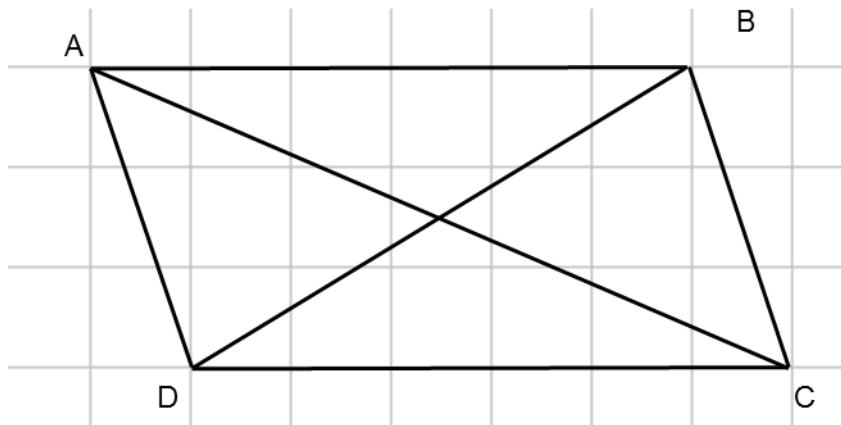
Basic Operations  
with Vectors  
study guide



Model Answers  
to this sheet



1. Look at the vectors in the parallelogram ABCD.



Which vectors are given by:

i.  $\vec{AB} + \vec{BC}$

ii.  $\vec{AC} + \vec{CB} + \vec{BD}$

iii.  $\vec{CD} + \vec{DA}$

iv.  $\vec{AB} - \vec{CB}$

What do you notice?

2. This question is about the vectors  $\mathbf{a} = 3\mathbf{i} - 2\mathbf{j}$  and  $\mathbf{b} = -\mathbf{i} - 3\mathbf{j}$ .

a. Which vectors are given by:

i.  $\mathbf{a} + \mathbf{b}$

iv.  $\mathbf{b} - \mathbf{a}$

ii.  $\mathbf{b} + \mathbf{a}$

v.  $2\mathbf{a}$

iii.  $\mathbf{a} - \mathbf{b}$

vi.  $2\mathbf{a} + \mathbf{b}$

b. Use graph paper to draw the following vectors:

i.  $\mathbf{a}$

ii.  $2\mathbf{a}$

iii.  $\mathbf{b}$

iv.  $-3\mathbf{b}$

What do you notice for the vectors that you drew?

v.  $\mathbf{a} + \mathbf{b}$

vii.  $\mathbf{a} - \mathbf{b}$

vi.  $\mathbf{b} + \mathbf{a}$

viii.  $\mathbf{b} - \mathbf{a}$

What do you notice for the vectors that you drew?

3. You have the vectors  $\mathbf{a} = \frac{2}{3}\mathbf{i} - \frac{4}{6}\mathbf{j} - \frac{6}{9}\mathbf{k}$ ,  $\mathbf{b} = -\frac{1}{2}\mathbf{i} - 3\mathbf{j} + \frac{3}{4}\mathbf{k}$  and  $\mathbf{c} = \frac{9}{12}\mathbf{i} - \frac{3}{4}\mathbf{j} + \frac{1}{2}\mathbf{k}$ .

Calculate the following vectors:

i.  $3\mathbf{a}$

iv.  $3\mathbf{a} - 2\mathbf{b} + 4\mathbf{c}$

ii.  $-2\mathbf{b}$

v.  $12(\mathbf{a} + \mathbf{b} + \mathbf{c})$

iii.  $4\mathbf{c}$

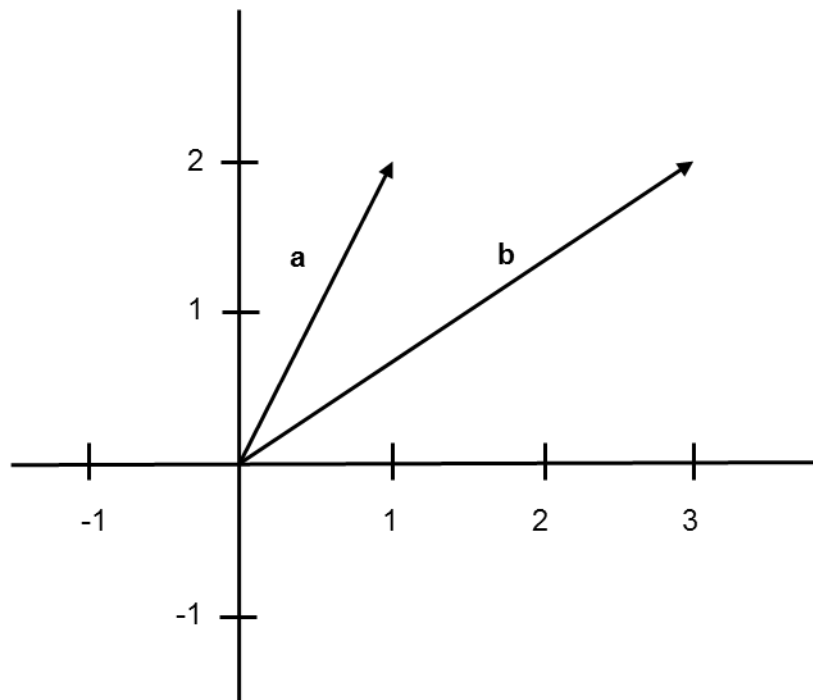
vi.  $\mathbf{a} + \mathbf{b} + \mathbf{c}$

4. Given that  $\mathbf{a} = 2\mathbf{i} + 3\mathbf{j} - \mathbf{k}$ ,  $\mathbf{b} = -\mathbf{i} + 2\mathbf{k}$  and  $\mathbf{c} = d\mathbf{i} + 3\mathbf{j} + f\mathbf{k}$ .

i. Find  $d$  and  $f$  so that  $\mathbf{c} = \mathbf{a} + 3\mathbf{b}$ .

ii. Show that the magnitude of  $\mathbf{c}$  is  $\sqrt{35}$

5. The graph below shows the two vectors **a** and **b**:



Express **a** and **b** in terms of the rectangular unit vectors **i** and **j**.

Given that  $\mathbf{c} = -2\mathbf{a}$  and  $\mathbf{d} = 3\mathbf{b}$ . Use graph paper to draw and describe the following vectors in terms of the rectangular unit vectors **i** and **j**.

- i. **d**
- ii. **c - d**
- iii. **c + d**



This worksheet is one of a series on mathematics produced by the Learning Enhancement Team with funding from the UEA Alumni Fund. Scan the QR-code with a smartphone app for [more resources](#).



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