

# Answers:

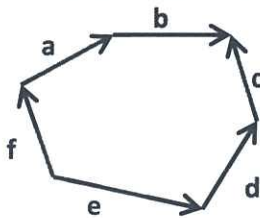
## Vector Partner Daily #1

1. Draw a diagram that demonstrates the following vector equation:  $\mathbf{a} + \mathbf{b} - \mathbf{c} - \mathbf{d} = -\mathbf{e}$

open-ended



2. Write two different vector equations for the given diagram:



open-ended. → answers will vary

3. For points K, L, M, N, and P, simplify the following vector equations. Justify your answer.

a.  $\overrightarrow{PM} + \overrightarrow{MK} - \overrightarrow{LK} - \overrightarrow{NL}$   
 $\overrightarrow{PM} + \overrightarrow{MK} + \overrightarrow{KL} + \overrightarrow{LN}$   
 $= \overrightarrow{PK} + \overrightarrow{KN} = \overrightarrow{PN}$

b.  $-\overrightarrow{NM} + \overrightarrow{NK} + \overrightarrow{KP} - \overrightarrow{LP}$   
 $\overrightarrow{MN} + \overrightarrow{NK} + \overrightarrow{KP} + \overrightarrow{PL}$   
 $= \overrightarrow{MK} + \overrightarrow{KL}$   
 $= \overrightarrow{ML}$

4. Given points  $A(2, 4, -6)$ ,  $B(0, -1, 5)$ , and  $C(-4, 2, 1)$ ,

a. State  $\overrightarrow{OA}$  and find  $|\overrightarrow{OA}|$ .  $\therefore \overrightarrow{OA} = \begin{pmatrix} 2-0 \\ 4-0 \\ -6-0 \end{pmatrix} = \begin{pmatrix} 2 \\ 4 \\ -6 \end{pmatrix}$ ,  $|\overrightarrow{OA}| = \sqrt{2^2 + 4^2 + 6^2}$

b. State  $\overrightarrow{CA}$  and find  $|\overrightarrow{CA}|$ .  $\overrightarrow{CA} = \begin{pmatrix} 2 - (-4) \\ 4 - 2 \\ -6 - 1 \end{pmatrix} = \begin{pmatrix} 6 \\ 2 \\ -7 \end{pmatrix}$ ,  $|\overrightarrow{CA}| = \sqrt{6^2 + 2^2 + (-7)^2} = \sqrt{89}$

c. Find point D if  $\overrightarrow{CA} = \overrightarrow{DB}$ .  
 let D be  $(x, y, z)$   $\overrightarrow{DB} = \begin{pmatrix} 0-x \\ -1-y \\ 5-z \end{pmatrix} = \begin{pmatrix} 6 \\ 2 \\ -7 \end{pmatrix} \therefore \text{Point D } (-6, -3, 12)$

5. Given vectors  $\mathbf{a} = \begin{pmatrix} 1 \\ -3 \end{pmatrix}$ ,  $\mathbf{b} = \begin{pmatrix} 0 \\ 4 \end{pmatrix}$ , and  $\mathbf{c} = \begin{pmatrix} -5 \\ 2 \end{pmatrix}$ ,

- a. Find  $|\mathbf{a}|$ .

$$|\vec{a}| = \sqrt{(1)^2 + (-3)^2}$$

$$= \sqrt{1+9}$$

$$= \sqrt{10}$$

- b. Find  $|\mathbf{b} + \mathbf{c}|$ .

$$\vec{b} + \vec{c} = \begin{pmatrix} 0 \\ 4 \end{pmatrix} + \begin{pmatrix} -5 \\ 2 \end{pmatrix} = \begin{pmatrix} -5 \\ 6 \end{pmatrix}$$

$$\therefore |\vec{b} + \vec{c}| = \sqrt{(-5)^2 + (6)^2}$$

$$= \sqrt{25 + 36}$$

$$= \sqrt{61}$$

\* Remember, these are vectors, NOT points.

0-x=6  
x=-6  
-1-y=2  
y=-3  
5-z=-7  
z=12

6. Name points A and B.

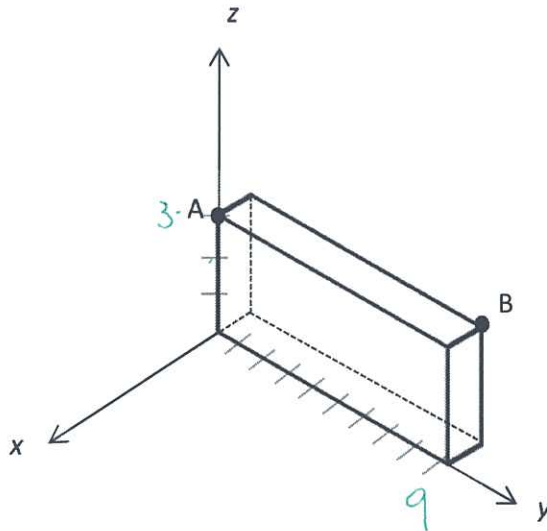
$$A(0, 0, 3)$$

$$B(-1, 9, 3)$$

7. Find  $\overrightarrow{AB}$  and  $|\overrightarrow{AB}|$ .

$$\overrightarrow{AB} = \begin{pmatrix} -1 - 0 \\ 9 - 0 \\ 3 - 3 \end{pmatrix} = \begin{pmatrix} -1 \\ 9 \\ 0 \end{pmatrix}$$

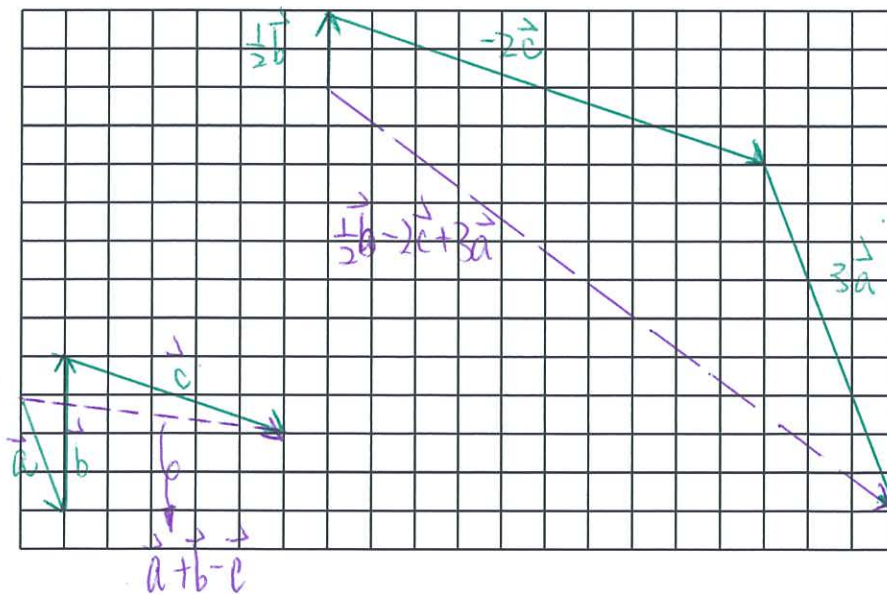
$$|\overrightarrow{AB}| = \sqrt{(-1)^2 + (9)^2 + 0} = \sqrt{82} //$$



8. Given vectors  $\mathbf{a} = \begin{pmatrix} 1 \\ -3 \end{pmatrix}$ ,  $\mathbf{b} = \begin{pmatrix} 0 \\ 4 \end{pmatrix}$ , and  $\mathbf{c} = \begin{pmatrix} -5 \\ 2 \end{pmatrix}$ , demonstrate the following operations graphically. Label all vectors and use a dotted vector for the answer.

a.  $\mathbf{a} + \mathbf{b} - \mathbf{c} = \begin{pmatrix} -6 \\ -1 \end{pmatrix}$

b.  $\frac{1}{2}\mathbf{b} - 2\mathbf{c} + 3\mathbf{a} = \begin{pmatrix} 13 \\ -11 \end{pmatrix}$



$$\begin{aligned} & \frac{1}{2}\mathbf{b} - 2\mathbf{c} + 3\mathbf{a} \\ & \frac{1}{2} \begin{pmatrix} 0 \\ 4 \end{pmatrix} - 2 \begin{pmatrix} -5 \\ 2 \end{pmatrix} + 3 \begin{pmatrix} 1 \\ -3 \end{pmatrix} \\ & = \begin{pmatrix} 0 \\ 2 \end{pmatrix} + \begin{pmatrix} 10 \\ -4 \end{pmatrix} + \begin{pmatrix} 3 \\ -9 \end{pmatrix} \\ & = \begin{pmatrix} 0+10+3 \\ 2-4-9 \end{pmatrix} \\ & = \begin{pmatrix} 13 \\ -11 \end{pmatrix} \end{aligned}$$

9. Sketch point P (-1, 1, -2)

