

VECTOR ARITHMETIC - ANSWERS

Let $\vec{u} = 2\hat{i} + 3\hat{j} + 4\hat{k}$, $\vec{v} = \hat{i} - 5\hat{j} + \hat{k}$, and $\vec{w} = -3\hat{i} - 2\hat{j} - 8\hat{k}$. Find the following.

1. $\vec{u} + \vec{v} + \vec{w}$

$$\vec{u} + \vec{v} + \vec{w} = \langle 2, 3, 4 \rangle + \langle 1, -5, 1 \rangle + \langle -3, -2, -8 \rangle = \langle 0, -4, -3 \rangle$$

2. $3\vec{u} - \vec{v} - 2\vec{w}$

$$\begin{aligned} 3\vec{u} - \vec{v} - 2\vec{w} &= 3\langle 2, 3, 4 \rangle - \langle 1, -5, 1 \rangle - 2\langle -3, -2, -8 \rangle \\ &= \langle 6, 9, 12 \rangle + \langle -1, 5, -1 \rangle + \langle 6, 4, 16 \rangle = \langle 11, 18, 27 \rangle \end{aligned}$$

3. $2(\vec{u} + \vec{v}) + \vec{w}$

$$\begin{aligned} 2(\vec{u} + \vec{v}) + \vec{w} &= 2(\langle 2, 3, 4 \rangle + \langle 1, -5, 1 \rangle) + \langle -3, -2, -8 \rangle \\ &= \langle 4, 6, 8 \rangle + \langle 2, -10, 2 \rangle + \langle -3, -2, -8 \rangle = \langle 3, -6, 2 \rangle \end{aligned}$$

4. $\vec{u} + 3(\vec{v} - \vec{w})$

$$\begin{aligned} \vec{u} + 3(\vec{v} - \vec{w}) &= \langle 2, 3, 4 \rangle + 3(\langle 1, -5, 1 \rangle - \langle -3, -2, -8 \rangle) \\ &= \langle 2, 3, 4 \rangle + \langle 3, -15, 3 \rangle + \langle 9, 6, 24 \rangle = \langle 14, -6, 31 \rangle \end{aligned}$$

5. $4\vec{w} - 3\vec{w}$

$$4\vec{w} - 3\vec{w} = \vec{w} = \langle -3, -2, -8 \rangle$$