Addition and scalar multiplication: questions

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Summary

A selection of questions for the study guide on addition and scalar multiplication.

Before attempting these questions, it is highly recommended that you read Guide: Addition and scalar multiplication.

Q1

Answer the following questions.

1.1. If $\mathbf{a} = 4\mathbf{i} + 5\mathbf{j} + 7\mathbf{k}$ and $\mathbf{b} = 8\mathbf{i} + 2\mathbf{j} + 4\mathbf{k}$, find $\mathbf{a} + \mathbf{b}$.

1.2. If $\mathbf{a} = 0\mathbf{i} + 3\mathbf{j} + 4\mathbf{k}$ and $\mathbf{b} = 2\mathbf{i} + 0\mathbf{j} + 5\mathbf{k}$, find $\mathbf{a} + \mathbf{b}$.

1.3. If $\mathbf{a} = -2\mathbf{i} + 6\mathbf{k}$ and $\mathbf{b} = -4\mathbf{i} + 11\mathbf{j} - 8\mathbf{k}$, find $\mathbf{a} - \mathbf{b}$.

1.4. If $\mathbf{a} = 4\mathbf{i} + 12\mathbf{j} - 7\mathbf{k}$, $\mathbf{b} = 3\mathbf{i} - 3\mathbf{j} - 2\mathbf{k}$ and $\mathbf{c} = 11\mathbf{i} - 4\mathbf{j} + 9\mathbf{k}$, find $\mathbf{a} - (\mathbf{b} + \mathbf{c})$.

Q2

Solve the following in terms of α, β and γ.

2.1. If $\mathbf{a} = \begin{pmatrix} \alpha \\ 2\beta \end{pmatrix}$ and $\mathbf{b} = \begin{pmatrix} 3\alpha \\ 5\beta \end{pmatrix}$, find $\mathbf{a} + \mathbf{b}$.

2.2. If $\mathbf{a} = \begin{pmatrix} 5 \\ 3\beta \\ 5\gamma \end{pmatrix}$ and $\mathbf{b} = \begin{pmatrix} -2 \\ 2\alpha \\ 6\gamma \end{pmatrix}$, find $\mathbf{a} - \mathbf{b}$.

2.3. If $\mathbf{a} = \begin{pmatrix} 2\alpha \\ 3\beta \\ 4\gamma \end{pmatrix}$, $\mathbf{b} = \begin{pmatrix} -2\alpha \\ \beta \\ 0 \end{pmatrix}$ and $\mathbf{c} = \begin{pmatrix} 0 \\ 4\beta \\ 4\gamma \end{pmatrix}$, find $\mathbf{a} + \mathbf{b} - \mathbf{c}$.

2.4. If $\mathbf{a} = \begin{pmatrix} 2\alpha \end{pmatrix}$, What is $\mathbf{a} + 0$?

Q3

Answer the following questions.

3.1. If $\mathbf{u} = 5\mathbf{j} + 6\mathbf{k}$. find $3\mathbf{u}$.

3.2. If $\mathbf{v} = \begin{pmatrix} 0 \\ -3 \\ 7 \end{pmatrix}$, find $-6\mathbf{v}$.

3.3. If $\mathbf{u} = \begin{pmatrix} 0 \\ 5 \\ 6 \end{pmatrix}$ and $\mathbf{v} = \begin{pmatrix} 0 \\ -3 \\ 7 \end{pmatrix}$, find $4\mathbf{v} - 3\mathbf{u}$.

3.4. If $\mathbf{u} = \begin{pmatrix} 0 \\ 5 \\ 6 \end{pmatrix}$, $\mathbf{v} = \begin{pmatrix} 0 \\ -3 \\ 7 \end{pmatrix}$ and $\mathbf{w} = \begin{pmatrix} 2 \\ 3 \\ -4 \end{pmatrix}$, find $-2\mathbf{w} - (4\mathbf{u} - 2\mathbf{v})$.

Q4

Answer the following questions.

4.1. If $A = (3, 4, 5)$. $B = (-2, 5, 7)$, find $\overrightarrow{AB}$.

4.2. If $A = (2, 5, 7)$, $B = (6, 11, 7)$ and $C = (0, 1, 2)$, find $\overrightarrow{AB} - \overrightarrow{AC}$.

4.3. If $A = (2, 9)$, $B = (12, 4)$, $C = (4k, 3k)$ and $\overrightarrow{AB}$ and $\overrightarrow{BC}$ are parallel, find k.

4.4. If $\overrightarrow{AB} = \Big(6, 7, -2\Big)$ and $B = (1, 5, 9)$, find the coordinates of A.

4.5. If $\mathbf{a} = 2\mathbf{i} + 3\mathbf{j}$ and $\mathbf{b} = 3\mathbf{i} - 5\mathbf{j}$, find $13\mathbf{i} + -9\mathbf{j}$ in terms of $\mathbf{a}$ and $\mathbf{b}$.

4.6. If $\mathbf{a} = \begin{pmatrix} 3 \\ 5 \\ \gamma \end{pmatrix}$, $\mathbf{b} = \begin{pmatrix} -1 \\ -3 \\ 4 \end{pmatrix}$ and $2\mathbf{a} + 3\mathbf{b} = \begin{pmatrix} \alpha \\ \beta \\ 0 \end{pmatrix}$, solve for the unknowns.

4.7.Given that $\mathbf{a}$ and $\mathbf{b}$ are parallel. If $\mathbf{a} = (k - 7)\mathbf{i} + (5k + 1)\mathbf{j}$ and $\mathbf{b} = -2\mathbf{i} + 8\mathbf{j}$, find k.

4.8. If $5\begin{pmatrix} \alpha \\ 3 \\ 7 \\ 1 \end{pmatrix} - \begin{pmatrix} -5 \\ \beta \\ 2 \\ -5 \end{pmatrix} = \begin{pmatrix} 2\alpha \\ 3\beta \\ \gamma \\ 2\delta \end{pmatrix} + 2\begin{pmatrix} -1 \\ 4 \\ 6 \\ \delta \end{pmatrix}$, solve for the unknowns.

Please click this link to find the answers.
