O Level Maths

Topic: Vector Addition and Subtraction

Instructions

Answer all questions. Show working where necessary. Use your knowledge of vector addition and subtraction to solve the given problems. Use the diagrams to assist with the vector operations.

Practice Problems

Vector Addition:

1. Given two vectors $\mathbf{a} = 3\hat{i} + 4\hat{j}$ and $\mathbf{b} = 2\hat{i} - \hat{j}$, find the sum $\mathbf{a} + \mathbf{b}$.
2. Find the resultant of vectors $\mathbf{A} = 5\hat{i} - 2\hat{j}$ and $\mathbf{B} = 3\hat{i} + 4\hat{j}$.
3. If vector $\mathbf{u} = 6\hat{i} + 8\hat{j}$ and vector $\mathbf{v} = 4\hat{i} - 3\hat{j}$, find the sum of the vectors $\mathbf{u} + \mathbf{v}$.
4. Calculate the resultant of vectors $\mathbf{p} = 2\hat{i} + 3\hat{j}$ and $\mathbf{q} = -\hat{i} + 2\hat{j}$.
5. If $\mathbf{a} = 2\hat{i} + \hat{j}$ and $\mathbf{b} = 3\hat{i} - 4\hat{j}$, find the vector $\mathbf{a} + \mathbf{b}$.

Vector Subtraction:

1. Subtract vector $\mathbf{b} = 2\hat{i} - 3\hat{j}$ from vector $\mathbf{a} = 4\hat{i} + 5\hat{j}$, i.e., $\mathbf{a} - \mathbf{b}$.
2. Given $\mathbf{A} = 3\hat{i} + 2\hat{j}$ and $\mathbf{B} = 5\hat{i} - 4\hat{j}$, find $\mathbf{A} - \mathbf{B}$.
3. If $\mathbf{u} = 7\hat{i} - 2\hat{j}$ and $\mathbf{v} = 3\hat{i} + 4\hat{j}$, find the difference $\mathbf{u} - \mathbf{v}$.
4. Find the difference between $\mathbf{A} = 5\hat{i} + 3\hat{j}$ and $\mathbf{B} = 4\hat{i} - 6\hat{j}$.
5. Calculate $\mathbf{A} - \mathbf{B}$ where $\mathbf{A} = 8\hat{i} - 5\hat{j}$ and $\mathbf{B} = 4\hat{i} + 2\hat{j}$.

Word Problems

1. A person walks 4 meters north and then 3 meters east. Represent the two movements as vectors. Find the resultant vector.
2. Two forces act on an object, one with a magnitude of 5N to the east and the other with a magnitude of 3N to the north. Find the resultant force vector.
3. An airplane travels 100 km north and then 120 km east. Find the displacement vector from the start point to the end point.
4. Two displacement vectors $\mathbf{A} = 10\hat{i} + 15\hat{j}$ and $\mathbf{B} = 8\hat{i} - 6\hat{j}$ are given. Find the total displacement vector.

Multiple-Choice Questions

1. If $\mathbf{a} = 2\hat{i} + 3\hat{j}$ and $\mathbf{b} = 5\hat{i} - 2\hat{j}$, what is $\mathbf{a} + \mathbf{b}$?

   A. $7\hat{i} + \hat{j}$
   B. $3\hat{i} + 5\hat{j}$
   C. $7\hat{i} + 5\hat{j}$
   D. $3\hat{i} + \hat{j}$

2. If $\mathbf{A} = 3\hat{i} + 2\hat{j}$ and $\mathbf{B} = \hat{i} - 2\hat{j}$, what is $\mathbf{A} - \mathbf{B}$?

   A. $4\hat{i} + 6\hat{j}$
   B. $2\hat{i} + 6\hat{j}$
   C. $2\hat{i} + 2\hat{j}$
   D. $4\hat{i} + 2\hat{j}$

3. What is the magnitude of the vector $\mathbf{a} = 3\hat{i} + 4\hat{j}$?

   A. 5
   B. 25
   C. 7
   D. 10

4. The resultant vector of $\mathbf{A} = 6\hat{i} + 8\hat{j}$ and $\mathbf{B} = 2\hat{i} + 3\hat{j}$ is:

   A. $8\hat{i} + 11\hat{j}$
   B. $4\hat{i} + 5\hat{j}$
   C. $8\hat{i} + 5\hat{j}$
   D. $6\hat{i} + 3\hat{j}$