O Level Maths

Topic: Scalar Multiplication

Instructions

Answer all questions. Show working where necessary. Use your knowledge of scalar multiplication to solve the given problems.

Practice Problems

1. If $\mathbf{v} = 4\hat{i} - 3\hat{j}$ and $k = 2$, find $k\mathbf{v}$.
2. Given $\mathbf{a} = 2\hat{i} + \hat{j}$ and $k = -4$, find $k\mathbf{a}$.
3. If $\mathbf{u} = 5\hat{i} + 2\hat{j}$ and $k = 3$, calculate $k\mathbf{u}$.
4. Given $\mathbf{b} = -3\hat{i} + 4\hat{j}$ and $k = -2$, find $k\mathbf{b}$.
5. Let $\mathbf{p} = \hat{i} + 2\hat{j}$ and $k = 5$, find $k\mathbf{p}$.

Word Problems

1. A car moves along a straight path in the direction of the vector $\mathbf{v} = 3\hat{i} + 4\hat{j}$. If the speed of the car is 2 m/s, find the velocity vector.
2. A force vector $\mathbf{F} = 4\hat{i} - 2\hat{j}$ is applied to an object. If the force is doubled, find the new force vector.
3. A vector $\mathbf{v} = 5\hat{i} + 7\hat{j}$ represents the displacement of a body. If the displacement is tripled, find the new displacement vector.
4. A vector $\mathbf{v} = -2\hat{i} + 3\hat{j}$ represents the velocity of an object. If the velocity is reduced by a factor of 3, find the new velocity vector.

Multiple-Choice Questions

1. If $\mathbf{a} = 2\hat{i} - 3\hat{j}$ and $k = 4$, what is $k\mathbf{a}$?

   A. $8\hat{i} - 12\hat{j}$
   B. $6\hat{i} - 12\hat{j}$
   C. $8\hat{i} + 12\hat{j}$
   D. $6\hat{i} + 12\hat{j}$

2. If $\mathbf{v} = -5\hat{i} + 6\hat{j}$ and $k = -2$, what is $k\mathbf{v}$?

   A. $10\hat{i} - 12\hat{j}$
   B. $-10\hat{i} + 12\hat{j}$
   C. $10\hat{i} + 12\hat{j}$
   D. $-10\hat{i} - 12\hat{j}$

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

   A. $15\hat{i} - 10\hat{j}$
   B. $5\hat{i} - 10\hat{j}$
   C. $5\hat{i} + 10\hat{j}$
   D. $15\hat{i} + 10\hat{j}$

4. What is the resultant vector if $\mathbf{v} = 3\hat{i} + 2\hat{j}$ is multiplied by 4?

   A. $12\hat{i} + 8\hat{j}$
   B. $7\hat{i} + 6\hat{j}$
   C. $6\hat{i} + 8\hat{j}$
   D. $4\hat{i} + 2\hat{j}$