Test - Vectors in two dimensions

Year: Year 12 · Duration: 60 minutes · /20

Name:	Date:	**Mark:** /20

Question	1	2	3	4	5	Total
marks	4	4	4	4	4	**20**
Mark						

Show your working.

Question 1 (4 marks)

Question 1 – Vector arithmetic

$\mathbf{a} = 4\mathbf{i} - 3\mathbf{j}$ and $\mathbf{b} = \mathbf{i} + 2\mathbf{j}$.

a. Find $3\mathbf{a} - 2\mathbf{b}$. (2 marks)
b. Find $|\mathbf{a} + 2\mathbf{b}|$. (2 marks)

Question 2 (4 marks)

Question 2 – Parallel vectors

$\mathbf{p} = (k+2)\mathbf{i} + 9\mathbf{j}$ and $\mathbf{q} = 2\mathbf{i} + 3\mathbf{j}$ are parallel.

a. Find k. (2 marks)
b. Find the ratio $|\mathbf{p}| : |\mathbf{q}|$. (2 marks)

Question 3 (4 marks)

Question 3 – Position vectors

$A(1, 4)$ and $B(7, -2)$.

a. Find $\overrightarrow{AB}$ and its magnitude. (2 marks)

b. The point P divides AB in the ratio $2 : 1$. Find its position vector. (2 marks)

Question 4 (4 marks)

Question 4 – Velocity

A ship travels at 20 km/h on a bearing of $150°$.

a. Write its velocity as $a\mathbf{i} + b\mathbf{j}$. (2 marks)
b. Find its position after 3 hours relative to its starting point. (1 mark)

c. How far east is it after 3 hours? (1 mark)

Question 5 (4 marks)

Question 5 – Geometric proof

In triangle OAB, $\overset{\frown}{\quad}$ and $\overset{\frown}{\quad}$. M is the midpoint of OA and N is the midpoint of OB. Prove that MN is parallel to AB and half its length.