

PENANG SANGAM HIGH SCHOOL  
YEAR 13  
MATHEMATICS  
WORKSHEET 5 - VECTORS

1. Let  $\vec{a} = -2\vec{i} + 3\vec{k}$  and  $\vec{b} = 4\vec{i} + 5\vec{j} - 6\vec{k}$ .

Find:  $2\vec{a} - \vec{b}$

2. Find the unit vector that has the same direction as  $\vec{v} = 4\vec{i} - 4\vec{j} + 7\vec{k}$ .

3. Find the parametric equation of the line passing through the points (2, -1, 3) and (3, 1, -1).

4. Find the vector, parametric and symmetric equations of the line passing through  $P_1 = (-1, 3, 4)$  and  $P_2 = (3, -1, -2)$

5. The vector form of the equation of a line is given as  $\begin{pmatrix} x \\ y \\ z \end{pmatrix} = \begin{pmatrix} 2 \\ -1 \\ 3 \end{pmatrix} + t \begin{pmatrix} 1 \\ -2 \\ 3 \end{pmatrix}$

i) Give the coordinates of a point that lies on this line.

ii) Write down the Parametric equation of the line.

iii) Write down the Symmetric equation of the line.

6) Given vectors  $\vec{a} = \begin{pmatrix} -1 \\ 2 \\ 4 \end{pmatrix}$  and  $\vec{b} = \begin{pmatrix} -2 \\ 3 \\ 2 \end{pmatrix}$ , find the constant  $k$  such that

$$3\vec{a} + k\vec{b} = \begin{pmatrix} -7 \\ 12 \\ 8 \end{pmatrix}$$

6. Points A and B has position vectors

$$\vec{a} = \begin{pmatrix} 2 \\ -3 \\ -3 \end{pmatrix} \quad \vec{b} = \begin{pmatrix} -3 \\ 2 \\ 4 \end{pmatrix}$$

a) Express the vector **AB** in terms of the unit vectors  $\vec{i}$ ,  $\vec{j}$  and  $\vec{k}$ .

b) Determine the **scalar product** of  $\vec{a}$  and  $\vec{b}$ . (*Hint: Use:  $a \cdot b = a_1b_1 + a_2b_2 + a_3b_3$* )

c) Find the **angle** between  $\vec{a}$  and  $\vec{b}$ . (*Hint Use:  $a \cdot b = |a| \times |b| \cos \theta$* )

7. Are the vectors  $\vec{c} = \begin{pmatrix} -1 \\ 2 \\ 4 \end{pmatrix}$  and  $\vec{d} = \begin{pmatrix} 1 \\ -2 \\ 3 \end{pmatrix}$  orthogonal?

8. Let A be the point (-3, 5, 10) and let B be the point (12, -5, -15). Find the coordinates of point P on the line AB given that  $\frac{AP}{AB} = \frac{2}{5}$  (*Hint Use:  $P = \frac{mB+nA}{m+n}$* )

10. The equation of a line in symmetric form is

$$\frac{-(x - 3)}{-2} = \frac{y + 1}{1} = \frac{4(z - 2)}{-4}$$

Give the coordinates of a point that lies on this line.