

Higher Ink Exercise Block 1 - Vectors

Calculators should only be used when necessary

1. $\mathbf{a} = \begin{pmatrix} 3 \\ -1 \\ 2 \end{pmatrix}$, $\mathbf{b} = \begin{pmatrix} -4 \\ 0 \\ 2 \end{pmatrix}$. Calculate $|2\mathbf{a} - \mathbf{b}|$ (3)

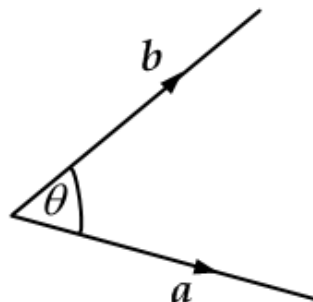
2. Show that the vectors $\mathbf{a} = 2\mathbf{i} - 4\mathbf{j} + 6\mathbf{k}$ and $\mathbf{b} = 4\mathbf{i} - 7\mathbf{j} - 6\mathbf{k}$ are perpendicular. (3)

3. The point Q divides the line joining P(-1, -1, 0) to R(5, 2, -3) in the ratio 2 : 1.
Find the coordinates of Q. (3)

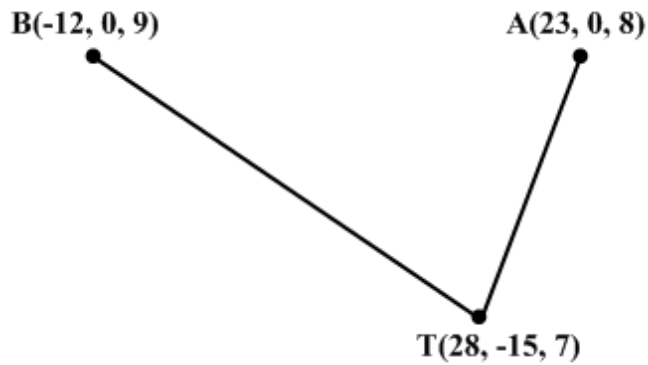
4. $\mathbf{u} = 2\mathbf{i} - 2\mathbf{j} + 4\mathbf{k}$ and $\mathbf{v} = \mathbf{i} + a\mathbf{j} + \sqrt{7}\mathbf{k}$.
If $|\mathbf{u}| = |\mathbf{v}|$ find the value of a . (4)

5. With reference to a suitable set of coordinate axes, A, B and C are the points
(-8, 10, 20), (-2, 1, 8) and (0, -2, 4) respectively.
Show that A, B and C are collinear and find the ratio AB : BC (4)

6. The diagram shows vectors \mathbf{a} and \mathbf{b} .
If $|\mathbf{a}| = 5$, $|\mathbf{b}| = 4$, and $\mathbf{a} \cdot (\mathbf{a} + \mathbf{b}) = 36$, find the
size of the acute angle θ between \mathbf{a} and \mathbf{b} . (4)



7. The sketch below shows the positions of Andrew(A), Bob(B) and Tracy(T) on 3 hill-tops. Relative to a suitable origin, the coordinates (in hundreds of metres) of the three people are A(23,0,8), B(-12,0,9) and T(28, -15,7). In the dark, Andrew and Bob locate Tracy using heat-seeking beams.



- (a) Express the vectors \vec{TA} and \vec{TB} in component form. (2)
- (b) Calculate the angle between these two beams. (5)
8. Find the equation of the line which passes through the point (-1, 5) and is perpendicular to the line with equation $2x + 3y = 1$. (4)

TOTAL = 32 MARKS