= Year 12 **= Vectors** **= Worksheet 3**

1. Find the value of $\cos^2\alpha+\cos^2\beta+\cos^2\gamma$, where α, β and γ are the angles that a vector makes with the x, y and z axes respectively.	2. Find a vector perpendicular to $3\boldsymbol{i}$ - $2\boldsymbol{j}$ + $4\boldsymbol{k}$.
3. Calculate the angle between vector $3\boldsymbol{i}-4\boldsymbol{j}-5\sqrt{3}\,\boldsymbol{k}$ and the x-y plane.	4. Use a vector method to find the shortest distance from the point $(3,-2,5)$ to the line that passes through $(3,2,1)$ and $(1,0,2)$.
5. P and Q are points with position vectors $\boldsymbol{p}$ and $\boldsymbol{q}$ respectively. If $\lvert\boldsymbol{p}\rvert = 4$, $\lvert\boldsymbol{q}\rvert = 7$ and $\boldsymbol{p}\cdot\boldsymbol{q} = 20$, find $\overline{PQ}$.	6. Given points $A(3,-4)$, $B(7,0)$ and M between A and B, find the coordinates of M such that $\overrightarrow{AM} = 3\overrightarrow{MB}$.
7. Given points $A(3,-4)$, $B(7,0)$ and M on the extension of $\overline{AB}$, find the coordinates of M such that $\overrightarrow{AM} = 3\overrightarrow{BM}$.	8. Find a vector perpendicular to $\boldsymbol{i}+\boldsymbol{j}$ and $\boldsymbol{j}-\boldsymbol{k}$.
9. Find a vector $\boldsymbol{p}$ such that $\boldsymbol{i}+\boldsymbol{j}, \boldsymbol{j}-\boldsymbol{k}$ and the vector $\boldsymbol{p}$ are linearly dependent.	10. If $\boldsymbol{a}$ and $\boldsymbol{b}$ are linearly independent and $\boldsymbol{d}$ is perpendicular to both $\boldsymbol{a}$ and $\boldsymbol{b}$, find a vector $\boldsymbol{c}$ in terms of $\boldsymbol{a}$ and $\boldsymbol{b}$ such that $\boldsymbol{c}$ and $\boldsymbol{d}$ are also perpendicular.
11. Show that vectors $2\boldsymbol{i}-3\boldsymbol{j}+5\boldsymbol{k}, \boldsymbol{i}-\boldsymbol{j}+2\boldsymbol{k}, \boldsymbol{i}+2\boldsymbol{j}+\boldsymbol{k}$ and $\boldsymbol{i}+7\boldsymbol{j}$ are linearly dependent.	Numerical, algebraic and worded answers. 1. 1 2. E.g. $2\boldsymbol{i}+\boldsymbol{j}-\boldsymbol{k}$ 3. 60° 4. 4 5. 5 6. (6, –1) 7. (9, 2) 8. E.g. $\boldsymbol{i}-\boldsymbol{j}-\boldsymbol{k}$ 9. E.g. $\boldsymbol{i}+2\boldsymbol{j}-\boldsymbol{k}$ 10. E.g. $\boldsymbol{c}=2\boldsymbol{a}-\boldsymbol{b}$