| Topic | What students need to learn: |  |  |
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|  | Content |  | Guidance |
|  |  |  |  |
| 6 Further vectors | 6.1 | Understand and use the vector and Cartesian forms of an equation of a straight line in 3-D. | The forms, $r=a+\lambda b$ and $\frac{x-a_{1}}{b_{1}}=\frac{x-a_{2}}{b_{2}}=\frac{x-a_{3}}{b_{3}}$ <br> Find the point of intersection of two straight lines given in vector form. <br> Students should be familiar with the concept of skew lines and parallel lines. |
|  | 6.2 | Understand and use the vector and Cartesian forms of the equation of a plane. | The forms $\mathbf{r}=\mathbf{a}+\lambda \mathbf{b}+\mu \mathbf{c} \text { and } \mathbf{a} x+\mathbf{b} y+\mathbf{c} z=d$ |
|  | 6.3 | Calculate the scalar product and use it to express the equation of a plane, and to calculate the angle between two lines, the angle between two planes and the angle between a line and a plane. | $\mathbf{a} \cdot \mathbf{b}=\|\mathbf{a}\|\|\mathbf{b}\| \cos \theta$ <br> The form r.n = $\boldsymbol{k}$ for a plane. |
|  | 6.4 | Check whether vectors are perpendicular by using the scalar product. | Knowledge of the property that $\mathbf{a} . \mathrm{b}=0$ if the vectors $a$ and $b$ are perpendicular. |


| Topic | What students need to learn: |  |  |
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| 6 <br> Further vectors <br> continued | 6.5 | Find the intersection of a line and a plane. <br> Calculate the perpendicular distance between two lines, from a point to a line and from a point to a plane. | The perpendicular distance from $(\alpha, \beta, \gamma)$ to $n_{1} x+n_{2} y+n_{3} z+d=0$ is $\frac{\left\|n_{1} \alpha+n_{2} \beta+n_{3} \gamma+d\right\|}{\sqrt{n_{1}^{2}+n_{2}^{2}+n_{3}^{2}}}$ |

