Vectors: lines and planes

Answers

Further Maths topic practice

This topic online

Q	Answer	Marks
1	**a)** $\mathbf{r} = (2\mathbf{i} - \mathbf{j} + 3\mathbf{k}) + \lambda(3\mathbf{i} + 2\mathbf{j} - 4\mathbf{k})$ **b)** $(x - 2)/3 = (y + 1)/2 = (3 - z)/4$ **c)** $\lambda = 3$ gives (11, 5, -9), so C lies on l	5
2	15.6°	4
3	**a)** $\mathbf{r} \cdot (2\mathbf{i} - \mathbf{j} + 4\mathbf{k}) = 12$ **b)** $2x - y + 4z = 12$ **c)** $17 \neq 12$, so B does not lie on Π	4
4	**a)** Directions are not multiples, and $\lambda = 5$, $\mu = 7$ fail the z equation ($-4 \neq 18$), so the lines are skew **b)** $a = -1$	6
5	**a)** $\lambda = 2$, $\mu = -1$ satisfy all three equations; point (3, 0, 3) **b)** 80.4°	7
6	**a)** $(3, 4, 5) \cdot (2, 1, -2) = 0$ and $(3, 4, 5) \cdot (-1, 2, -1) = 0$ **b)** $3x + 4y + 5z = 13$ **c)** $\frac{13\sqrt{2}}{10}$	7
7	**a)** (7, 6, 7) **b)** 32.3°	7
8	**a)** $(6, -1, -2) \cdot (1, 0, 3) = 0$ and $(6, -1, -2) \cdot (0, 2, -1) = 0$ **b)** $6x - y - 2z = 11$ **c)** 74.3°	7
9	**a)** 6 **b)** (2, 2, 1) **c)** (-2, 0, 5)	7
10	**a)** (3, 0, 0) **b)** $5\sqrt{2}$ **c)** $\frac{45\sqrt{2}}{2}$	8
11	**a)** $7\mathbf{i} + 5\mathbf{j} + 6\mathbf{k}$ **b)** 9 m **c)** 62.7° **d)** 8 m **e)** e.g. the drone is modelled as a particle, or wind means it will not fly in an exact straight line, or the roof is not a perfectly flat plane	8
12	**a)** $(7, 1, -3) \cdot (1, -1, 2) = 0$ and $(7, 1, -3) \cdot (1, 2, 3) = 0$ **b)** $7x + y - 3z = 9$ **c)** (3, 0, 4) **d)** 22.1°	9

Full worked solutions, written out by hand, are on the solutions sheet for this topic.

Free for classroom and home use: print, photocopy and share. Not for resale or re-hosting.