PARALLEL AND PERPENDICULAR LINES IN THREE DIMENSIONS

1 Given L_1 has equation $x = 1 + 2t$, $y = 2 - t$, $z = 3 + t$ and L_2 has equation $x = 2 + s$, $y = -1 + 2s$, $z = 1 - 3s$, then L_1 and L_2:

A are parallel **B** intersect **C** are perpendicular **D** are skew

4 Given L_1 has equation $x = 2 + 2t$, $y = 2 + t$, $z = 3 - t$ and L_2 has equation $x = 2 + s$, $y = -1 + 2s$, $z = -6 + 4s$, then L_1 and L_2:

A are parallel **B** intersect **C** are perpendicular **D** are skew

5 Line L_1 passes through the points $(1, 2, -1)$ and $(4, -1, 2)$ while line L_2 passes through the points $(2, 6, -2)$ and $(a, -1, 5)$, where $a \in R$.

Find the value(s) of a, if:

(a) L_1 is parallel to L_2 **(b)** L_1 is perpendicular to L_2.

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7 Find the coordinates of the points where the line $\underset{\sim}{r} = (1-\lambda)\underset{\sim}{i} + (4+2\lambda)\underset{\sim}{j} + (3-\lambda)\underset{\sim}{k}$ cuts the coordinate planes.

9. (a) Show that the line L_1 through the points (2, 1, -1) and (3, -2, 0) is parallel to the line L_2 through the points (-2, -3, 2) and (2, -15, 6).
(b) Show that the point (1, 4, -2) lies on the first line and the point (6, -27, 10) lies on the second line.

10 Show that the line through the points $(2, 1, -1)$ and $(3, -2, 3)$ is perpendicular to the line through the points $(1, 3, 2)$ and $(-1, 5, 4)$.

11 **(a)** Find the equation of the line L_1 through the point $(2, 1, -2)$ parallel to the vector $\underset{\sim}{v} = \underset{\sim}{i} - 2\underset{\sim}{j} + 3\underset{\sim}{k}$.
(b) Find the equation of the line L_2 through the points $(1, -2, 1)$ and $(0, 2, -2)$.
(c) Determine whether **(i)** $L_1 \parallel L_2$, **(ii)** $L_1 \perp L_2$, **(iii)** L_1 and L_2 intersect.