Cartesian Form of a Line

Specification: AQA 7366/7367: F1 · Edexcel 9FM0: Core Pure 6.1

HOMEWORK Consolidation

1 Find a Cartesian equation of the line $\mathbf{r} = \begin{pmatrix} -2 \\ 5 \\ 1 \end{pmatrix} + \lambda \begin{pmatrix} 3 \\ -4 \\ 2 \end{pmatrix}$.

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2 Find a Cartesian equation of the line $\mathbf{r} = \begin{pmatrix} 2 \\ 0 \\ 7 \end{pmatrix} + \mu \begin{pmatrix} 1 \\ -3 \\ 0 \end{pmatrix}$.

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3 Find a vector equation of the line $\dfrac{x-6}{4} = \dfrac{y+2}{-5} = \dfrac{z+3}{2}$.

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4 Find a vector equation of the line $\dfrac{2-x}{3} = \dfrac{y+2}{3} = \dfrac{z-1}{-1}$.

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5 Find a Cartesian equation of the line through $A(3, -1, 2)$ and $B(5, 2, -2)$.

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6 Show that the point $(-1, 9, -5)$ lies on the line $\dfrac{x-3}{-2} = \dfrac{y-1}{4} = \dfrac{z+1}{-2}$.

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7 The point $(p, -3, q)$ lies on the line $\dfrac{x+1}{5} = \dfrac{y-3}{-2} = \dfrac{z-2}{3}$. Find p and q.

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8 Find where the line $\dfrac{x-4}{-2} = \dfrac{y+6}{3} = \dfrac{z-1}{2}$ meets the plane $y = 0$.

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9 Find a Cartesian equation of the line through $(2, -3, 1)$ that is parallel to the line $\dfrac{x+5}{3} = \dfrac{1-y}{2} = \dfrac{z-4}{6}$.

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10 Show that $\dfrac{x-1}{2} = \dfrac{y+2}{-1} = \dfrac{z-3}{4}$ and $\dfrac{x+3}{-4} = \dfrac{y}{2} = \dfrac{z+5}{-8}$ are the same line.

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11 *AQA-style*. The points A and B have coordinates $(1, -2, 5)$ and $(3, 2, -1)$ respectively.

(a) Find a Cartesian equation of the line AB. [3 marks]

(b) The point $C(k, 6, -7)$ lies on AB. Find the value of k. [2 marks]

(c) The line l has Cartesian equation $x = 4$, $\dfrac{y-1}{3} = \dfrac{z+2}{2}$. Explain why l is not parallel to AB. [2 marks]

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12 *Edexcel-style*. The line l has Cartesian equation $\dfrac{x-2}{3} = \dfrac{y+1}{-2} = \dfrac{5-z}{4}$.

(a) Write l in the form $\mathbf{r} = \mathbf{a} + \lambda\mathbf{b}$. (2)

(b) The point P on l has $x = 11$. Find P. (2)

(c) Show that the vector $2\mathbf{i} + \mathbf{j} + \mathbf{k}$ is perpendicular to l. (2)

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