



QUESTION WORKBOOK

Lines and planes in three dimensions

Further vectors · Year FM

7 questions · 26 marks

NAVY SCREEN EDITION

SECTION A · Warm-up

A1 Find a vector equation of the line through the points $P(2, 1, 0)$ and $Q(4, 2, 3)$. [2]

A2 Determine whether the point $(8, 4, 9)$ lies on the line $\mathbf{r} = (2, 1, 0) + \lambda(2, 1, 3)$. [3]

SECTION B · Standard

B1 A plane has equation $\mathbf{r} \cdot (2, -1, 2) = 9$. Write down its cartesian equation, and determine whether the point $(3, 1, 2)$ lies in it. [3]

B2 Find a cartesian equation of the plane through $A(1, 1, 1)$, $B(2, 3, 1)$ and $C(3, 1, 4)$. [5]

- B3** Convert the line $r = (2, 1, 0) + \lambda(2, 1, 3)$ to cartesian form, and explain what the equal fractions represent. [3]

- B4** A line has direction vector $(0, 2, 5)$. Explain the difficulty in writing its cartesian equation in the standard form, and give the correct way to write it. [3]

SECTION C · Stretch

- C1** Show that the lines $r = (1, 2, 3) + \lambda(1, 0, -1)$ and $r = (2, 0, 1) + \mu(0, 1, 1)$ are skew, and find the shortest distance between them. [7]