inkMaths

QUESTION WORKBOOK

Systems of equations and invariance

Matrices · Year FM

7 questions · 31 marks

PRINT EDITION

SECTION A · Warm-up

A1 Write the simultaneous equations $2x + y = 7$ and $x + 3y = 11$ as a single matrix equation $M\mathbf{v} = \mathbf{b}$, identifying M, $\mathbf{v}$ and $\mathbf{b}$. [3]

A2 Using an inverse matrix, solve $2x + y = 7$ and $x + 3y = 11$. [4]

SECTION B · Standard

B1 Three planes have no common point, yet no two of them are parallel. Describe the two geometric configurations consistent with this, and state which one admits pairwise intersection lines that are parallel to each other. [4]

B2 Show that the line $y = x$ is invariant under the transformation with matrix rows $(4, 1)$ and $(2, 3)$, and find the factor by which points on it are stretched. [4]

B3 Find the second invariant line through the origin of the transformation with matrix rows $(4, 1)$ and $(2, 3)$. [4]

B4 Explain the difference between an invariant line and a line of invariant points, and give a transformation with an example of each. [4]

SECTION C · Stretch

C1 The system $x + y + z = 1$, $x + 2y + 3z = 4$ and $2x + 3y + kz = 5$ has a coefficient matrix M. Find the value of k for which M is singular. For that value of k, determine whether the system is consistent, and describe the geometry of the three planes. [8]