Simultaneous equations with matrices

Answers

Further Maths topic practice

This topic online

Q	Answer	Marks
1	x = 5, y = -4	3
2	**a)** det = -36 + 36 = 0 **b)** k = $\frac{15}{2}$: both equations are the same line **c)** parallel (distinct) lines, no solutions	4
3	**a)** (1, 2, -1; 2, -1, 3; 1, 1, 1)(x; y; z) = (-3; 14; 4) **b)** $\frac{1}{5}$(4, 3, -5; -1, -2, 5; -3, -1, 5) **c)** x = 2, y = -1, z = 3	5
4	k = -1	3
5	**a)** (4, -1, -1; -2, 1, 0; 1, -1, 1) **b)** x = 3, y = -1, z = 2 **c)** The three planes meet at one point, (3, -1, 2)	6
6	**a)** det = 0 **b)** x = 1 - t, y = 1 + t, z = t **c)** A sheaf: all three planes meet in one common line	6
7	**a)** det of the coefficient matrix = 0, so no unique solution **b)** k = 6 **c)** k = 6: sheaf; k ≠ 6: triangular prism	6
8	**a)** Π1 and Π2 are parallel and distinct (Π2 ÷ 2 is 2x - y + 3z = 2.5); Π3 cuts both: no common point **b)** Π1 and Π2 coincide; they meet Π3 in a line: infinitely many solutions	4
9	**a)** k = 1 **b)** (second) - (first): x + 3y - 4z = -1, which contradicts x + 3y - 4z = 5 **c)** No two planes are parallel and there is no common point: a triangular prism	6
10	**a)** (12, 20, 15; 18, 25, 10; 9, 30, 22)(t; c; s) = (130.40; 145.10; 174.40) **b)** t = 2.20, c = 3.10, s = 2.80 **c)** Predicted £81.00 but took £78.50: the prices may not be fixed (for example a discount or offer)	7
11	**a)** x + y + z = 20000; 0.02x + 0.035y + 0.05z = 640; x - 2z = 0 **b)** x = 8000, y = 8000, z = 4000 **c)** 3.2% of £20 000 is £640, so the new equation repeats the interest equation; the matrix is singular and there are infinitely many solutions	8
12	**a)** det = k^2 - k - 6 **b)** x = 1, y = 1 - t, z = t (a sheaf) **c)** first - second gives -x + 3y - 2z = -3, contradicting = 2: triangular prism **d)** a single point (unique solution)	10

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

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