1.10 Systems of Linear Equations

Question Paper

Course	DP IB Maths
Section	1. Number & Algebra
Topic	1.10 Systems of Linear Equations
Difficulty	Hard

Time allowed: 90

Score: /69

Percentage: /100

Question 1a

Solve the following simultaneous equations.

a)

$$\frac{1}{2}x + y = 9$$
$$x - 2y = 2$$

[2 marks]

Question 1b

(b)

$$3a - 5b = 30$$
$$5a + 2b = 3.5$$

[2 marks]

Question 1c

(c)

$$\frac{5m}{6} - \frac{3n}{4} = 2n$$
$$\frac{2m}{3} - \frac{4n}{5} = -\frac{2}{3}$$

[3 marks]

Question 2

Use an algebraic method to solve the following system of linear equations.

$$2x - y + 3z = 4$$

$$3x + 2y + 6z = -5$$

$$2x - 4y - z = 8$$

[6 marks]

Question 3

Use an algebraic method to solve the following system of linear equations.

$$2x + 3y + 4z = 15$$

$$x - 2y - 6z = -5$$

$$2x - 6y - 5z = 6$$

[6 marks]

Question 4

Use an algebraic method to solve the following system of linear equations.

$$2x + 2y - 3z = 8$$

$$3x - y + 2z = 6$$

$$x - 2y + 4z = -3$$

[6 marks]

Question 5

Two straight lines have equations $y = \frac{3}{2}x + 1$ and $4x - 3y - 1 = 0$. Find the coordinates of their point of intersection.

[4 marks]

Question 6

Consider the polynomial $f(x) = x^4 + ax^3 + bx^2 + cx + 12$

Given that $f(1) = f(2) = f(3) = 0,$

(i)
set up a system of linear equations in three unknowns,
(ii)
hence, find the values of a, b, and c.

[8 marks]

Question 7

Consider the following system of linear equations.

$$2x + y - 2z = 6$$

$$2x - 2y + 3z = -5$$

$$-2x + 3y + az = b$$

Given that the system has no solutions, find the value of a and the set of possible values of b.

[6 marks]

Question 8a

Consider the following system of equations

$$ax + y + z = 4$$

$$x + y + z = a$$

$$x - y + az = 2$$

(a)
Find, in terms of a, expressions for x, y and z.

[6 marks]

Question 8b

(b)
Find value(s) of the real parameter a so that the system has no unique solutions.

[2 marks]

Question 8c

(c)
Given $a = 0$, find the values of x, y and z.

[2 marks]

Question 9

The following system of equations has an infinite number of solutions

$$x - 2y + z = k$$

$$x + y - z = 2$$

$$3x - 3y + z = 12$$

(i)
Find the value of k,
(ii)
Find the general solution.

[8 marks]

Question 10a

Consider the system of equations

$$x + ky + z = k$$

$$x + 2y + 3z = 0$$

$$3x + 8y + 5z = 6$$

(a)
When $k = m$, the system does not have a unique solution. Find the value of m.

[4 marks]

Question 10b

(b)
Given that $k \neq m$, show that the solution to the system is independent of k and hence find the unique solution.

[4 marks]