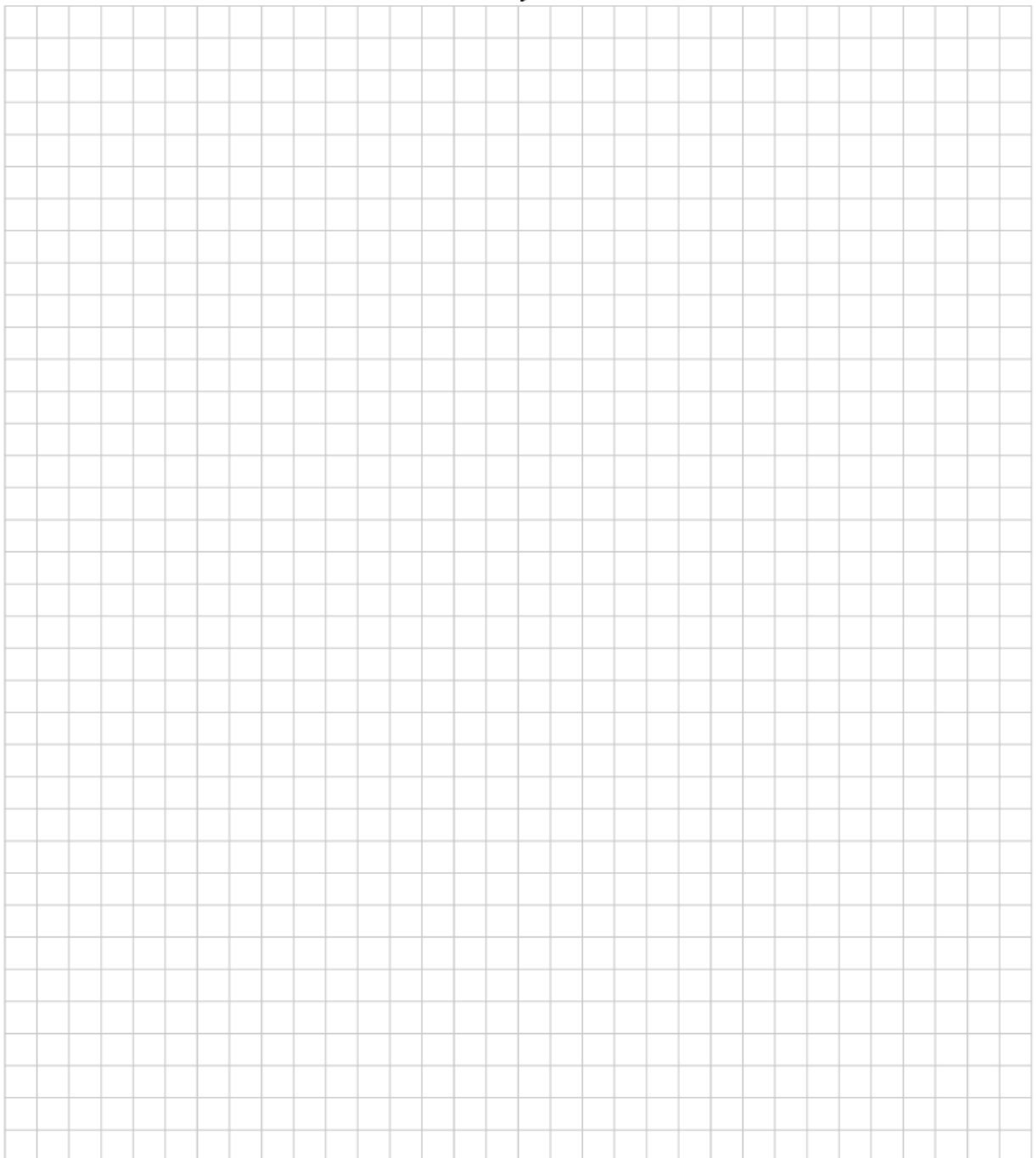# Question 1

(a) Find the range of values of x for which $|x - 4| \geq 2$, where $x \in \mathbb{R}$.

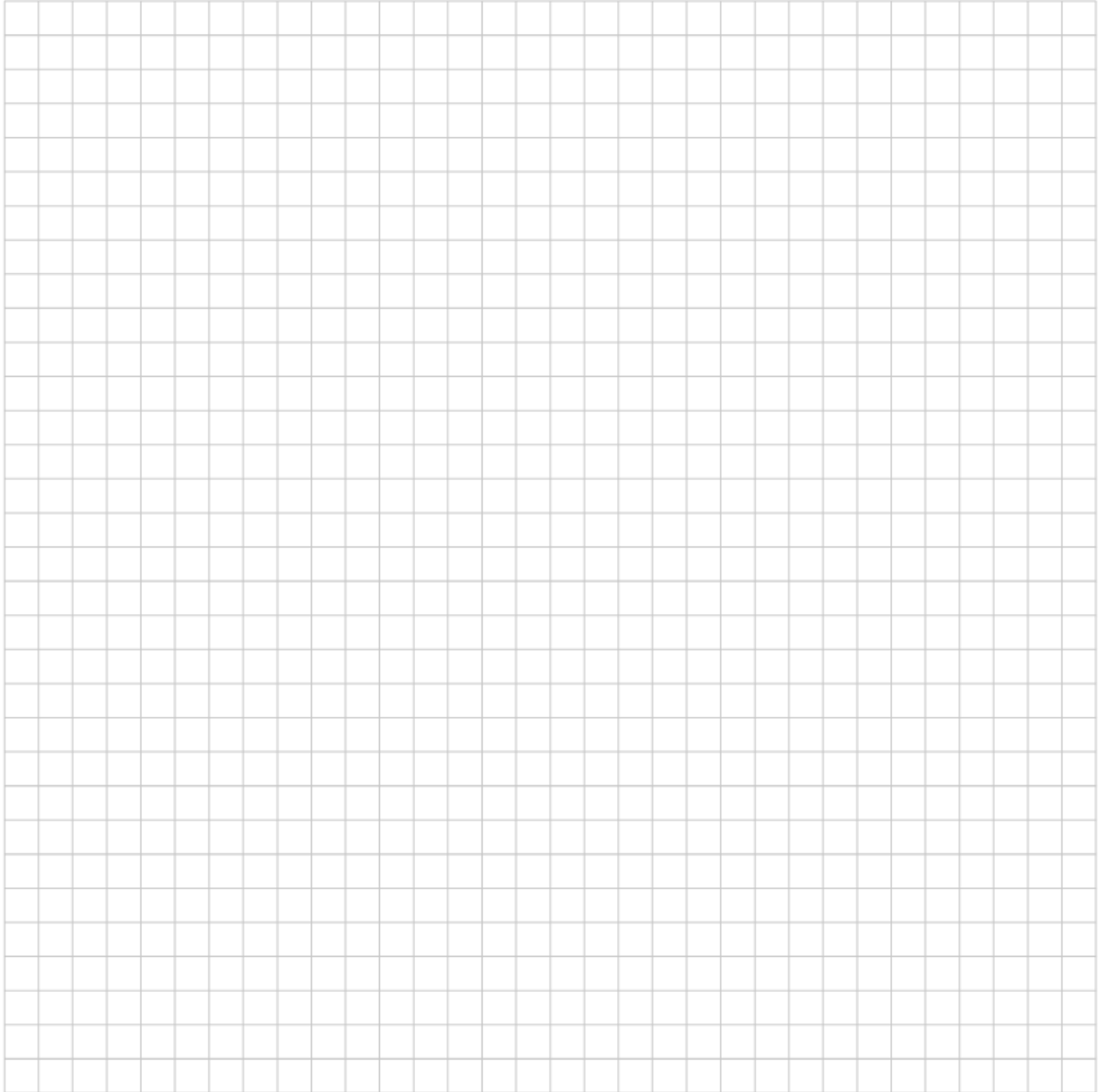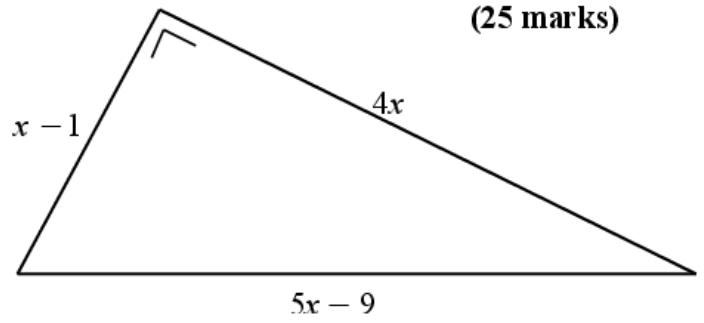**(b)** Solve the simultaneous equations:

$$x^2 + xy + 2y^2 = 4$$
$$2x + 3y = -1.$$

Question 2

(a)   **(i)**   The lengths of the sides of a right-angled triangle are given by the expressions $x - 1$, $4x$, and $5x - 9$, as shown in the diagram. Find the value of x.

$x - 1$ $4x$

$5x - 9$

(ii)   Verify, with this value of x, that the lengths of the sides of the triangle above form a pythagorean triple.

Question 3

(b) A male bee comes from an unfertilised egg, i.e. he has a female parent but he does not have a male parent. A female bee comes from a fertilised egg, i.e. she has a female parent and a male parent.

(i) The following diagram shows the ancestors of a certain male bee. We identify his generation as G_1 and our diagram goes back to G_4. Continue the diagram to G_5.

G_1	G_2	G_3	G_4	G_5
			Female	
		Female		
Male $\longrightarrow$ Female			Male	
		Male $\longrightarrow$ Female		

(ii) The number of ancestors of this bee in each generation can be calculated by the formula

$$G_{n+2} = G_{n+1} + G_n,$$

where $G_1 = 1$ and $G_2 = 1$, as in the diagram.
Use this formula to calculate the number of ancestors in G_6 and in G_7.

G_6 \hspace{6cm} G_7

(iii) The number of ancestors in each generation can also be calculated by using the formula

$$G_n = \frac{(1 + \sqrt{5})^n - (1 - \sqrt{5})^n}{2^n \sqrt{5}}.$$

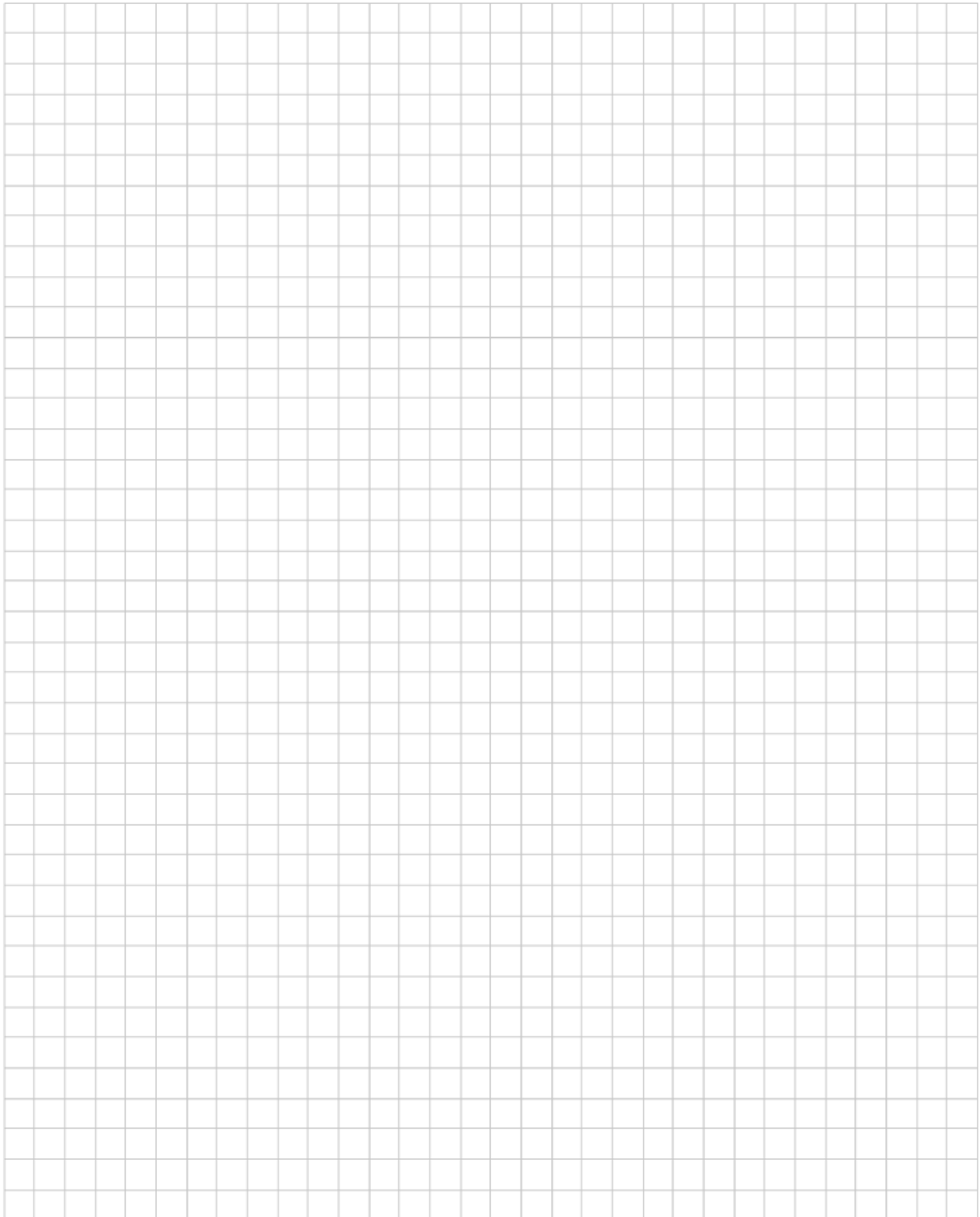Use this formula to verify the number of ancestors in G_3.

Question 4

Question 2 (25 marks)

Solve the equation $x^3 - 3x^2 - 9x + 11 = 0$.

Write any irrational solution in the form $a + b\sqrt{c}$, where $a, b, c \in \mathbb{Z}$.

Question 5

(a) Solve the equation $x = \sqrt{x+6}$, $x \in \mathbb{R}$.
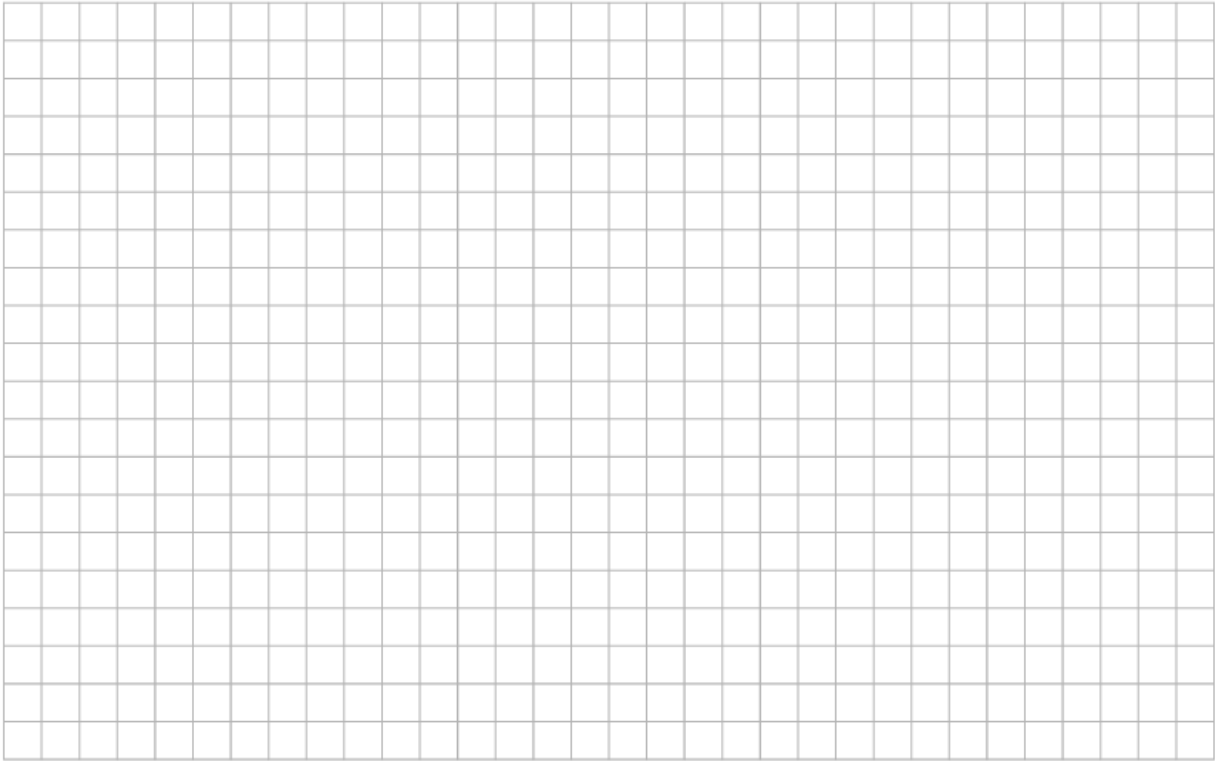
Question 4 **(25 marks)**
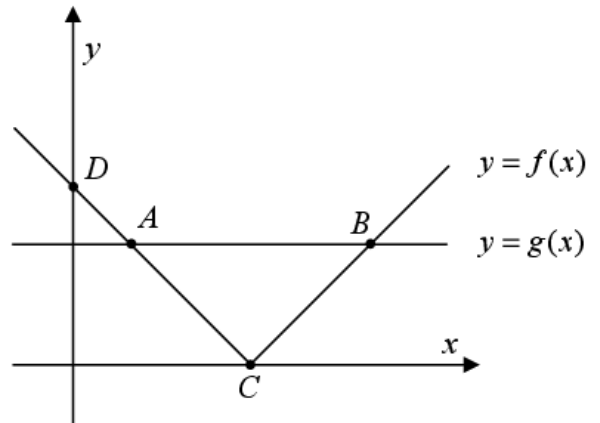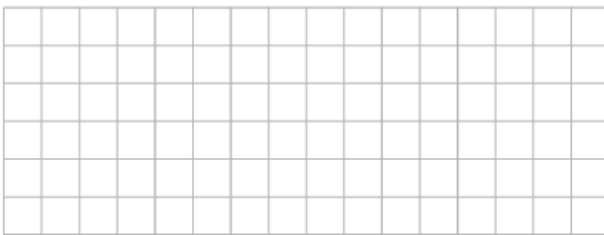
(a) Solve the simultaneous equations:

$$2x + 8y - 3z = -1$$
$$2x - 3y + 2z = 2$$
$$2x + y + z = 5.$$

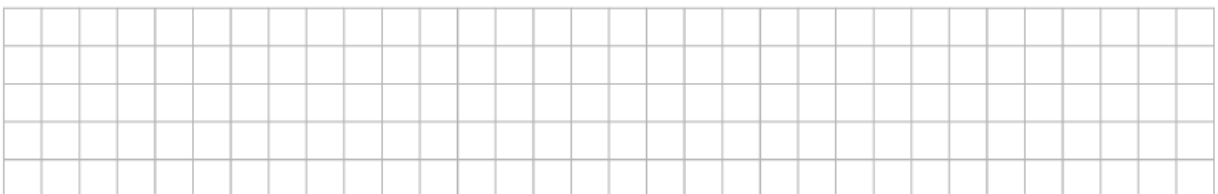(b) The graphs of the functions $f : x \mapsto |x-3|$ and $g : x \mapsto 2$ are shown in the diagram.

(i) Find the co-ordinates of the points A, B, C and D.

$A = ($ $,$ $)$ $B = ($ $,$ $)$

$C = ($ $,$ $)$ $D = ($ $,$ $)$

$y = f(x)$

$y = g(x)$

(ii) Hence, or otherwise, solve the inequality $|x-3| < 2$.

Question 7

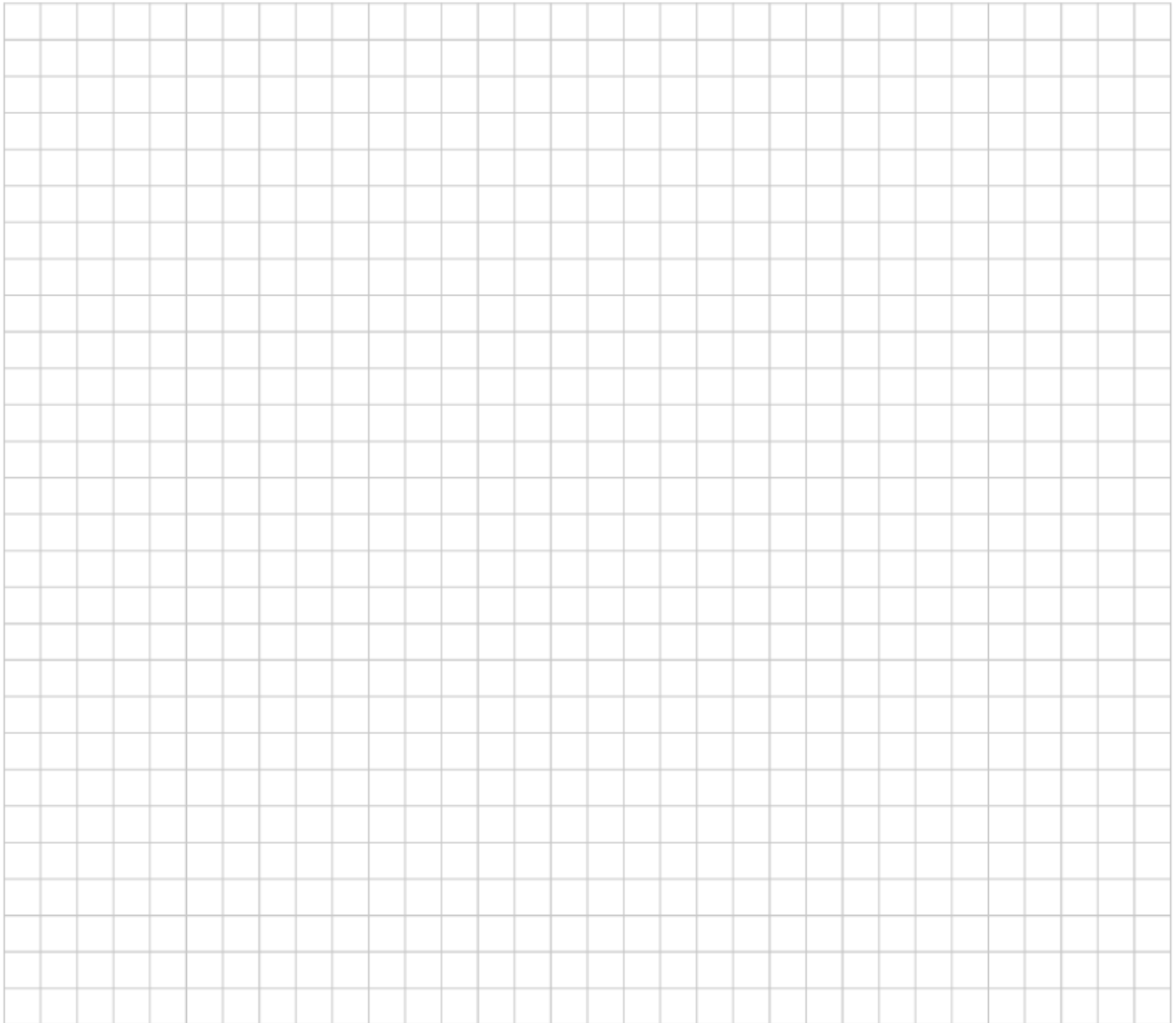(a) Find the set of all real values of x for which $2x^2 + x - 15 \geq 0$.
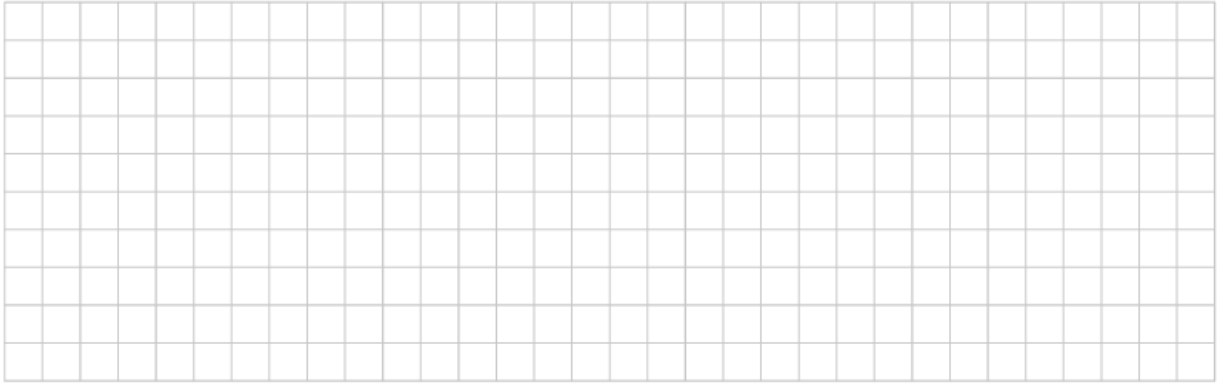
(b) Solve the simultaneous equations;

$$x + y + z = 16$$

$$\frac{5}{2}x + y + 10z = 40$$
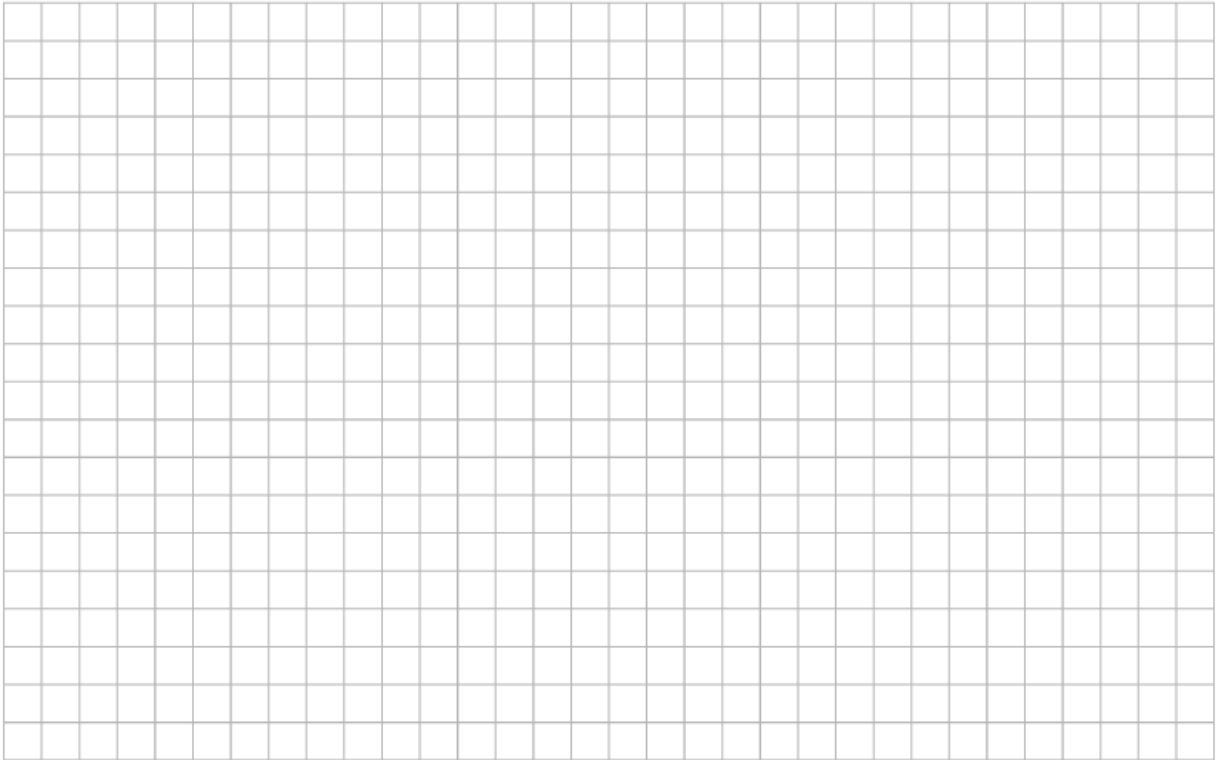
$$2x + \frac{1}{2}y + 4z = 21.$$

Question 8

(a) Solve the simultaneous equations,

$$2x + 8y - 3z = -1$$
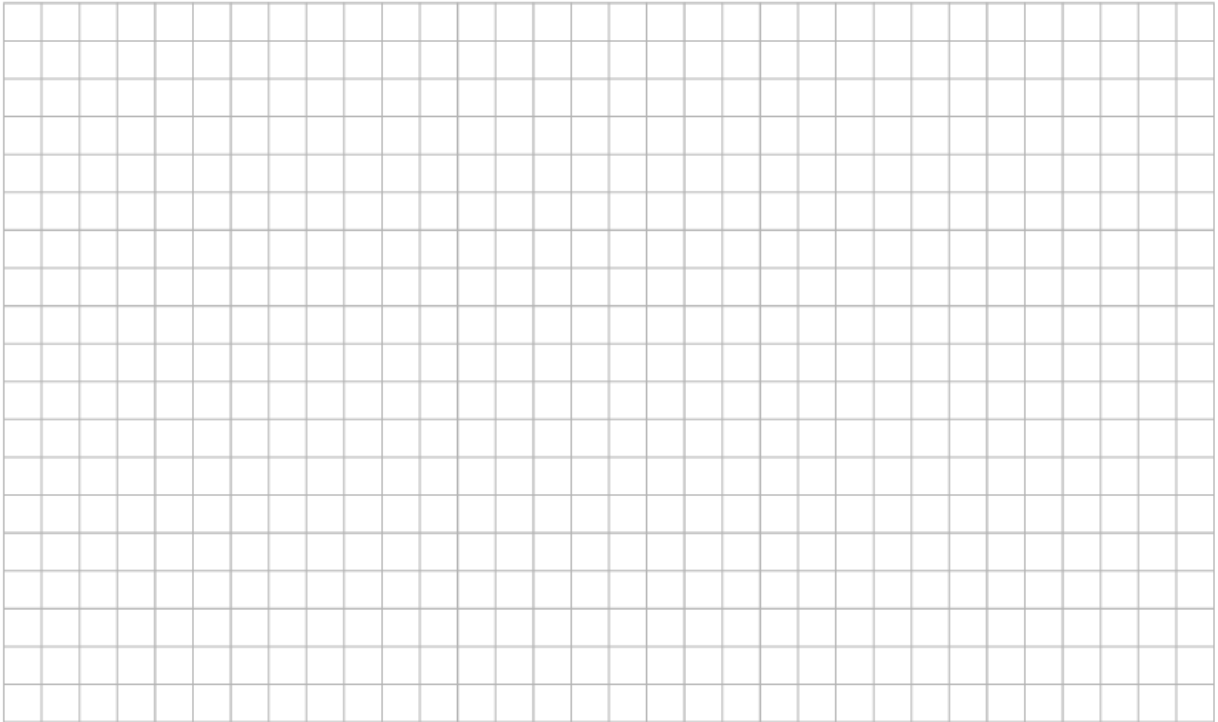$$2x - 3y + 2z = 2$$
$$2x + y + z = 5.$$

Question 1 **(25 marks)**

(a) Solve the simultaneous equations:

$$a^2 - ab + b^2 = 3$$
$$a + 2b + 1 = 0$$

(b) Find the set of all real values of x for which $\dfrac{2x-5}{x-3} \le \dfrac{5}{2}$.

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