1.3 Simultaneous Equations

Question Paper

Course	Edexcel IAL Maths: Pure 1
Section	1. Algebra & Functions
Topic	1.3 Simultaneous Equations
Difficulty	V. Hard

Time allowed: **60**

Score: **/51**

Percentage: **/100**

Question 1

Use elimination to solve the simultaneous equations

$$6x - 15y = -1$$
$$9x + 20y = 7$$

[4 marks]

Question 2

Use substitution to solve the simultaneous equations

$$4x + 3y = 1$$
$$5y - 2x = -1$$

[4 marks]

Question 3

Solve the simultaneous equations

$$4x^2 + 2x - 6y = 4$$
$$2x - 3y = -1$$

[7 marks]

Question 4

Solve the simultaneous equations

$$9x^2 - 7xy + 4y^2 = 36$$
$$3x + 2y = -6$$

[7 marks]

Question 5

(a) By eliminating y from the equations

$$8y^2 - 3x^2 - 4x = -\frac{11}{2}$$
$$3x + 4y = 1$$

show that $3x^2 - 14x + 12 = 0$.

[2 marks]

Question 5

(b) Hence solve the simultaneous equations

$$8y^2 - 3x^2 - 4x = -\frac{11}{2}$$
$$3x + 4y = 1$$

giving x and y in the form $a \pm b\sqrt{c}$, where a and b are rational numbers and c is a prime number.

[5 marks]

Question 6

$$5x + (k+1)y = -20$$
$$7x - 2ky = 2y + 6$$

are simultaneous equations, where k is a constant.

(a) Solve the equations for x and y, giving your answer for y in terms of the constant k.

[4 marks]

Question 6

(b) For what value of the constant k do the equations not have a solution?

[1 mark]

Question 7

$x^2 + 2y^2 = 25$

$x - y = k$

are simultaneous equations, where k is a constant.

(a) Find the respective sets of values for k for which the simultaneous equations have one, two, and no solutions.

[6 marks]

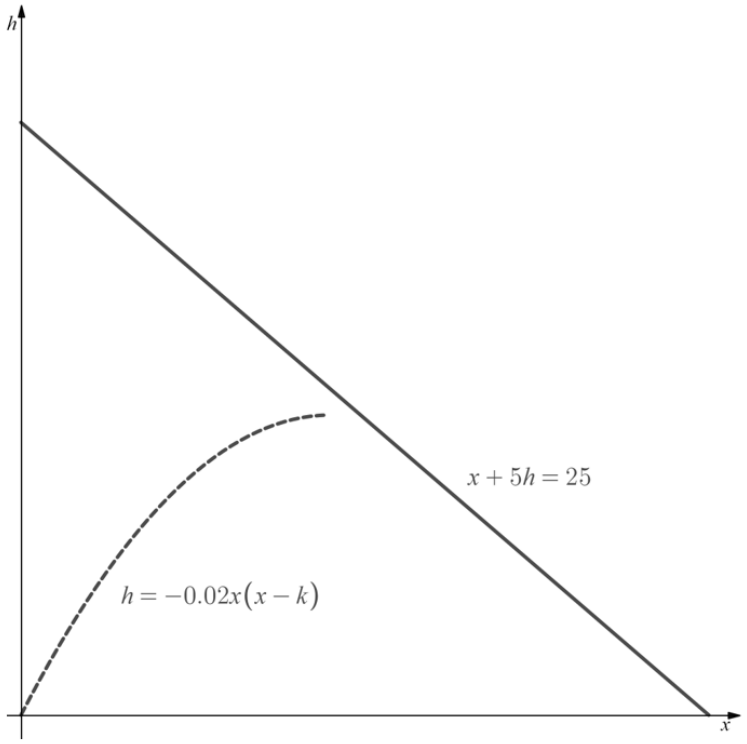
Question 7

(b) Given that the simultaneous equations have exactly one solution, find all possible pairs (x, y) that might correspond to that solution. Give all your values for x and y in the form $a\sqrt{6}$, where a is a rational number.

[3 marks]

Question 8

The goal in a video game is to have a unicorn leap as far as possible in a horizontal direction without being destroyed by the death ray that is being fired overhead. You hack into the game code and find that the height of the unicorn, h, is being modelled in relation to the horizontal distance from the point it jumps by the quadratic equation $h = -0.02x(x - k)$, where $k \geq 0$ is a parameter that can be controlled by the player's actions, and x is the horizontal distance in metres. You also find that the path of the death ray is being modelled by the equation $x + 5h = 25$.



The value of h can never be less than zero, and if the path of the unicorn crosses or touches the path of the death ray, the unicorn is considered to have been destroyed.

(a) Ignoring the problem of the death ray, explain why the parameter k represents the horizontal distance leapt by the unicorn.

[2 marks]

Question 8

(b) Your friend's personal best in the game is a leap of 21.5 m without the unicorn being destroyed. He is determined to keep playing until his unicorn has leapt 22 m safely. Determine whether or not your friend has a chance of reaching this goal.

[6 marks]