

1.4 Inequalities

Question Paper

Course	Edexcel IAL Maths: Pure 1
Section	1. Algebra & Functions
Topic	1.4 Inequalities
Difficulty	V. Hard

Time allowed: 70

Score: /57

Percentage: /100

Question 1

Solve the simultaneous inequalities

$$t^2 - 2t - 15 < 0 \text{ and}$$

$$t^2 + 14 \leq 9t.$$

[4 marks]**Question 2**

Solve the inequality $\frac{4x^2-11}{(x+1)^2} \geq 4$.

[4 marks]**Question 3**

The equation $(k + 1)t^2 + 2(k + 2)t = 3(k + 3)$ has real roots.

Find the possible values of k .

[3 marks]

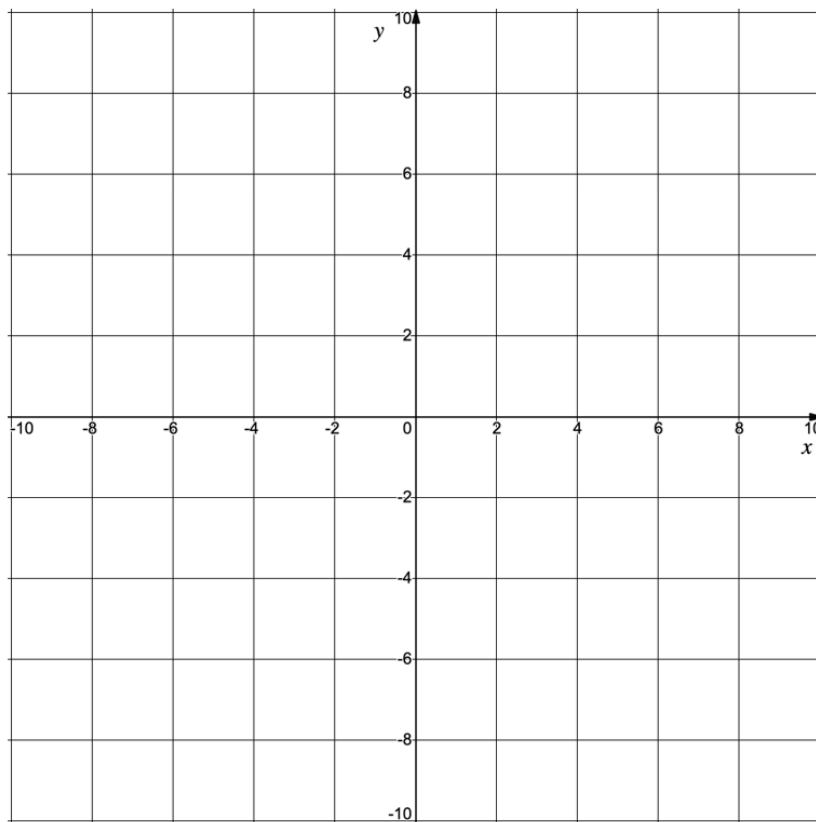
Question 4

(a) On the axes below show the region satisfied by the inequalities

$$x^2 - 9 \leq y$$

$$y \leq (2 + x)(2 - x)$$

Label this region R.

**[3 marks]**

Question 4

(b) Write down the equation(s) of any line(s) of symmetry of the region R.

[1 mark]

Question 5

Solve the inequality $-6 \leq x^2 + 3x - 4 \leq 6$, giving your answer in set notation.

[6 marks]

Question 6

Solve the inequality $2x^2 + 1 \leq x^2 + 10x - 8 < 2x^2 - 7x + 52$, giving your answer in interval notation.

[5 marks]

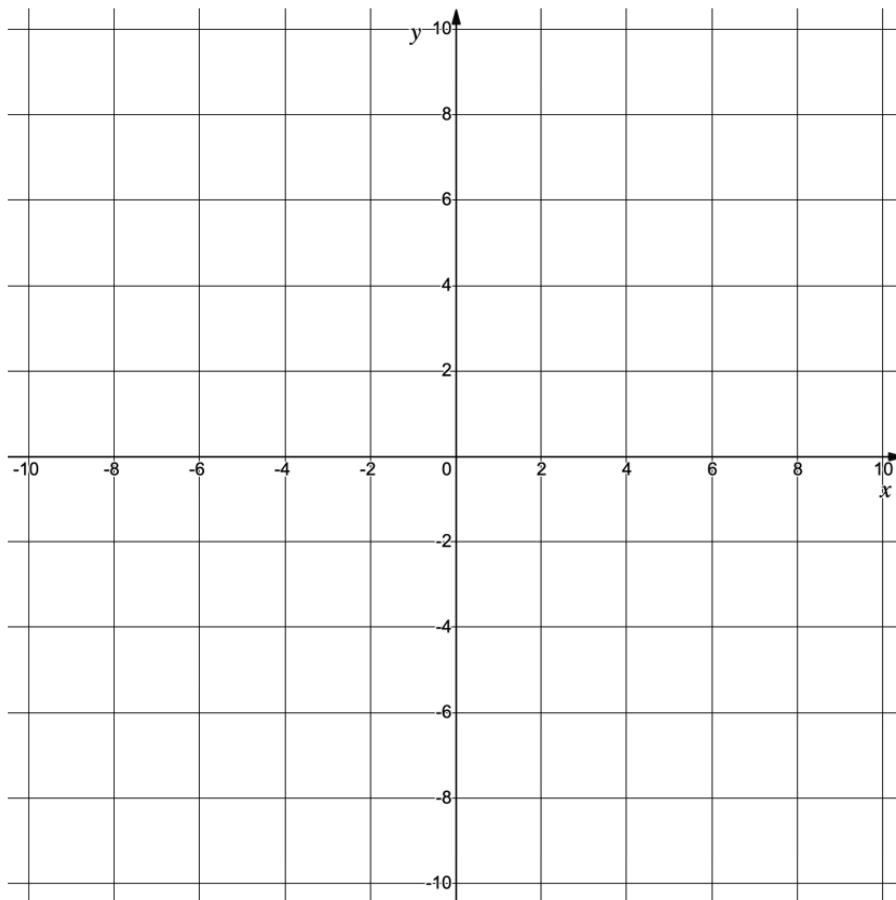
Question 7

The cross section of a tunnel is in the shape of the region defined by the inequalities

$$y \leq 6 - \frac{x^2}{6}$$

$$y \geq 0$$

(a) On the axes below show the region satisfying the inequalities



[2 marks]

Question 7

(b) Given that x and y are in metres, write down the height and the maximum width of the tunnel.

[2 marks]

Question 7

(c) Using a semi-circle of radius 6, estimate the area of the cross-section of the tunnel.

[3 marks]

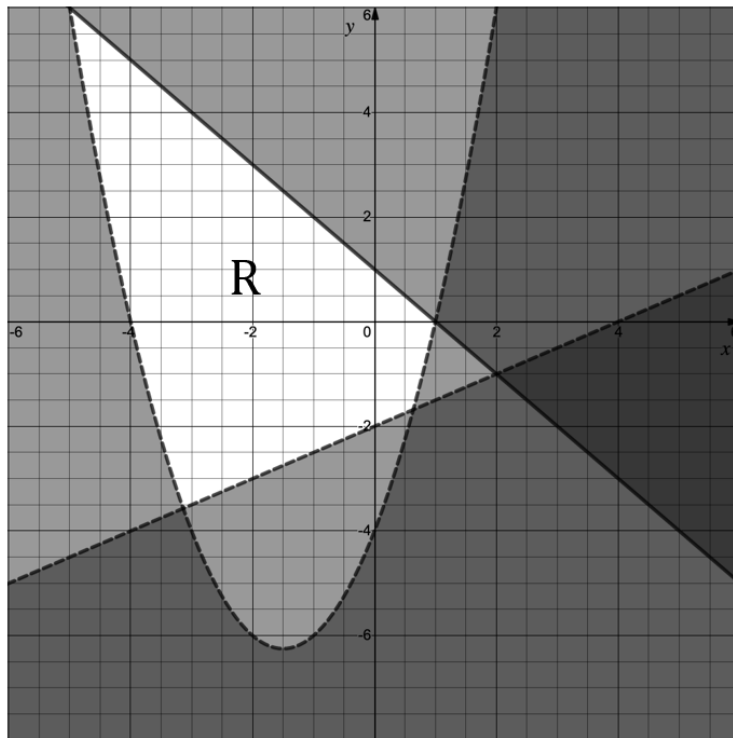
Question 7

(d) Given that the tunnel is to be 20 m in length estimate the volume of earth that will need to be removed in order to build the tunnel.

[2 marks]

Question 8

Write down the inequalities that define the region R shown in the diagram below.



[3 marks]

Question 9

An electronics company can produce c cables at a total cost of $(160 + 12c)$ pence. The cables can then be sold for $(38 - c)$ pence each.

- (a) Find the minimum and maximum number of cables the company needs to sell in order to make a profit?

[5 marks]**Question 9**

- (b) How many cables does the company need to sell to make the maximum profit?

[1 mark]**Question 10**

A stone is projected vertically upwards from a height of 2 m.

It's height, above it's starting position, d_1 m, at time t seconds after launch, is given by

$$d_1(t) = 13.2t - 4.9t^2$$

At the same time a second stone is projected upwards from a height of 2.3 m.

It's height, above its starting position, is given by

$$d_2(t) = 13t - 4.9t^2$$

For how long are both stones simultaneously at least 4 m above the ground?

[5 marks]

Question 11

A company produces x chairs and y tables in a day. They sell every chair and every table they produce. Due to the manufacturing processes involved the number of chairs and tables they can make in a day are limited by the following inequalities:

$$y \leq x + 20$$

$$y \leq -2x + 80$$

$$y \geq 3x - 45$$

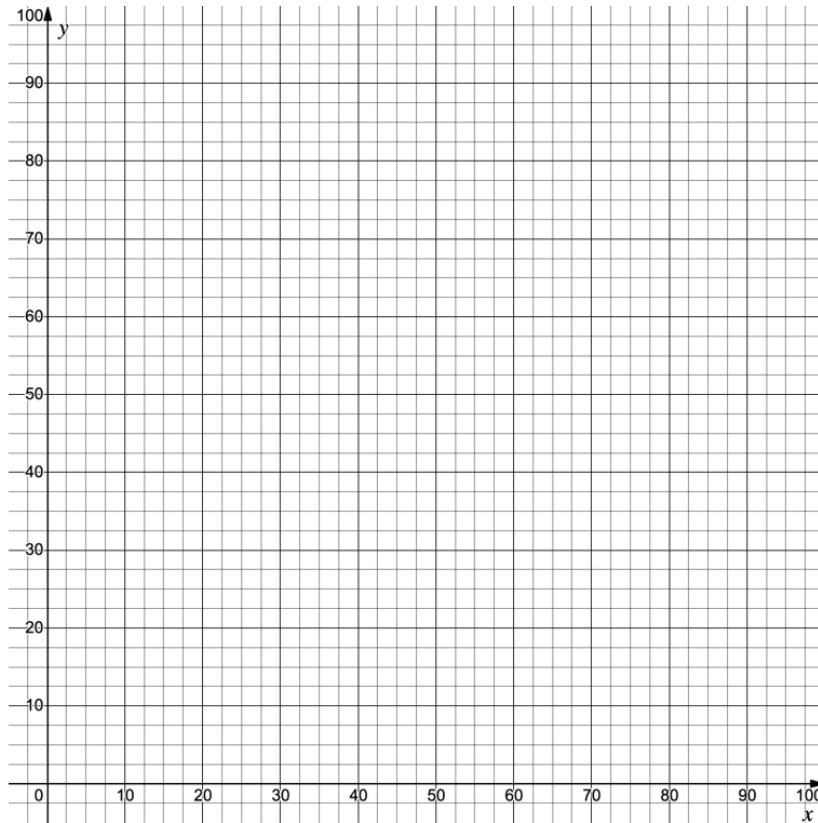
$$x \geq 0, y \geq 0$$

(a) Briefly explain why the inequalities $x \geq 0$ and $y \geq 0$ are appropriate.

[1 mark]

Question 11

(b) On the axes below show the region within which the company can produce x chairs and y tables per day.



[4 marks]

Question 11

(c) The company's profit, $\pounds P$, per day, is given by the formula $P = 3x + 2y$.

Given that the maximum profit lies on a vertex of the region found in part (b), find the number of chairs and tables the company should make in order to maximise its daily profit.

[3 marks]