

Please check the examination details below before entering your candidate information

Candidate surname					Other names				
Pearson Edexcel		Centre Number			Candidate Number				
		<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>		
Thursday 16 May 2019									
Afternoon					Paper Reference 8FM0-21				
Further Mathematics									
Advanced Subsidiary									
Further Mathematics options									
21: Further Pure Mathematics 1									
(Part of options A, B, C and D)									
You must have:								Total Marks	
Mathematical Formulae and Statistical Tables (Green), calculator								<input type="text"/>	

Candidates may use any calculator allowed by Pearson regulations. Calculators must not have the facility for symbolic algebra manipulation, differentiation and integration, or have retrievable mathematical formulae stored in them.

Instructions

- Use **black** ink or ball-point pen.
- If pencil is used for diagrams/sketches/graphs it must be dark (HB or B).
- **Fill in the boxes** at the top of this page with your name, centre number and candidate number.
- Answer **all** questions and ensure that your answers to parts of questions are clearly labelled.
- Answer the questions in the spaces provided
– *there may be more space than you need.*
- You should show sufficient working to make your methods clear. Answers without working may not gain full credit.
- Answers should be given to three significant figures unless otherwise stated.

Information

- A booklet 'Mathematical Formulae and Statistical Tables' is provided.
- The total mark for this part of the examination is 40. There are 5 questions.
- The marks for **each** question are shown in brackets
– *use this as a guide as to how much time to spend on each question.*

Advice

- Read each question carefully before you start to answer it.
- Try to answer every question.
- Check your answers if you have time at the end.

Turn over ►

P61862A

©2019 Pearson Education Ltd.

1/1/1




Pearson

2. A student was set the following problem.

Use algebra to find the set of values of x for which

$$\frac{x}{x-24} > \frac{1}{x+11}$$

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

The student's attempt at a solution is written below.

$$x(x-24)(x+11)^2 > (x+11)(x-24)^2$$

$$x(x-24)(x+11)^2 - (x+11)(x-24)^2 > 0$$

$$(x-24)(x+11)[x(x+11) - x - 24] > 0$$

Line 3

$$(x-24)(x+11)[x^2 + 10x - 24] > 0$$

$$(x-24)(x+11)(x+12)(x-2) > 0$$

$$x = 24, x = -11, x = -12, x = 2$$

$$\{x \in \mathbb{R} : -12 < x < -11\} \cup \{x \in \mathbb{R} : 2 < x < 24\}$$

Line 7

There are errors in the student's solution.

(a) Identify the error made

(i) in line 3

(ii) in line 7

(2)

(b) Find a correct solution to this problem.

(4)



3. Julie decides to start a business breeding rabbits to sell as pets.

Initially she buys 20 rabbits. After t years the number of rabbits, R , is modelled by the differential equation

$$\frac{dR}{dt} = 2R + 4 \sin t \quad t > 0$$

Julie needs to have at least 40 rabbits before she can start to sell them.

Use two iterations of the approximation formula

$$\left(\frac{dy}{dx}\right)_n \approx \frac{y_{n+1} - y_n}{h}$$

to find out if, according to the model, Julie will be able to start selling rabbits after 4 months.

(7)

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA



5.

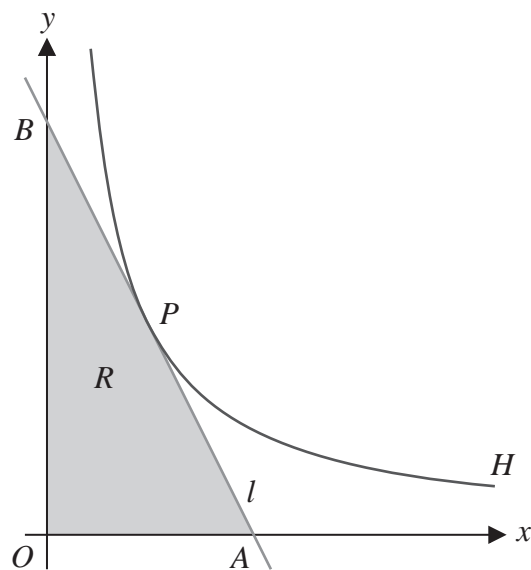


Figure 2

Figure 2 shows a sketch of part of the rectangular hyperbola H with equation

$$xy = c^2 \quad x > 0$$

where c is a positive constant.

The point $P\left(ct, \frac{c}{t}\right)$ lies on H .

The line l is the tangent to H at the point P .

The line l crosses the x -axis at the point A and crosses the y -axis at the point B .

The region R , shown shaded in Figure 2, is bounded by the x -axis, the y -axis and the line l .

Given that the length OB is twice the length of OA , where O is the origin, and that the area of R is 32, find the exact coordinates of the point P .

(10)

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA



