Please check the examination details belo	ow before enter	ering your candidate information			
Candidate surname		Other names			
Centre Number Candidate Nu	Centre Number Candidate Number				
Pearson Edexcel Level 3 GCE					
	Paper reference	8FM0/21			
Further Mathematics					
Advanced Subsidiary					
Further Mathematics option	ons				
21: Further Pure Mathematics 1					
(Part of options A, B, C and D)					
(i di t di options A, B, e di d B)					
You must have: Total Marks					
Mathematical Formulae and Statistical Tables (Green), calculator					

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.
- Inexact 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 ▶



Q:1/1/1/





1. Use algebra to find the set of values of <i>x</i>	for which $x \geqslant \frac{2x+15}{2x+3}$	
	$x \geqslant 2x + 3$	(6)

Question 1 continued	
(T _c + 1 f , C	Augstian 1 is 6 mayles)
(10tal for C	Question 1 is 6 marks)



2. A population of deer was introduced onto an island.

The number of deer, P, on the island at time t years following their introduction is modelled by the differential equation

$$\frac{dP}{dt} = \frac{P}{5000} \left(1000 - \frac{P(t+1)}{6t+5} \right) \qquad t > 0$$

It was estimated that there were 540 deer on the island six months after they were introduced.

Use **two** applications of the approximation formula $\left(\frac{dy}{dx}\right)_n \approx \frac{y_{n+1} - y_n}{h}$ to estimate the number of deer on the island 10 months after they were introduced.

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•	1	,	

Question 2 continued	
(Total f	or Question 2 is 7 marks)
(Iotai i	vi vuosion 2 is / murns)



3. (a) Use $t = \tan \frac{\theta}{2}$ to show that, where both sides are defined

$$\frac{29 - 21\sec\theta}{20 - 21\tan\theta} \equiv \frac{5t + 2}{2t + 5}$$

(4)

(b) Hence, again using $t = \tan \frac{\theta}{2}$, prove that, where both sides are defined

$$\frac{20 + 21\tan\theta}{29 + 21\sec\theta} \equiv \frac{29 - 21\sec\theta}{20 - 21\tan\theta}$$

(3)

Question 3 continued	
(Tota	l for Question 3 is 7 marks)



4. The parabola C has equation $y^2 = 10x$

The point F is the focus of C.

(a) Write down the coordinates of F.

(1)

The point P on C has y coordinate q, where q > 0

(b) Show that an equation for the tangent to C at P is given by

$$10x - 2qy + q^2 = 0$$

(3)

The tangent to C at P intersects the directrix of C at the point A.

The point B lies on the directrix such that PB is parallel to the x-axis.

(c) Show that the point of intersection of the diagonals of quadrilateral *PBAF* always lies on the *y*-axis.

(5)

Question 4 continued



Question 4 continued

Question 4 continued	
(T	otal for Question 4 is 9 marks)



5.

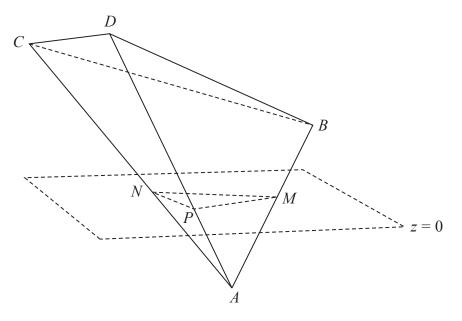


Figure 1

The points A(3, 2, -4), B(9, -4, 2), C(-6, -10, 8) and D(-4, -5, 10) are the vertices of a tetrahedron.

The plane with equation z = 0 cuts the tetrahedron into two pieces, one on each side of the plane.

The edges AB, AC and AD of the tetrahedron intersect the plane at the points M, N and P respectively, as shown in Figure 1.

Determine

(a) the coordinates of the points M, N and P,

(3)

(b) the area of triangle MNP,

(2)

(c) the exact volume of the solid BCDPNM.

(6)

Question 5 continued



Question 5 continued

Question 5 continued



TOTAL FOR FURTHER PURE MATHEMATICS 1 IS 40 MARKS