Please check the examination details bel	ow before ente	ering your candidate information
Candidate surname		Other names
Centre Number Candidate N	umber	
Pearson Edexcel Inter	nation	al Advanced Level
Time 1 hour 30 minutes	Paper reference	WMA14/01
Mathematics		•
International Advanced Le	avel	
Pure Mathematics P4		
You must have: Mathematical Formulae and Statistica	al Tables (Ye	Total Marks
	al Tables (Ye	

Candidates may use any calculator permitted 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.
- There are 9 questions in this question paper. The total mark for this paper is 75.
- 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.
- If you change your mind about an answer, cross it out and put your new answer and any working underneath.

Turn over ▶



Q:1/1/1/





1. The binomial expansion of

$$\left| \left| (3 + kx) \right|^{-2} \qquad \left| kx \right| < 3$$

where k is a non-zero constant, may be written in the form

$$A + Bx + Cx^2 + Dx^3 + \dots$$

where A, B, C and D are constants.

(a) Find the value of A

(1)

Given that C = 3B

(b) show that

$$k^2 + 6k = 0$$

(3)

- (c) Hence (i) find the value of k
 - (ii) find the value of D

(3)



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Question 1 continued	
(Total for Question 1 is 7 marks)	



2. (a) Express  $\frac{1}{(1+3x)(1-x)}$  in partial fractions.

**(3)** 

(b) Hence find the solution of the differential equation

$$(1+3x)(1-x)\frac{dy}{dx} = \tan y - \frac{1}{3} < x \le \frac{1}{2}$$

for which  $x = \frac{1}{2}$  when  $y = \frac{\pi}{2}$ 

Give your answer in the form  $\sin^n y = f(x)$  where *n* is an integer to be found.

**(6)** 


Question 2 continued	



Question 2 continued

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Question 2 continued
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3.

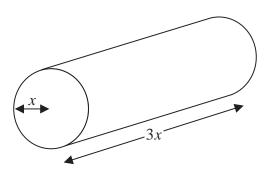


Figure 1

A tablet is dissolving in water.

The tablet is modelled as a cylinder, shown in Figure 1.

At t seconds after the tablet is dropped into the water, the radius of the tablet is x mm and the length of the tablet is 3x mm.

The cross-sectional area of the tablet is decreasing at a constant rate of  $0.5\,\mathrm{mm}^2\,\mathrm{s}^{-1}$ 

(a) Find 
$$\frac{dx}{dt}$$
 when  $x = 7$ 

**(4)** 

(b) Find, according to the model, the rate of decrease of the volume of the tablet when x = 4

**(4)** 


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Question 3 continued
(Total for Question 3 is 8 marks)



In this question you must show all stages of your working.Solutions relying on calculator technology are not acceptable.

A curve has equation

$$16x^3 - 9kx^2y + 8y^3 = 875$$

where k is a constant.

(a) Show that

$$\frac{\mathrm{d}y}{\mathrm{d}x} = \frac{6kxy - 16x^2}{8y^2 - 3kx^2}$$

**(4)** 

Given that the curve has a turning point at  $x = \frac{5}{2}$ 

(b) find the value of k

**(4)** 



Question 4 continued	



Question 4 continued

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Question 4 continued	
(To	otal for Question 4 is 8 marks)



5. In this question you must show all stages of your working.

Solutions relying on calculator technology are not acceptable.

(a) Use the substitution  $x = 2 \sin u$  to show that

$$\int_{0}^{1} \frac{3x+2}{(4-x^{2})^{\frac{3}{2}}} dx = \int_{0}^{p} \left(\frac{3}{2}\sec u \tan u + \frac{1}{2}\sec^{2} u\right) du$$

where p is a constant to be found.

**(4)** 

(b) Hence find the exact value of

$$\int_{0}^{1} \frac{3x+2}{(4-x^2)^{\frac{3}{2}}} \, \mathrm{d}x$$

**(4)** 



Question 5 continued



Question 5 continued

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Question 5 continued	
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- **6.** Relative to a fixed origin *O*,
  - the point A has position vector  $\mathbf{i} 4\mathbf{j} + 3\mathbf{k}$
  - the point *B* has position vector  $5\mathbf{i} + 3\mathbf{j} 2\mathbf{k}$
  - the point C has position vector  $3\mathbf{i} + p\mathbf{j} \mathbf{k}$

where p is a constant.

The line l passes through A and B.

(a) Find a vector equation for the line l

(3)

Given that  $\overrightarrow{AC}$  is perpendicular to l

(b) find the value of p

**(3)** 

(c) Hence find the area of triangle *ABC*, giving your answer as a surd in simplest form. (3)



Question 6 continued



Question 6 continued	
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Question 6 continued
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(Total for Question 6 is 9 marks)



# 7. In this question you must show all stages of your working.

# Solutions relying entirely on calculator technology are not acceptable.

The curve C has parametric equations

$$x = \sin t - 3\cos^2 t \qquad y = 3\sin t + 2\cos t \qquad 0 \leqslant t \leqslant 5$$

(a) Show that 
$$\frac{dy}{dx} = 3$$
 where  $t = \pi$ 

**(4)** 

The point *P* lies on *C* where  $t = \pi$ 

(b) Find the equation of the tangent to the curve at P in the form y = mx + c where m and c are constants to be found.

**(3)** 

Given that the tangent to the curve at P cuts C at the point Q

(c) show that the value of t at point Q satisfies the equation

$$9\cos^2 t + 2\cos t - 7 = 0$$

**(2)** 

(d) Hence find the exact value of the y coordinate of Q

**(3)** 

Question 7 continued	



Question 7 continued			

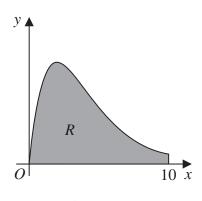
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Question 7 continued	
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## 8. In this question you must show all stages of your working.

Solutions relying entirely on calculator technology are not acceptable.



20 cm

Figure 2

Figure 3

Figure 2 shows the curve with equation

$$y = 10xe^{-\frac{1}{2}x}$$

$$0 \leqslant x \leqslant 10$$

The finite region R, shown shaded in Figure 2, is bounded by the curve, the x-axis and the line with equation x = 10

The region R is rotated through  $2\pi$  radians about the x-axis to form a solid of revolution.

(a) Show that the volume, V, of this solid is given by

$$V = k \int_0^{10} x^2 \mathrm{e}^{-x} \, \mathrm{d}x$$

where k is a constant to be found.

**(2)** 

(b) Find 
$$\int x^2 e^{-x} dx$$

**(3)** 

Figure 3 represents an exercise weight formed by joining two of these solids together.

The exercise weight has mass 5 kg and is 20 cm long.

Given that

$$density = \frac{mass}{volume}$$

and using your answers to part (a) and part (b),

(c) find the density of this exercise weight. Give your answer in grams per cm³ to 3 significant figures.

**(5)** 

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Question 8 continued			



Question 8 continued

Question 8 continued
(Total for Question 8 is 10 marks)



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<b>never</b> divisible by 4	(4)
	( <del>*</del> )

Question 9 continued	



Question 9 continued	
	(Total for Question 9 is 4 marks)
TO	TAL FOR PAPER IS 75 MARKS

