

Please check the examination details below before entering your candidate information

Candidate surname

Other names

Pearson Edexcel
International
Advanced Level

Centre Number

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Candidate Number

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Tuesday 13 October 2020

Morning (Time: 1 hour 30 minutes)

Paper Reference **WMA14/01**

Mathematics

International Advanced Subsidiary/Advanced Level
Pure Mathematics P4

You must have:

Mathematical Formulae and Statistical Tables (Lilac), calculator

Total Marks

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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.

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Question 5 continued

(Total 7 marks)



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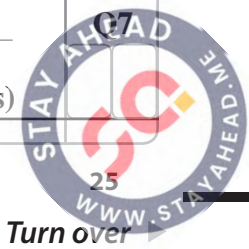
Question 7 continued

Lined writing area for the answer to Question 7.

(Total 12 marks)



P 6 5 7 5 9 A 0 2 5 3 2



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8. Relative to a fixed origin O , the lines l_1 and l_2 are given by the equations

$$l_1: \mathbf{r} = \begin{pmatrix} 4 \\ -3 \\ 2 \end{pmatrix} + \lambda \begin{pmatrix} 3 \\ -2 \\ -1 \end{pmatrix} \quad \text{where } \lambda \text{ is a scalar parameter}$$

$$l_2: \mathbf{r} = \begin{pmatrix} 2 \\ 0 \\ -9 \end{pmatrix} + \mu \begin{pmatrix} 2 \\ -1 \\ -3 \end{pmatrix} \quad \text{where } \mu \text{ is a scalar parameter}$$

Given that l_1 and l_2 meet at the point X ,

(a) find the position vector of X . **(5)**

The point $P(10, -7, 0)$ lies on l_1

The point Q lies on l_2

Given that \vec{PQ} is perpendicular to l_2

(b) calculate the coordinates of Q . **(5)**

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9. Bacteria are growing on the surface of a dish in a laboratory.

The area of the dish, $A \text{ cm}^2$, covered by the bacteria, t days after the bacteria start to grow, is modelled by the differential equation

$$\frac{dA}{dt} = \frac{A^3}{5t^2} \quad t > 0$$

Given that $A = 2.25$ when $t = 3$

(a) show that

$$A = \left(\frac{pt}{qt + r} \right)^2$$

where p , q and r are integers to be found.

(7)

According to the model, there is a limit to the area that will be covered by the bacteria.

(b) Find the value of this limit.

(2)

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