Write your name here

Surname	Other Names

AS/A Level Mathematics

Arithmetic Sequences and Series

Candidates may use any calculator allowed by the regulations of the Joint Council for Qualifications. 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.
• 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

• 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.

1 An arithmetic series has first term a and common difference d.

Prove that the sum of the first n terms of the series is

$$\frac{1}{2}n\left(2a+(n-1)d\right)$$

(Total for question 1 is 4 marks)

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2 The fifth term of an arithmetic sequence is 5 and the eighth term of the sequence is -16.

(a) Find the first term of the sequence. **(2)**
(b) Find the common difference. **(2)**

(Total for question 2 is 10 marks)

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3 The third term of an arithmetic series is -4 and the sum of the first eight terms of the series is 22.

(a) Find the first term of the series. **(2)**
(b) Find the common difference. **(2)**
(c) Find the highest value of n for which the sum of the first n terms is less than 200. **(6)**

(Total for question 3 is 10 marks)

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4 Bob saves some money every week. He saves £2.20 in the first week, £2.40 in the second week, £2.60 in the third week, and so on until week 100. His weekly savings form an arithmetic sequence.

(a) Find the amount he saves in week 100. **(3)**
(b) Calculate his total savings over the 100 week period. **(3)**

(Total for question 4 is 6 marks)

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5 The first three terms of an arithmetic series are (k + 3), (2k + 4) and (4k – 2) respectively.

(a) Find the value of the constant k. **(2)**
(b) Find the sum of the first 20 terms of the series. **(3)**

(Total for question 5 is 5 marks)

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6 The amount of cars produced by a factory each week forms an arithmetic sequence.
In the first week the factory produces 100 cars. The number of cars produced will increase by 4 each week until the number of cars being produced reaches 180.
The factory will then continue to produce 180 cars each week.

(a) After how many weeks does the factory reach production of 180 cars per week. **(2)**
(b) Find the total number of cars produced in the first 52 weeks. **(4)**

(Total for question 6 is 6 marks)

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7 Bertie makes payments into a savings account every month. He pays in £300 in the first month and the amount he pays increases by £40 each subsequent month.
Charlotte also makes payments into a savings account. She pays in £500 in the first month and the amount she pays in increases by £20 each subsequent month

After how many months have Bertie and Charlotte paid in the same amount in total.

(Total for question 7 is 5 marks)