

Arithmetic Progressions

Q1

A worker in a factory is given the task of sewing a total of 780 garments.

On the first day she completes 20 garments and plans to increase the number of garments she completes in a day by 2 every day.

(i) Find how many garments she will complete on the 16th day. [4]

(ii) Find how many days in total she will need to complete the task. [4]

Q2

A married couple, Nicole and Brad, take out savings' investment plans.

Nicole plans to save £225 in the first year, £275 in the second year, £325 in the third year and so on increasing the annual amount saved by £50

Using the fact that her planned savings form an arithmetic progression,

(i) find the amount that Nicole plans to save in the 10th year of her savings plan, [2]

(ii) find the **total** amount that Nicole plans to save over a 20 year period. [3]

Brad plans to save £14 000 over a 20 year period.

He plans to save £ P in the first year. His planned annual savings form an arithmetic progression with common difference £60

(iii) Find the value of P [3]

Q3

- (i) Prove that the sum of the first n terms of an arithmetic series, with first term a and common difference d , is

$$S_n = \frac{n}{2}[2a + (n-1)d] \quad [5]$$

The sum of the first two terms of an arithmetic series is 2
The 41st term is 475

- (ii) Show that the first term and the common difference are -5 and 12 respectively. [7]
- (iii) Hence find the sum of the first 20 terms of this series. [2]

Q4

The first term of a Geometric Series is 4 and its common ratio is $\frac{1}{2}$
Find:

- (i) the fifth term of the series; [2]
- (ii) the sum to infinity of the series. [2]

Q5

A sequence is defined recursively by

$$u_n = u_{n-1} - 3 \text{ where } u_1 = 5$$

- (i) Find u_2 and u_3 [2]
- (ii) Using the fact that the terms of this sequence form an arithmetic progression, find its 600th term. [4]