[Maximum mark: 7]

The first three terms of a geometric sequence are $u_1 = 0.64$, $u_2 = 1.6$, and $u_3 = 4$.

(a) Find the value of r. [2]

(b) Find the value of S_6. [2]

(c) Find the least value of n such that $S_n > 75\,000$. [3]

[Maximum mark: 5]

The first three terms of an infinite geometric sequence are 32, 16 and 8.

(a) Write down the value of r. *[1 mark]*

(b) Find u_6. *[2 marks]*

(c) Find the sum to infinity of this sequence. *[2 marks]*

[Maximum mark: 6]

Three consecutive terms of a geometric sequence are $x-3$, 6 and $x+2$.
Find the possible values of x.

[Maximum mark: 6]

In a geometric sequence, the fourth term is 8 times the first term. The sum of the first 10 terms is 2557.5. Find the 10th term of this sequence.

[Maximum mark: 16]

The first three terms of a infinite geometric sequence are $m-1$, 6, $m+4$, where $m \in \mathbb{Z}$.

(a) (i) Write down an expression for the common ratio, r.

(ii) Hence, show that m satisfies the equation $m^2+3m-40=0$. *[4]*

(b) (i) Find the two possible values of m.

(ii) Find the possible values of r. *[6]*

(c) The sequence has a finite sum.

(i) State which value of r leads to this sum **and** justify your answer.

(ii) Calculate the sum of the sequence. *[6]*

[Maximum mark: 14]

(a) Consider an infinite geometric sequence with $u_1 = 40$ and $r = \frac{1}{2}$.

(i) Find u_4.

(ii) Find the sum of the infinite sequence. *[4 marks]*

Consider an arithmetic sequence with n terms, with first term (-36) and eighth term (-8).

(b) (i) Find the common difference.

(ii) Show that $S_n = 2n^2 - 38n$. *[5 marks]*

(c) The sum of the infinite geometric sequence is equal to twice the sum of the arithmetic sequence. Find n. *[5 marks]*

[Maximum mark: 6]

The sum of the first three terms of a geometric sequence is 62.755, and the sum of the infinite sequence is 440. Find the common ratio.

[Maximum mark: 14]

The first two terms of a geometric sequence u_n are $u_1 = 4$ and $u_2 = 4.2$.

(a) (i) Find the common ratio.

(ii) Hence or otherwise, find u_5. *[5]*

Another sequence v_n is defined by $v_n = an^k$, where $a, k \in \mathbb{R}$, and $n \in \mathbb{Z}^+$, such that $v_1 = 0.05$ and $v_2 = 0.25$.

(b) (i) Find the value of a.

(ii) Find the value of k. *[5]*

(c) Find the smallest value of n for which $v_n > u_n$. *[4]*

[Maximum mark: 15]

The sides of a square are 16 cm in length. The midpoints of the sides of this square are joined to form a new square and four triangles (diagram 1). The process is repeated twice, as shown in diagrams 2 and 3.

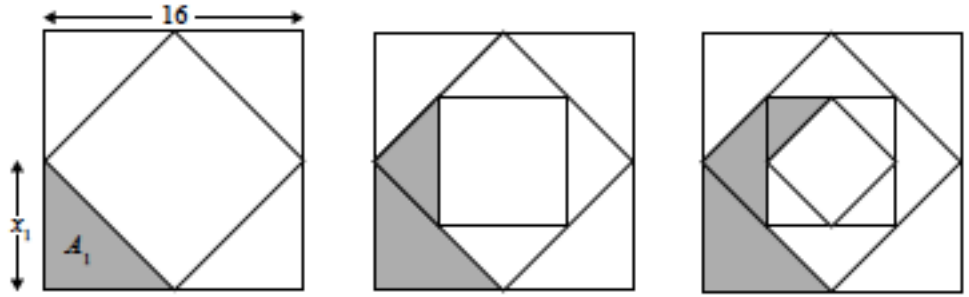

diagram 1 diagram 2 diagram 3

Let x_n denote the length of one of the equal sides of each new triangle.
Let A_n denote the area of each new triangle.

(a) The following table gives the values of x_n and A_n, for $1 \leq n \leq 3$. Copy and complete the table. *(Do not write on this page.)* *[4]*

n	1	2	3
x_n	8		4
A_n	32	16	

(b) The process described above is repeated. Find A_5. *[4]*

(c) Consider an initial square of side length k cm. The process described above is repeated indefinitely. The total area of the shaded regions is $k\text{cm}^2$. Find the value of k. *[7]*

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