**Topic: Arithmetic and Geometric Sequences and Linear Recurrence**

Time: 45 mins Marks: /45 marks

**No calculator allowed**



**Question One: [2, 2, 2, 2, 2: 10 marks]**

For the following sequences determine which are arithmetic, geometric or neither.

Provide a reason to support your answer.

a) 1, 1.5, 2.25, 3.375…

b) 5, -5, 5, -5, 5, -5 …

c)

d) 300, -60, 12, -2.4, 0.48, -0.096 …

e) 2, 1, 2, 1, 2, 1 …

**Question Two: [3, 3, 3: 9 marks]**

a) A geometric sequence has and .

i) Determine the recursive rule.

ii) Calculate the 5th term.

b) An arithmetic sequence has and .

i) Determine the recursive rule.

ii) Calculate the 5th term.

c) For the following sequence determine the recursive rule and term and .

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  |  |  |  |  |
| 4 | -8 | 16 | -32 | 64 |

**Question Three: [3, 2, 2: 7 marks]**

a) An arithmetic sequence has and a common difference of . Determine term 12.

b) The following graph depicts a geometric sequence.



Determine the rule to find the nth term.

c) The following graph depicts a geometric sequence.



Determine the 8th term.

**Question Four: [4, 4: 8 marks]**

a) Generate the first 5 terms according to the following recursive rule and graph the terms on the axis below.



b) Graph the first 5 terms generated by the following recursive rule on the axis below.



**Question Five: [2, 2, 2: 6 marks]**

Doctors are monitoring the growth of a bacteria in order to help calculate the dosage of medication needed to combat it. The following table shows the growth of the bacteria over several hours.

|  |  |
| --- | --- |
| Population of bacteria (B) in 1000s | Number of hours (t) |
| 100 | 0 |
| 120 | 1 |
| 144 | 2 |
| 172.8 | 3 |
| 207.36 | 4 |

a) Determine the rate at which the bacteria is growing each hour.

b) After how many hours will the number of bacteria first exceed 300 000?

c) What is the rule which can be used to calculate the number of bacteria, *B,* after *t* hours.

**Question Six: [2, 1, 1, 1: 5 marks]**

Isabel is attempting to increase her fitness and has decided to follow a fitness program called *Sofa to Six*. The aim is to slowly build up her fitness to get her from doing nothing (sitting on the sofa) to running six kilometers. She records the distance she runs in total each week in the app on her phone and a graph is generated to show her progress.



a) Write the recursive rule to show how many km Isabel has run each week.

b) How many kilometers does Isabel run in the first week?

c) How long does it take for her to achieve the goal of running 6km?

d) How many kilometers has Isabel run in total after 6 weeks?

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Gometric

b) 5, -5, 5, -5, 5, -5 …



Geometric

c)

Arithmetic

d) 300, -60, 12, -2.4, 0.48, -0.096 …

Geometric

e) 2, 1, 2, 1, 2, 1 …

Neither

**Question Two: [3, 3, 3: 9 marks]**

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i) Determine the recursive rule.



ii) Calculate the 5th term.



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i) Determine the recursive rule.



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