**Do Now: Sequences and series, IB-style exam problems**

**1a.** Only one of the following four sequences is arithmetic and only one of them is geometric.









State which sequence is

(i) arithmetic;

(ii) geometric. *[2 marks]*

**1b.** For **another** geometric sequence 

write down the common ratio; *[1 mark]*

**1c.** Find the **exact** value of the tenth term. Give your answer as a fraction. *[3 marks]*

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| 1a. i) \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_  ii) \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_  1b. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_  1c. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ |

**2a.** The second term of an arithmetic sequence is 30. The fifth term is 90.

Calculate

(i) the common difference of the sequence;

(ii) the first term of the sequence. *[3 marks]*

**2b.** The first, second and fifth terms of this arithmetic sequence are the first three terms of a geometric sequence.

Calculate the seventh term of the **geometric** sequence. *[3 marks]*

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| 2a. i) \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_  ii) \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_  2b. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ |

**3a.** The first term, , of an arithmetic sequence is . The fifth term, , of the sequence is .

Find the common difference of the sequence. *[2 marks]*

**3b.** The  term, , of the sequence is .

Find the value of . *[2 marks]*

**3c.** Find , the sum of the first twenty terms of the sequence. *[2 marks]*

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| 3a. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_  3b. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_  3c. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ |

**4a.** The fourth term, *u*, of a geometric sequence is 135. The fifth term, *u*, is 101.25 .

Find the common ratio of the sequence. *[2 marks]*

**4b.** Find *u*, the first term of the sequence. *[2 marks]*

**4c.** Calculate the sum of the first 10 terms of the sequence. *[2 marks]*

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| 4a. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_  4b. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_  4c. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ |

**5a.** Shiyun bought a car in 1999. The value of the car  , in USD, is depreciating according to the exponential model



where *t* is the time, in years, that Shiyun has owned the car.

Write down the value of the car when Shiyun bought it. *[1 mark]*

**5b.** Calculate the value of the car three years after Shiyun bought it. Give your answer correct to **two decimal places**. *[2 marks]*

**5c.** Calculate the time for the car to depreciate to half of its value since Shiyun bought it. *[3 marks]*

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| 5a. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_  5b. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_  5c. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ |

**6a.** ***Give your answers to parts (a) to (e) to the nearest dollar.***

On Hugh’s 18th birthday his parents gave him options of how he might receive his monthly allowance for the next two years.

**Option A**  each month for two years

**Option B**  in the first month,  in the second month,  in the third month, increasing by  each month for two years

**Option C**  in the first month and increasing by  each month for two years

**Option D** Investing  at a bank at the beginning of the first year, with an interest rate of  per annum, **compounded monthly**.

Hugh does not spend any of his allowance during the two year period.

If Hugh chooses **Option A**, calculate the total value of his allowance at the end of the two year period. *[2 marks]*

**6b.** If Hugh chooses **Option B**, calculate

(i) the amount of money he will receive in the 17th month;

(ii) the total value of his allowance at the end of the two year period. *[5 marks]*

**6c.** If Hugh chooses **Option C**, calculate

(i) the amount of money Hugh would receive in the 13th month;

(ii) the total value of his allowance at the end of the two year period. *[5 marks]*

**6d.** If Hugh chooses **Option D**, calculate the total value of his allowance at the end of the two year period. *[3 marks]*

**6e.** State which of the options, A, B, C or D, Hugh should choose to give him the greatest total value of his allowance at the end of the two year period. *[1 mark]*

**6f.** Another bank guarantees Hugh an amount of  after two years of investment if he invests $1500 at this bank. The interest is **compounded annually**.

Calculate the interest rate per annum offered by the bank. *[3 marks]*