 Name:

7-13 Problem Set: Sequences, series, and interest rate calculations

3a. The first term, u_1, of an arithmetic sequence is 145. The fifth term, u_5, of the sequence is 113.

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

3b. The n^{th} term, u_n, of the sequence is -7.

Find the value of n. *[2 marks]*

3c. Find S_{20}, 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 V , in USD, is depreciating according to the exponential model

$$V = 25000 \times 1.5^{-0.2t}, t \geqslant 0$$

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]*

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 $\$60$ each month for two years

Option B $\$10$ in the first month, $\$15$ in the second month, $\$20$ in the third month, increasing by $\$5$ each month for two years

Option C $\$15$ in the first month and increasing by 10% each month for two years

Option D Investing $\$1500$ at a bank at the beginning of the first year, with an interest rate of 6% 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 $\$1750$ 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]*