Algebra and Functions – Paper 2 (non-Calculator) IB SL

Part A *[30 marks]*

1. a) Solve for x, $\log_9 x = 3.5$.

   b) Express as a single logarithm $2\log 3 - \log 18 + \frac{1}{2}\log 16$.

a) .....

b) .....

2. $2000 is invested at 9% interest per annum with interest compounded monthly.

.....

3. $a = 4.3 \times 10^{12}$ and $b = 6.8 \times 10^{-5}$

Calculate, giving your answers in the form $p \times 10^{q}$, where $1 \leq p \leq 10$.

a) ab,

b) $\frac{a}{b}$

a) .....

b) .....

4. Find the value of $\log(3x + 1) = 0$.

.....

5. The first three terms of an arithmetic sequence are 10, 13.5, 17.

   a) Find the 65^{th} term.

   b) Calculate the sum of the 10^{th} to the 20^{th} terms inclusive.

a) .....

b) .....

Part B *[19 marks]*

6. *[Maximum marks 7]*

The number of bacteria present in a culture at time t hours after the beginning of an experiment is denoted by N. The relation between N and t is modeled by,

$N = 150e^{kt}$

a) Write down the initial value of N. *[1 mark]*

b) At 6 hours the value of N is known to be 8189.7225.

Show that the value of k is $\frac{2}{3}$. *[3 marks]*

c) Find the value of t when the bacteria reaches 4.47043×10^5. *[3 marks]*

4. *[Maximum mark 12]*

Barlow is setting out a plan to train for a triathlon.

He determines that during the first week he will swim 300 metres and then add 100 metres each week.
He cycles 1 km in the first week and determines to cycle 50% more each week so in week 2 he cycles 1.5 km, and in week 3 he cycles 2.25 km.
He runs 5 km in the first week and runs an extra km each week.

i) Determine which sequences are arithmetic and which are geometric from the information above. *[1 mark]*

ii) Calculate how far Barlow will run in the 6^{th} week. *[2 marks]*

iii) Calculate how far Barlow will cycle in the 7^{th} week. *[2 marks]*

iv) Calculate how far Barlow will swim in the 8^{th} week. *[2 marks]*

v) When Barlow completes the 10^{th} week of training, he calculates the total amount of training he has completed.

How far has he,

a) swam,

b) cycled,

c) run. *[5 marks]*

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Answers

Part A

1. a) 2187 b) log2

2. 92 or 93

3. a) 2.924×10^{8} b) 6.32×10^{16}

4. $x = 0$

5. a) 234 b) 704

Part B

6. a) 150 c) $t = 12$

7. i) Swim – Arithmetic
   Cycle – Geometric
   Run – Arithmetic

   ii) 10 km

   iii) 11.4 km

   iv) 2400 m

   v) a) 7500 m b) 74.9 km c) 95 km