Topic : Algebra
Total Marks : 54   Total Time : 60 mins
Prior to starting the test, please take a moment to carefully review the following
instructions:

1. On the first page please mention your name, start time, and end time of the test and
   share your answer sheet as a single pdf.
2. To create a realistic test environment, ensure that you are live on Zoom during the
   test, for that you must use the Zoom app not web version. Keep your video camera
   turned on and share your entire desktop.
3. **IMPORTANT:** If you encounter any questions that haven't been covered in class
   yet or fall outside the test syllabus, no need to worry. Just skip that question and
   mention 'NA', and your grades will be based on the questions you attempted.
4. Unless otherwise stated in the question, all numerical answers should be given
   exactly or correct to three significant figures.
5. You are allowed to use the official IB formula booklet for all testUse of GDC is not
   allowed.

1.   Solve the equation $4^{3x-1} = 1.5625 \times 10^{-2}$.

(Total 4 marks)

2.   Find the coefficient of a^3b^4 in the expansion of $(5a + b)^7$.

(Total 4 marks)

3.   An arithmetic series has five terms. The first term is 2 and the last term is 32. Find the sum of
           the series.

(Total 4 marks)

4.   Find the coefficient of x^5 in the expansion of $(3x - 2)^8$.

(Total 4 marks)

5.   Solve the equation $9^{x-1} = \left(\dfrac{1}{3}\right)^{2x}$.

(Total 4 marks)

6. $1000 is invested at the beginning of each year for 10 years.

           The rate of interest is fixed at 7.5% per annum. Interest is compounded annually.

           Calculate, giving your answers to the nearest dollar

           (a)   how much the first $1000 is worth at the end of the ten years;

           (b)   the total value of the investments at the end of the ten years.

(Total 4 marks)

7. In an arithmetic sequence, $u_1 = 2$ and $u_3 = 8$.

    (a) Find d.

                                         (2)

    (b) Find u_{20}.

                                         (2)

    (c) Find S_{20}.

                                         (2)
(Total 6 marks)

8. Let $f(x) = 3 \ln x$ and $g(x) = \ln 5x^3$.

    (a) Express $g(x)$ in the form $f(x) + \ln a$, where $a \in \mathbb{Z}^+$.

                                         (4)

    (b) The graph of g is a transformation of the graph of f. Give a full geometric description of this transformation.

                                         (3)
(Total 7 marks)

9. Solve $\log_2 x + \log_2(x - 2) = 3$, for $x > 2$.

                                         (Total 7 marks)

10. The *Acme* insurance company sells two savings plans, Plan A and Plan B.

For Plan A, an investor starts with an initial deposit of $1000 and increases this by $80 each month, so that in the second month, the deposit is $1080, the next month it is $1160 and so on.

For Plan B, the investor again starts with $1000 and each month deposits 6% more than the previous month.

    (a) Write down the amount of money invested under Plan B in the second and third months.

                                         (2)

Give your answers to parts (b) and (c) correct to the nearest dollar.

    (b) Find the amount of the 12th deposit for each Plan.

                                         (4)

    (c) Find the total amount of money invested during the first 12 months

        (i) under Plan A;

                                         (2)

        (ii) under Plan B.

                                         (2)
(Total 10 marks)