St. Paul's College

F.4 Mid-year Examination 2019-2020

A

MATHEMATICS Compulsory Part
PAPER 1 Section A
Question-Answer Book

Time Allowed: 1 hour 15 minutes

Name	
Class	
Class No.	
Group	Group 1 KWN Group 2 FN Group 3 WHP Group 4 TH Group 5 FBL Group 6 PSK Group 7 HL

INSTRUCTIONS

1. Attempt ALL questions.
2. Answer this section in the spaces provided in this Question-Answer Book.
3. Unless otherwise specified, all working must be clearly shown.
4. Marks will be deducted for poor and untidy presentation.
5. Unless otherwise specified, numerical answers should be either exact or correct to 3 significant figures.
6. The diagrams in this paper are not necessarily drawn to scale.

Question No.	1	2	3	4	5	6	7	8	9	Total
Marks										/40

Section A (40 marks)

1. Solve the quadratic equation $3x^2 - 2x - 7 = 0$.

(3 marks)

2. The coordinates of the points A, B, C are $(6,\ 1)$, $(2,\ 5)$ and $(-2,\ -1)$ respectively. Find the equation of the straight line passing through A and the mid-point of BC.

(4 marks)

3. (a) Factorize $a^2 - 4a + 3$.

(b) Hence or otherwise, solve $(x^2 - 1)^2 - 4(x^2 - 1) + 3 = 0$.

(4 marks)

4. (a) Express $\frac{169}{5-12i}$ in the form $p + qi$ where p and q are real numbers.

(b) If $(2a + 9bi) + (-b + ai) = \frac{169}{5-12i}$, find the values of the real numbers a and b.

(4 marks)

5. Let $f(x) = 3x^2 - 2x + 1$.

(a) Find $f(-4) - f(5)$.

(b) Someone claims that $f(x) = 0$ has no real roots.

Do you agree? Explain your answer.

(4 marks)

6. Let $f(x) = (2x+1)^2 - 3$.

(a) Write down

(i) the coordinates of the vertex, and

(ii) the y- intercept

of the graph of $y = f(x)$.

(b) A student claims that $y = g(x) = -(x-2)^2 - 3$ has the same maximum value as $y = f(x)$. Do you agree? Explain your answer.

(4 marks)

7. The equation $2x^2+7x+4=0$ has roots α and β, where $\alpha \neq \beta$.

(a) Find the value of $\frac{1}{\alpha}+\frac{1}{\beta}$ without solving for α and β.

(b) Form a quadratic equation in y with roots $\frac{1}{\alpha}+5$ and $\frac{1}{\beta}+5$.

(7 marks)

8. (a) Solve the equation $3^n + 5(3^{n-1}) = \frac{24}{\sqrt{3}}$.

(b) If $9^{x+1} = 36$, find 27^x without solving for x.

(6 marks)

9. If $\log_9 a - 1 = 2\log_3 b$, express a in terms of b.

(4 marks)

End of Section A