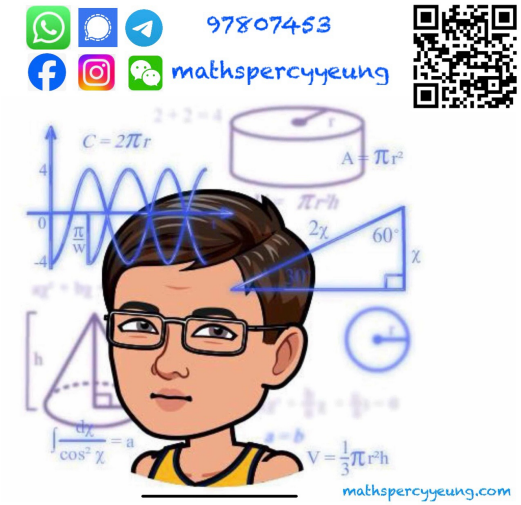
2018-19 F.4
MATH EP
M2



2018 - 2019
Form 4 1st Term Uniform Test

MATHEMATICS Extended Part
Module 2 (Algebra and Calculus)

Question–Answer Book

8th November, 2018. (Thursday)

9:30 – 10:15 am (45 minutes)

This paper must be answered in English.

INSTRUCTIONS

1. After the announcement of the start of the examination, you should first write your name, class and class number in the spaces provided on this cover.
2. Answer ALL questions. Write your answers in the spaces provided in this Question-Answer Book.
3. Supplementary answer sheets will be supplied on request. Write your name, class, class number and mark the question number box on each sheet.
4. Unless otherwise specified, all working must be clearly shown.
5. Unless otherwise specified, numerical answers must be exact.

Grand Total	/ 33

1. **(a)** Rationalize the denominator of $\dfrac{x-2}{x+\sqrt{x+2}}$.

(b) Using the result of (a), find the value of $\sum_{x=1}^{3}\left(\dfrac{x-2}{x+\sqrt{x+2}}+\dfrac{\sqrt{x+2}}{x+1}\right)$.

(5 marks)

Answers written in the margins will not be marked.

2. In the expansion of $(1-2x)^n\left(x+\frac{5}{x}\right)^2$, the constant term is 2 110.

(a) Find the value of n.

(b) Find the coefficient of $\frac{1}{x}$.

(5 marks)

Answers written in the margins will not be marked.

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3. The sum of the coefficients of x and x^2 in the expansion of $(1-3x)^n$ is 117, where n is a positive integer.

(a) Find the value of n.

(b) Find the coefficient of x^4.

(5 marks)

Answers written in the margins will not be marked.

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4. Prove, by mathematical induction, that

$$\frac{1}{1\times 3}+\frac{1}{2\times 4}+\frac{1}{3\times 5}+\cdots+\frac{1}{n\,(n+2)}=\frac{n\,(3n+5)}{4\,(n+1)\,(n+2)}$$

for all positive integers n.

(5 marks)

Answers written in the margins will not be marked.

5. **(a)** Prove, by mathematical induction, that

$$1^2 \times 2 + 2^2 \times 3 + 3^2 \times 4 + \ldots + n^2 (n+1) = \frac{n(n+1)(n+2)(3n+1)}{12}$$

for all positive integers n.

(5 marks)

(b) Hence, find the value of each of the following expressions.

(i) $1^2 \times 2 + 2^2 \times 3 + 3^2 \times 4 + \cdots + 15^2 \times 16$

(ii) $16^2 \times 17 + 17^2 \times 18 + 18^2 \times 19 + \cdots + 36^2 \times 37$

(4 marks)

Answers written in the margins will not be marked.

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6. Prove that $\frac{\sin\theta}{\csc\theta-\cot\theta}-\frac{\tan\theta}{\csc\theta+\cot\theta}=2-\sec\theta\sin^2\theta$.

(4 marks)

END OF PAPER

Answers written in the margins will not be marked.

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