Sequences and Series – 2021/20 GCE Pure Mathematics A

1. Nov/2021/Paper_H240/01/No.6

(a) Find the first three terms in the expansion of $(8-3x)^{\frac{1}{3}}$ in ascending powers of x. **[4]**

(b) State the range of values of x for which the expansion in part **(a)** is valid. **[1]**

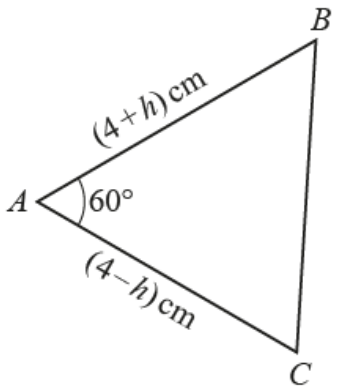
(c) Find the coefficient of x^2 in the expansion of $\dfrac{(8-3x)^{\frac{1}{3}}}{(1+2x)^2}$. **[4]**

2. Nov/2021/Paper_H240/02/No.3

The 15th term of an arithmetic sequence is 88. The sum of the first 10 terms is 310.

Determine the first term and the common difference. **[6]**

3. Nov/2021/Paper_H240/03/No.2(b)



The diagram shows triangle ABC in which angle A is $60°$ and the lengths of AB and AC are $(4+h)$ cm and $(4-h)$ cm respectively.

(b) Hence show that, when h is small, $p \approx 4+\lambda h^2+\mu h^4$, where λ and μ are rational numbers whose values are to be determined. **[4]**

4. Nov/2021/Paper_H240/03/No.3

An arithmetic progression has first term 2 and common difference d, where $d \neq 0$. The first, third and thirteenth terms of this progression are also the first, second and third terms, respectively, of a geometric progression.

By determining d, show that the arithmetic progression is an increasing sequence. **[5]**

5. Nov/2020/Paper_H240/02/No.3

In this question you should assume that $-1 < x < 1$.

(a) For the binomial expansion of $(1-x)^{-2}$

(i) find and simplify the first four terms, **[2]**

(ii) write down the term in x^n. **[1]**

(b) Write down the sum to infinity of the series $1+x+x^2+x^3+\ldots$. **[1]**

(c) Hence or otherwise find and simplify an expression for $2+3x+4x^2+5x^3+\ldots$ in the form $\frac{a-x}{(b-x)^2}$ where a and b are constants to be determined. **[3]**