HARRISON COLLEGE INTERNAL EXAMINATION APRIL 2014
CARIBBEAN ADVANCED PROFICIENCY EXAMINATION
SCHOOL BASED ASSESSMENT
PURE MATHEMATICS
UNIT 1 – TEST 2
1 hour 30 minutes

This examination paper consists of 2 printed pages.

This paper consists of 3 questions.

The maximum mark for this examination is 60.

INSTRUCTIONS TO CANDIDATES

(i) Write your name clearly on each sheet of paper used.

(ii) Answer ALL questions.

(iii) Number your questions identically as they appear on the question paper and do NOT write your solutions to different questions beside each other.

(iv) Unless otherwise stated in the question, any numerical answer that is not exact, MUST be written correct to three (3) significant figures

EXAMINATION MATERIALS ALLOWED

(i) Mathematical formulae

(ii) Scientific calculator (non-programmable, non-graphical)

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1. (a) Determine the Cartesian equation for the curve defined parametrically by

$$x = \sin t \quad y = \tan t$$ [5]

(b) The circle C_1 has equation $x^2 + y^2 - 2x = 4$. Determine

(i) the centre and radius of C_1. [3]

(ii) the exact length of the tangent from the point $A(5, 5)$. [4]

The circle C_2 with equation $x^2 + y^2 + 2x + 4y = 4$ intersects C_1 at A and B.

(iii) Determine the coordinates of P and Q. [6]

TOTAL 18 marks

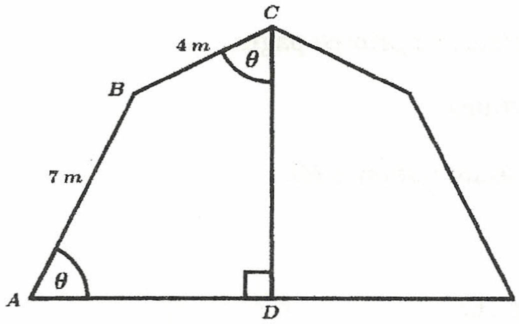
2. (a) Prove that $\frac{\cot x}{\sec x} = \operatorname{cosec} x - \sin x$ [4]

(b) Find the general solutions of the equation

$$2\cos^2\theta - \sin\theta = 1$$

[7]

(c) The diagram below shows the vertical cross – section of a tent in which $AB = 7$ m, $BC = 4$ m and $B\hat{A}D = B\hat{C}D = \theta°$.



(i) Show that $CD = 4\cos\theta + 7\sin\theta$ [2]

(ii) Express CD in the form $R\cos(\theta - \alpha)$ where $R > 0$ and $0 \le \alpha < \frac{\pi}{2}$. [3]

(iii) Hence, state the maximum value of CD and the value of θ for which this maximum occurs. [4]

(iv) Show that the area of quadrilateral $ABCD$ is

$$\frac{112\sin^2\theta + 65\sin 2\theta}{4}$$

[6]

TOTAL 26 marks

3. The position vectors of the points A, B, C are given by

$$\boldsymbol{a} = 3\boldsymbol{i} + 2\boldsymbol{j} + 4\boldsymbol{k}, \boldsymbol{b} = 2\boldsymbol{i} + \boldsymbol{j} + 3\boldsymbol{k}, \boldsymbol{c} = \boldsymbol{i} + 3\boldsymbol{j} + 4\boldsymbol{k}$$

(a) Determine

(i) the vectors

(a) $\overrightarrow{AB}$, [1]

(b) $\overrightarrow{BC}$ [1]

(ii) the equation of the line, l, which passes through the points A and B. [3]

(iii) the angle between a and b. [5]

(b) (i) Show that the vector $\boldsymbol{i} + 2\boldsymbol{j} - 3\boldsymbol{k}$ is perpendicular to the plane through the points A, B and C. [3]

(ii) Hence, determine the equation of the plane in the form $r.n = d$. [3]

TOTAL 16 marks

End of Test