FORM TP 2016038

TEST CODE **01254032**

MAY/JUNE 2016

C A R I B B E A N E X A M I N A T I O N S C O U N C I L

CARIBBEAN SECONDARY EDUCATION CERTIFICATE®
EXAMINATION

ADDITIONAL MATHEMATICS

Paper 032 – General Proficiency

ALTERNATIVE TO SCHOOL-BASED ASSESSMENT

1 hour 30 minutes

READ THE FOLLOWING INSTRUCTIONS CAREFULLY.

1. This paper consists of ONE compulsory question. Answer the given question.
2. Write your answers in the spaces provided in this booklet.
3. Do NOT write in the margins.
4. A list of formulae is provided on page 4 of this booklet.
5. If you need to rewrite any answer and there is not enough space to do so on the original page, you must use the extra page(s) provided at the back of this booklet. **Remember to draw a line through your original answer**.
6. **If you use the extra page(s) you MUST write the question number clearly in the box provided at the top of the extra page(s) and, where relevant, include the question part beside the answer.**

DO NOT TURN THIS PAGE UNTIL YOU ARE TOLD TO DO SO.

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"*"Barcode Area"*"
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LIST OF FORMULAE

Arithmetic Series $T_n = a + (n-1)d \qquad S_n = \frac{n}{2}[2a + (n-1)d]$

Geometric Series $T_n = ar^{n-1} \qquad S_n = \frac{a(r^n - 1)}{r-1} \qquad S_\infty = \frac{a}{1-r}, \ -1 < r < 1$ or $|r| < 1$

Circle $x^2 + y^2 + 2fx + 2gy + c = 0 \qquad (x+f)^2 + (y+g)^2 = r^2$

Vectors $\hat{\mathbf{v}} = \frac{\mathbf{v}}{|\mathbf{v}|} \qquad \cos\theta = \frac{\mathbf{a}\bullet\mathbf{b}}{|\mathbf{a}| \times |\mathbf{b}|} \qquad |\mathbf{v}| = \sqrt{(x^2 + y^2)}$ where $\mathbf{v} = x\mathbf{i} + y\mathbf{j}$

Trigonometry

$\sin(A \pm B) \equiv \sin A \cos B \pm \cos A \sin B$

$\cos(A \pm B) \equiv \cos A \cos B \mp \sin A \sin B$

$\tan(A \pm B) \equiv \frac{\tan A \pm \tan B}{1 \mp \tan A \tan B}$

Differentiation

$\frac{d}{dx}(ax+b)^n = an(ax+b)^{n-1}$

$\frac{d}{dx}\sin x = \cos x$

$\frac{d}{dx}\cos x = -\sin x$

Statistics $\bar{x} = \frac{\sum_{i=1}^{n} x_i}{n} = \frac{\sum_{i=1}^{n} f_i x_i}{\sum_{i=1}^{n} f_i}, \qquad S^2 = \frac{\sum_{i=1}^{n}(x_i - \bar{x})^2}{n} = \frac{\sum_{i=1}^{n} f_i x_i^2}{\sum_{i=1}^{n} f_i} - (\bar{x})^2$

Probability $P(A \cup B) = P(A) + P(B) - P(A \cap B)$

Kinematics $v = u + at \qquad v^2 = u^2 + 2as \qquad s = ut + \frac{1}{2}at^2$

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A manufacturing plant wants to minimize the amount of material used to produce paint containers. The project team has the task of designing a container to hold 19 litres (5 gallons) of paint. The team suggests three designs, Design I, Design II and Design III.

(a) Express the volume of paint in m^3.

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(1 mark)

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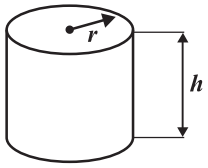
Design I – A cylindrical container of height, h, and radius, r.



Surface area of a cylinder = $2 \pi r (h + r)$

Take $\pi = 3.142$

(b) Using the required volume, formulate the appropriate equation for Design I to show that the minimum surface area is 0.394 m^2.

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(5 marks)

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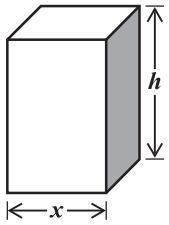
Design II – A rectangular container of height, h, with a top and a base of area x^2.



(c) Using the required volume, formulate the appropriate equation for Design II to determine the minimum surface area.

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(7 marks)

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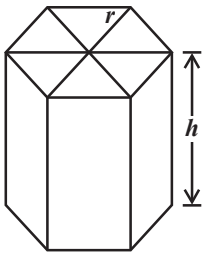
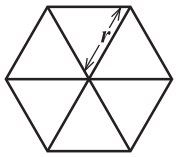
Design III – A hexagonal container of height, h, and radius, r.

Cross-sectional area of the hexagonal container

$$= \frac{3}{2}\left(\sqrt{3}\right) r^2$$





(d) Given that the equation for the surface area of Design III is

$$A = 5.20\, r^2 + \frac{0.044}{r}, \text{ determine the minimum surface area.}$$

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(4 marks)

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(e) Recommend to the project team the design which is BEST in order to minimise the amount of material used to produce the paint containers. Include the dimensions of the selected design.

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(3 marks)

Total 20 marks

END OF TEST

IF YOU FINISH BEFORE TIME IS CALLED, CHECK YOUR WORK ON THIS TEST.

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