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MATHEMATICS

PAPER 3 (CORE/EXTENDED) 3815/3

Friday **22 MAY 2020** 9:00 A.M.–11:30 A.M.

Additional materials:
answer booklet
graph paper

MINISTRY OF EDUCATION NATIONAL EXAMINATIONS
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BAHAMAS GENERAL CERTIFICATE OF SECONDARY EDUCATION

INSTRUCTIONS TO CANDIDATES

Do not open this booklet until you are told to do so.

Write your school number, candidate number, Surname and Initials in the spaces provided on each answer booklet.

Remove the graph paper from the question paper. Write your school number, candidate number, surname and initials, signature and date on the graph paper. Place the graph paper in the answer booklet.

Answer **ALL** questions in the answer booklet.

ALL working must be shown.

ALL working must be done in blue or black ink, except for drawings, lines and constructions which may be done in pencil.

INFORMATION FOR CANDIDATES

Calculators may be used. **[NO GRAPHING CALCULATORS ALLOWED].**

Tracing paper and geometrical instruments may be used.

The mark for each question, or part question, is shown in brackets [].

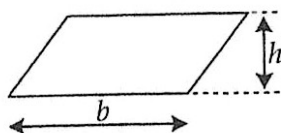
The total number of marks for this paper is 100.

This question paper consists of 8 printed pages.

INFORMATION AND FORMULAE

MENSURATION

Parallelogram



$$\text{Area} = bh$$

Circle (radius r , diameter d)

Cylinder (radius r , height h)

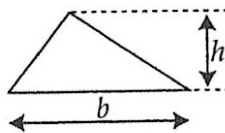
Sphere (radius r)

Prism

Pyramid

Cone (radius r , height h)

Triangle



$$\text{Area} = \frac{1}{2}bh$$

Circumference

Area

Volume

Area of curved surface

Volume

Area of surface

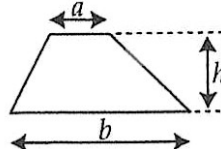
Volume

Volume

Volume

Area of curved surface

Trapezium



$$\text{Area} = \frac{1}{2}(a+b)h$$

$$= 2\pi r \text{ or } \pi d$$

$$= \pi r^2$$

$$= \pi r^2 h$$

$$= 2\pi r h$$

$$= \frac{4}{3}\pi r^3$$

$$= 4\pi r^2$$

$$= \text{area of cross-section} \times \text{length}$$

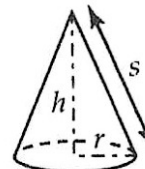
$$= \frac{1}{3} \times \text{area of base} \times \text{height}$$

$$= \frac{1}{3}\pi r^2 h$$

$$= \pi r s$$

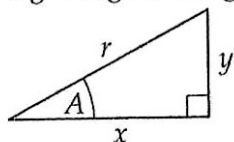
$$\text{where } s = \text{slant height } \sqrt{h^2 + r^2}$$

Cone

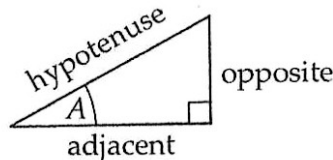


TRIGONOMETRY

Right-angled triangle

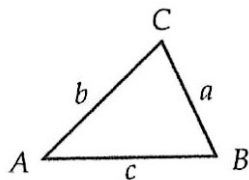


$$r^2 = x^2 + y^2 \text{ (result of Pythagoras)}$$



$$\sin A = \frac{\text{opposite}}{\text{hypotenuse}}, \cos A = \frac{\text{adjacent}}{\text{hypotenuse}}, \tan A = \frac{\text{opposite}}{\text{adjacent}}$$

Any triangle



$$\begin{aligned} \text{In any triangle ABC: } \frac{a}{\sin A} &= \frac{b}{\sin B} = \frac{c}{\sin C} \\ a^2 &= b^2 + c^2 - 2bc \cos A \\ \cos A &= \frac{b^2 + c^2 - a^2}{2bc} \end{aligned}$$

$$\text{Area of triangle ABC} = \frac{1}{2}ab \sin C$$

NUMBER ALGEBRA

Standard form is $a \times 10^n$ where $1 \leq a < 10$ and n is an integer.
The quadratic equation $ax^2 + bx + c = 0$ has solutions

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

The determinant of matrix $\begin{pmatrix} a & b \\ c & d \end{pmatrix}$ is $ad - bc$.

The inverse of $\begin{pmatrix} a & b \\ c & d \end{pmatrix}$ is $\frac{1}{ad - bc} \begin{pmatrix} d & -b \\ -c & a \end{pmatrix}$

If $y = ax^n$, then $\frac{dy}{dx} = anx^{n-1}$



1. VAT is charged at 7.5% of the sales price of an item. The VAT added to a sales price of one item is \$6.48.

Calculate (a) the sales price of the item, [2]

(b) the total price charged for the item. [1]

2. Matrices **A** and **B** are defined as follows:

$$\mathbf{A} = \begin{pmatrix} 1 & 4 \end{pmatrix} \quad \mathbf{B} = \begin{pmatrix} 2 \\ -3 \end{pmatrix}$$

Calculate the matrix products

(a) **AB**, [1]

(b) **BA**. [2]

3. A straight-line graph passes through the points $(-6,1)$ and $(0,5)$.

(a) Calculate the slope (gradient) of this line. [2]

(b) Write down an equation for the graph of this line. [1]

4. The power, P watts, of the wind passing through a wind turbine with radius r metres and in a wind speed of s metres per second is given by

$$P = \frac{r^2 s^3}{2}$$

Calculate the wind speed passing through a turbine with radius 25 metres producing power of 540 kW. [4]

5. Given that $f(x) = \frac{5+x}{2}$ and $g(x) = \frac{6}{x}$, calculate

(a) the value of $g(1.5)$, [1]

(b) x where $f(x) = -9$, [2]

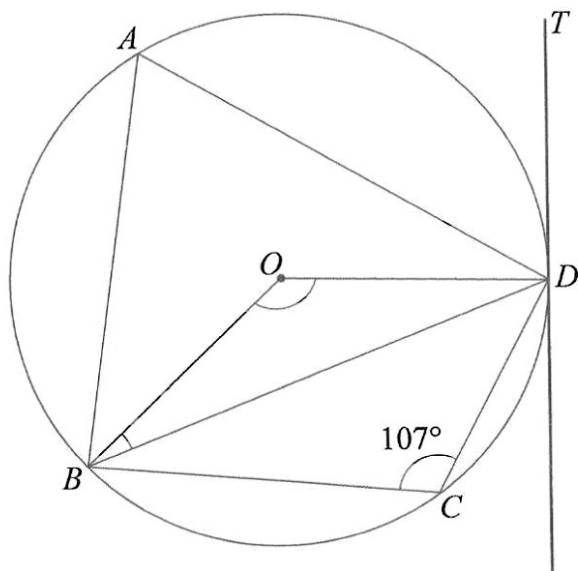
(c) a simplified expression for $g(f(x))$, [2]

(d) the inverse of g , $g^{-1}(x)$. [1]

6. (a) In the diagram, O is the centre of circle $ABCD$ and $\angle BCD = 107^\circ$.

Calculate the value of

- (i) $\angle BAD$, [1]
 (ii) $\angle BOD$, [1]
 (iii) $\angle OBD$. [1]

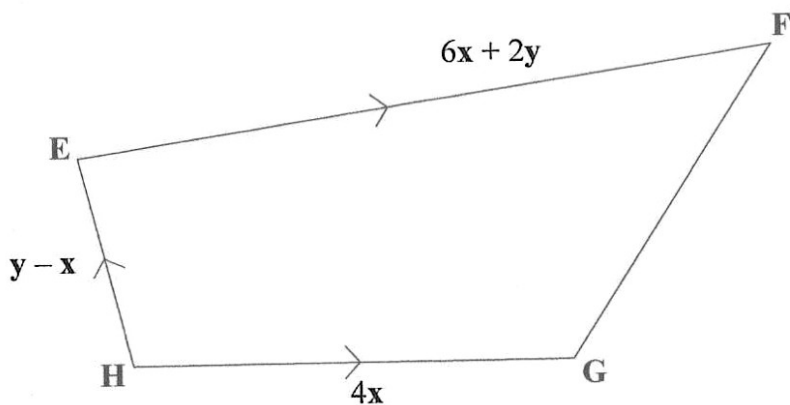


- (b) DT is the tangent to the circle at D

Write down the value of $\angle ODT$. Give reason for your answer.

[2]

7. Express in terms of x and y in simplest terms.

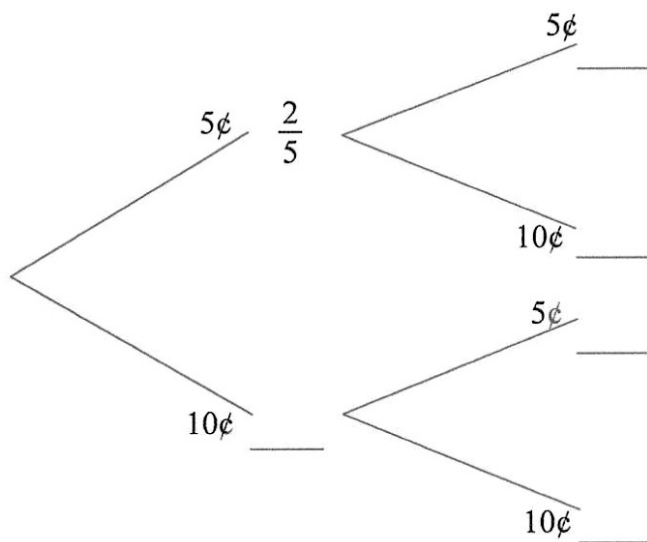


- (a) $\overrightarrow{HM}$, where M is the midpoint of $\overrightarrow{EF}$ [2]
 (b) $\overrightarrow{GF}$ [2]
 (c) $\overrightarrow{FN}$ if N is located on $\overrightarrow{FG}$ such that $FN:NG$ is $1:2$. [2]



8. Julie has two 5¢ and three 10¢ coins in her pocket. She takes out two coins at random, one after the other without replacement.

(a) Copy and complete the tree diagram below to show the possible outcomes.



[3]

(b) Use your tree diagram to calculate the probability that

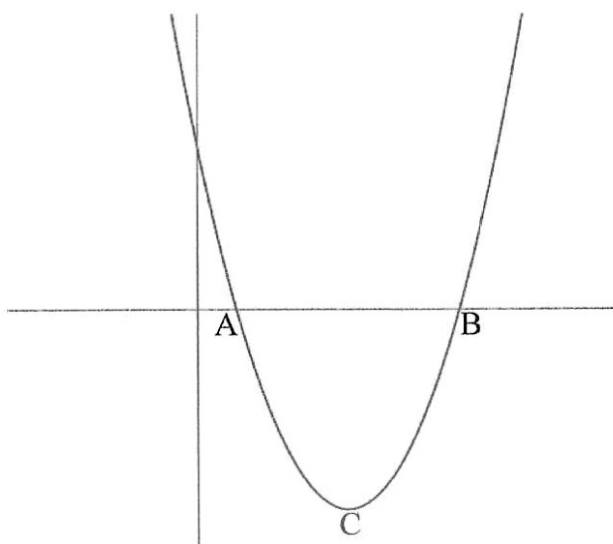
(i) she takes out two coins of the same kind,

[2]

(ii) she is left with 25¢ in her pocket.

[2]

9. The diagram shows part of the graph of $y = x^2 - 6x + 4$ intersecting the x – axis at A and B with the minimum point (vertex) labelled C .



Calculate (a) the x – intercepts, giving your answer to 2 d.p.

[5]

(b) the gradient of the tangent at C . Show working to support your answer.

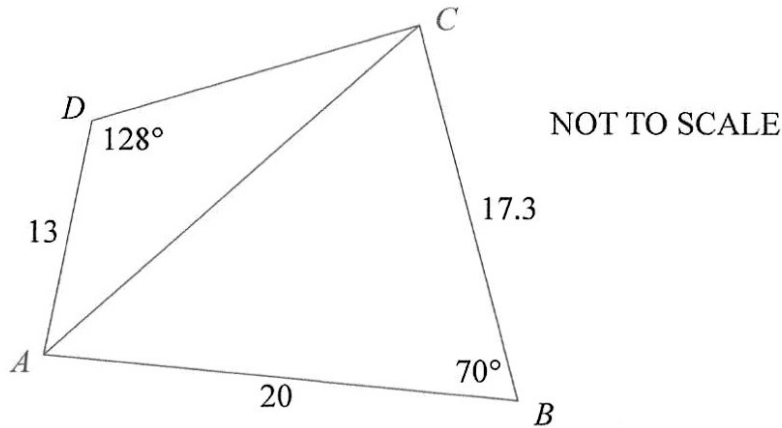
[3]

[Turn over



10. In the quadrilateral $ABCD$, $AB = 20$ cm, $AD = 13$ cm and $BC = 17.3$ cm.

Also, $\angle B = 70^\circ$ and $\angle D = 128^\circ$.



Calculate,

- (a) correct to 3 d.p., the length of AC , [4]
 (b) to the nearest whole number, $\angle ACD$. [4]

11. (a) Solve the inequalities

(i) $5x + 7 \leq 17$ [2]

(ii) $6 - \frac{x}{2} < 7$ [3]

- (b) Write down the set of integers that satisfies both inequalities in (a). [1]

- (c) Using a scale of 1 cm for 1 unit on each axis for $-4 \leq x \leq 6$ and $-4 \leq y \leq 6$, draw the graphs of

(i) $y = 5 - x$ [2]

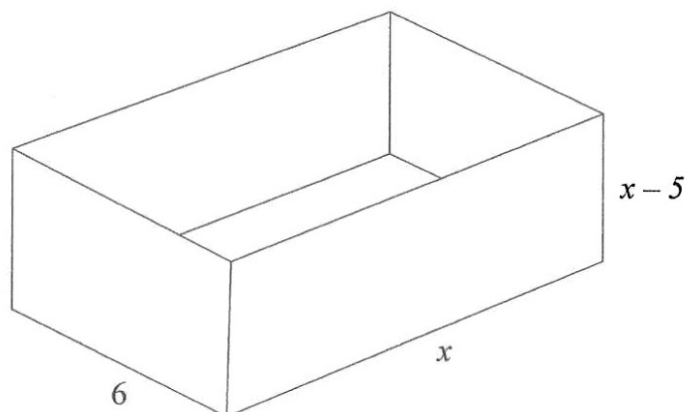
(ii) $y = 3x - 3$ [2]

- (d) From the graphs of (c), shade the region that satisfies the following system of inequalities.

$$\begin{cases} y \leq 5 - x \\ y \leq 3x - 3 \\ y \geq 0 \end{cases} \quad [2]$$



12.



The diagram represents an open box with length x cm, width 6 cm and height $(x - 5)$ cm.

- (a) Write an expression, in terms of x , for the area of
- (i) the base, [1]
 - (ii) the side with length x , [1]
 - (iii) the side with length 6. [1]
- (b) Show that the surface area of the box is given by $2x^2 + 8x - 60$. [4]
- (c) The surface area of the box is 174 cm^2 .
Write an equation for the surface area and find the length, x , of the box. [4]

13. (a) Write as a single fraction in simplest form
- (i) $\frac{x}{6} + x - \frac{11x}{12}$ [3]
 - (ii) $\frac{5}{t-2} - \frac{3}{t}$ [3]
 - (iii) $\frac{7w^3}{z^2} \div \frac{14w}{z^2}$ [3]
- (b) Factorise and simplify
- $$\frac{x^2 - 16}{3x - 12}$$
- [3]

14. The results of 400 candidates in an end of year exam are as follows:

% Mark	1-10	11-20	21-30	31-40	41-50	51-60	61-70	71-80	81-90	91-100
No. of Candidates	8	20	40	76	160	56	16	16	4	4

(a) Copy and complete the following cumulative frequency table.

% Mark	Cumulative Frequency
10 or less	8
20 or less	28
30 or less	68
40 or less	144
50 or less	
60 or less	
70 or less	
80 or less	
90 or less	
100 or less	

[2]

(b) Using a horizontal scale of 1 cm to represent 10%, and a vertical scale of 2 cm to represent 40 candidates, draw and label a cumulative frequency curve for these results. [4]

(c) From your graph, estimate

(i) the median mark, [1]

(ii) the number of students who scored 60% or more, [2]

(iii) the pass mark if 70% of the candidates were successful. [3]



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EXAMINATION

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Surname & Initials:		Section:	
Signature:	Date:	Qu. No.	

