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MATHEMATICS

PAPER 3 (CORE/EXTENDED) 3815/3

Tuesday **7 JUNE 2022** 9:00 A.M.–11:30 A.M.

Additional materials:

Calculator (not graphing)

Answer booklet

Geometrical instruments

Graph paper

MINISTRY OF EDUCATION NATIONAL EXAMINATIONS
--

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.

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 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.

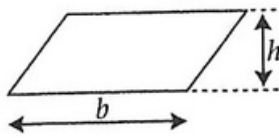


This question paper consists of 8 printed pages.

INFORMATION AND FORMULAE

MENSURATION

Parallelogram



$$\text{Area} = bh$$

Circle (radius r , diameter d)

Cylinder (radius r , height h)

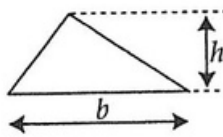
Sphere (radius r)

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

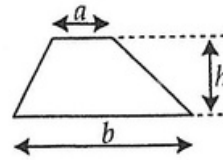
Volume

Volume

Volume

Area of curved surface

Trapezium



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

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

$$= \pi r^2$$

$$= \pi r^2 h$$

$$= 2\pi r h$$

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

$$= 4\pi r^2$$

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

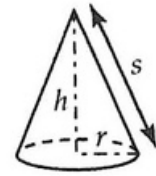
$$= \frac{1}{3} \times \text{area of base} \times \text{height}$$

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

$$= \pi r s$$

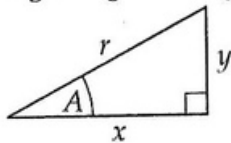
$$\text{where } s = \text{slant height } \sqrt{h^2 + r^2}$$

Cone

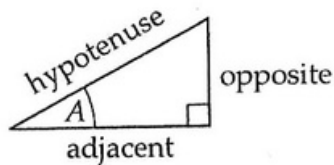


TRIGONOMETRY

Right-angled triangle

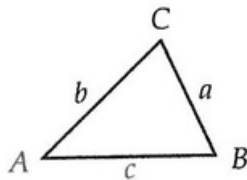


$$r^2 = x^2 + y^2 \text{ (result of Pythagoras)}$$



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

Any triangle



$$\text{In any triangle ABC: } \frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C}$$

$$a^2 = b^2 + c^2 - 2bc \cos A$$

$$\cos A = \frac{b^2 + c^2 - a^2}{2bc}$$

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

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. Kenrick imports a car at a total landing cost of \$8,250. This cost includes 65% customs duty on the purchase price of the car. Calculate this purchase price. [2]
-

2. If $0^\circ \leq \theta \leq 360^\circ$, find the possible values of θ , correct to the nearest degree, for which $\tan 58^\circ = 1 + \cos \theta$. [4]
-

3. Given the matrix operation below, find the values of a , b and c .

$$\begin{pmatrix} 3 & a \\ 2c & 7 \end{pmatrix} - \begin{pmatrix} 4 & 1 \\ c & -3 \end{pmatrix} = \begin{pmatrix} -1 & 5 \\ -8 & b \end{pmatrix}$$

[3]

4. Solve the following equations:

(a) $(2^x)(4^{x-1}) = 128$ [4]

(b) $64x^{-3} = 125$ [3]

5. The cost of a circular table is directly proportional to the square of the radius. A circular table with radius of 40 cm cost \$50.

(a) Find the cost of the circular table with a radius of 60 cm. [4]

(b) If the cost of a circular table is \$200, calculate the radius of the table. [3]

6. Simplify completely:

(a) $\frac{3m-7}{3} - \frac{2m-5}{2}$ [4]

(b) $\frac{2x-6}{x^2-5x+6} \div \frac{1}{x-2}$ [4]



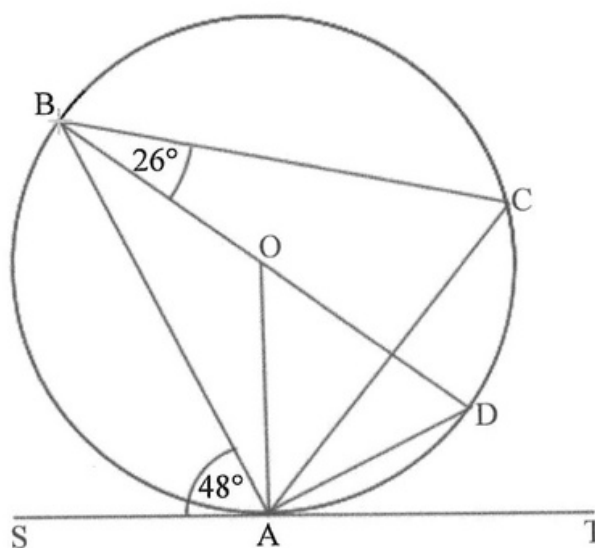
7. The population of Spain in 2016 was 46 million people. If this amount increases by 5% each year, calculate the population of Spain in 2019 to nearest million. [3]

8. The equation of a curve is $y = 8 + 2x - 3x^2$:

- (a) Find $\frac{dy}{dx}$. [2]
 (b) Calculate the gradient of the curve at $(-1, 3)$. [1]
 (c) Hence, write down the equation of the tangent to the curve at the point $(-1, 3)$. [3]

9. In the diagram, which is not drawn to scale, the points A, B, C and D are on the circumference of the circle. O is the centre of the circle and ST is the tangent to the circle at the point A.

BD is a diameter, $\angle SAB = 48^\circ$ and $\angle CBD = 26^\circ$.



NOT TO SCALE

Find:

- (a) $\angle ACB$ [1]
 (b) $\angle AOB$ [1]
 (c) $\angle CAD$ [1]
 (d) $\angle DAT$ [1]
 (e) $\angle OAD$ [1]



10. A rectangular plot of land in the Cool Breeze community has a width of x m and a length of $(x + 2)$ m.

(a) Write an expression for the area of this plot in terms of x . [1]

A larger rectangular plot of land in the Sunny Side community has a length of $2x$ m and a width of $(x - 3)$ m.

(b) Write an expression for the area of this plot in terms of x . [1]

The Sunny Side plot is 240 m^2 larger than the Cool Breeze plot.

(c) Write an equation to represent this information and solve for x . [5]

(d) Find the length and width of the Sunny Side plot. [2]

11. (a) The function is defined as $f: x \rightarrow ax + b$.

(i) Find the values of a and b given that $f(1) = 11$ and $f(2) = 9$. [4]

(ii) Hence or otherwise find the value of x if $f(x) = -1$. [2]

(b) The function h is such that $h(x) = \frac{2x-3}{x}$. Calculate $h^{-1}(x)$. [4]

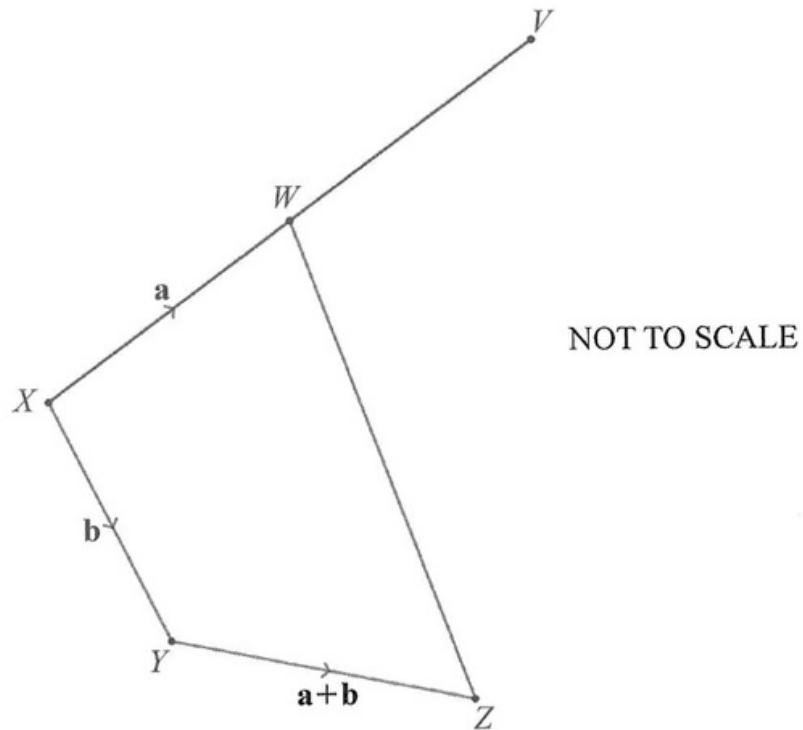
12. (a) Given the vectors $\overrightarrow{PQ} = \begin{pmatrix} 3 \\ -5 \end{pmatrix}$, $\overrightarrow{RQ} = \begin{pmatrix} 5 \\ -10 \end{pmatrix}$ and $\overrightarrow{RS} = \begin{pmatrix} k \\ 7.5 \end{pmatrix}$, calculate:

(i) $\overrightarrow{PR}$ [3]

(ii) $|\overrightarrow{PR}|$ [2]

- (b) If $\overrightarrow{RS}$ is parallel to $\overrightarrow{PQ}$, find the value of k . [2]

(c)



In the above diagram, $\overrightarrow{XW} = \mathbf{a}$, $\overrightarrow{XY} = \mathbf{b}$, $\overrightarrow{YZ} = \mathbf{a} + \mathbf{b}$, and W is the midpoint of XV .

Find, in terms of $\mathbf{a}$ and/or $\mathbf{b}$, simplifying where possible

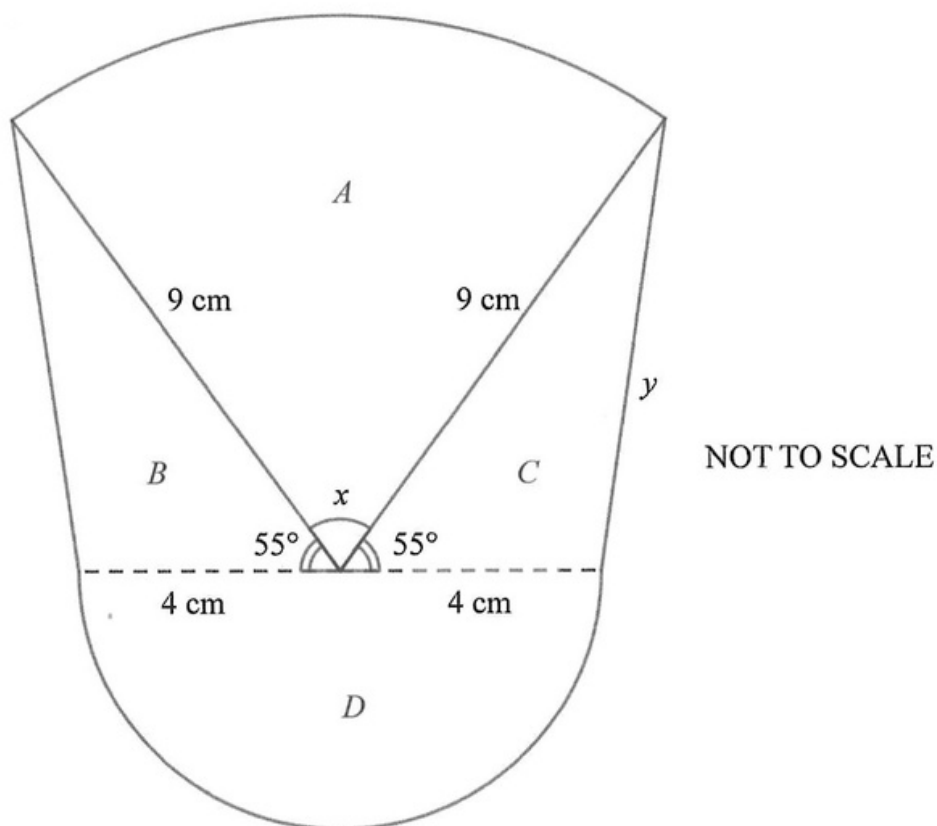
(i) $\overrightarrow{XV}$, [1]

(ii) $\overrightarrow{XZ}$, [2]

(iii) $\overrightarrow{VZ}$. [2]



13.



In the compound shape above, A is a sector, B and C are congruent triangles, and D is semi-circle.

- (a) Determine the size of angle x . [1]
- (b) Using $\pi = \frac{22}{7}$ when necessary, calculate the areas of the following:
 - (i) sector A , [2]
 - (ii) triangle B , [2]
 - (iii) the total area of the compound shape. [3]
- (c) Calculate the length of y correct to 1 decimal place. [4]

14. **ANSWER THIS ENTIRE QUESTION ON THE GRAPH PAPER PROVIDED**

- (a) Copy and complete the following table of values for the equation $y = \frac{x^2 - 7x}{4}$ [2]

x	-1	0	1	2	3	4	5	6	7	8
y	2		-1.5	-2.5	-3		-2.5	-1.5	0	

- (b) Using a scale of 1 cm to 1 unit on the x -axis for $-2 \leq x \leq 9$ and 2 cm to 1 unit on the y -axis for $-4 \leq y \leq 3$, draw the graph of $y = \frac{x^2 - 7x}{4}$. [3]
- (c) By drawing a suitable line on your graph, find approximate solutions to the equation $\frac{x^2 - 7x}{4} = 1$ [3]
- (d) A line has a gradient of $\frac{1}{2}$ and passes through the point $(0, -2)$. Draw this line on the same coordinate plane. [2]
- (e) State the coordinates of the points where the two graphs intersect. [2]
-



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