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MATHEMATICS

PAPER 3 (CORE/EXTENDED) 3815/3

Monday **27 MAY 2024** 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.

Remove the graph paper from the question paper. Close the question paper.

Write your School Number, Candidate Number, Surname and Initials in the spaces provided on the answer booklet **AND** the graph paper. **Place the graph paper 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.

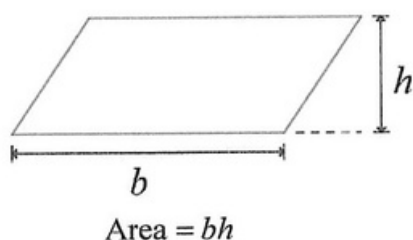


This question paper consists of 8 printed pages.

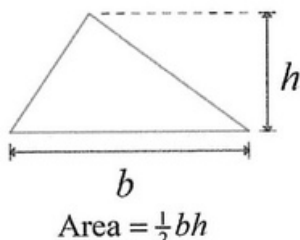
INFORMATION AND FORMULAE

MENSURATION

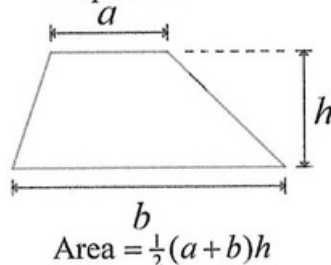
Parallelogram



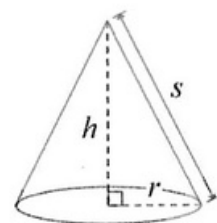
Triangle



Trapezium



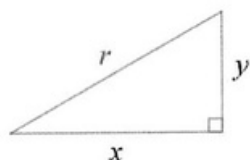
Cone



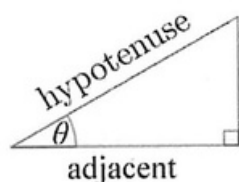
Circle (radius r , diameter d)	Circumference	$2\pi r$ or πd
	Area	πr^2
Cylinder (radius r , height h)	Volume	$\pi r^2 h$
	Area of curved surface	$2\pi r h$
Sphere (radius r)	Volume	$\frac{4}{3}\pi r^3$
	Area of curved surface	$4\pi r^2$
Prism	Volume	area of cross-section $\times$ length
Pyramid	Volume	$\frac{1}{3} \times$ area of base $\times$ height
Cone (radius r , height h)	Volume	$\frac{1}{3}\pi r^2 h$
	Area of curved surface	$\pi r s$ where slant height $s = \sqrt{h^2 + r^2}$

TRIGONOMETRY

Right-angled Triangle:



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

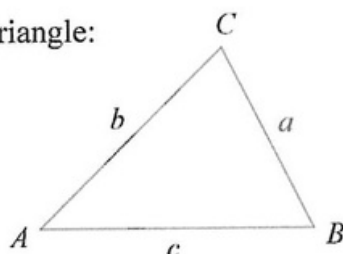


opposite

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

adjacent

Any Triangle:



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

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

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

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

NUMBER Standard Form is $a \times 10^n$ where $1 \leq a < 10$ and n is an integer.

ALGEBRA 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. There are 20% more fish in a pond this year than there were last year.
There are currently 1,590 fish in the pond.
Find the number of fish that were in the pond last year. [2]
-
2. A new car cost \$32,000.
By the end of each year after purchase, it loses 15% of its value at the beginning of the year.
Find the value of the car three years after purchase. [3]
-
3. Given that $\overrightarrow{PQ} = \begin{pmatrix} -3 \\ 6 \end{pmatrix}$ and $\overrightarrow{RQ} = \begin{pmatrix} 5 \\ -9 \end{pmatrix}$, find $|\overrightarrow{PR}|$. [4]
-
4. (a) Given $\begin{pmatrix} a & 3 \\ -2 & b \end{pmatrix} \begin{pmatrix} 5 \\ -2 \end{pmatrix} = \begin{pmatrix} 14 \\ -8 \end{pmatrix}$, find the values of a and b . [4]
(b) If $M = \begin{pmatrix} -3 & n \\ 9 & -12 \end{pmatrix}$ and M is singular (has no inverse), find the value of n . [3]
-
5. Find all possible values of x that solve each of the following equations:
(a) $x^2 = 4$ [2]
(b) $x^2 + 4x = 0$ [3]
(c) $x^2 + 4x = 5$ [4]
-
6. The equation of a curve is $y = x^2 - x - 6$.
Find the coordinates of the point where
(a) the curve intersects the y -axis, [3]
(b) $\frac{dy}{dx} = -7$. [5]
-

7.

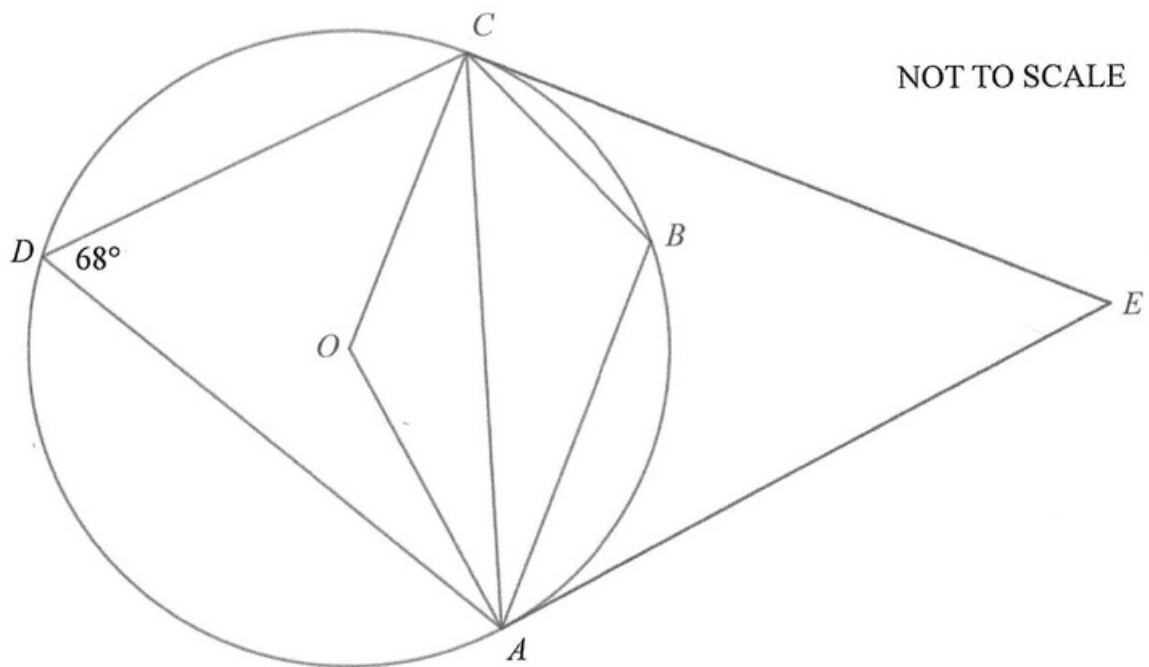
p	2	10	
q	15		240

In the table above, q varies inversely as the square of p .

Find the missing value of

- (a) q , [4]
 (b) p . [3]

8.



In the above diagram, O is the centre of the circle.

AE and CE are tangents.

Find the size of the following angles:

- (a) $\angle COA$ [1]
 (b) $\angle CBA$ [1]
 (c) $\angle OAE$, giving a reason for your answer [2]
 (d) $\angle CAE$ [1]
 (e) $\angle AEC$ [1]



9. Express as a single fraction in lowest terms:

(a) $\frac{6x}{(x+3)(x-3)} - \frac{3}{x-3}$ [4]

(b) $\frac{x^2-16}{x+4} \times \frac{4xy}{3xy-12y}$ [4]

10. Functions f and h are defined as $f(x) = \frac{3+x}{7}$ and $h(x) = 2x + 3$

Find

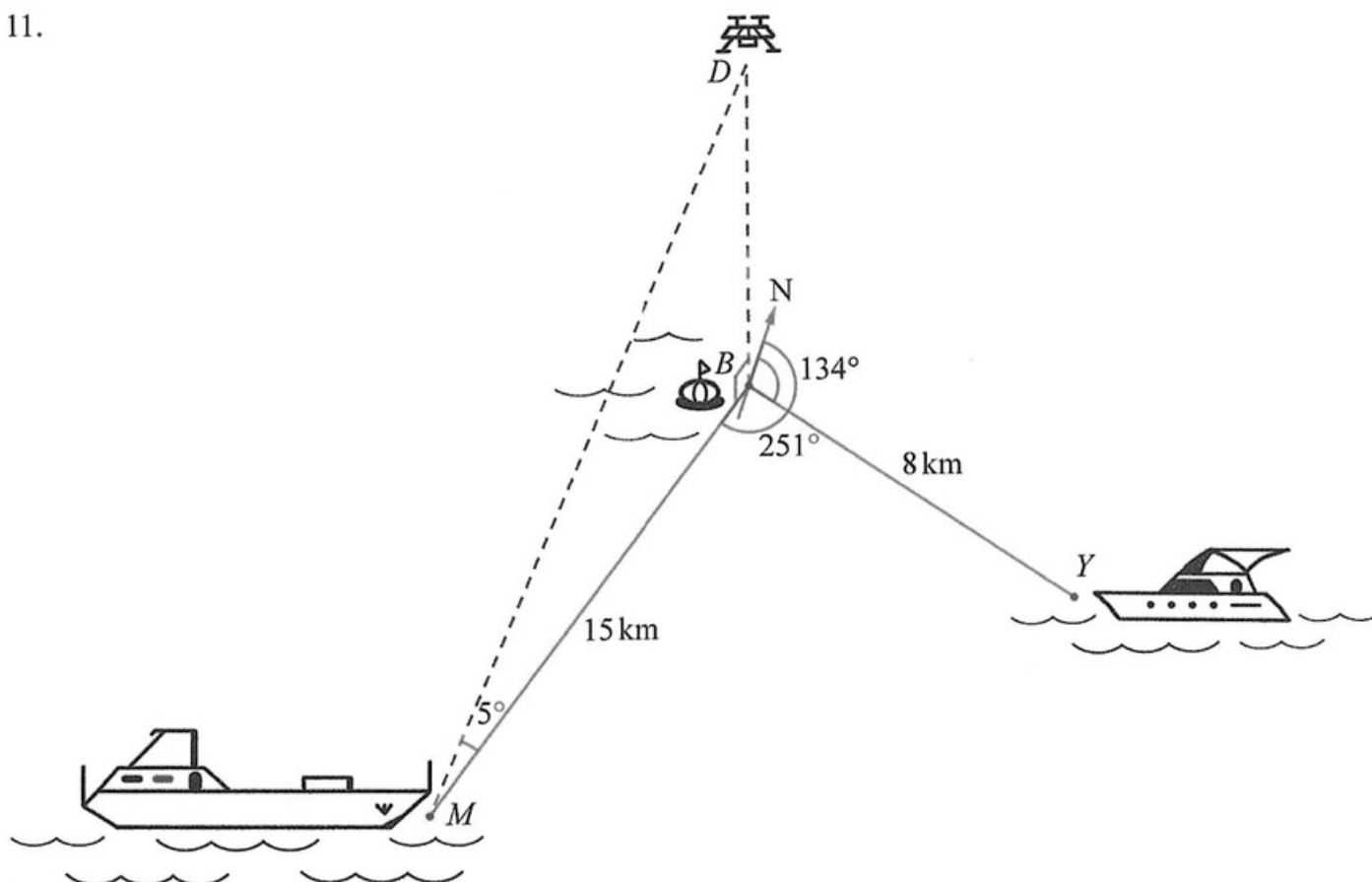
(a) $h(4)$, [1]

(b) $f(h(x))$, [2]

(c) x , where $f(x) = h(x)$, [4]

(d) $h^{-1}(x)$. [2]

11.



The diagram shows the relative positions of a yacht (Y), mailboat (M), buoy (B) and a flying drone (D).

The yacht is 8 km from the buoy on a bearing of 134° .

The mailboat is 15 km from the buoy on a bearing of 251° .

- Calculate $\hat{M\hat{B}Y}$. [1]
- Find the distance MY between the mailboat and the yacht, correct to the nearest km. [4]
- Calculate $\hat{M\hat{Y}B}$, correct to the nearest degree. [4]
- Find the bearing of the mailboat from the yacht. [2]

A drone (D) hovers directly above the buoy.

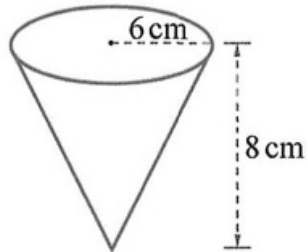
The angle of elevation from the mailboat to the drone is 5° .

- Find the hovering height of the drone above the buoy. [2]



12. For this question, use $\pi \approx 3.14$.

- (a) A solid cone has a radius of 6 cm and height of 8 cm.

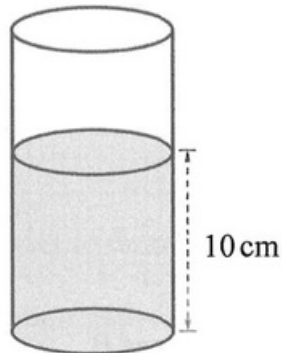


NOT TO SCALE

Find the total surface area of the cone.

[4]

- (b) 500 cm^3 of water is poured into a cylinder to a depth of 10 cm.

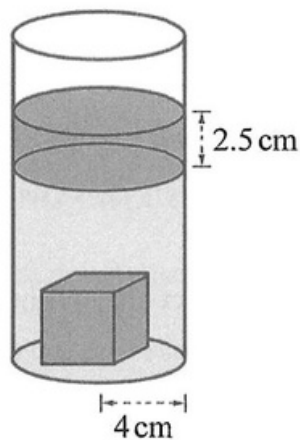


NOT TO SCALE

- (i) Show that the radius of the cylinder is 4 cm, correct to the nearest cm.

[3]

A solid cube is dropped into the cylinder of water such that the water level increases by 2.5 cm.

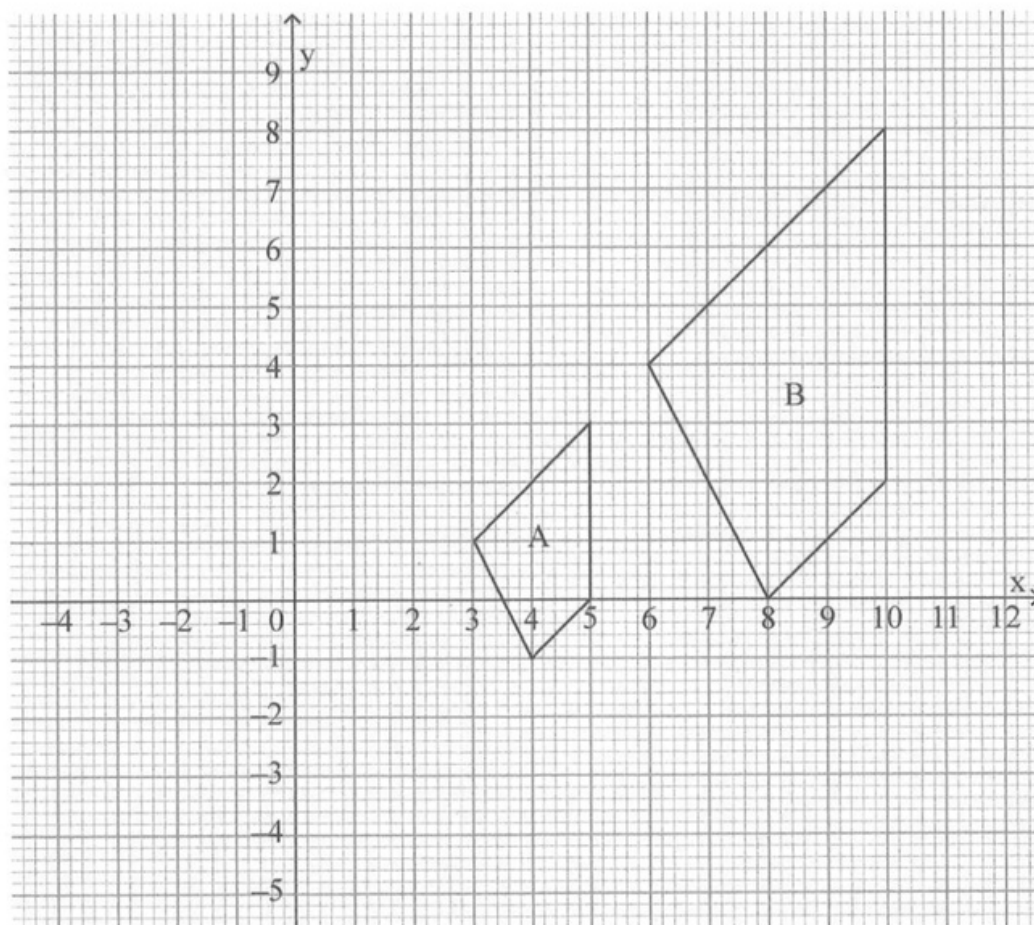


NOT TO SCALE

- (ii) Find the length of a side of the cube, correct to the nearest cm.

[4]

13.



The diagram shows object A and an image B.

- (a) Describe fully the transformation that maps A onto B. [3]

ANSWER THE REMAINDER OF THIS QUESTION ON THE GRAPH PAPER PROVIDED

- (b) Using a scale of 1 cm to 1 unit on each axis, for $-8 \leq x \leq 6$ and $-2 \leq y \leq 12$, draw and label object A. [2]

- (c) Translate object A by the vector $\begin{pmatrix} -6 \\ 7 \end{pmatrix}$.
Draw and label the image C. [2]

- (d) Draw the line $y = x$ and reflect object A in this line.
Draw and label the image D. [3]

- (e) Rotate object A 180° about the point (0, 2).
Draw and label the image E. [3]



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