EXAMINATIONS COUNCIL OF LESOTHO
Lesotho General Certificate of Secondary Education

CANDIDATE NAME														
CENTRE NUMBER						CANDIDATE NUMBER								

MATHEMATICS **0178/03**

Paper 3 (Core) **May/June 2022**

2 hours

Candidates answer on the Question Paper.

Additional Materials: Electronic Calculator
Geometrical Instruments
Tracing Paper (optional)

READ THESE INSTRUCTIONS FIRST

Write your name, centre number and candidate number on all the work you hand in.
Write in dark blue or black pen.
You may use an HB pencil for any diagrams or graphs.
Do not use staples, paper clips, glue or correction fluid.

Answer **all** questions.

If working is needed for any question it must be shown below that question.
Electronic calculators should be used.
If the degree of accuracy is not specified in the question, and if the answer is not exact, give the answer to three significant figures. Give answers in degrees to one decimal place.
For π use either your calculator value or 3.142.

The number of marks is given in brackets [ ] at the end of each question or part question.
The total of the marks for this paper is 100.

This document consists of **15** printed pages and **1** blank page.

1 **(a)** Written as a product of its prime factors, $120 = 2 \times 2 \times 2 \times 3 \times 5$.

(i) Express 180 as a product of its prime factors.

..... [2]

(ii) Find the lowest common multiple of both 120 and 180.

..... [1]

(iii) Find the smallest positive integer p for which $\sqrt{120p}$ is a rational number.

..... [2]

(b) Pulumo, Manka and Thabo run at constant speeds around a track.
For each lap of the track, Pulumo takes 36 seconds, Manka takes 48 seconds and Thabo takes 42 seconds.

They all start from the same place on the track at 0615 hrs.

(i) Find the length of time, to the nearest **minute**, they will next be together at the same time at the same place they started from.

.....minutes [3]

(ii) Work out the time, to the nearest **minute**, when they will next be together at this starting point.

..... [1]

2 (a) $\overrightarrow{PQ} = \begin{pmatrix} -5 \\ 1 \end{pmatrix}$ and $\overrightarrow{QS} = \begin{pmatrix} -3 \\ -7 \end{pmatrix}$

Find

(i) $\overrightarrow{PS}$.

( ) [2]

(ii) $|\overrightarrow{QS}|$

..... [2]

(b) $\boldsymbol{A} = \begin{pmatrix} -2 & 3 \\ 1 & 5 \end{pmatrix}$ and $\boldsymbol{B} = \begin{pmatrix} 1 & 4 \\ -1 & 3 \end{pmatrix}$

Find

(i) $2\boldsymbol{A}$.

( ) [1]

(ii) $\boldsymbol{A} - \boldsymbol{B}$.

( ) [2]

3 Diagram I shows a cylindrical drinking glass of height 12 cm and radius 5 cm.
The glass is filled with drink to the height of 9 cm.

Diagram II shows four identical perfect ice cubes.

NOT TO SCALE

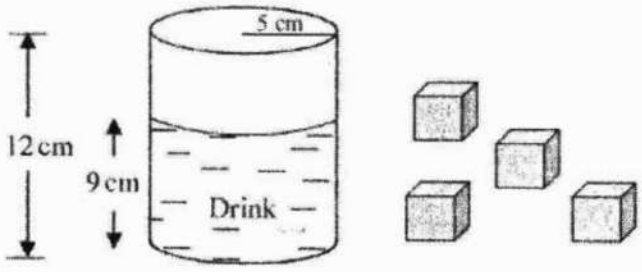


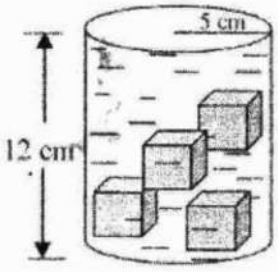
Diagram I Diagram II

(a) Calculate the volume of drink in the glass.

.....cm^3 [2]

(b) Diagram III shows the four ice cubes placed in the glass of drink.

The glass is now completely filled.



NOT TO SCALE

Diagram III

(i) Show that the total volume of the four ice cubes is $236\,cm^3$ correct to three significant figures.

[2]

(ii) Calculate the length of one edge of an ice cube.

.....cm [2]

4 The diagram shows patterns of dots.

Pattern 1 Pattern 2 Pattern 3 Pattern 4

(a) Draw the 4^{th} pattern. [1]

(b) Write the number of dots in pattern 6.

..... [2]

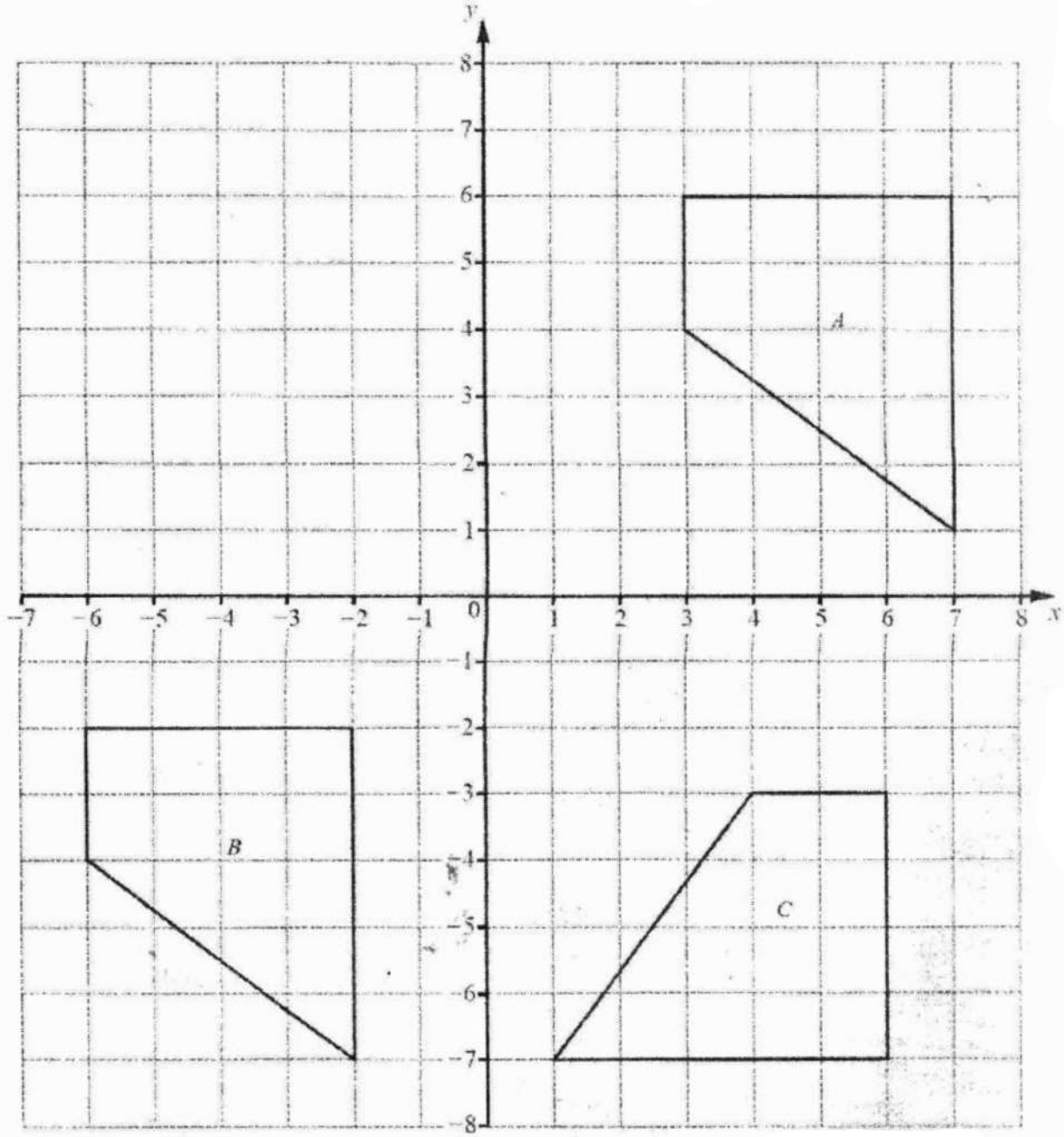
(c) Find an expression, in terms of n, for the total number of dots in the nth pattern.

..... [3]

(d) Find the number of dots which will be in the 20^{th} pattern.

..... [2]

5 The diagram shows three quadrilaterals A, B, and C on a grid.



(a) Write down the name of these quadrilaterals.

..... [1]

(b) Describe fully, the **single** transformation that maps quadrilateral A onto

(i) quadrilateral B,

.....

..... [2]

(ii) quadrilateral C.

.....

..... [3]

(c) On the grid,

(i) reflect quadrilateral B in the line $y = -1$. [2]

(ii) enlarge quadrilateral C by scale factor $\frac{1}{2}$, centre (0, 1). [2]

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6 (a) Thato spent 2 hours and 32 minutes preparing food.
The food was ready at 13 07.

Find the time at which she started preparing the food.

..... [1]

(b) On one day, the exchange rate between US dollars ($) and Maloti (M) was $1 to M13.80.

Calculate the value of M23 400 in US dollars ($) on that day.

..... [2]

(c) The value of a car is M45 000.
The value of the car depreciates at 24% **every year**.

Calculate the value of the car after 3 years.

M..... [3]

(d) A tin contains 250 g of baked beans.
In a tin of baked beans, 100 g contains 0.5 g of fat.
A medical doctor recommends a daily amount of 70 g of fat.

Calculate the fat content in the tin as a percentage of the recommended daily amount.

..... [3]

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7 The table shows the ages of 30 students in a class.

Age (years)	14	15	16	17	18	19	20
Number of students	2	10	7	5	2	3	1

(a) Find

(i) the mode,

..... [1]

(ii) the median age,

..... [2]

(iii) the mean age.

..... [3]

(b) A student is chosen at random from the class.

Find the probability that their age is

(i) 15.

..... [1]

(ii) 14 or 18.

..... [2]

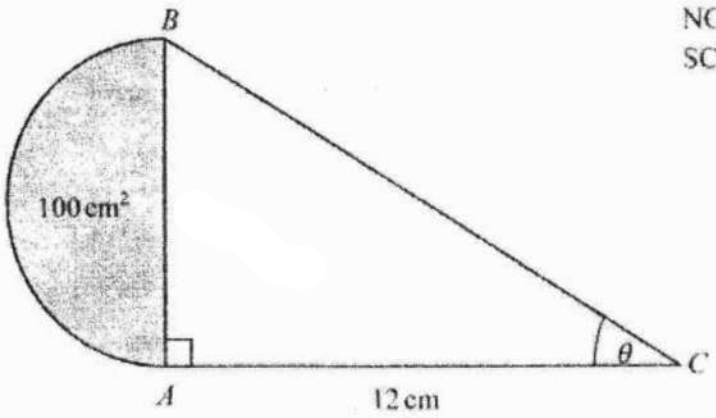
(c) A bar chart is drawn to represent the information in the table.
The height of the bar representing age 15 is 15 cm.

Find the height of the bar representing age 18.

.....cm [2]

8 The diagram shows a semi-circle attached to a right-angled triangled ABC.

The semi-circle has area of $100\,cm^2$ and $AC = 12\,cm$.



(a) What type of angle is θ?

..... [1]

(b) Show that $AB = 16.0\,cm$ correct to one decimal place.

[3]

(c) Calculate

(i) BC,

.....cm [3]

(ii) the size of the angle θ.

..... [2]

9 (a) Solve the equations.

(i) $2x - 3 = 7$

$x =$ ..... [2]

(ii) $x^2 - 4x - 5 = 0$

$x =$ ..... or $x =$ ..... [3]

(b) Solve the simultaneous equations.

$7x + 2y = 22$

$2x + 3y = -1$

$x =$ .....

$y =$ ..... [3]

(c) Factorise completely.

$8ax + 6by - 3bx - 16ay$

..... [3]

(d) Express as a single fraction in its simplest form.

$\frac{2x-1}{3} - \frac{x+2}{4}$.

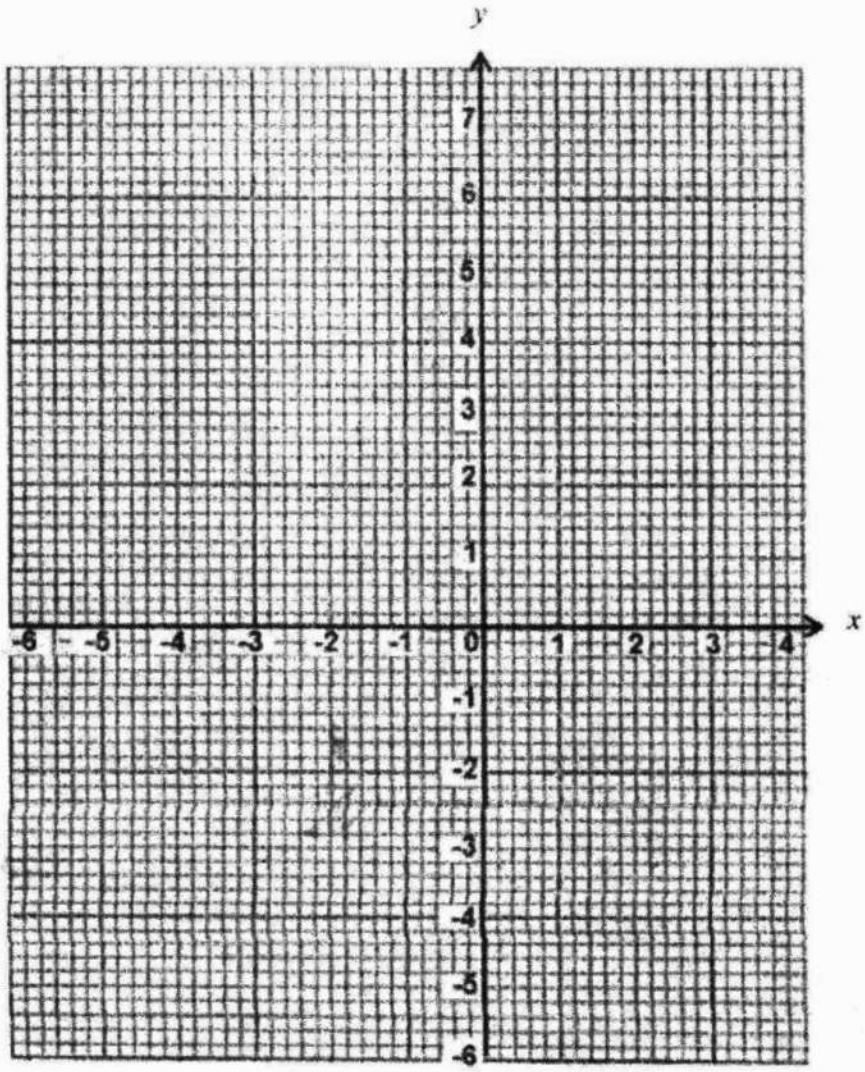
..... [3]

10 (a) (i) Complete the table for $y = x^2 + 3x - 3$

x	−5	−4	−3	−2	−1	0	1	2
y		1	−3	−5		−3		7

[2]

(ii) On the grid, draw the graph of $y = x^2 + 3x - 3$ for $-5 \leq x \leq 2$. [4]



(b) On the same grid, draw the graph of $y = 2x - 1$ for $-5 \leq x \leq 2$. [2]

(c) Find the coordinates of the points where the graph of $y = x^2 + 3x - 3$ meets the graph of $y = 2x - 1$.

(....., ...) and (....., ...) [2]

11 The diagram shows the positions of points A and B on a map.

(a) Construct locus of all points that are

I 3 cm from A
II equidistant from A and B. [3]

(b) Shade the region for all the points that are closer to B than to A and less than 3 cm from A. [1]

(c) Measure the bearing of B from A.

..... [1]

(d) If the scale on the map is 1cm to x km,

Write, in terms of x, the actual distance between A and B.

.....km [2]

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