EXAMINATIONS COUNCIL OF LESOTHO
Lesotho General Certificate of Secondary Education

CANDIDATE NAME														
CENTRE NUMBER						CANDIDATE NUMBER								

MATHEMATICS **0178/04**

Paper 4 (Extended) **October/November 2019**

2 hours 30 minutes

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.
DO **NOT** WRITE IN ANY BARCODES.

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 130.

1 **(a)** Write 0.017 as a percentage.

Answer (a) ..... % [

(b) Manka sells his car for M39 995 and makes a loss of 5% on the cost price of the car.

Calculate the cost price.

Answer (b) M ..... [3

(c) The value of a house depreciates from M50 000 by 4% every year.

Calculate the value of the house after **three** years.

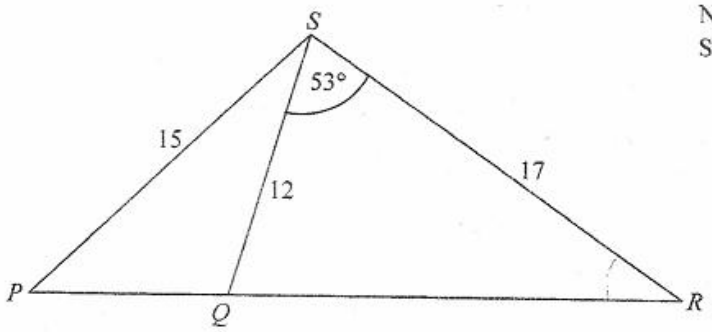
Answer (c) M ..... [3]

(d) Palesa invests M6 400 at the rate of 12.5% compound interest per year.

Calculate the number of years in which her investment will be worth a total amount of M9 112.50.

Answer (d) ..... [3]

2 The diagram shows triangle PRS.
$PS = 15$ cm, $QS = 12$ cm, $RS = 17$ cm and $Q\hat{S}R = 53°$
Area of triangle PQS is 45 cm^2.



NOT TO SCALE

Calculate

(a) QR,

Answer (a) ..... cm [4]

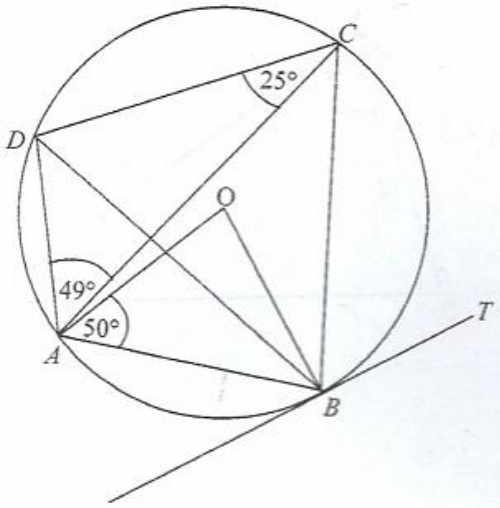
(b) the angle PSQ,

Answer (b) ..... [3]

(c) the shortest distance Q from PS.

Answer (c) ..... cm [2]

3 In the diagram, TB is a tangent to the circle at point B.
O is the centre of the circle.
The angle $OAB = 50°$, angle $CAD = 49°$ and angle $DCA = 25°$.



NOT TO SCALE

(a) Calculate the following angles and give a reason for each part.

(i) DBC

Answer (a)(i) ..... reason ..... [2]

(ii) ADB

Answer (a)(ii) ..... reason ..... [2]

(iii) CBT

Answer (a)(iii) ..... reason ..... [2]

(b) Find

(i) the angle CAO,

Answer (b)(i) ..... [2]

(ii) the angle OBC.

Answer (b)(ii) ..... [2]

4 **(a)** y is directly proportional to $\sqrt{x-3}$.

When $y = 10$, $x = 28$.

Find y when $x = 147$.

Answer (a) $y =$ ..... [2]

(b) Solve $2x^2 + 7x + 1 = 0$.

Give your answer correct to 2 decimal places.

Answer (b) $x =$ ..... or $x =$ ..... [4]

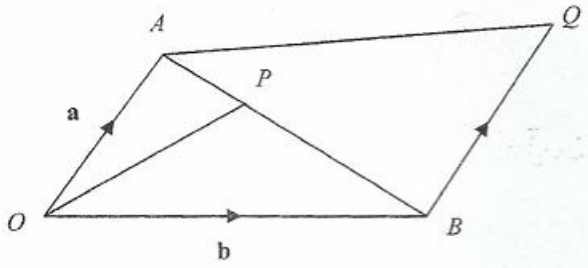
(c) Simplify.

$$\frac{x^2+5x+6}{x^2-9}$$

Answer (c) ..... [3]

5 In the diagram,

$\overrightarrow{OA} = \boldsymbol{a}$, $\overrightarrow{OB} = \boldsymbol{b}$, $\overrightarrow{BQ} = k\boldsymbol{b} + \boldsymbol{a}$ and $\overrightarrow{OP} = \frac{2}{3}\boldsymbol{a} + \frac{1}{3}\boldsymbol{b}$.



NOT TO SCALE

(a) Express $\overrightarrow{AB}$ in terms of $\boldsymbol{a}$ and/or $\boldsymbol{b}$.

Answer (a) ..... [1]

(b) $\overrightarrow{AQ}$ in terms of k, $\boldsymbol{a}$ and/*or* $\boldsymbol{b}$.

Answer (b) ..... [1]

(c) Find the ratio of AP to PB.

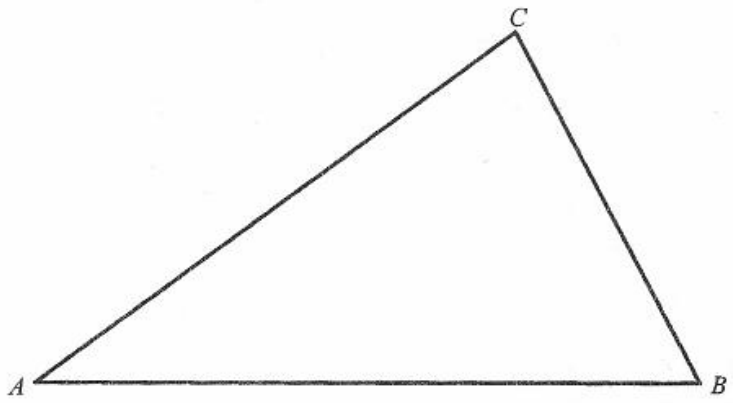
Answer (c) ..... [3]

(d) Given that OP is parallel to BQ, find the value of k.

Answer (d) $k =$ ..... [3]

6 The diagram represents a triangular field ABC.

Scale: 1 cm to 50 m.



(a) Find the actual distance AB.

Answer (a) AB = ... m [2]

(b) Construct the locus of all points, inside the field, that are

(i) 150 m from AB, [2]

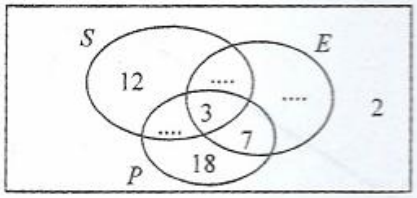
(ii) equidistant from AB and BC. [2]

(c) A tree is to be planted inside the field so that it is
- less than 150 m from AB, and
- closer to BC than to AB.

Shade the possible region in which the tree can be planted. [2]

7 In a class of 55 students, 30 are members of Phela club (P), and 20 are members of Science club (S), while some are members of English club (E).

The other information is shown in the Venn diagram.



(a) Complete the Venn diagram. [3]

(b) Find the number of students who are members of

(i) **both** English club and Phela club but **not** Science club,

Answer (b)(i) ..... [1]

(ii) **two** clubs only.

Answer (b)(ii) ..... [1]

(c) Find

(i) $n(E \cap P)$,

Answer (c)(i) ..... [1]

(ii) $n(P' \cap E' \cap S)$.

Answer (c)(ii) ..... [1]

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

Find the probability that the student is a member of

(i) **both** English club and Phela club,

Answer (d)(i) ..... [1]

(ii) all the **three** clubs.

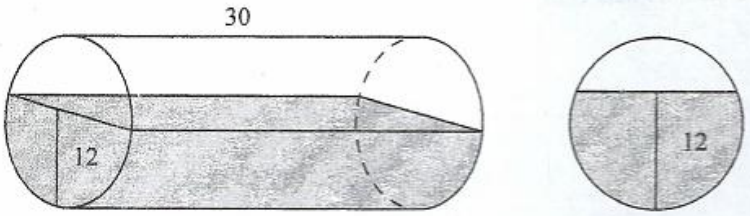
Answer (d)(ii) ..... [1]

(e) A student is chosen at random from the class to be a school prefect.
Another student is then chosen at random from the remaining, to be a class monitor.

Find the probability that **one** is a member of the Science club only while the other is a member of the Phela club only.

Answer (e) ..... [3]

8 The diagram shows a cylindrical container resting on a horizontal surface.
The container has radius 8 cm and length 30 cm.
The cylinder contains water to a depth of 12 cm.



NOT TO SCALE

(a) Show that the **cross sectional area** of one end of the container in contact with water is 162 cm^2, correct to three significant figures.

[4]

(b) Calculate the volume of water in the container.

Answer (b) ..... cm^3 [2]

(c) The container is now placed upright on its circular base.
Calculate the height of the water in the container.

Answer (c) ..... cm [2]

(d) Water leaks from the container at a rate of 10 cm^2 per second.
Calculate the time, in **minutes** and **seconds**, it takes the container to be emptied.

Answer (d) ..... minutes ..... seconds [2]

9 A carpenter makes x tables and y chairs per week.
The total number of tables and chairs made cannot exceed 16.

(a) Two of the inequalities are $x \geq 0$ and $y \geq 0$.
Write the third inequality in x and y to represent the information.

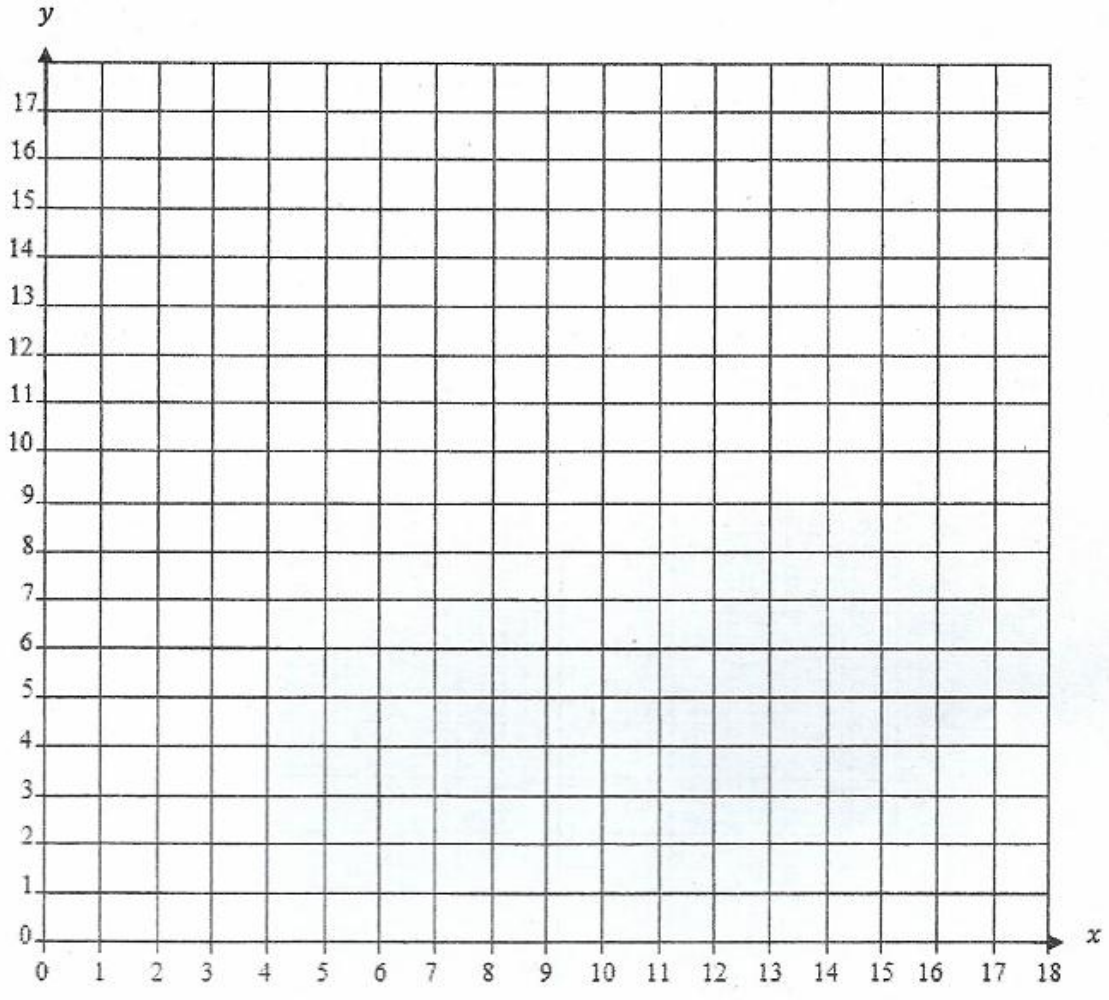
Answer (a) ..... [1]

(b) The carpenter makes a profit of M20 per table and M30 per chair on his sales.
The total profit made cannot be less than M360.

Show that the inequality representing this information is $2x + 3y \geq 36$.

[2]

(c) By shading the unwanted regions, show all this information on the grid.



[5]

(d) Find the

(i) **maximum** profit that the carpenter can make,

Answer (d)(i) M ..... [1]

(ii) number of tables and chairs that can be made in order to get a maximum profit.

Answer (d)(ii) tables ..... [1]

chairs ..... [1]

10 The table shows some values of $y = x^2 + x - 2$.

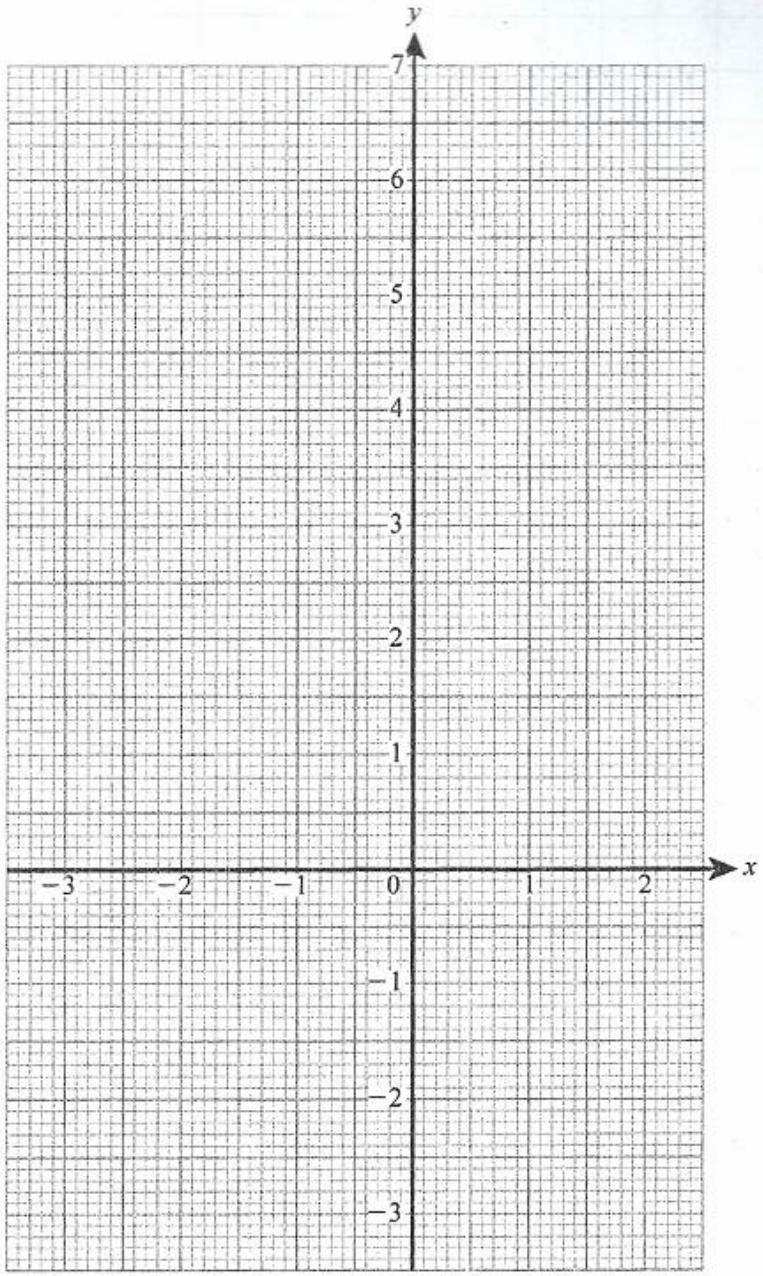
x	–3.5	–2	–1.5	–1	0	0.5	1	1.5	2
y	6.75	0	–1.25	–2	–2	p	0	q	4

(a) Calculate the value of p and the value of q.

Answer (a) $p =$ ..... [1]

$q =$ ..... [1]

(b) On the grid, draw the graph of $y = x^2 + x - 2$ for $-3.5 \leq x \leq 2$.



[4]

(c) Write the equation of the line of symmetry of the graph.

Answer (c) ..... [1]

(d) **(i)** On the **same grid**, draw the graph of $x + y = 2$. [2]

(ii) Use your graphs to solve the equation $x^2 + 2x = 4$.

Answer (d)(ii) x = ..., ... [2]

11 The first three diagrams of a sequence are shown.
Each diagram is made from dots and lines in which the area of each square is 1 square unit.

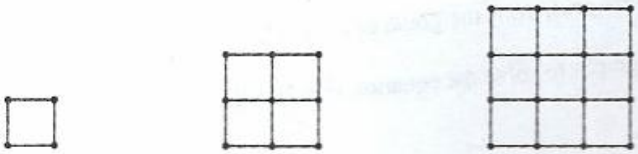


Diagram 1 Diagram 2 Diagram 3

Diagram	1	2	3	4	...	n
Number of dots	4	9	16		...	x
Area	1	4	9		...	y
Number of lines	4	12	24		...	z

(a) Complete the table for diagram 4. [3]

(b) Express x, y and z in terms of n.
Give each answer in its simplest form.

Answer (b) $x =$ ..... [2]

$y =$ ..... [1]

$z =$ ..... [2]

(c) Diagram k has 361 dots.

Find

(i) k,

Answer (c)(i) $k =$ ..... [3]

(ii) the number of lines in diagram k.

Answer (c)(ii) ..... [2]

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12 **(a)** In a group of students 60% are female and 40% are male.

One third of the female students study Sesotho and a quarter of the male students study Sesotho.

A student is chosen at random from the group.
Find the probability that the student

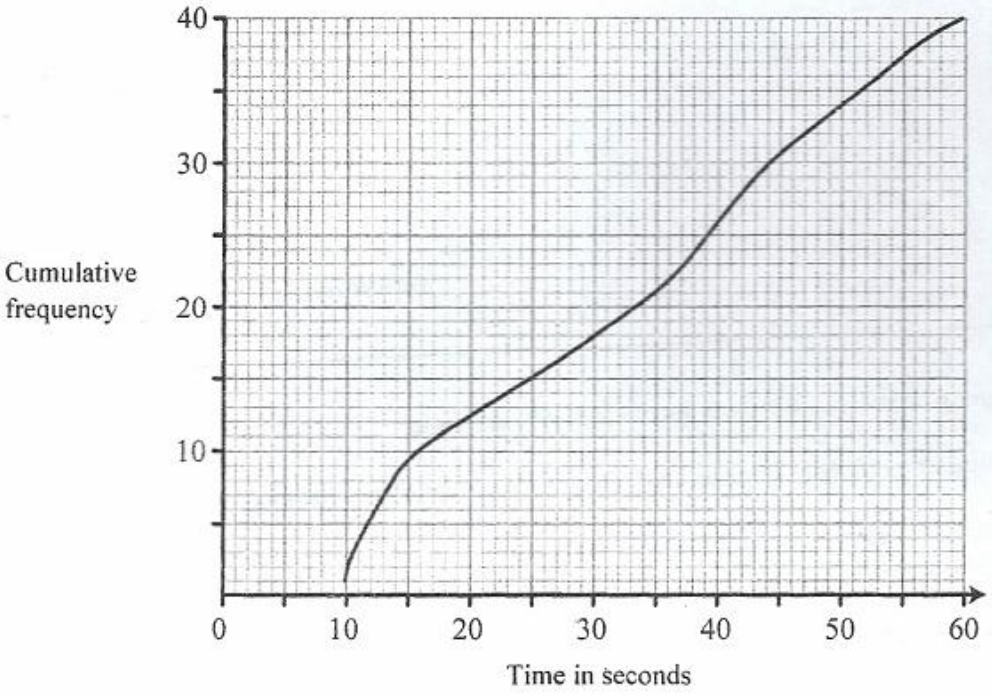
(i) is a female and studies Sesotho,

Answer (a)(i) ..... [2]

(ii) studies Sesotho.

Answer (a)(ii) ..... [2]

(b) 40 students completed a puzzle.
The cumulative frequency curve shows the time in seconds taken to complete the puzzle.



Use the graph to find

(i) the median time taken to complete the puzzle,

Answer (b)(i) ..... [2]

(ii) the inter-quartile range,

Answer (b)(ii) ..... [2]

(iii) the number of students who completed the puzzle in **more than** 35 seconds.

Answer (b)(iii) ..... [2]

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13 $f(x) = 3 - 2x$ and $g(x) = 3x + 2$.

(a) Find

(i) $f(-1)$,

Answer (a)(i) $f(-1) =$ ..... [1]

(ii) $f^{-1}(x)$.

Answer (a)(ii) $f^{-1}(x) =$ ..... [2]

(b) Find $gf(x)$ in its simplest form.

Answer (b) ..... [3]

(c) Solve the equation.

$f(x^2 + 1) = -17$

Answer (c) $x =$ ..... or $x =$ ..... [3]