

EXAMINATIONS COUNCIL OF LESOTHO
Lesotho General Certificate of Secondary Education

CANDIDATE
NAME

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CENTRE
NUMBER

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CANDIDATE
NUMBER

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MATHEMATICS
Paper 4 (Extended)

0178/04
May/June 2024
2 hours 30 minutes
Marks: 130

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

Candidates answer on the Question Paper.

READ THESE INSTRUCTIONS FIRST

Write your name, centre number and candidate number in the relevant spaces provided at the top of this page.

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.

Electronic calculators should be used.

If working is needed for any question, it must be shown below that question.

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.

This document consists of **19** printed pages and **1** blank page.



- 1 (a) Evaluate.

$$\sqrt[4]{\frac{12 \times 98}{5}}$$

..... [2]

- (b) Three sets of 300 ml, 500 ml and 750 ml bottles are each filled with water.

Find

- (i) the smallest amount of water that can completely fill each of the sets,

..... ml [3]

- (ii) the number of 300 ml bottles that can hold all the water.

..... [1]

- 2 The data shows monthly salaries, in Maloti, of 13 employees at the supermarket.

1000	1100	1100	1100	1300	1350	1400
1400	1500	1600	2200	3000	6000	

- (a) Find

(i) the mode,

M.....[1]

(ii) the median.

M..... [1]

- (b) Analyse the given data and state if the employees are fairly paid by the supermarket. Support your statement.

.....
.....[2]

- (c) Two employees are chosen at random from the supermarket.

Calculate the probability that one earns less than M1200 and the other earns M1600.

..... [2]

- (d) The company plans to pay the employees equally from their monthly salaries.

Calculate how much each would earn.

M..... [3]

- 3 Pule, Mpona and Rantho contributed M480 000 for 8 hectares of land. Their contribution was in the ratio 4 : 5 : 7.

(a) Find the amount of money contributed by Rantho.

M [2]

- (b) They set aside $\frac{1}{4}$ of the land for a garden and subdivided the rest into 15 m by 25 m plots.

(i) Calculate the number of plots obtained.

..... plots [3]

- (ii) The plots were sold at M8 000 each.

Calculate the profit obtained from selling the plots.

M [3]

- 4 The table shows two sequences S1 and S2 and the sum of their terms.

n	1	2	3	4	5
S1	0	2	8	18	
S2	1	7	17	31	
Sum	1	9	25	49	

- (a) Complete the table.

[3]

- (b) Find an expression for the n th term in S2.

..... [3]

- (c) One of the terms in S2 is 287.

Find the corresponding term in S1.

..... [3]

- 5 (a) Find the value of n in the equation.

$$1 + \left(\frac{1}{3}\right)^n = \frac{4}{3}$$

$$n = \dots\dots\dots [2]$$

- (b) Make p the subject of the formula.

$$d = \frac{3p + 2q^2}{5}$$

$$p = \dots\dots\dots [3]$$

- (c) $x^2 + 6x + 17$ can be expressed in the form $(x + p)^2 + q$.

Find the integer values of p and q .

$$p = \dots\dots\dots$$

$$q = \dots\dots\dots [3]$$

6 $f(x) = 2x + 4$ $g(x) = x^2 + 2x$ $h(x) = 3^x$

(a) Find

(i) $g(-2)$,

..... [1]

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

..... [2]

(b) Find in simplest form

(i) $\frac{g(x)}{f(x)}$,

..... [2]

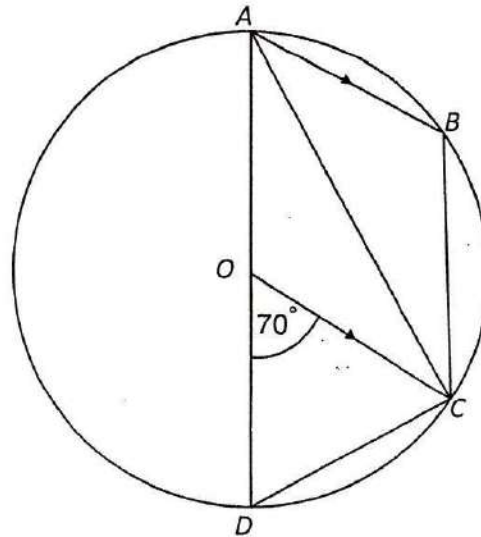
(ii) $gf(x)$.

..... [3]

(c) Find the value of x when $h^{-1}(x) = 2$.

$x =$ [1]

- 7 The diagram shows a circle with centre O .
 AD is the diameter of the circle.
 Angle $COD = 70^\circ$ and AB is parallel to OC .



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- (a) Find the size of angle OAC and give a reason.

$\widehat{OAC} = \dots\dots\dots$ because $\dots\dots\dots$
 $\dots\dots\dots$ [2]

- (b) Find the size of angle ABC .

$\dots\dots\dots^\circ$ [2]

- (c) The area of triangle OAC is 90 cm^2 .

Calculate the radius of the circle.

$\dots\dots\dots\text{ cm}$ [3]

- 8 (a) Two companies *A* and *B* offer compound and simple interest respectively, both at 4% interest per annum.
For the same amount *P* invested in each company for 3 years, the **compound** interest is greater than **simple** interest by M48.64.

Calculate the value of *P*.

M..... [4]

- (b) There are 50 compulsory questions in a test with two sections A and B.

Matrix **T** shows the result of Tebang in the test.

Correct	Wrong	
$\begin{pmatrix} 16 \\ 24 \end{pmatrix}$	$\begin{pmatrix} 4 \\ 6 \end{pmatrix}$	Section A Section B

- (i) Each correct answer is given 2 marks and 1 mark is deducted for each wrong answer.

Write a column matrix **M** to represent mark allocation.

..... [1]

- (ii) Evaluate **TM**.

..... [2]

- (iii) State what the elements of matrix **TM** represent.

.....
..... [1]

- (iv) Find the total marks obtained by Tebang in the test.

..... [1]

- 9 In 2017, the price of a litre of petrol was Mx and Tau bought petrol for M750. The expression, in terms of x , for the number of litres of petrol bought is $\frac{750}{x}$.

- (a) In 2018 the price of petrol was cheaper by 40 lisente per litre.

Write an expression, in terms of x , for the number of litres of petrol that could be bought for M750.

.....l [1]

- (b) If Tau could buy 3 litres more for M750 in 2018, form an equation, in terms of x and show that it simplifies to $5x^2 - 2x - 500 = 0$.

[3]

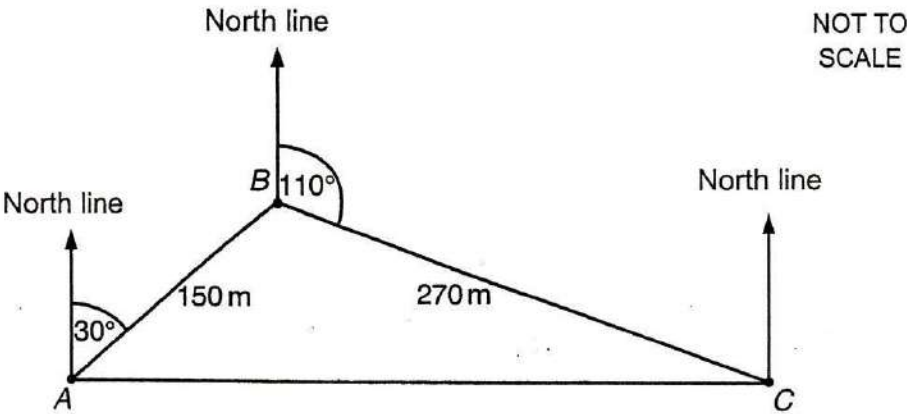
- (c) Solve the equation $5x^2 - 2x - 500 = 0$.
Give your answer correct to 2 decimal places.

$x = \dots\dots\dots$ or $x = \dots\dots\dots$ [4]

- (d) Find the number of litres of petrol that could be bought with M600 in 2017.

.....l [2]

- 10 The diagram shows positions A , B and C of a soldier training on a level ground. He travelled a distance of 150 m from A to B on a bearing of 030° , and 270 m from B to C on a bearing of 110° .



- (a) Show that angle ABC is 100° .

[1]

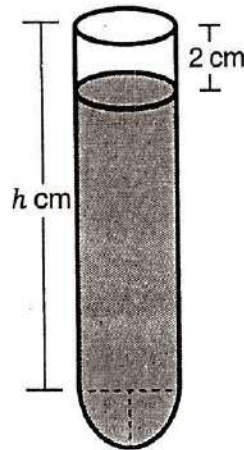
- (b) Calculate
- (i) the distance AC ,

..... m [4]

- (ii) the bearing of A from C .

..... $^\circ$ [3]

- 11 The diagram shows a test tube made of a cylinder and a **hemisphere** of the same radius. The total volume of the test tube is 282 cm^3 . The test tube contains 242 cm^3 of water to a level that is 2 cm below the top.



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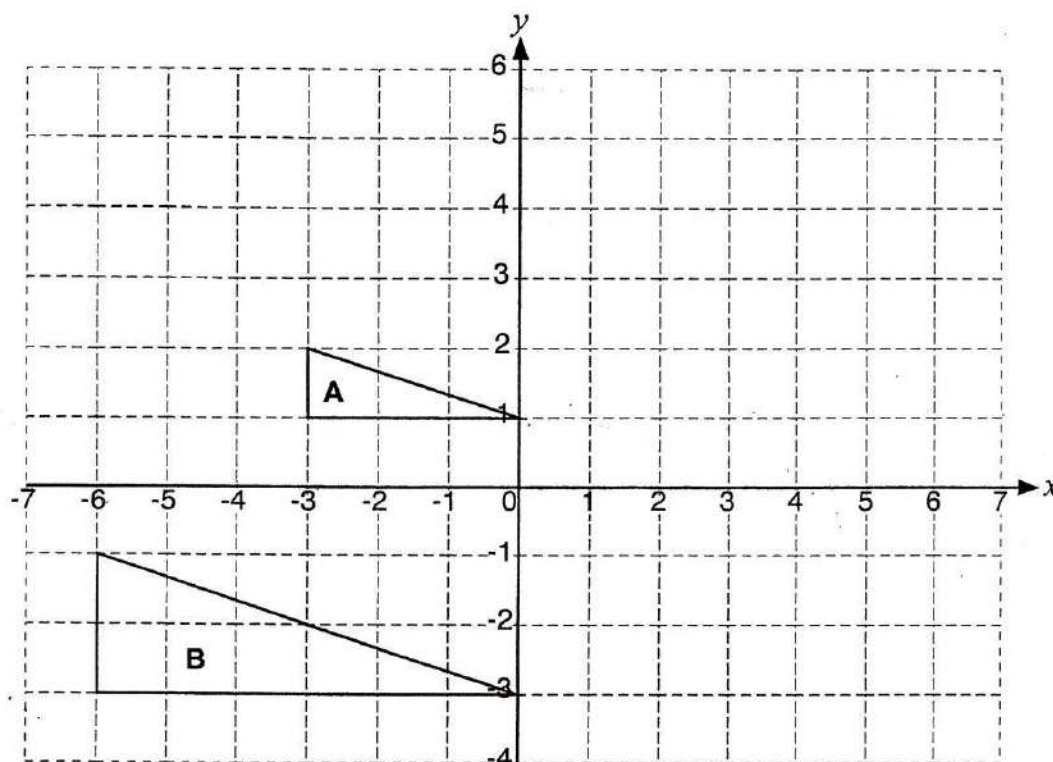
[The formula for volume of a sphere of radius r is $V = \frac{4}{3}\pi r^3$.]

- (a) Show that the radius of the test tube is approximately 2.52 cm . [3]

- (b) Calculate the height h , of the cylindrical part.

.....cm [4]

- 12 The grid shows triangles **A** and **B**.



- (a) Describe fully a single transformation that maps **A** onto **B**.

.....
.....[3]

- (b) Rotate triangle **A** through 180° about the origin.

[2]

- (c) Describe fully a single transformation represented by matrix $\begin{pmatrix} 1 & 2 \\ 0 & 1 \end{pmatrix}$.

.....
.....[3]

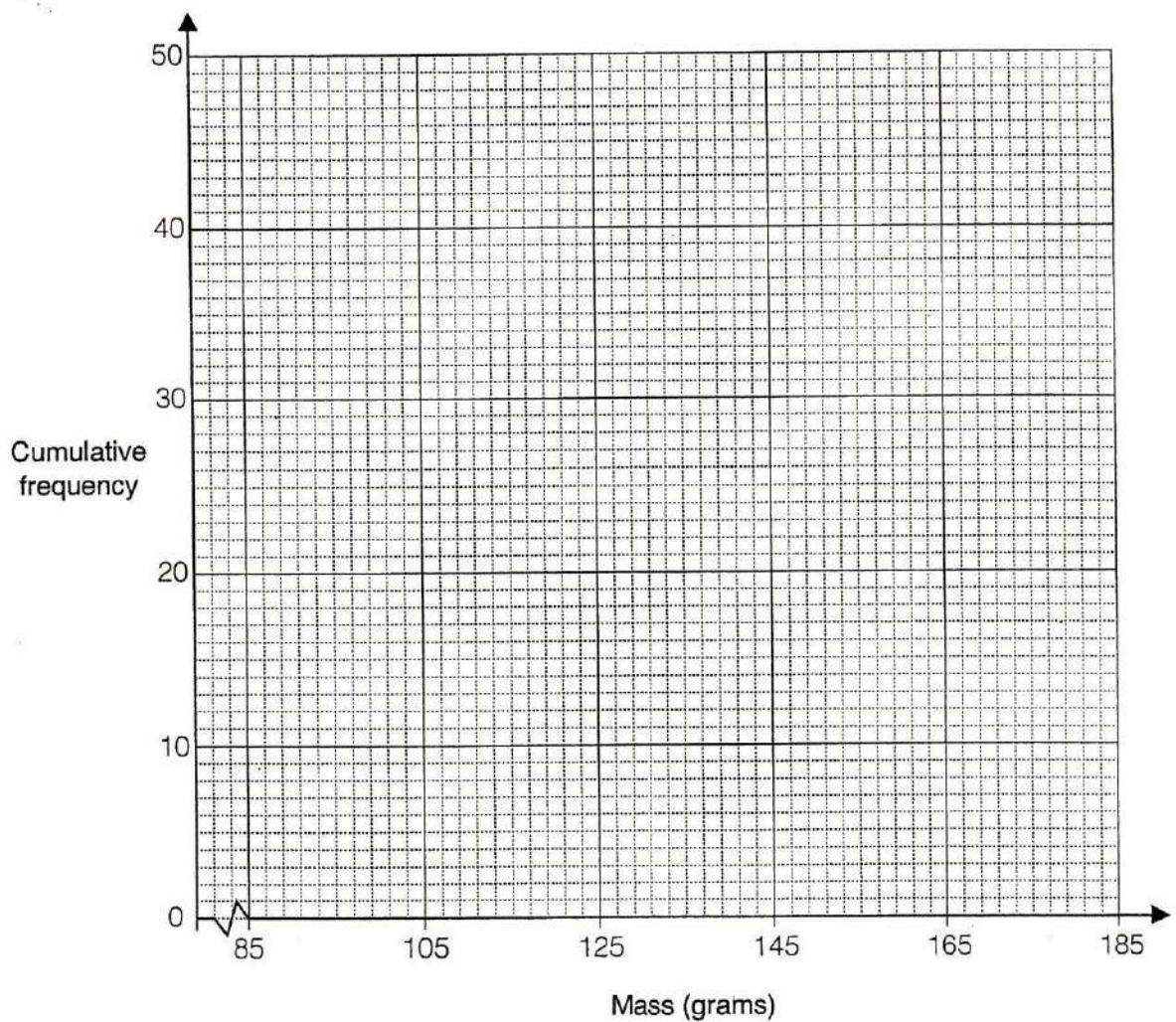
- 13 The frequency table shows the masses of 50 apples.

Mass x (g)	$x < 85$	$x \leq 105$	$x \leq 125$	$x \leq 145$	$x \leq 165$	$x \leq 185$
Cumulative frequency	0	4	16	38	48	50

- (a) Find the probability that the mass of the apples is more than 145 g.

..... [2]

- (b) Use the information from the table to draw a cumulative frequency curve. [3]



(c) Use the graph to find an estimate of

(i) the median,

..... [1]

(ii) the interquartile range,

..... [2]

(iii) the number of apples with a mass of at least 135 g.

..... [2]

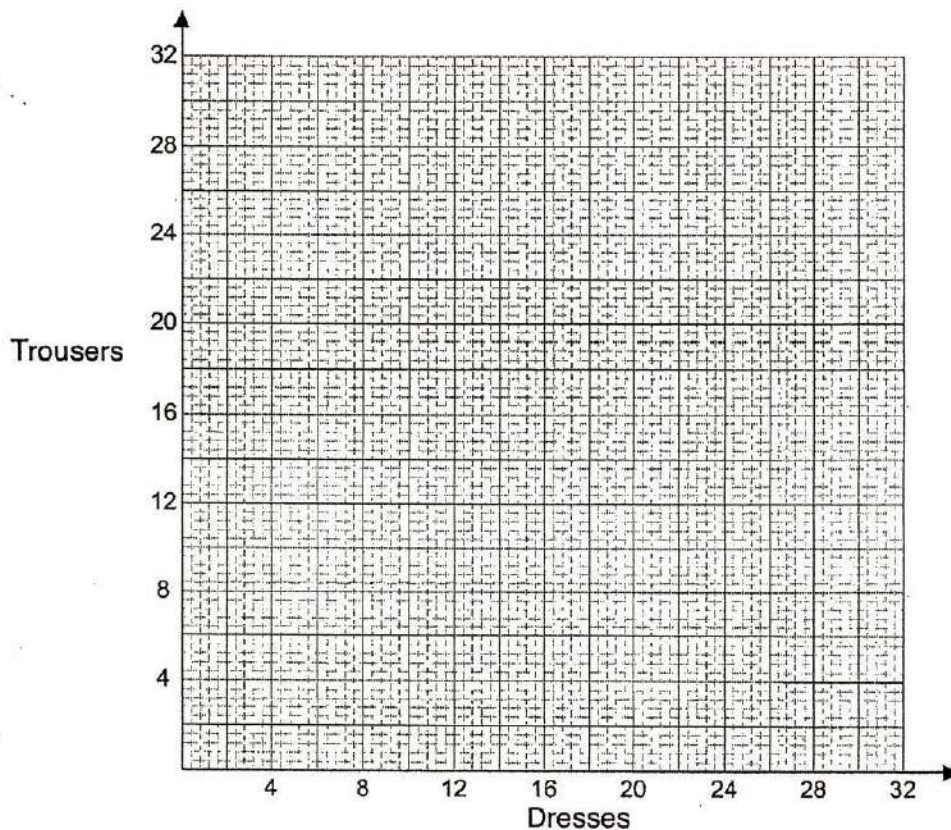
- 14 A small clothing factory makes x dresses and y pairs of trousers per day. The factory operates for a maximum of 8 hours per day. The table shows the time taken for cutting and stitching one dress and a pair of trousers.

	Dresses (x)	Trousers (y)	Total operating hours
Cutting	$\frac{1}{2}$ hour	15 minutes	8
Stitching	20 minutes	$\frac{1}{2}$ hour	8

Three of the inequalities are $x \geq 0$, $y \geq 0$ and $2x + y \leq 32$.

- (a) Show that one of the inequalities is $2x + 3y \leq 48$. [2]

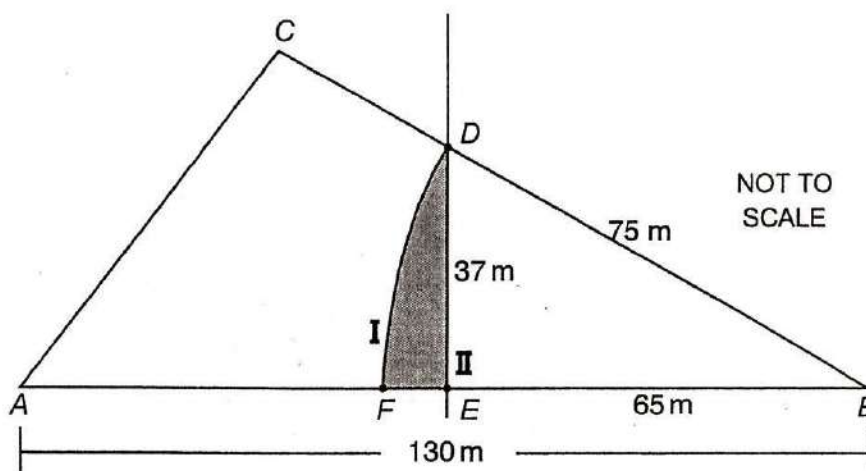
- (b) Draw the four inequalities to represent the required region. [3]



- (c) The objective function for profit is $P = 40x + 50y$. Find the maximum profit.

M..... [1]

- 15 The diagram shows a sketch of a plan for a park ABC .
 The arc FD (I) and line ED (II) represent the loci of points.
 $AB = 130\text{ m}$, $BE = 65\text{ m}$, $BD = BF = 75\text{ m}$ and $DE = 37\text{ m}$.



- (a) Measure and write the size of angle ABC .

.....° [1]

- (b) Complete the statements

Locus I : Locus of points that are

.....
[1]

Locus II : Locus of points that are

.....
[1]

- (c) Calculate the area of the shaded region.

.....m² [3]

- 16 A boy is standing on a tall building and throws a stone up.

The distance h of the stone is represented by the equation $h = -t^2 + 8t + 20$.

The corresponding values of h for the time taken are shown in the table.

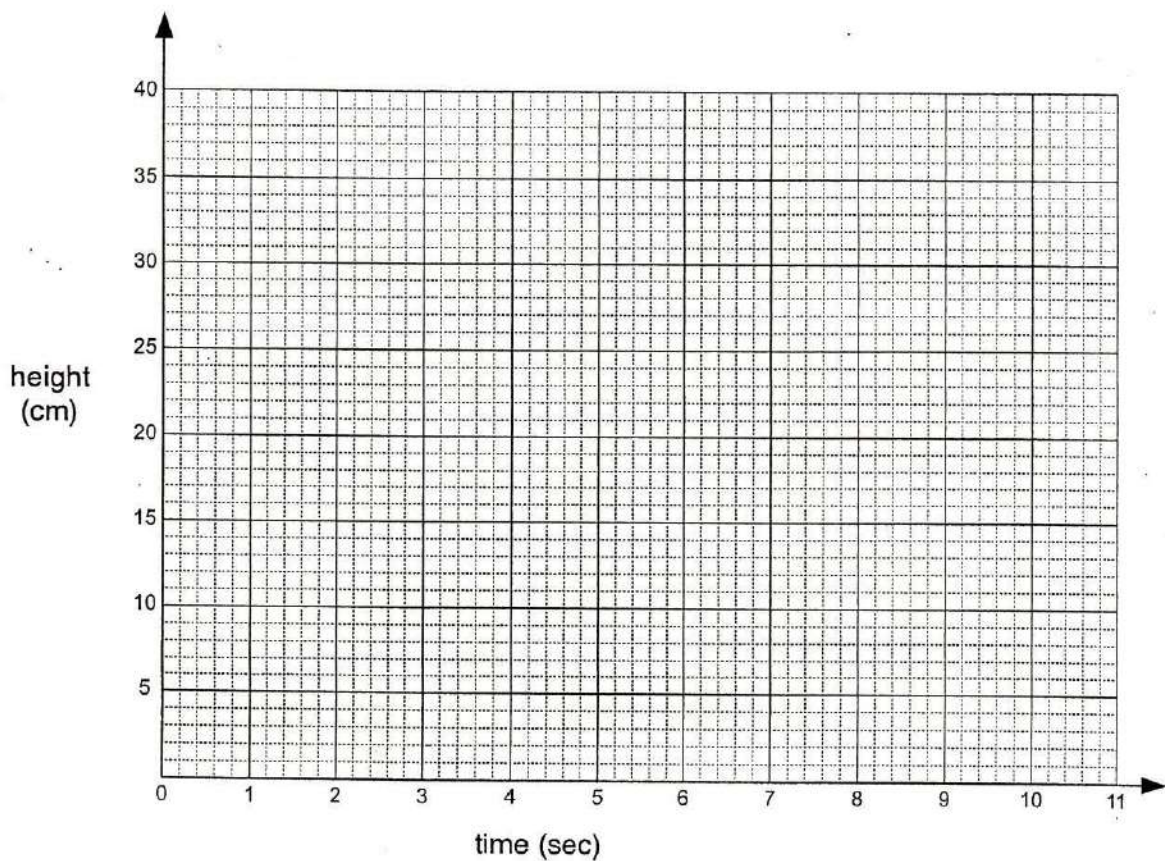
Time t (sec)	0	1	2	3	5	6	7	8	9
Height h (m)	20	27	32	35	35	32	27	20	

- (a) Complete the table.

[1]

- (b) Draw the graph of h for $0 \leq t \leq 9$.

[4]



- (c) Use the graph to find

- (i) the maximum height, above the building, the stone reaches,

..... [1]

(ii) the height of the stone, above the building, after 4 seconds.

..... [1]

(d) Draw a tangent at 7 seconds and find the estimate of gradient for the graph.

..... [3]

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