



MARANDA HIGH SCHOOL

MOCK EXAMINATIONS - JULY 2019

121/2
Paper 2

MATHEMATICS

Alt. A
July 2019 - 2½ hours

Name:

AdmNo:

Stream:

.....

Date.....Signature:

Instructions to candidates

- Write your name, admission number and stream in the spaces provided above.
- Sign and write the date of examination in the spaces provided above.
- This paper consists of **two** sections: **Section I** and **Section II**.
- Answer **all** the questions in **Section I** and only **five** questions from **Section II**.
- Show all the steps in your calculations, giving your answers at each stage in the spaces provided below each question.**
- Marks may be given for correct working even if the answer is wrong.
- Non-programmable** silent electronic calculators **and** KNEC Mathematical tables may be used, except where stated otherwise.
- This paper consists of 18 printed pages.**
- Candidates should check the question paper to ascertain that all the pages are printed as indicated and that no questions are missing.**
- Candidates should answer the questions in **English**

For Examiner's Use Only

Section I

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	Total

Section II

17	18	19	20	21	22	23	24	Total

Grand Total

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SECTION I (50 marks)

Answer **all** the questions in this section in the spaces provided.

1. Without using tables or calculators, evaluate $\sqrt{\frac{\log 4096}{1 + \frac{1}{2}\log 0.16 + \frac{1}{3}\log 8}}$ (3 marks)

2. By rationalizing the denominator, evaluate the following surds

(3marks) $\frac{\sqrt{2}}{\sqrt{2} - \sqrt{3}} - \frac{\sqrt{3}}{\sqrt{3} + \sqrt{2}}$

3. Make H the subject of the formula

(3marks)

$$\frac{f\sqrt{H}}{d} = \sqrt{\frac{a^2 - k}{H}}$$

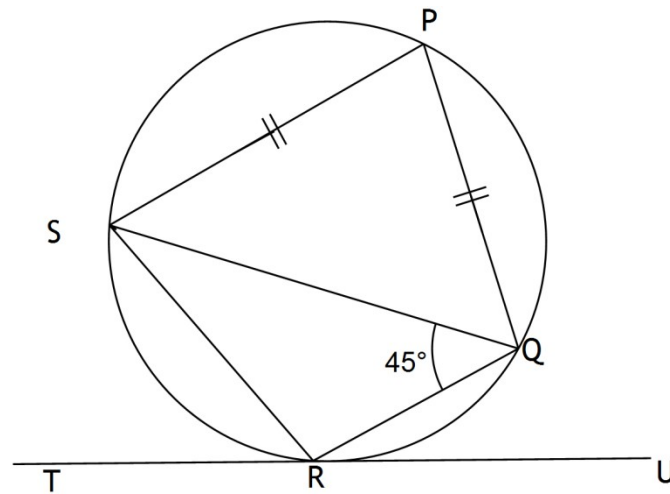
4. Ken truncated $\frac{7}{9}$ to 3 decimal places. Calculate the percentage error resulting from the truncation.
(2marks)
5. A point **P** divides the line **RT** in the ratio -2:5. Find the coordinates of **P** given **R**(3,1) and **T**(6,-5)
(3marks)
6. Two straight lines $x + 2y = -1$ and $2x + 3y = 3$ intersect at a point **R**. Find the equation of the circle, centre **R**, radius 5 units, giving your answer in the form $x^2 + y^2 + ax + by + c = 0$. (4marks)
7. A hot water tap **H** can fill a bathtub in 5 minutes while a cold water tap **C** can fill the same bath tab in 3 minutes. The drain pipe **D** can empty the full bathtub in $3\frac{3}{4}$

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minutes. Given that the bathtub is empty and that the two taps and the drain pipe are fully open for $1\frac{1}{2}$ minutes after which the drain pipe is closed, how much longer it will take to fill the bathtub? (3marks)

8. **P** varies partly as **Q** and partly inversely as the square of **Q**. Given that **P** = 7 when **Q** is either 1 or 2, find the value of **P** when $\mathbf{Q} = \frac{2}{3}$. (3marks)

9. In the figure below TRU is a tangent to the circle at point R and points P, Q, R and S lie on the circle such that $PS = PQ$, $\angle QRU = 30^\circ$ and $\angle RQS = 45^\circ$. Determine the size of angle;



a) SRQ

(1 mark)

b) TRS

(1 mark)

c) SPQ

(1 mark)

d) PSR

(1 mark)

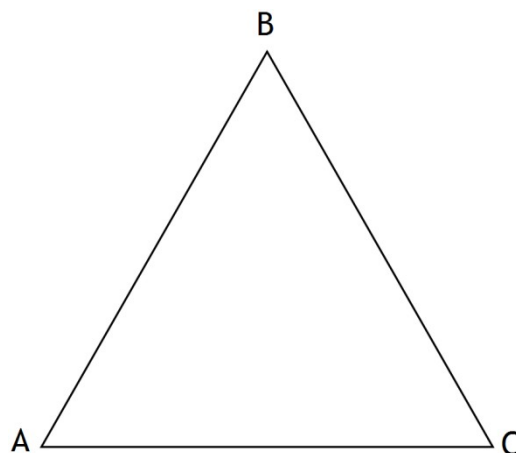
10. a) Expand and simplify the expression $\left(x + \frac{3}{x}\right)^5$
(1mark)

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- b) Use the first four terms of the expansion to evaluate $(10.3)^5$
(2marks)

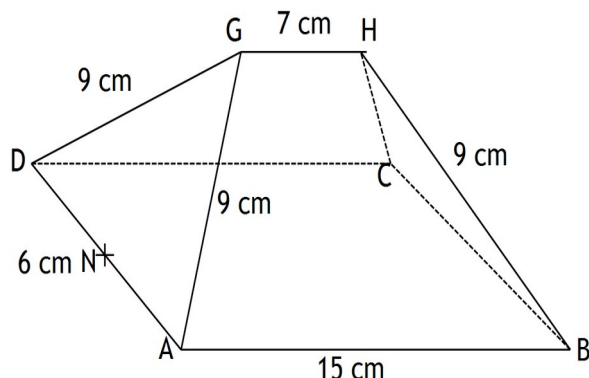
11. Solve the equation $8\sin^2 x^\circ = 7 - 2\cos x^\circ$ for $0^\circ < x < 360^\circ$.
(4marks)

12. The figure below drawn to scale represents a field in the shape of an equilateral triangle of sides 120m.



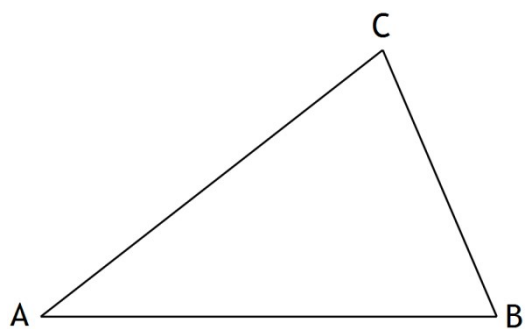
Mr. Zed wants to plant some tea seedlings in the field. The seedling must be at most 90m from A and nearer to B than to C. If no seedling is to be more than 60m from BC, show by shading, the exact region where the seedlings may be planted within the triangle. (3 marks)

- 13.** In the figure below ABCDGH is a rectangular based wedge with $AD = 6\text{ cm}$ and $AB = 15\text{ cm}$. The midpoint of AD is N and $DG = GA = BH = HC = 9\text{ cm}$. If $GH = 7\text{ cm}$, calculate the angle between planes ADG and the base ABCD. (3marks)

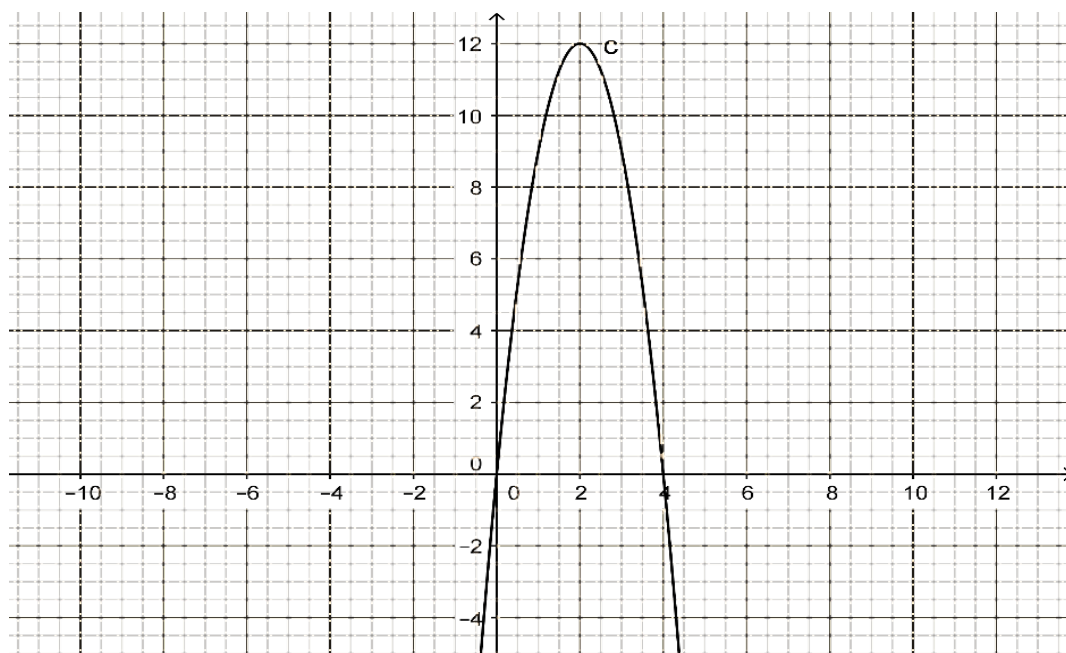


- 14.** On triangle ABC below, draw a circle touching the side BC, and AC and AB produced. (3marks)

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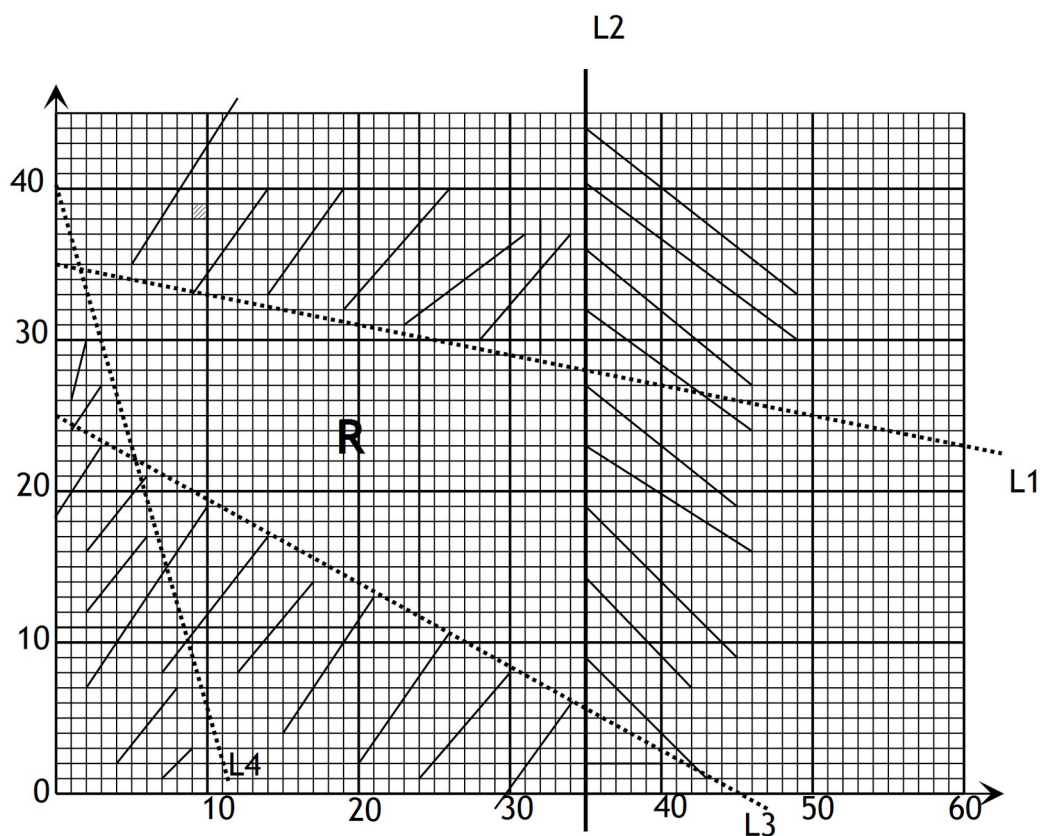


15. The graph below represent the function of $y = 3x(4-x)$.



Using the graph to estimate the roots of the equation $-3x^2 + 11x - 4 = 0$ (3marks)

16. The figure below shows a region defined by the inequalities L_1 , L_2 , L_3 and L_4 .



Draw a search line and use it to determine the:

a) The maximum value of $5x + 4y$ (2 marks)

b) The minimum value of $5x + 4y$ (1 mark)

SECTION II (50 marks)

Answer any **five** questions from this section in the spaces provided

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- 17.** A metal dealer cut a wire into pieces and arranged them on ascending order of their lengths. The shortest piece was 0.5 m and the longest was 15 m. The difference in length of successive pieces was 25 cm.

a) Determine:

(i) The total number of pieces cut
(2marks)

(ii) The length of the tenth piece
(2marks)

(iii) The total length of all the pieces
(2marks)

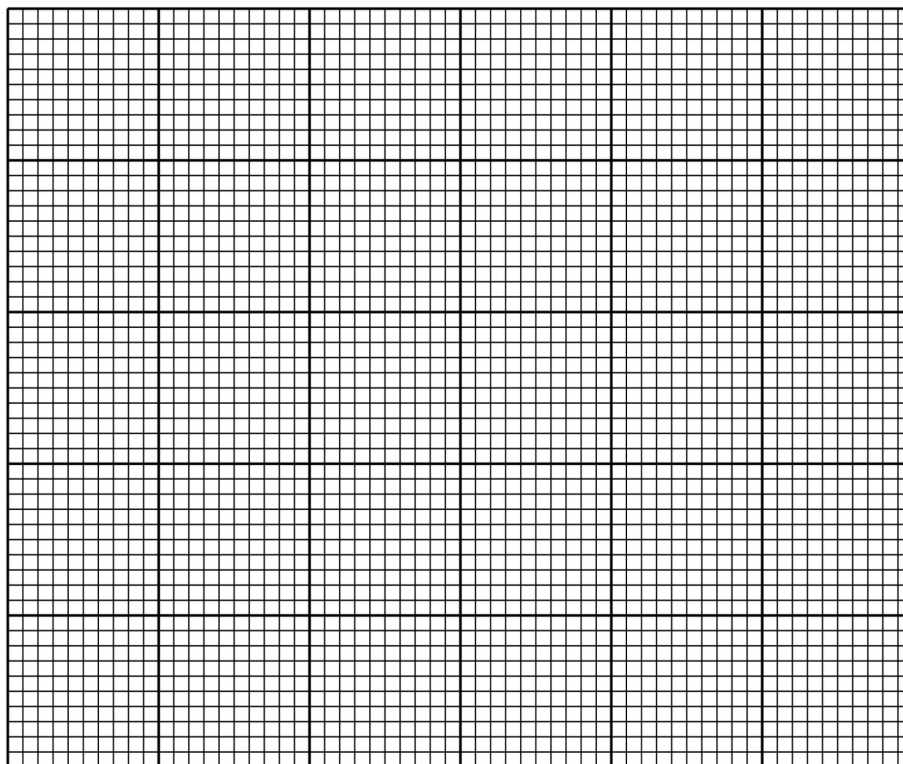
- b) Determine the number of pieces starting from the shortest, that will give a total length of 63 m.
(4 marks)

- 18.** In an experiment involving two variables P and T , the following results were obtained.

P	-0.8	-0.2	0.5	1	1.8	2	3	4	4.4
T	1	1.5	2	2.5	3	3.5	4	4.5	5

The relationship between P and T , is said to be of the form $P=rT-x$, where r is a constant.

- a) Plot the graph of P against T (4 marks)



- b) Using the graph above find:

(i) The value of r (3 marks)

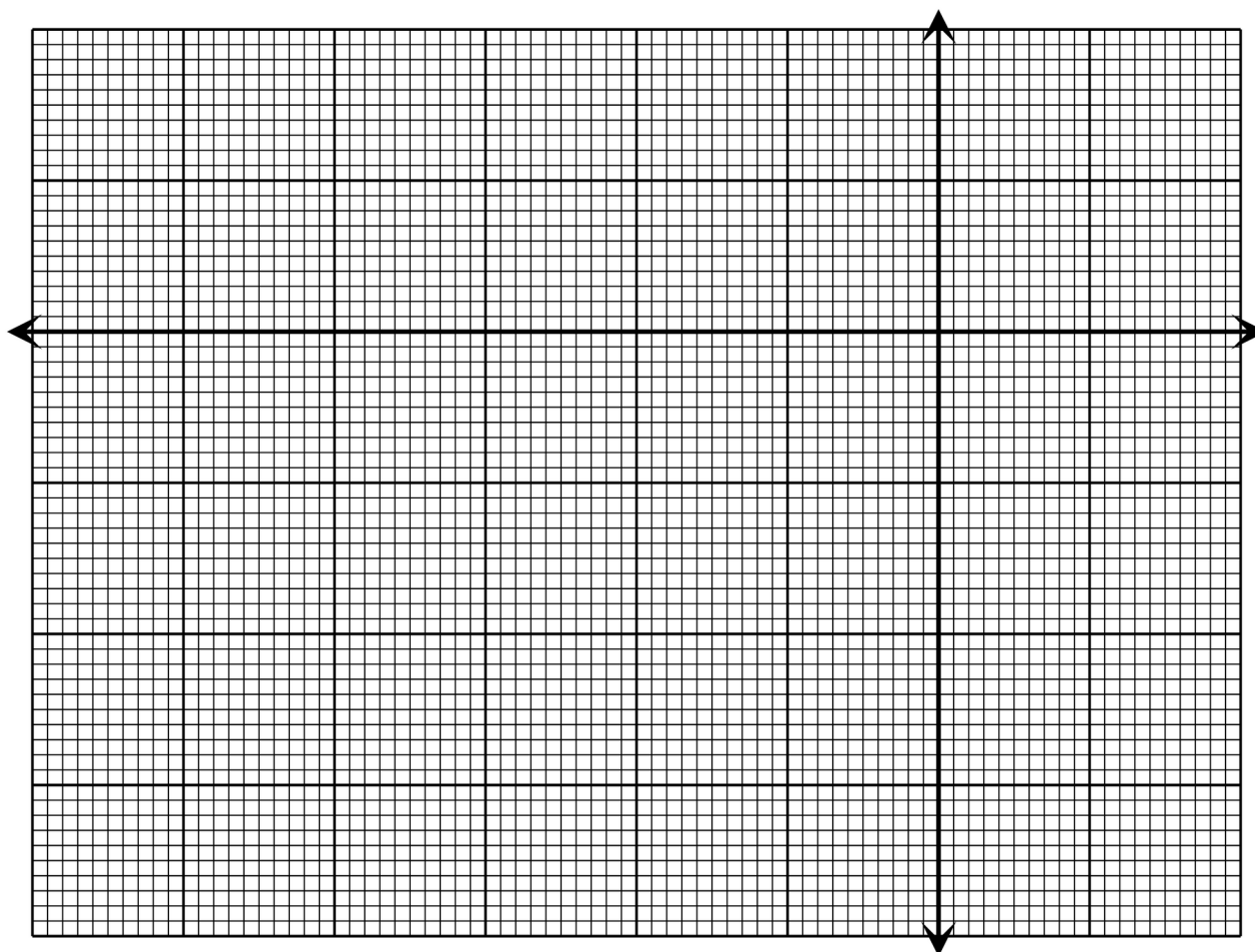
(ii) The vertical axis intercept. (1 mark)

- c) i) Write the equation connecting P and T (1 mark)

(ii) Hence find the value of P when T is 0.3 (1 mark)

19. The vertices of a square PQRS are P(1,1), Q(1,3), R(3,3) and S(3,1). The vertices of its image under a transformation T are P'(1,-2), Q'(1,-6), R'(3,-6) and S'(3,-2).

- a) (i) On the grid provided draw PQRS and its image $P'Q'R'S'$ under T. (2 marks)



- (ii) Describe fully the transformation T. (3 marks)

- (iii) Determine the matrix of transformation T (2 marks)

- b) On the same grid as in (a) above, draw the image of the square PQRS under a shear with line $y = -1$ invariant and $R(3,3)$ is mapped onto $R''(-5,3)$ (3 marks)

20. The positions of three ports A, B and C are $(34^\circ\text{N}, 16^\circ\text{W})$, $(34^\circ\text{N}, 16^\circ\text{E})$ and $(26^\circ\text{S}, 16^\circ\text{W})$ respectively.

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(a) Find the distance to the nearest nautical miles between

- (i) Ports A and B
(3 marks)

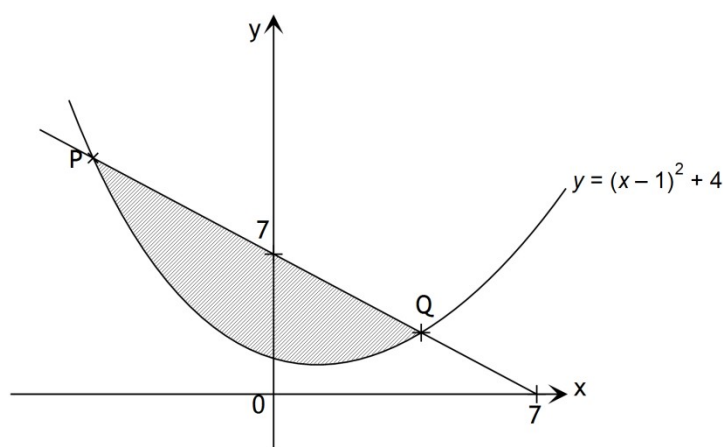
- (ii) Ports A and C
(2 marks)

(b) A ship left port A on Monday at 1330h and sailed to port B at 40 knots. Calculate the:

- (i) Local time at port B when the ship left port A
(2 marks)

- (ii) Day and time the ship arrived at port B.
(3 marks)

21. The diagram below shows a straight line intersecting the curve $y = (x - 1)^2 + 4$ at the points P and Q. The line also cuts the x-axis at (7, 0) and y-axis at (0, 7)



(a) Find the equation of the straight line in the form $y = mx + c$ (2marks)

(b) Find the co-ordinates of P and Q (4marks)

(c) Calculate the area of the shaded region. (4marks)

22. A jewelry room is guarded by three policemen X, Y, and Z. A thief on his way in has to pass X, Y and Z in that order. On his way out after stealing the jewelry he has to pass Z, Y and X in that order. The probability of being caught by X is $\frac{1}{3}$, Y is $\frac{1}{5}$ and Z is $\frac{1}{4}$, on his way in and X is $\frac{5}{6}$, Y is $\frac{2}{5}$ and Z is $\frac{2}{3}$ on his way out. Find the probability that;

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a) The thief is caught by policeman Z.
(4marks)

b) The thief is caught by Y on his way out.
(1mark)

c) The jewelry is stolen and the thief escapes.
(2marks)

d) The thief stole the jewelry but is caught on his way out.
(3marks)

23. The cash price of a radio cassette is Ksh.27,000. It can also be bought using either of the two plans below

PLAN A : A deposit of shillings 6,000 and 15 equal monthly instalments

PLAN B: 20 equal monthly instalments of shillings 1680 each.

a) If the total payment in plan A is 20% more than the cash price. Find the :
(i) Amount of each instalment (2marks)

(ii) Annual rate of interest

(3marks)

b) Find the annual rate of interest in **PLAN B**
(3marks)

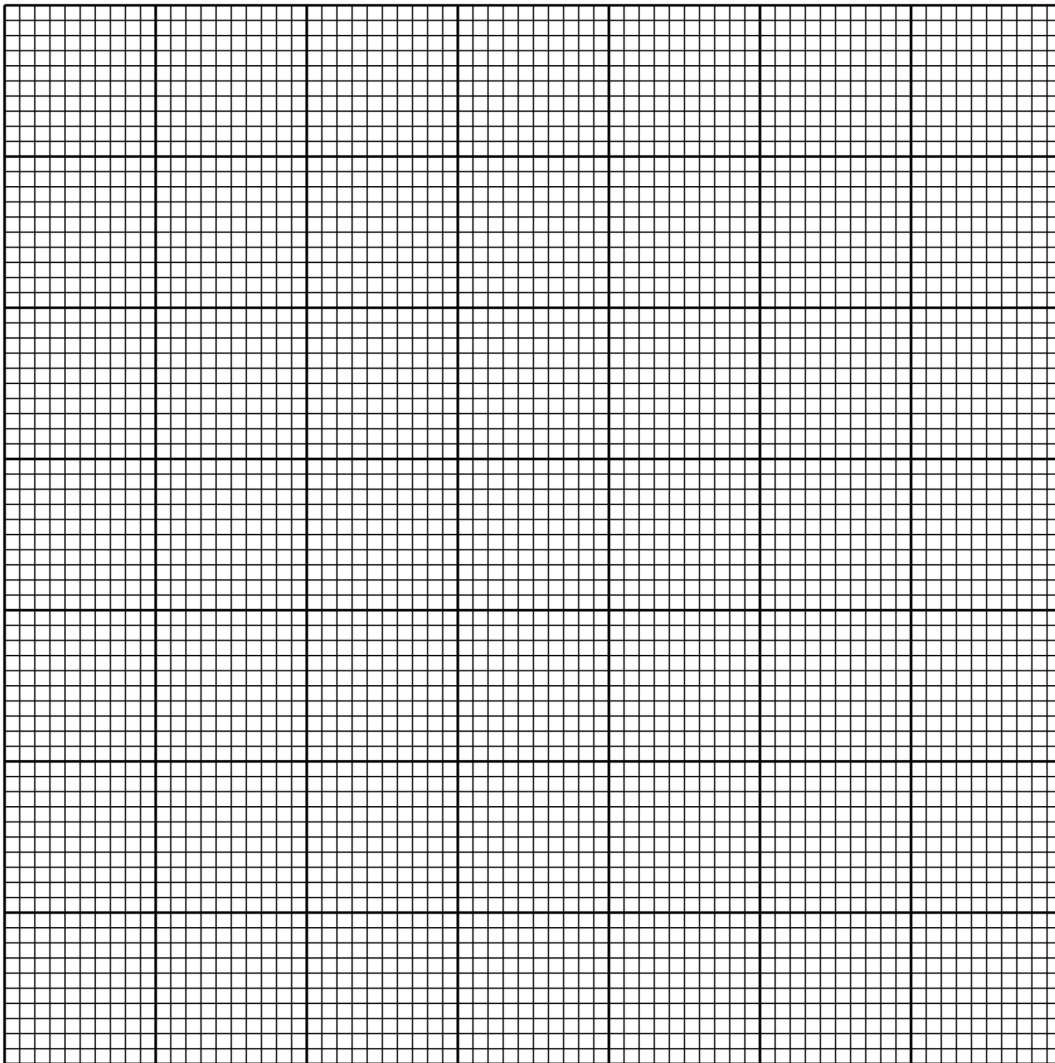
c) Which plan is cheaper and by how much

(2marks)

24. (a) Fill the table below for the curves given by $y = 3 \sin (2^\circ x + 30^\circ)$ and $y = \cos 2^\circ x$ for x values in the range $0 \leq x \leq 180^\circ$. (2marks)

x	0°	15°	30°	45°	60°	75°	90°	120°	150°	180°
$y = 3 \sin (2^\circ x + 30^\circ)$	1.50		3.00			0.00		-3.00		1.50
$y = \cos 2^\circ x$	1.00			0.00			-1.00		0.50	

(b) Draw the graphs of $y = 3 \sin (2^\circ x + 30^\circ)$ and $y = \cos 2^\circ x$ on same axes. Use a scale of 1cm to represent 15° on the x axis and 1cm to represent 0.5 units on the y axis (5marks)



(c) Use your graph to solve the equation $3 \sin(2^x + 30^\circ) = \cos 2^x$.
(2marks)

(d) Determine the following from your graph:

(i) Amplitude of $y = 3 \sin(2^x + 30^\circ)$.

(1mark)

(ii) Period of $y = 3 \sin(2^x + 30^\circ)$.

(1mark)

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