

NAIROBI SCHOOL

121/1 – MATHEMATICS – Paper 1 ALT A

END OF TERM 1 EXAMINATIONS

April, 2023 – 2½ hours

Name: Admission Number:

Candidate's Signature: Date: Class:

Instructions to Candidates

- Write your name, Index Number and Admission number and Class in the spaces provided at the top of this page.
 - 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 questions in Section I and only five questions from Section II
 - Show all the steps in your calculations, giving your answer at each stage in the spaces 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.
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For Examiners 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. Evaluate, without using a calculator:

(3 marks)

$$\frac{10\%}{1\frac{4}{5} \div \frac{2}{3} \text{ of } 2\frac{1}{4} - \frac{3}{10}}$$

2. Solve for x, given:

(3 marks)

$$\frac{\sin(3x - 15)}{\cos(x + 15)} = \frac{1}{1}$$

3. The line AB drawn below is part of a triangle ABC, in which AC = 6.8 cm and $\angle CAB = 55^\circ$.

(a) Complete triangle ABC.

(1 mark)

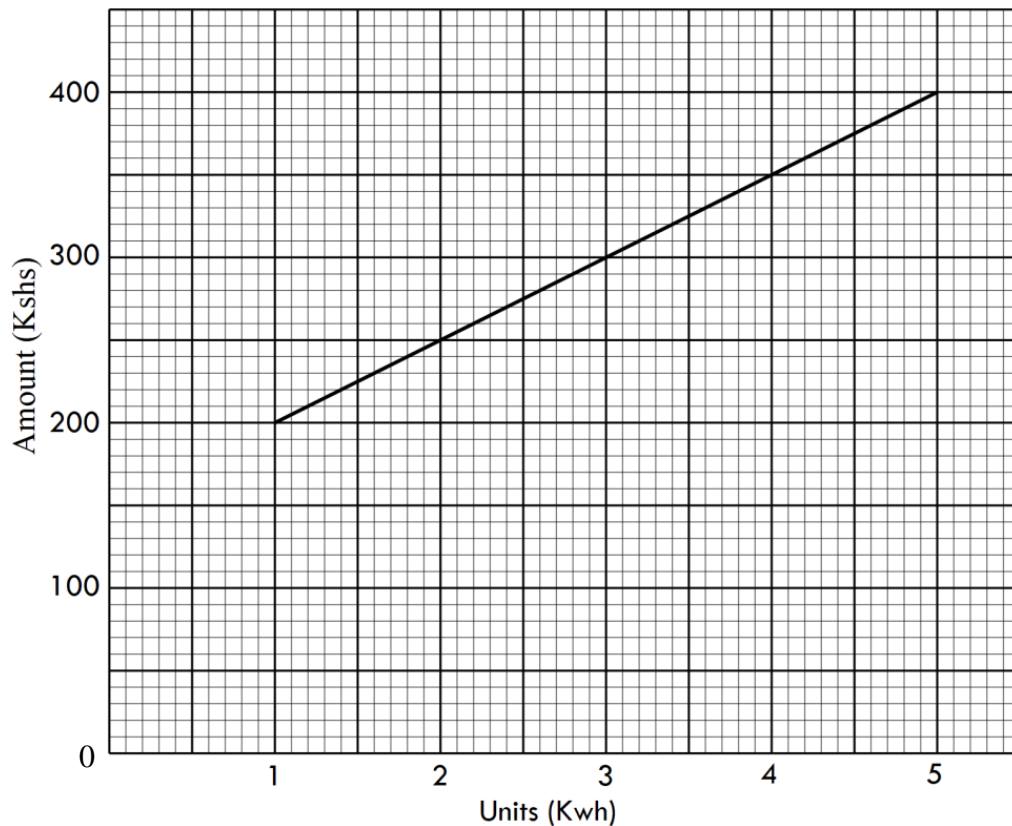
(b) Using a ruler and compasses only, locate a point P on \overline{AB} such that AP:PB = 3:1.
Measure CP.

(2 marks)



4. Hanna, a saleslady earns a basic salary of Ksh. 20000 per month. She is also given a commission of 12% on sales of goods above Ksh 100000. In a certain month, her total earnings were Ksh. 46400. Calculate the goods sold that month. (4 marks)

5. The graph below shows the relationship between the electricity bill (in Ksh.) and the number of units consumed (in kilowatt hours)



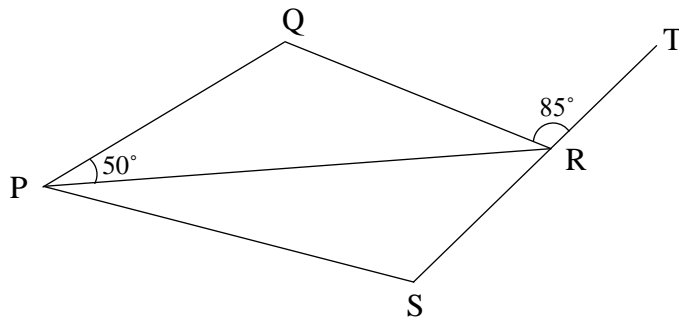
Use a graph to determine the

- (a) fixed charge of the bill. (1 mark)

- (b) cost per unit of the consumption (2 marks)

6. Given the number 4,827,627,932.
- (i) Round it off to the nearest thousand (1 mark)
- (ii) State the total value of digit six (6) in the number. (1 mark)
- (iii) State the place value of the fourth digit. (1 mark)

7. The figure below shows a cyclic quadrilateral PQRS. Given that SRT is a straight line, $\angle QRT = 85^\circ$ and $\angle QPR = 50^\circ$, determine the size of $\angle SQR$. (3 marks)



8. The floor of a room is in the shape of a rectangle of side 10.5m long and 6.0m wide. Square tiles of length 30cm are to be fitted on the floor. Calculate the number of tiles need to fill the floor. (3 marks)

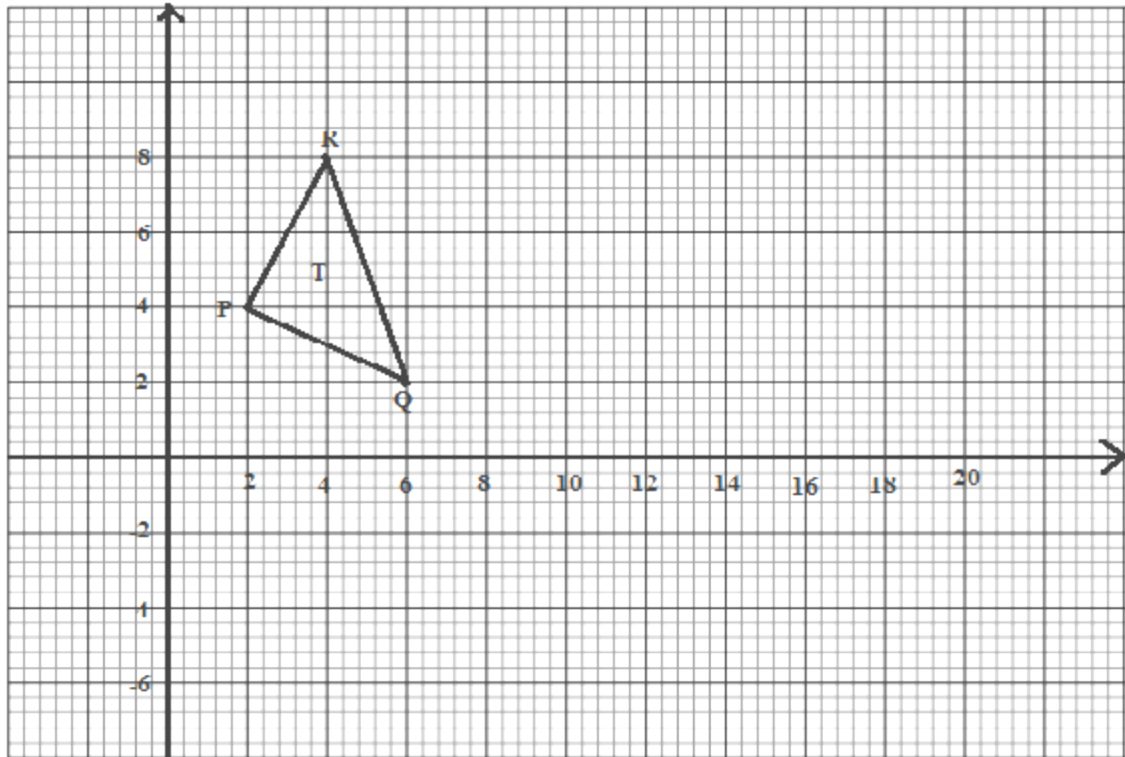
9. Solve the equation: $8^x + 3 = 35$

(2 marks)

10. The figure below shows triangle T with vertices P(2,4), Q(6,2) and R(4,8). It is mapped onto triangle T¹ with vertices P¹(10,0), Q¹(8,-4) and R¹(14,-2) by a rotation.

(a) Draw on the same axis T¹, the image of triangle T.

(1 mark)



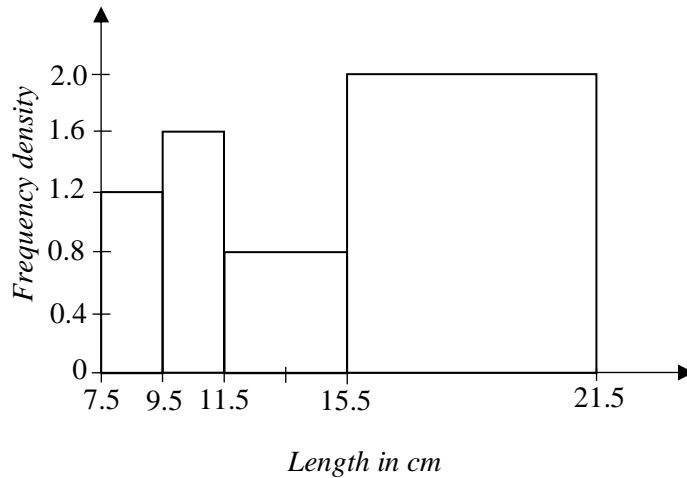
(b) By construction, determine the centre and angle of rotation.

(2marks)

11. Find the number of revolutions made by a cylindrical roller of diameter 1.02 m and thickness 1.3 m, if it rolls over a surface area of 291.72 m^2 . (Take $\pi = \frac{22}{7}$)

(3 marks)

12. The figure below shows a histogram.



Fill in the table below the missing frequencies.

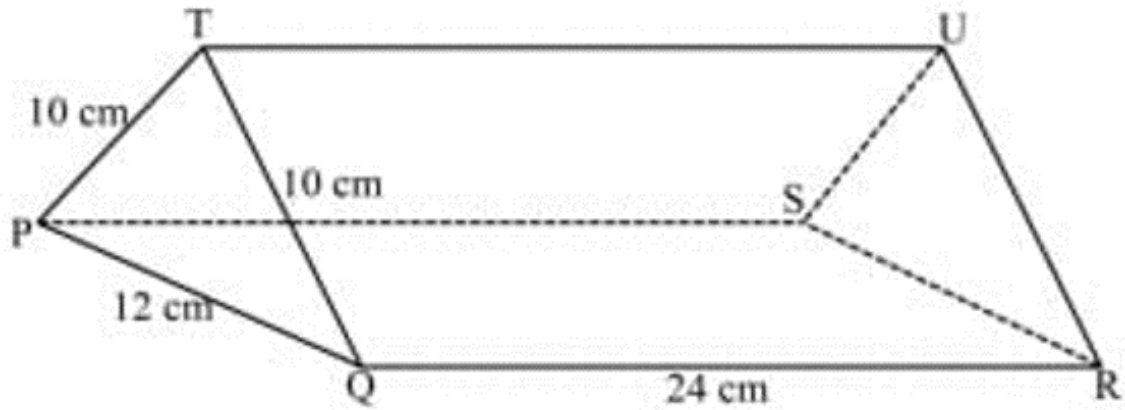
(3 marks)

Length in cm	Frequency
$7.5 \leq x \leq 9.5$	12
$8.5 \leq x \leq 11.5$	
$11.5 \leq x \leq 15.5$	
$15.5 \leq x \leq 21.5$	

13. Port L is 120 km on a bearing of $S30^\circ W$ from Port K. A ship left Port K at 1000h and sailed at a speed of 40 km/h along the bearing of $S60^\circ E$.

Using a scale of 1:2000000, determine the compass bearing of the ship from Port L at 1400h. (4 marks)

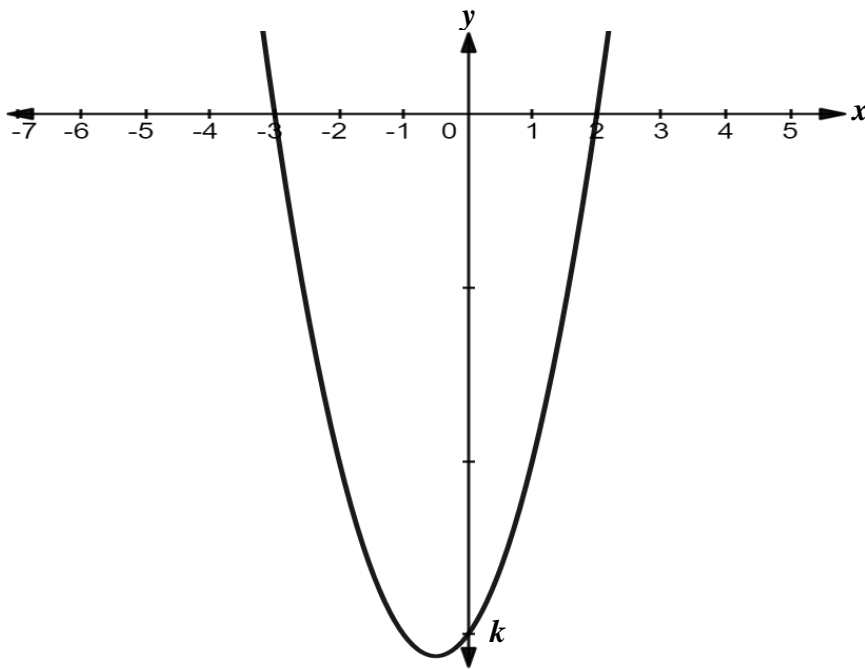
14. The roof of a ware house is in the shape of a triangular prism as shown below



Calculate the angle between the plane QUP and PQRS, correct to 2 d.p. (4 marks)

15. 1000 cm^3 of milk was shared by three children, Arlette, Kellan and Monna in the ratio $\frac{1}{4} : \frac{1}{2} : \frac{1}{5}$. Determine which child got the highest share, and how much. (3 marks)

16. The graph (not drawn to scale) is a plot for the function $y = ax^2 + bx + k$, where a , b and k are constants. Determine the values of a , b and k . (3 marks)



SECTION II (50 MARKS)

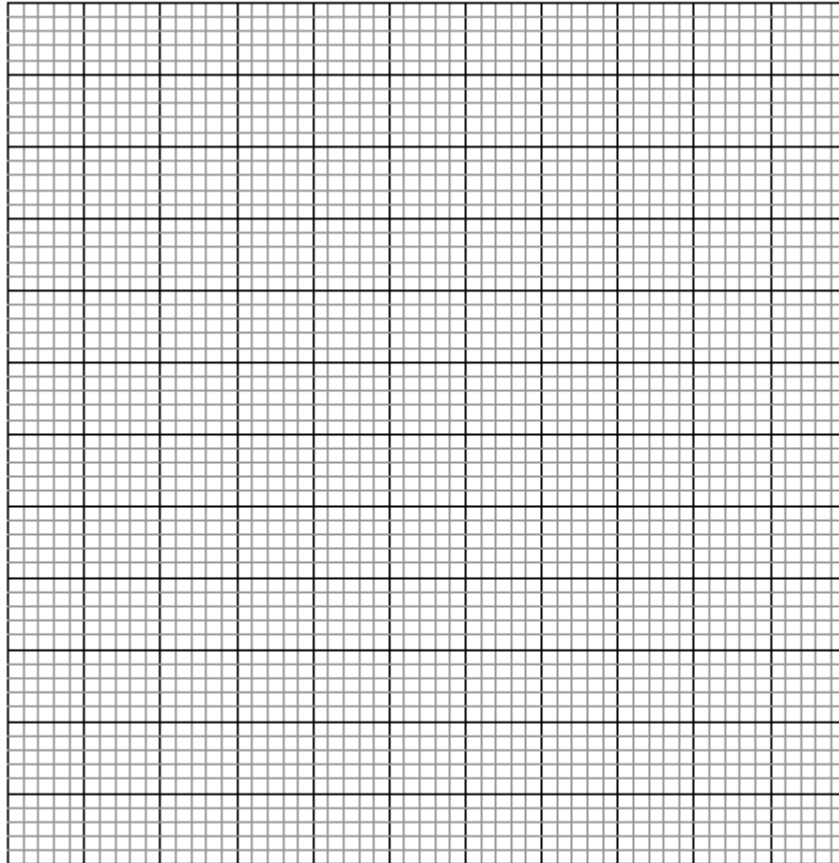
Answer only five questions from this section in the spaces provided.

17. Soda depot had 30,816 sodas which were packed in crates. Each crate contained 24 sodas. The mass of an empty crate was 2kg and that of a full crate was 12kg.
- a) How many crates were there? (2 marks)
- b) What was the total mass of empty crates? (2 marks)
- c) What was the total mass of sodas alone? (3 marks)
- d) A lorry was hired to transport the crates at a cost of Ksh. 5 per crate of soda per trip. The lorry could only carry 107 crates per trip. How much money was spent on transporting all the crates? (3 marks)

18. (a) Two towns, A and B, are 120 km apart. A minibus leaves town A at 9:00 a.m. and travels towards town B at an average speed of 80 km/h. at the same time, a truck leaves town B and travels towards town A along the same road at an average speed of 60 km/h.

Using a scale of 4 cm represents 1 hour on the x-axis and 1 cm represents 10 km on the y-axis, draw distance-time graph to the two vehicles on the same axes.

(4 marks)



From the graph, determine:

- (ii) The time the two vehicles met. (1 mark)

- (iii) The distance the minibus had travelled before meeting the truck. (1 mark)

(b) Two towns P and Q are 80 km apart. Juma started cycling from town P to town Q at 10.00 a.m. at an average speed of 40 km/h. Mutuku started his journey from town Q to town P at 10.30 a.m. and travelled by car at an average speed of 60 km/h. Calculate the distance from town P when Juma and Mutuku met. (4 marks)

19. Below is a travel timetable for a vehicle operating between towns A and D 70 km apart.

Town	Arrival	Departure
A		12:25 a.m.
B	12:45 a.m.	12:58 a.m.
C	1:15 a.m.	1:33 a.m.
D	1:55 a.m.	

- (a) Convert the departure time from town A to 24-hour system (1 mark)
- (b) How many hours does it take to travel from town A to town C? (2 marks)
- (c) How long does it stay in town C? (1 mark)
- (d) How long before 6:00 a.m. does it arrive in town D. (2 marks)
- (e) What is the average speed for the whole journey? (2 marks)
- (f) Calculate the fare a passenger pays from A to D if the cost per kilometer is Ksh. 8. (2 marks)

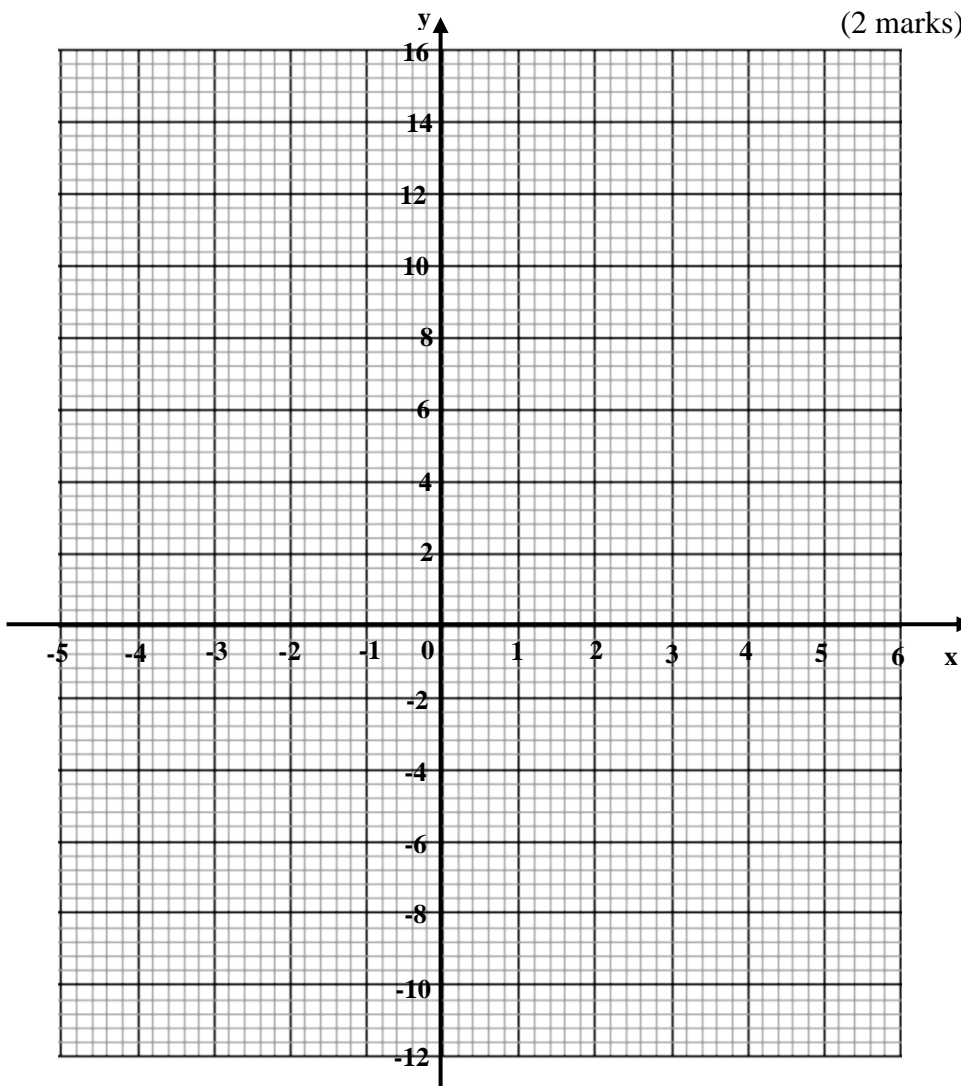
20. The equation of the curve is given by $y = -x^2 + x + 12$.

(a) Complete the table for the integral values in the domain/range given. (1 mark)

x	-4	-3	-2	-1	0	1	2	3	4	5
y	-8	0		10		12				-8

(b) On the grid provided, draw the graph of $y = -x^2 + x + 12$ for $-4 \leq x \leq 5$.

(2 marks)



(c) Use the graph to solve:

(i) $y = -x^2 + x + 12 = x + 8$ (2 marks)

(ii) $0 = -2x^2 + 6x + 10$. (2 marks)

(d) From the graph: -

(i) state the range of values for which $-x^2 + x + 12 \geq 0$ (1 mark)

(ii) estimate the coordinate of the turning point of the curve $y = -x^2 + x + 12$. (1 mark)

(iii) write down the equation of the line of symmetry of the curve drawn in (b) above. (1 mark)

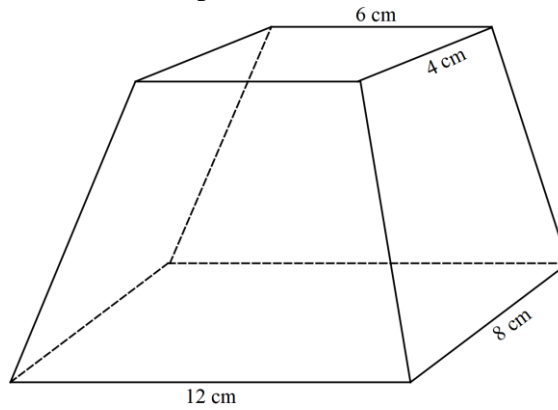
21. (a) A straight l_1 passes through A(3,0) and B(0,4). Another line, l_2 has the equation $x - y = 0$. P is the point of intersection of l_1 and l_2 .

(i) Find the equation of line l_1 in the form $ax + by + c = 0$ where a , b and c are integers. (3 marks)

(ii) Find the coordinates of P. (3 marks)

(c) A straight line through the points (4,5) and (2,2) meets the x-axis and y-axis at points P and Q, respectively. Determine the acute angle the line makes with the axis at point Q. (4 marks)

22. The figure below shows a frustum of a right pyramid whose top face is a rectangle of sides 4cm by 6cm and the bottom face is a rectangle of sides 8cm by 12cm. The perpendicular distance between top and bottom is 20cm.



- (a) Calculate,
- (i) the height of the original pyramid. (2 marks)

 - (ii) the length of any slant edge, to 2 d.p. (3 marks)
- (b) Hence, calculate the: -
- (i) the surface area of the frustum to 2 d.p. (3 marks)

 - (ii) the volume of the frustum. (2 marks)

23. A trader bought 2 cows and 9 goats for a total of Ksh. 98,200. If she had bought 3 cows and 4 goats, she would have spent Ksh. 2, 200 less.

(a) Form two equations to represent the above information. (2marks)

(b) Determine the cost of a cow and that of a goat. (4marks)

(c) The trader later sold the animals she had bought making a profit of 30% per cow and 40% per goat.

i) Calculate the total amount of money she received. (2marks)

ii) Determine, correct to 4 significant figures, the percentage profit the trader made from the sale of animals. (2marks)

24. A national reserve is in the shape of a polygon with straight edges measuring 325km by 125km by 300km.

(a) Calculate:

(i) The area occupied by the reserve in hectares. (4 marks)

(ii) The distance, in km, from the centre to the farthest corner of the reserve. (3 marks)

(b) Determine the maximum number of elephants the reserve can accommodate if one elephant requires a minimum of 200m^2 of grazing land. (3 marks)

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