NAME………………………………………………............. INDEX NO……......…………………..

121/2   CANDIDATE'S SIGNATURE…………………
MATHEMATICS ALT A
PAPER 2   DATE……………………………………….
March/April, 2015
TIME: 2½ hours

LAINAKU I YEAR 2015 FORM FOUR JOINT TRIAL EXAM

Kenya Certificate of Secondary Education
MATHEMATICS ALT A
PAPER 2
TIME: 2½ hours

<u>**INSTRUCTIONS TO CANDIDATES:**</u>
(a) Write your name, admission and class in the spaces provided at the top of this page.
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*(c) This paper consists of **TWO** Sections; **Section I** and **Section II.***
*(d) Answer **ALL** the questions in **Section I** and only **five** questions from **Section II**.*
*(e) **Show all the steps in your calculation, giving your answer at each stage in the spaces provided below each question.***
(f) Marks may be given for correct working even if the answer is wrong.
*(g) **Non-programmable** silent electronic calculators **and** KNEC Mathematical tables may be used except where stated otherwise.*
*(h) **This paper consist of 14 printed pages**.*
*(i) **Candidates should check the question paper to ascertain that all the pages are printed as indicated and that no questions are missing***
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<u>**FOR EXAMINER'S USE ONLY:**</u>

SECTION I

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

SECTION II   **GRAND TOTAL**

17	18	19	20	21	22	23	24	TOTAL

Page **1** of **15**

SECTION 1 (50 marks)

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

1. Use logarithms table to evaluate. (4mks)

$$\left(\frac{7.627 \times 0.3734}{log4.8}\right)^{-\frac{1}{2}}$$

2. Make P the subject of the formula given. (3 Marks)

$$d = \sqrt[3]{\frac{p^2 - 2q}{q - p^2}}$$

3. Expand and Simplify $(1 - 5x)^5$ up to the term in x^3 (2mks)

    Hence use your expansion to estimate $(0.95)^5$ correct to 4 decimal places (2mks)

4. Find, without using mathematical tables the values of x which satisfy the equation (4marks)
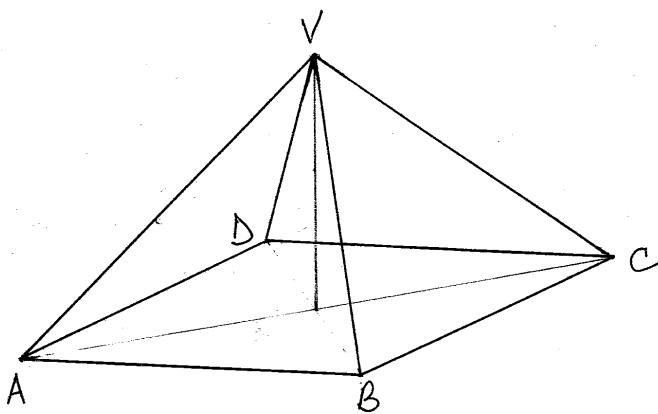 $$log_2(x^2 - 9) = 3log_2 2 + log_2 x$$

5. Solve the following inequality and list down the integral values. (3 marks)

$$\frac{1}{2}x + 2 \leq 5 - \frac{1}{4}x < \frac{6}{8}x + 8$$

6. The diagram below represents a right pyramid on a square base of sides 4cm. The slant edge of the pyramid is 4.1cm.

(a) Draw the net of the pyramid (2mks)

(b) Using the net, calculate the surface area of the pyramid (1mks)

7. Two similar bags A and B each contain a mixture of red and blue balls. Bag A contains 6 red balls and 4 blue balls while bag B contains 3 red balls while and 7 blue balls.
   A bag is selected at random and two balls are picked at random from it
   a) Draw a probability tree diagram to illustrate this information. (1 Mark)

   b) Find the probability that at least a blue ball picked is blue. (2 Marks)

8. Given that $\dfrac{3}{2-\sqrt{8}} - \dfrac{2}{2+\sqrt{8}} = a + b\sqrt{c}$. Find the values of a, b and c. (3 marks)

9. The points with coordinates (13,3) and (-3,.-9) are the ends of a diameter of a circle
   Centre A
   Determine:
   (a) The coordinates of A (1mk)

   (b) The equation of the circle, expressing it in form $x^2 + y^2 + ax + by + c = 0$ Where a, b, and c are constants (2mks)

10. Determine the inverse of the matrix $A = \begin{bmatrix} 2 & 3 \\ 1 & 2 \end{bmatrix}$.

   Hence find the co-ordinates to the point at which two lines $2x+3y = 17$ and $2x+4y=20$ intersect.

   (3 marks)

11. A man invest a certain sum of money at 16% compound interest semi-annually. Find the number of years, to the nearest year it takes to triple the money. (4 marks)

12. A rectangular room was measured and its measurement was found to be 40m by 80m to the nearest metre. Calculate the percentage error in working out its area. (2 marks)

13. A triangle ABC is such that AB=10cm, BC=12cm,K divides AC in the ratio 1:1 and angle ABC=120^0. Calculate the length of AK. (3 marks)

14. AC is a tangent to the circle given below (not drawn to scale) at B. ED is a chord to the same circle extended to meet tangent AC at C. Given that BC = 6.4cm and ED = 9.6cm, then find EC.

(3 Marks)
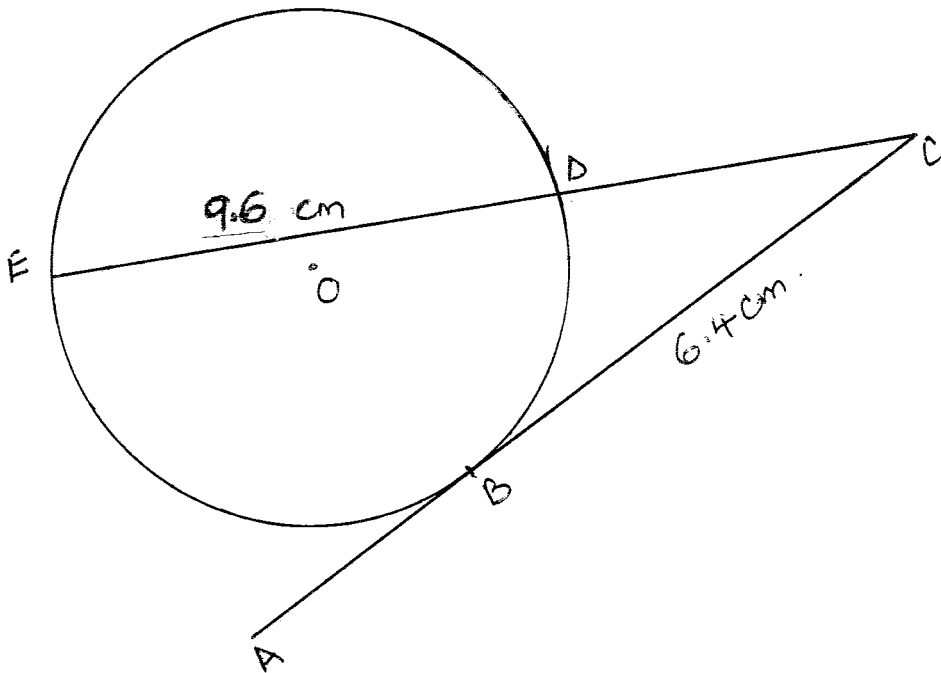
15. The masses of two similar bars of soap are 2560g and 5000g. If the surface area of the smaller bar is 256 cm². Calculate the surface are of the larger bar.

(3 marks

16. Use ruler and a pair of compasses only in this question
   a) Construct triangle ABC such that AB = 6cm, AC=BC and angle ACB = 120^0 2mks
   b) On one side only construct the locus of P such that $\angle APB = 60^0$ 1mks

SECTION 11 (50 marks)
Answer only five questions from this section in the spaces provided.

17. An aircraft leaves town A (60°S, 62°E) and moves directly northwards to B(60°N, 62°E). It then moved at an average speed of 480 knots for 8 hours westwards to town C. Determine;

a) The distance AB in kilometers. Take $\pi = \frac{22}{7}$ and the radius of the earth as 6,370 Km. in.

(3 marks)

b) The position of town C. (3 marks)

c) The local time at C if local time at A is 5.30p.m (2 marks)

    d)   The total distance moved from A to C in nautical miles   (2 mks)

18. Three quantities A B and C are such that A varies directly as the square root of B and inversely as the square of C.
    a)   Given that A=4 when B=64 and C=5, find
         a.   The law connecting A B and C   (4mks)

         b.   A when B=16 and C=10.   (2mks)

    b)   If B is increased by 44% and C decreases by 20%, find the percentage change in A.
   (4 Marks)

19. Three taps A, B and C can take 6 minutes, 24 minutes and 36 minutes respectively to fill a water tank. Tap D alone can take 72 minutes to empty the whole tank. Starting with an empty tank all the taps A, B, C and D are opened together for 1 ½ minutes. Tap C and D are then closed while A and B are left to continue for the next 1 minute and 12 seconds. After the 1 minute and 12 seconds taps A and B are closed while C and D are re-opened to continue for the rest of the time until the water tank is full. Determine:

(a) The portion of the tank filled during the first one minute if all the taps are opened. (2 mks)

(b) Portion filled after 2 minutes and 42seconds. (5 marks)

(c) Time taken to fill the water tank completely. (3 marks)

20. The diagram below shows a right pyramid VABCD. The base of pyramid is a rectangle ABCD, with AB = 12CM and BC= 5CM. The height of the pyramid is 8 cm.
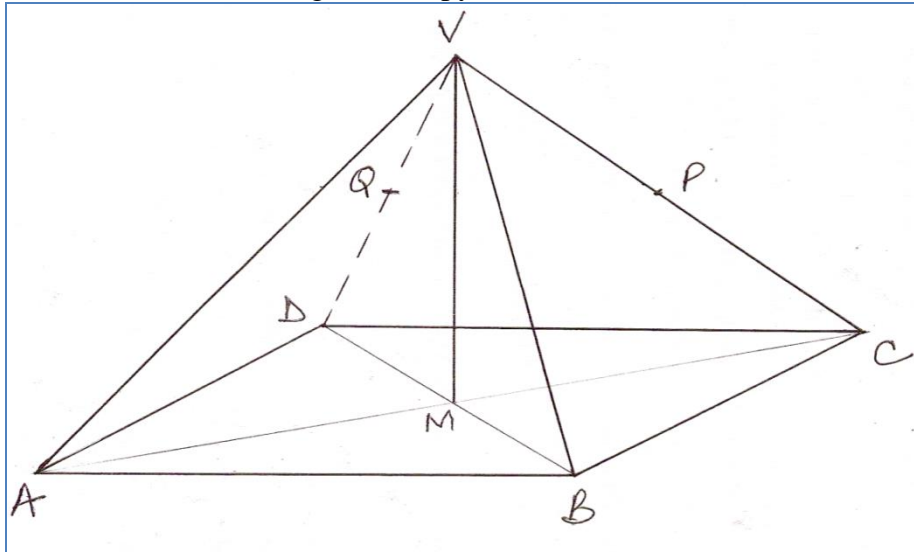
a) Calculate the
   i) Length AC.   (2 mks)

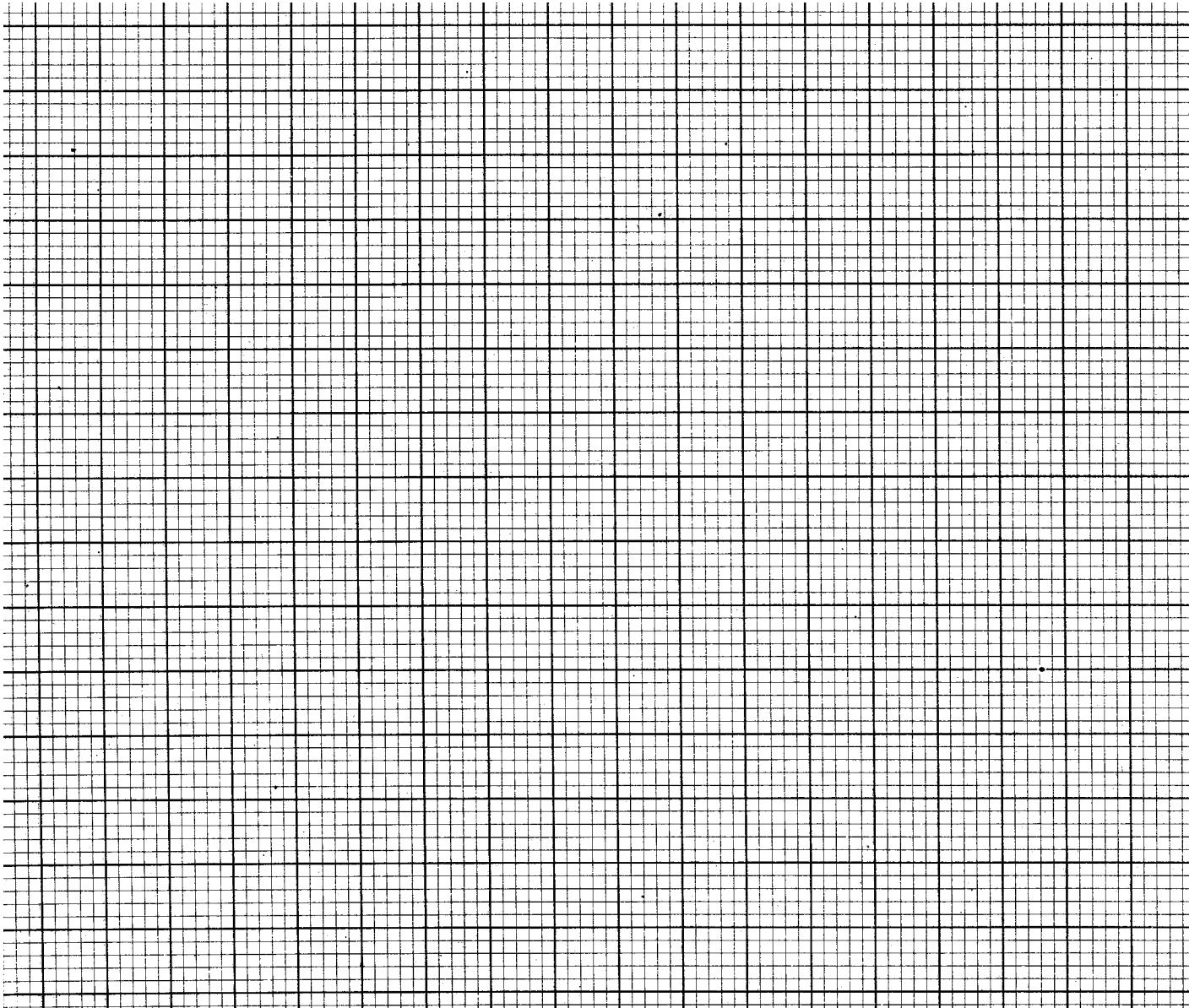   ii) The angle VA makes with the plane ABCD.   (2 mks)

   iii) Angle between the face VAB and the base.   (2mks)

b) P is the midpoint of VC and Q is the midpoint of VD. Find the angle between the plane VAB   and the plane ABPQ.   (4 mks)

21. The data below shows the masses in grams of 70 passion fruits.

Mass	1-10	11-20	21-30	31-40	41-50	51-60	61-70
f	3	8	14	19	14	9	3

a)   On the grid provided above, draw a cumulative frequency curve for the data.   (4 marks)

Use the graph in (a) above to determine
   i)   The 60th percentile   (1 mark)

   ii)   The quartile deviation   (3 marks)

        iii)   The percentage of passion fruits to the nearest two decimal places whose masses lie in the range 21.5g to 58.5g.   (2 marks)

22. The third, fourth and fifth terms of a G.P are 2^{2x+2}, 128 and 4^{3x} respectively.

    a.   Calculate the value of x   (2mks)

    b.   Find the common ratio of the series.   (2mks)

    c.   Calculate the sum of the first 10 terms of the series.   (3mks)

    d.   Given that the 2nd and 3rd terms of the G.P in (a) above form the first and the second terms of an A.P Calculate the sum of the first 30 terms of the A.P.   (3mks)

23. A quadrilateral ABCD is such that the vertices area A (1, 2), B (6,2), C (4,4) and D (2,4).

(a) $A'B'C'D'$ is the image of $ABCD$ under the transformation $\begin{pmatrix} 0 & -1 \\ 1 & 0 \end{pmatrix}$. On the grid provided below. draw the quadrilateral ABCD and its image $A'B'C'D'$. (3 marks)
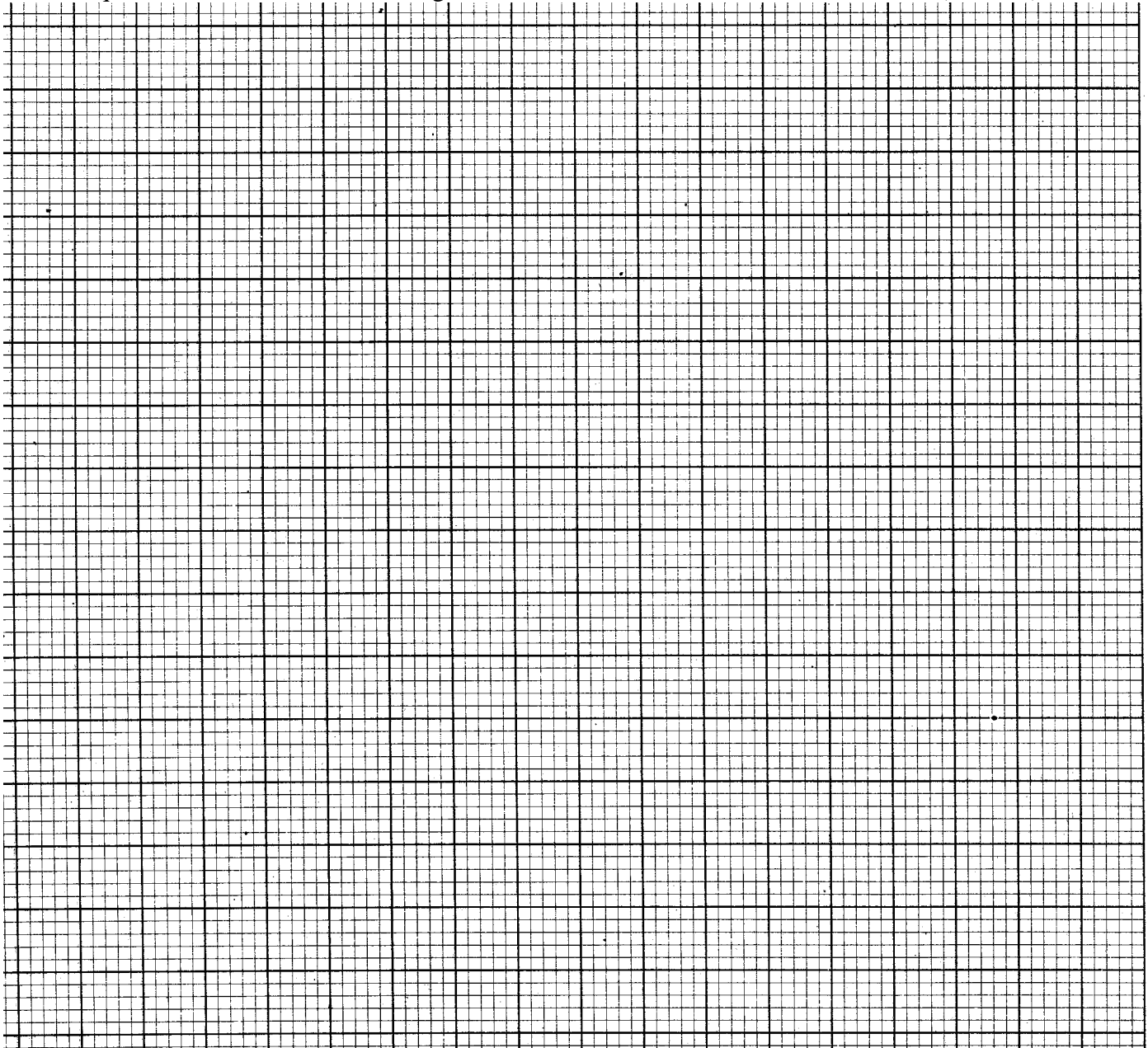
(a) $A''B''C''D''$ is the image of $A'B'C'D'$ under the transformation $\begin{pmatrix} 0 & 1 \\ 1 & 0 \end{pmatrix}$. On the same grid draw the image $A''B''C''D''$. (3 marks)

(b) Point $A''(6,-2)$ is mapped onto $A'''(2,-2)$ by a shear y axis invariant.

(i) Determine the shear matrix (2 marks)

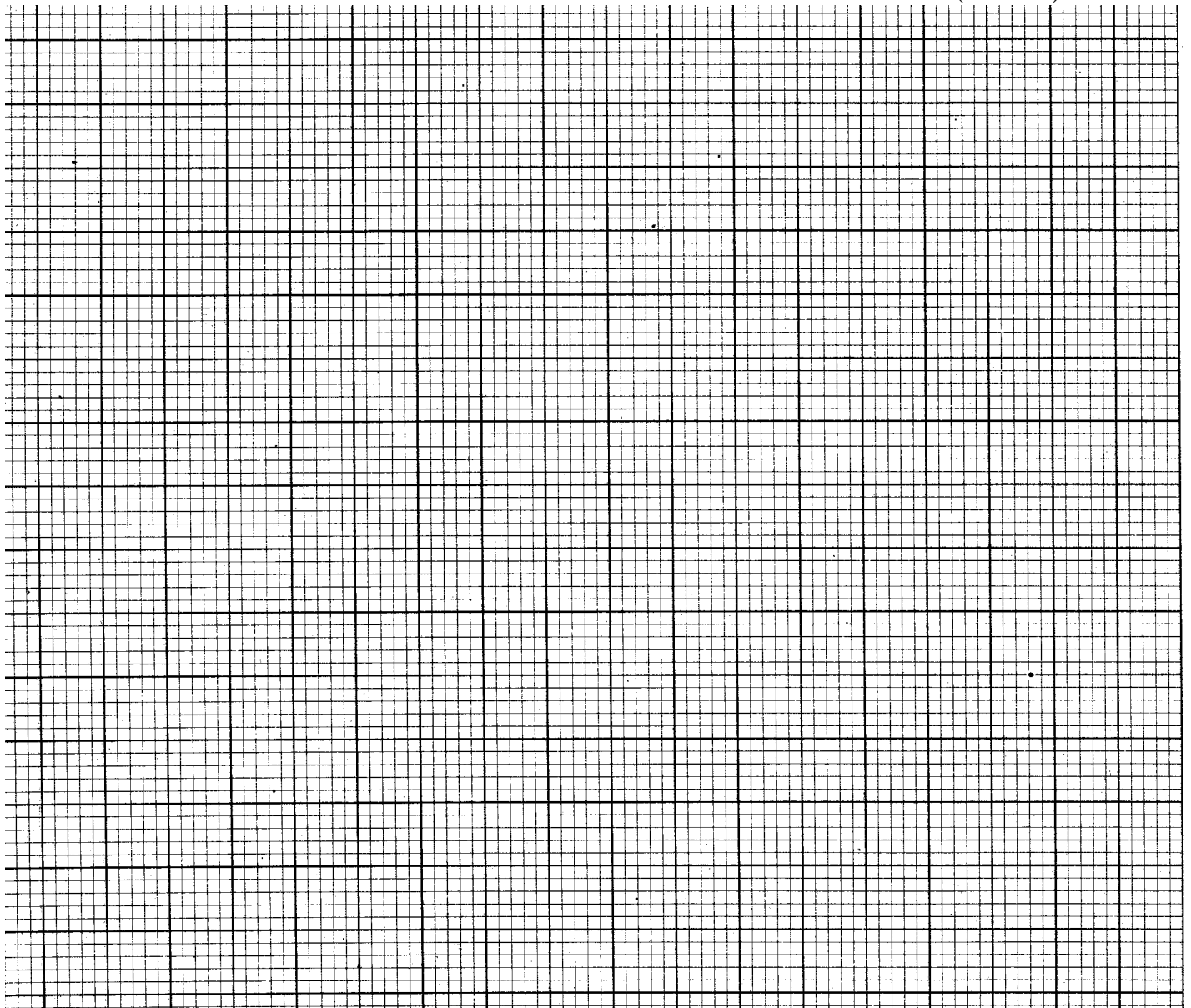(ii) On the same grid show image $A'''B'''C'''D'''$. (2 marks)

24. a) Complete the table below by filling in the blank spaces. (2mks)

x^0	0	30	60	90	120	150	180	210
$y = 3\ Sin\ x^0 - 2$	-2	-0.5	0.60					
$y = 2Cos\ x^0$	2	1.73	1			-1.73		

b) On the same axes draw the graphs of $y = 3\ Sin\ x^0 - 2$ and $y = 2Cos\ x^0$ for $0° \le x \le 210°$. (5 Marks)

c) Use the graph to solve the equation $y = 3\ Sin\ x^0 - 2Cos\ x^0 = 2$ (1mks)

d)   State the amplitude of   (2mks)

        a) $y = 3\ Sin\ x^0 - 2$

        b) $y = 2Cos\ x^0$

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1. Evaluate without using tables or a calculator (3mks)

$$\frac{-5 - (-7) \times -3 + 6}{(-36 + 30)0f - 8 \div 4 + 144 \div -4}$$

2. A school uses $\frac{2}{5}$ of its funding on food, ¼ of the remainder on stationary and $\frac{1}{6}$ of what remained on PTA funding. It still has sh 900,000 left. Determine the original amount of money that the school had. (3mks)

3. Simplify completely (3mks)

$$\frac{1}{xy - 3} - \frac{5}{x^2y^2 - xy - 6}$$

4. Given that A is an obtuse angle and that Tan A=$\frac{-15}{8}$. Find without using tables or calculator the value of :-

$$\frac{\sin A}{1 - \cos A}$$

(3mks)

5. What is the least number of books that if a teacher divides among 6 students 5 books remain or if he divides among 8 students 7 books remain or if he divides among 16 students 15 books remain (3mks)

6. 3 litres of water (density 1g/cm^3) is added to 5 litres of alcohol (density 0.8g/cm^3). Calculate the density of the mixture in g/cm^3 (3mks)

7. A straight line L$_1$ has its X intercept a-3 and its y-intercept5.
   a) Write the equation of L$_1$ in the form $\frac{x}{a} + \frac{y}{b} = 1$ $(1mks)$

   b) Find the equation of another line L$_2$ which passes through (1, -2) and is perpendicular to L$_1$ (3mks)

8. Use reciprocals, squares and square root table to evaluate (3mks)

$$\frac{2}{(0.5245)^2} - \frac{5}{\sqrt{363.4}}$$

9. Using a ruler and a pair of compasses only construct triangle ABC such that BC=6cm, <ABC=75° and BCA=45°. Drop a perpendicular to BC from A to meet BC at O hence find the area of triangle ABC

(3mks)

10. A hollow cylindrical alloy of length 6cm weighs 528g. if its internal and external radii are 3cm and 4cm respectively. Calculate the density of the metal. Use $\pi = \frac{22}{7}$ (3mks)

11. Write down the inequalities that define the region R given below.   (3mks)
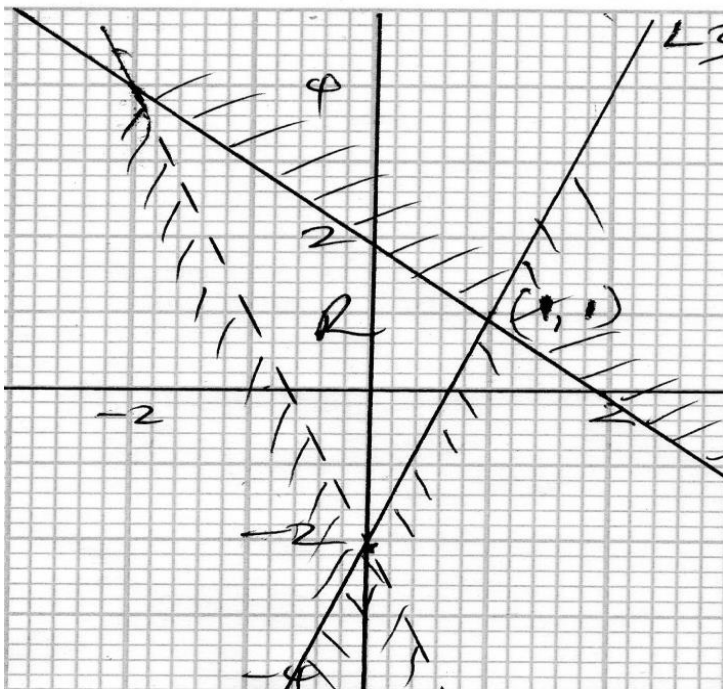
12. Three people Jane, Peter and Kimtai decided to start a business with a total of Ksh 400,000. The ratio of the contributions of Jane to Peter was 2:3 and that of Peter to Kimtai was 2:5. How much did Kimtai contribute?   (3mks)

13. A point P divides AB externally in the ratio -5:2. Given that the coordinates of A is (-2, 4) and B is (4, 7). Find the coordinates of P.   (3mks)

14. A sales lady earns a basic salary of Ksh 20,000. In addition she is paid a commission as follows;

	Commission
For sales up to 50,000	0%
For sales above 50,000	
i) For the first 20,000	2%
ii) For the next 30,000	$3\frac{1}{2}$%
For sales above 100,000	5%

In the month of December, 2014, she received sh 23, 950 as her total pay. Calculate the value of the goods she sold that month. (4mks)

15. The average speed of two trains A and B are 36km/h and 48km/h respectively. A leaves the station at 1200hrs. If B leaves the same station at 1400 hrs. At what time will it catch up with A?   (3mks)

16. Two equal sides of a triangle plot are 40m long given that the angle enclosed by these sides is obtuse and that the area of the plot is 400m^2
    Find;
    i) The size of the angle (1mk)

    ii) The length of the third side (2mks)
17. A tailor bought a number of suits at a cost of sh 57600 from Jimco clothing. Had he bought the same suits from Gikondi clothing it would have enabled him sh 480 less per suit. This would have enabled him to buy 4 extra suits for the same amount of money. If x represent the number of suits bought.
    a) Write an expression of the cost per suit bought from
       i)   Jimco clothing (1mk)

       ii)   Gikondi clothing (1mk)

    b) For an equation in x and determine the number of suit the tailor bought (4mks)

c) The tailor later sold each suit for sh 720 more than he had paid for it. Determine the percentage profit (4mks)

18. The table below shows the distribution of child birth in 60 hospitals

No. of births	11-20	21-25	26-35	36-55	56-65
Frequency	5	x	12	20	15

a) Given that the mean number of birth is 41.375, find the value of x (3mks)

b) Calculate the median for data (3mks)

c) On the grid provided below draw histogram for the data. Use a scale of; (4mks)
   1 cm to represent a width of 5- x-axis
   4cm to represent 1 unit on the vertical axis
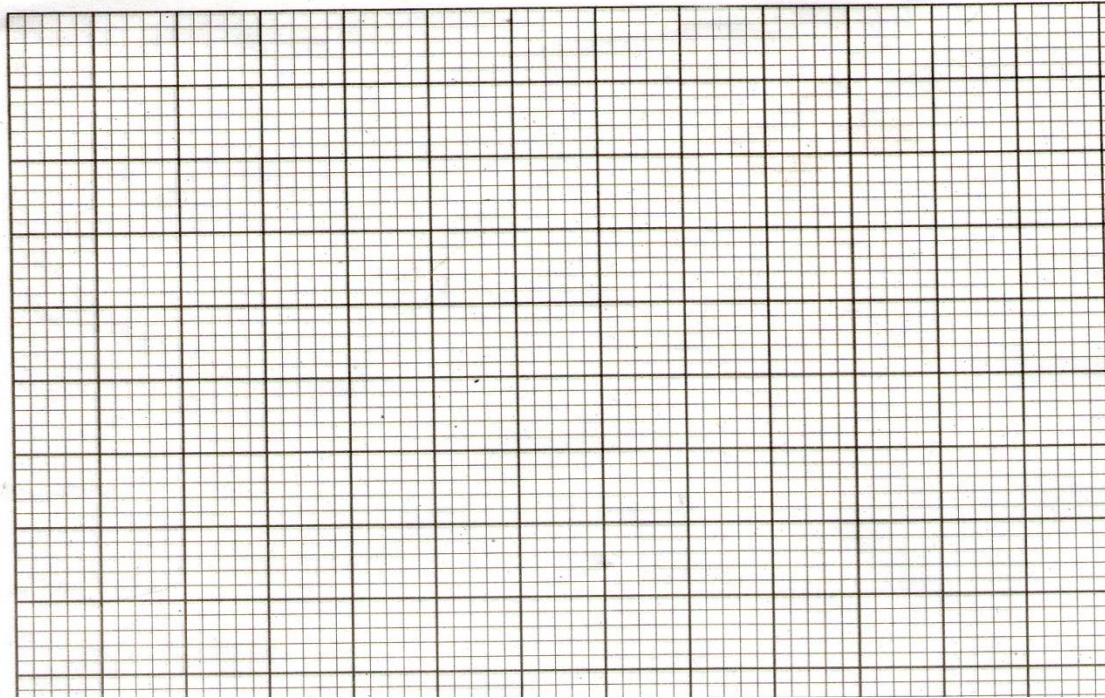
19. A particle moves along a straight line such that its distance 5 meters from affixed point O at time t seconds is given by $s=4t-2t^2+t^3$, find
   a) The average speed of the particles during the third second (3mks)

    b) At what times is the particle momentarily at rest (3mks)

c) The position of the particle when the particle is momentarily at rest (2mks)

d) The acceleration at t=3 seconds (2mks)

20. In the diagram below PT is a tangent to the circle centre O. ABCD is a cyclic quadraleral while triangle ACD is an equilateral triangle. Angle BCP=27°
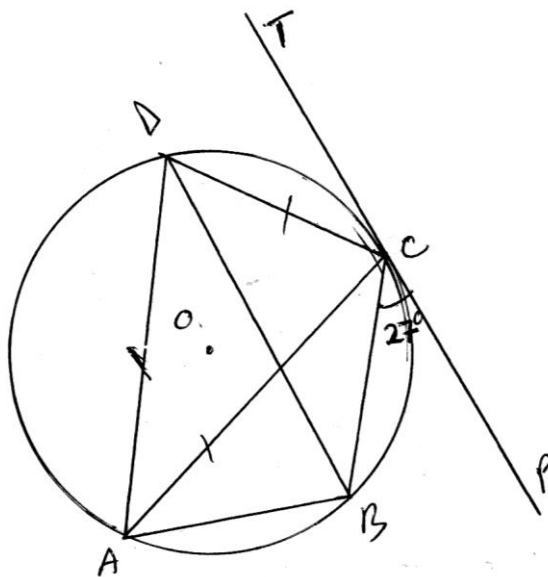
Find giving reasons the angles

a) DCT (2mks)

b) DBC (2mks)

c) DAB (2mks)

d) ADB (2mks)

e) ABC (2mks)
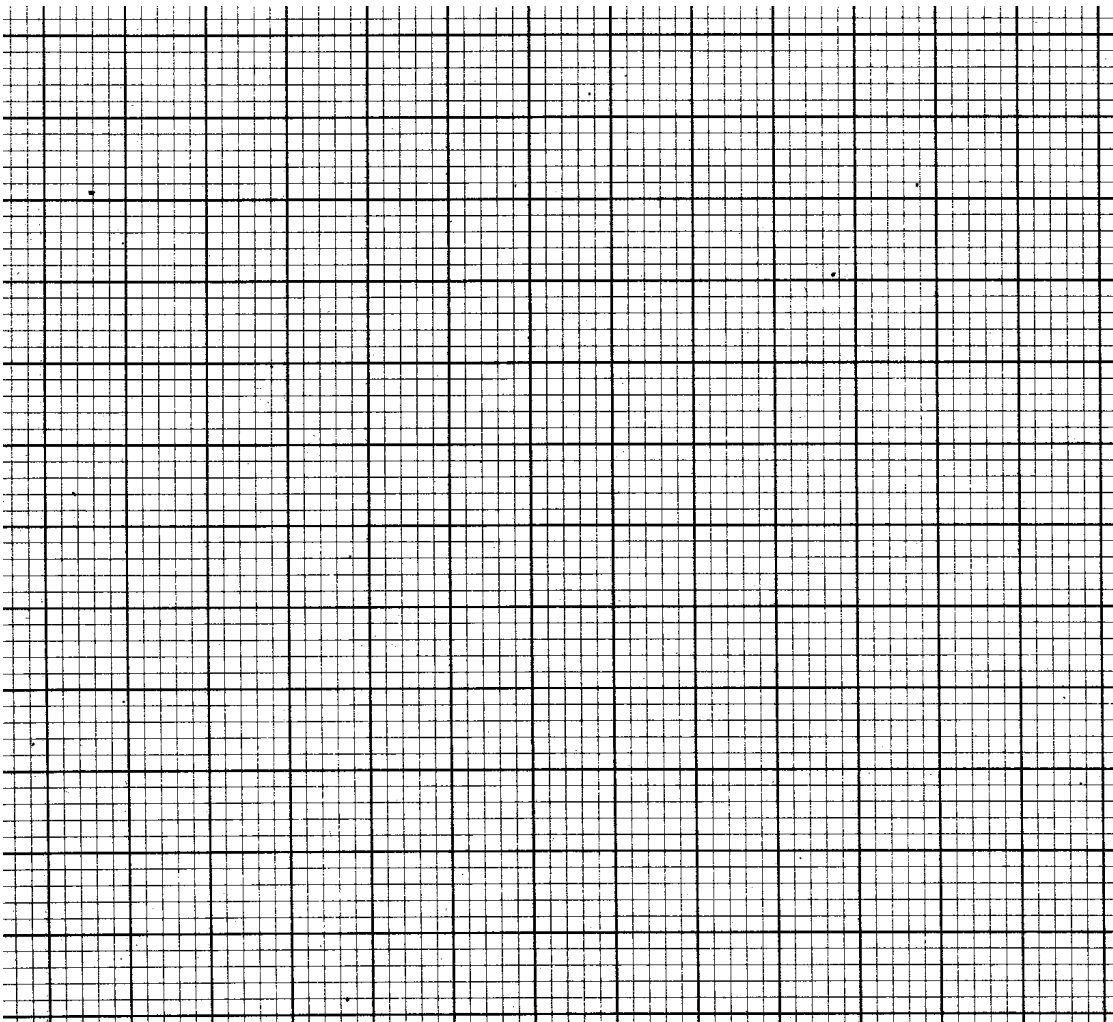
21. a) Complete the table below for $y=x^3 +2x^2-5x-6$ (2mks)

X	-4	-3	-2	-1	0	1	2	3
Y								

b) On the grid provided draw the graph of $y=x^3+2x^2-5x-6$ for $-4 \leq x \leq 3$ use a scale of; (3mks)

1 cm to represent 1 unit horizontal axis
1 cm to represent 5 units vertical axis

i) Use your graph to solve the equation, $y=x^3+2x^2-5x-6=0$ (2mks)

ii) Estimate the coordinates of the turning point of the curve (1mks)

iii) By drawing a suitable straight line on the graph solve the equation $y=x^3+2x^2-10x-11=0$ (2mks)

22. A quadrilateral ABCD has vertices A(-5,0), B (-9,-2), C(-5,-6) and D(-3, -2). Quadrilateral A'B'C'D' has vertices A'(1,0), B'(3,1), C'(1,3) and D'(0,1)
    a) Plot both quadrilateral on the same set of axes (2mks)
    b) Describe fully the transformation that maps ABCD onto A'B'C'D' (3mks)

c) A"B"C"D" is the image of A'B'C'D' under a positive quarter turn about (0, 0). Plot quadrilateral A"B"C"D" on the same grid and state its coordinates (3mks)

d) Quadrilateral A'''B'''C'''D''' is the image of A"B"C"D" under a reflection in the line y-x=0. Plot A'''B'''C'''D''' on the same axes (1mk)

e) Write down the coordinates of Δ A$_4$, B$_4$ C$_4$ D$_4$ the image of A''' B'''C'''D''' under a translation given by $\begin{pmatrix} 2 \\ -5 \end{pmatrix}$ (2mks)
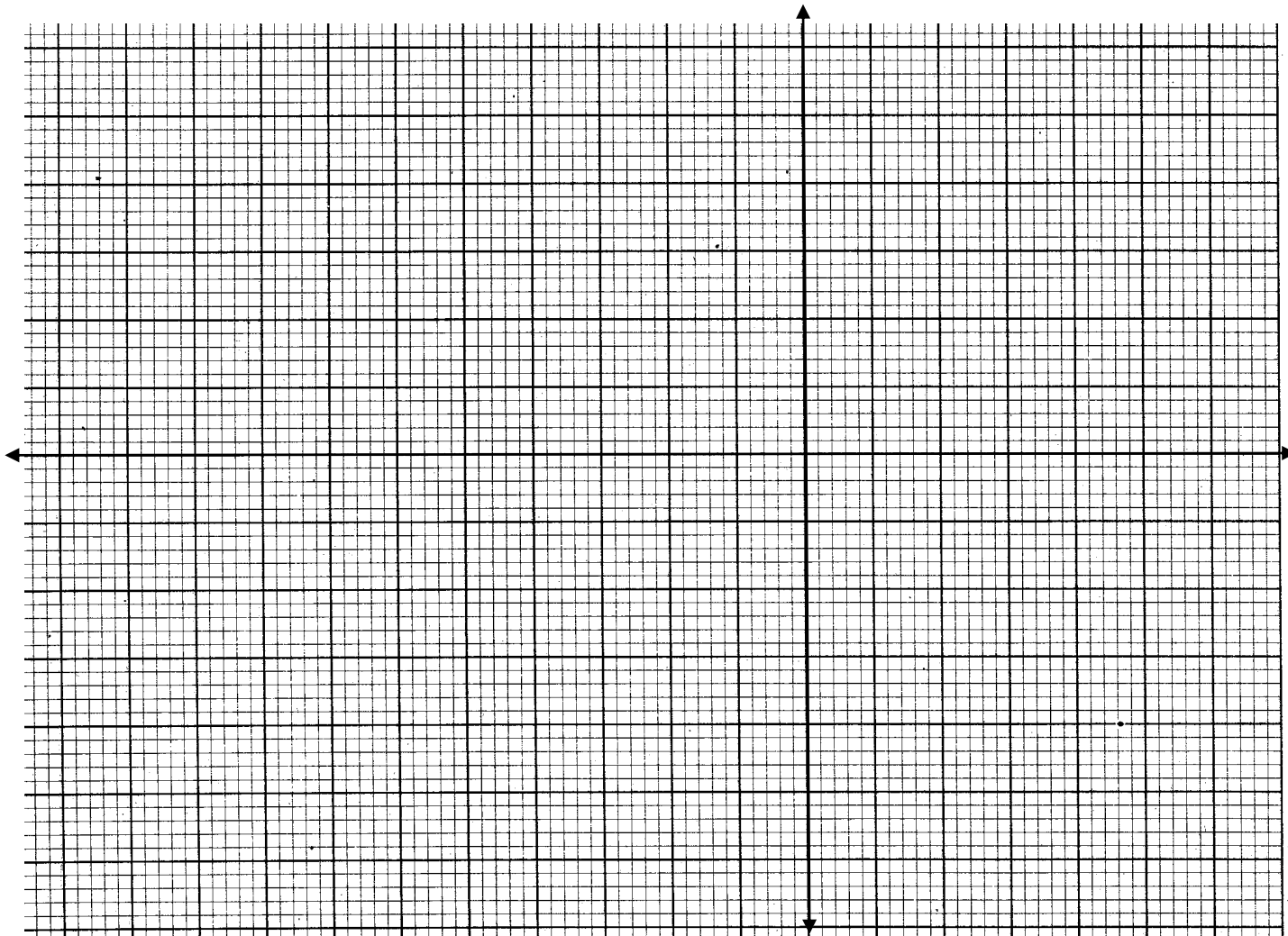
23. A lamp shade below is in form of a frustum of a cone open at both ends. The upper diameter is 24cm and the lower one is 48cm. if the shade is 5cm long. Use $\pi = 3.142$

Find

    a) The perpendicular height of the cone that was chopped off (2mks)

    b) The surface area of the frustum (4mks)

    c) The volume of the frustum (4mks)

24. From Jane's home, her school is 150m on a bearing of N60ºE. The shopping centre is on a bearing of 150º from the school and 110º from Jane's home. The church she attends is 180 m from her home on a bearing of 320º.· Using a scale of 1cm to represent 30m
    a) Show the relative positions of the four points (4mks)
    b) Use the drawing to determine
       i)   The distance of the school from the shopping centre (1mks)
       ii)   The distance of her home from the shopping centre (1mks)
       iii)   The distance and bearing of the church from the shopping centre (2mks)
       iv)   The distance and bearing of the school from the church (2mks)