NAME…… INDEX NO……. ……...…

SCHOOL……...……. CANDIDATE'S SIGNATURE…….

DATE……..

121/1
MATHEMATICS
PAPER 1
MARCH/APRIL - 2015
TIME: 2 ½ HOURS

KABONDO DIVISION JOINT EVALUATION TEST

Kenya Certificate of Secondary Education (K. C.S.E.)

121/1
MATHEMATICS
PAPER 1
MARCH/APRIL - 2015
TIME: 2 ½ HOURS

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1. *Write your **name** and **index number** in the spaces provided*
2. *Answer **all** questions in section I and any five questions in Section II*
3. *All markings and answers **must** not be clearly written in the spaces below*
4. *Marks may be awarded for correct working even if the answer is wrong.*
5. *Non programmable silent electronics and KNEC Mathematical tables may be use, except where otherwise.*

FOR EXAMINERS USE ONLY

SECTION I

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

SECTION II

QUESTION	17	18	19	20	21	22	23	24	TOTAL
MARKS									

This paper consists of 16 printed pages.
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SECTION I (50 MARKS)

1. Without using tables or calculators, evaluate (3mks)

$$\sqrt{\frac{0.38 \times 0.23 \times 2.7}{0.114 \times 0.0575}}$$

2. A line which joins the points A(3,K) and B(-2,5) is perpendicular to the line 5y+2x = 10. Find the value of K. (3mks)

3. The exterior angle of a regular polygon is equal to one –third of the interior angle. Calculate the number of sides of the polygon. (3mks)

4. A Kenyan bank buys and sells foreign currencies at the exchange rates below.

	Buying	Selling
1 Euro	Sh . 147.56	Sh. 148.00
1 US Dollar	Sh. 74.22	Sh 74.50

An American tourist arrived in Kenya with 20, 000 Euros. He converted all the Euros into Kenya shillings at the bank. He spent Ksh 2, 510, 200 while in Kenya and converted the remaining into US Dollars at the bank. Find the amount in dollars that he received to the nearest dollar. (3mks)

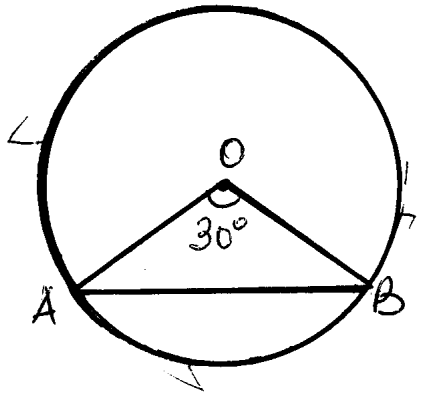
5. Solve the equation $(\log x)^2 - \log x - 2 = 0$ (4mks)

6. During a certain ceremony, goats and chicken were slaughtered. The number of heads for both goats and chicken was 45. The total number of legs was 100. Determine the exact number of goats and chicken slaughtered. (4mks)

7. Find the integral values of X which satisfy the inequality
$x+11>4x-9\geq 2(2-x)$ (3mks)

8. Momanyi paid Ksh 160 for a shirt after getting a discount of 20%. The vendor made a profit of 30% on sale of this shirt. What percentage profit would the vendor have made if no discount was allowed? (3mks)

9. The figure below shows a circle centre O. Chord AB subtends 30^0 at the centre. If the area of the minor segment is $5.25cm^2$, find the radius of the circle $\left(Take\ \pi = \frac{22}{7}\right)$ (3mks)



10. Expand the expression (2mks)

$\left(x^2-4\right)\left(x^2+4\right)\left(x^4-16\right)$

11. A point P is 40m on a bearing of 320^0 from a point R. The bearing of point Q from R is 080^0 and 60m from it. Using a scale of 1:10. Show the relative positions of P,Q and R, hence find the distance PQ. (3mks)

12. The figure below shows a triangle

Draw the net of the solid hence or otherwise find its surface area. (3mks)

13. Simplify $\dfrac{a^4 - b^4}{a^3 - ab^2}$ (3mks)

14. Solve for x in the equation (3mks)

$$2^{x-1} \times \left(\frac{1}{8}\right)^{1-x} = 4^{3x-1}$$

15. A solid cone of radius 13cm and height 18cm is recasted into a hemispherical solid. Find the surface area of the hemisphere to 1d.p $(Use\ \pi = 3.142)$ (4mks)

16. Using a ruler and a pair of compasses only, construct a rhombus ABCD given that AB = 6cm and $\angle ABC = 105^0$. (3mks)

SECTION II (50 MARKS)

Answer any five questions in this section

17. A cinema hall has 200 seats. Ticket prices are Sh 50 for an adult and sh 25 for a child

(a) One evening 80% of the seats in the cinema hall were occupied and 20 of the people present were children. Calculate the total money collected from the sale of tickets. (3mks)

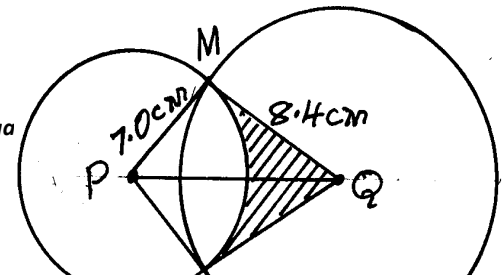
(b) On another evening, x children were present and all seats were occupied. The money colleted from the ticket sales was sh 9050. Calculate the value of x. (3mks)

(c) The money collected from tickets for a week is divided among costs, wages and profits in the ratio 2:3:7. If the profit for the week is sh 63,000. Calculate

(i) total amount collected for the week. (2mks)

(ii) the cost for the week (2mks)

18. Two circles of radius 7cm and 8.4cm with centres P and Q respectively intersect at points M and N as shown below.



Given that the centres of the circles are 12cm apart, find

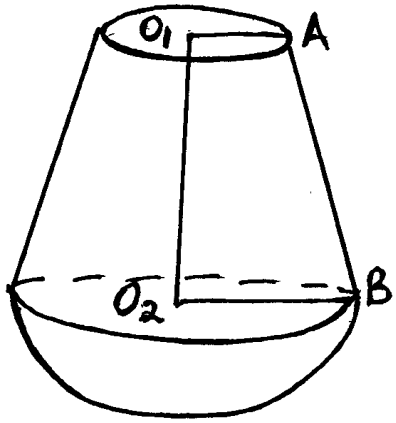
(a) Angle MPN (3mks)

(b) Angle MQN (3mks)

(c) The area of quadrilateral MPNQ correct to 2dp (2mks)

(d) The area of the shaded part correct to 2d.p (Take $\pi = \frac{22}{7}$) (2mks)

19. The diagram below represents a solid consisting of a hemispherical bottom and a conical frustum at the top. O_1O_2 = 4cm, O_1,B= 4.9cm and O_1,A = 2.1cm (Take $\pi = 3.142$)

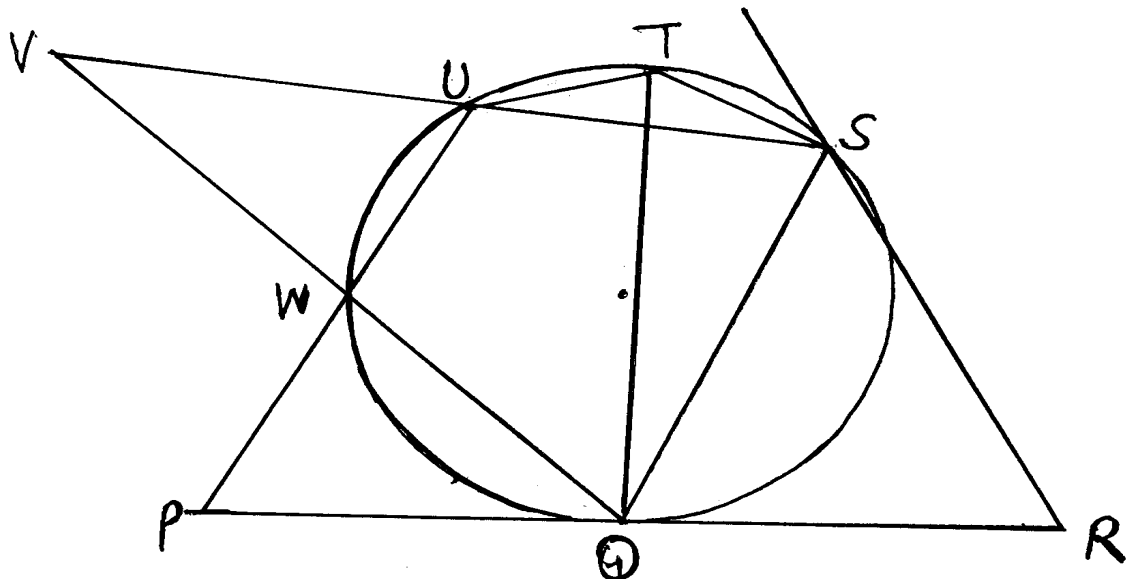


(a) Determine the height of the chopped off cone and hence the height of the bigger cone. (2mks)

(b) Calculate the surface area of the solid to 2d.p. (4mks)

(c) Calculate the volume of the solid to 4 s.f (4mks)

20. The figure below show a circle with chord UW and tangent PQR meeting at P. RS is another tangent that meets tangent PQR at R



Given that $\angle WUS = 82^{O}, \angle QWU = 150^{0}, \angle WPQ = 72^{0}$ *and* $\angle RQS = 28^{0}$, *Find by giving reasons*

(a) $\angle TSQ$ (2mks)

(b) $\angle$ SQV (2mks)

(c) $\angle$ WVU (2mks)

(d) $\angle$QTS (2mks)

(e) $\angle$PWQ (2mks)

21. (a) Find A^{-1} given that A = $\begin{pmatrix} 2 & 4 \\ 3 & 4 \end{pmatrix}$ (2mks)

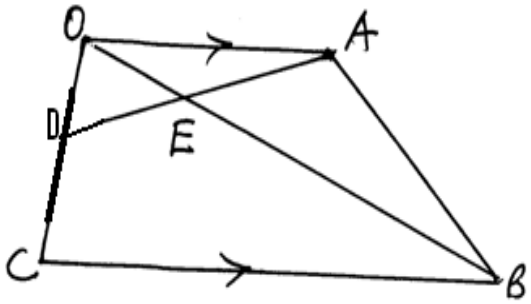
(b) Afflex bought 16 shirts and 32 trousers for sh 20, 800, in January.If he had bought 15 shirts and 20 trousers, he would have saved sh. 6, 300.

(i) From a matrix equation to represent the above information. (1mk)

(ii) Use matrix A^{-1} to find the price of each item. (3mks)

(c) The following Month the cost of a shirt increased by 10% while that of a trouser increased by 5%. If he bought 12 shirts and 10trousers, find the percentage increase in the total cost of both items. (4mks)

22. The figure below shows a trapezium OABC in which OA is paralled to CB.



Given CB = 4OA, D is a point on OC such that OC:OD = 5:1 AD and OB intersect at E. If OA = $\underset{\sim}{a}$ and OD = $\underset{\sim}{d}$

(a) Express interms of $\underset{\sim}{a}$ and $\underset{\sim}{d}$

(i) AD (1mk)

(ii) OB (2mks)

(b) (i) If AE = k AD where k is a scalar, express in terms of a, d and k
OE (2mks)

(ii) If OE = hOB where h is a scalar, find values of h and k (4mks)

(iii) State the ratio of DE: EA (1mk)

23. Use data below to answer the questions that follow

Class	1 – 15	16 – 30	31 – 45	46 – 60	61 – 75	76 – 90	91 – 105
Frequency	4	1	7	9	2	5	2

(a) State the modal frequency. (1mk)

(b) Calculate the mean using 38 as an assumed mean (5mks)

(c) State the median class. (1mk)

(d) Calculate the Median (3mks)

24. Below are the measurements of a wheat field using a baseline XY recorded in metres.

	Y	
	240	
TO R 60	190	
	180	75 TO Q
	150	50 TO P
TO S 100	120	
	100	100 TO N
TO T 30	50	
	20	20 TO M
	X	

(a) Using a scale of 1cm represents 20m. Sketch the map of the wheat field. (4mks)

(b) Find the area of the field in hectares. (4mks)

(c) If the cost of one hectare is sh 65,000 find the cost of the wheat field. (2mks)

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SECTION I (50 MARKS)

1. Use logarithm tables to evaluate (4mks)

$$\sqrt[3]{\frac{0.0485 \times \log 3.846}{(0.9834) + 88.3}}$$

2. Make Q the subject of the formula. (3mks)

$$T = \sqrt[3]{\frac{Q^2}{Q^2 - 1}}$$

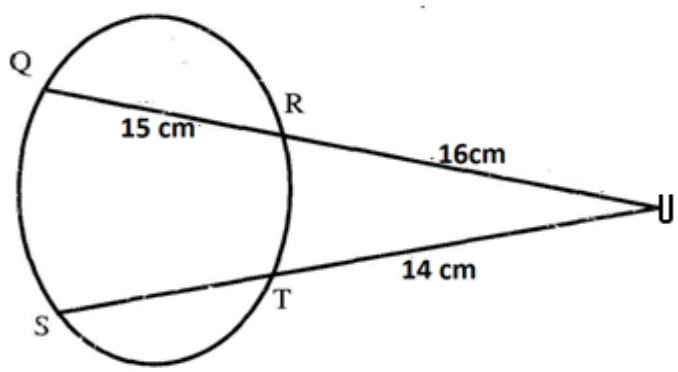
3. A student misreads $(p+q)^2$ as P^2+q^2 find the percentage error if p = 5 and q = 3. (3mks)

4. (a) Expand $(x-y)^6$ upto the term with y^3 (2mks)

(b) Use the first four terms in ascending powers of y to find the approximate value of $(0.98)^6$. Correct to 4 significant figure (2mks)

5. Given that matrix $\underset{\sim}{A} = \begin{pmatrix} 2 & 1 \\ 3 & 4 \end{pmatrix}$, Find matrix $\underset{\sim}{B}$ such that: $A^2 = \underset{\sim}{A} + \underset{\sim}{B}$ (3mks)

6. Chord QR and ST intersect at U. QR = 15cm, RU = 16cm and TU = 14 cm. (3mks)



Find the length SU to 2 dp

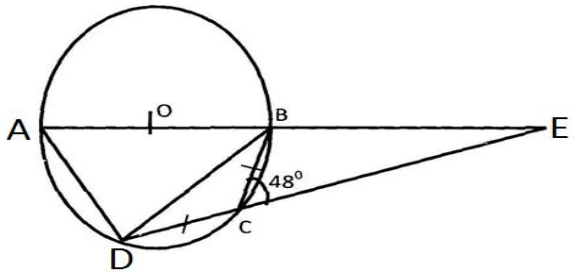
7. Simplify $\frac{3}{\sqrt{5}-2}+\frac{1}{\sqrt{5}}$ leaving your answer in the form $a+b\sqrt{c}$, where a, b and c are rational numbers. (3mks)

8. Achang'a deposited sh. 20 000 in a saving account. Find the interest after two years. If the intrest was paid at 16% per annum compound semi-annually. (3mks)

9. A coffee blender has two brands of coffee, Tamu and Chungu. A kilogram of Tamu costs sh. 70 while a kilogram of Chungu costs Shs. 64. In what ratio should he mix the two brands to make a blend which costs Shs. 68 per kilogram? (3mks)

10. Find the centre and radius of a circle whose equation is $x^2 + 8 + y^2 - 2y - 1 = 0$. (3mks)

11. In the figure below ABCD is a circle with centre O. AB and DC meet a point E outside the circle. DC = BC and $\angle BCE = 48^0$. Find the angles (3mks)



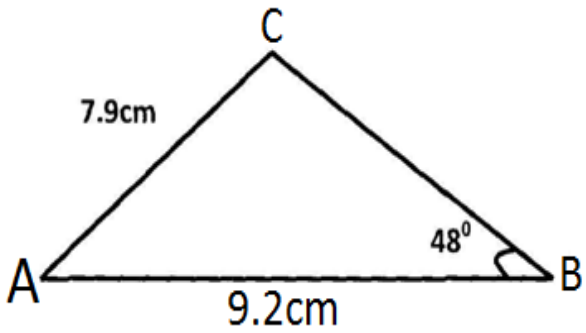
(i) BAD

(ii) BDC

(iii) BEC

12. Given that $4x^2 - 32y - 20 + k$ is a perfect square , Find K. (3mks)

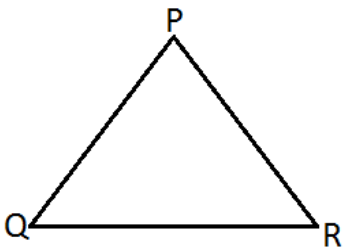
13. Given the triangle ABC below, AB = 9.2cm, AC = 7.9cm and $\angle ABC = 48^0$. (2mks)
Calculate to 1 decimal place the angle A C B.



14. A geometric progression has its first and second terms as 128 and 32 respectively. If the sum of the first five terms of the progression is $\frac{2^x - 1}{6}$, find x (4mks)

15. P varie directly as the square of B and inversely as the square root of C. Find the percentage change in P when C increases by 4% and B decreases by 10%. (3mks)

16. The diagram below represents a field PQR



(a) Draw the locus of points equidistant from sides PQ and PR. (1mk)

(b) Draw the locus of points equidistant from points P and R. (1mk)

(c) (i) Label the point of intersection of the two loci (a) and (b) as X. (1mk)

(ii) Measure QX (1mk)

SECTION II (50 MARKS)

Answer any five questions in this section

17. James' earning are as follows:- Basic salary 38,000 p.m, House allowance Sh. 14, 000p.m Travelling allowance Sh. 8,500p.m. Medical allowance sh. 3,300

The table for the taxable income is as shown below

Income tax in k£ p.a	Tax in Sh. Per pound
1 – 6000	2
6001 – 12000	3
12001 – 18000	4
1001 – 24 000	5
24001 - 30 000	6
30001 - 36000	7
36001 – 42 000	8
42001 – 48 000	9
Over 48 000	10

(a) Calculate Jame's taxable income in p.a (2mks)

(b) Calculate Jame's P.A.Y.E if he is entitled to a tax relief of Sh. 18 000 p.a (4mks)

(c) James is also deducted the following per month:-

NHIF	Sh.	320
Pension scheme	Sh.	1000
Co-operative shares	Sh.	2000
Loan repayment	Sh.	5000
Interest on loan	Sh.	500

(i) Calculate James' total deduction per month in Ksh. (2mks)

(ii) Calculate his net salary per month. (2mks)

18 .i) Fill the table, below of the function $y = 2x^2 + 5x - 12$ *for* $-8 \le x \le 4$ (2mks)

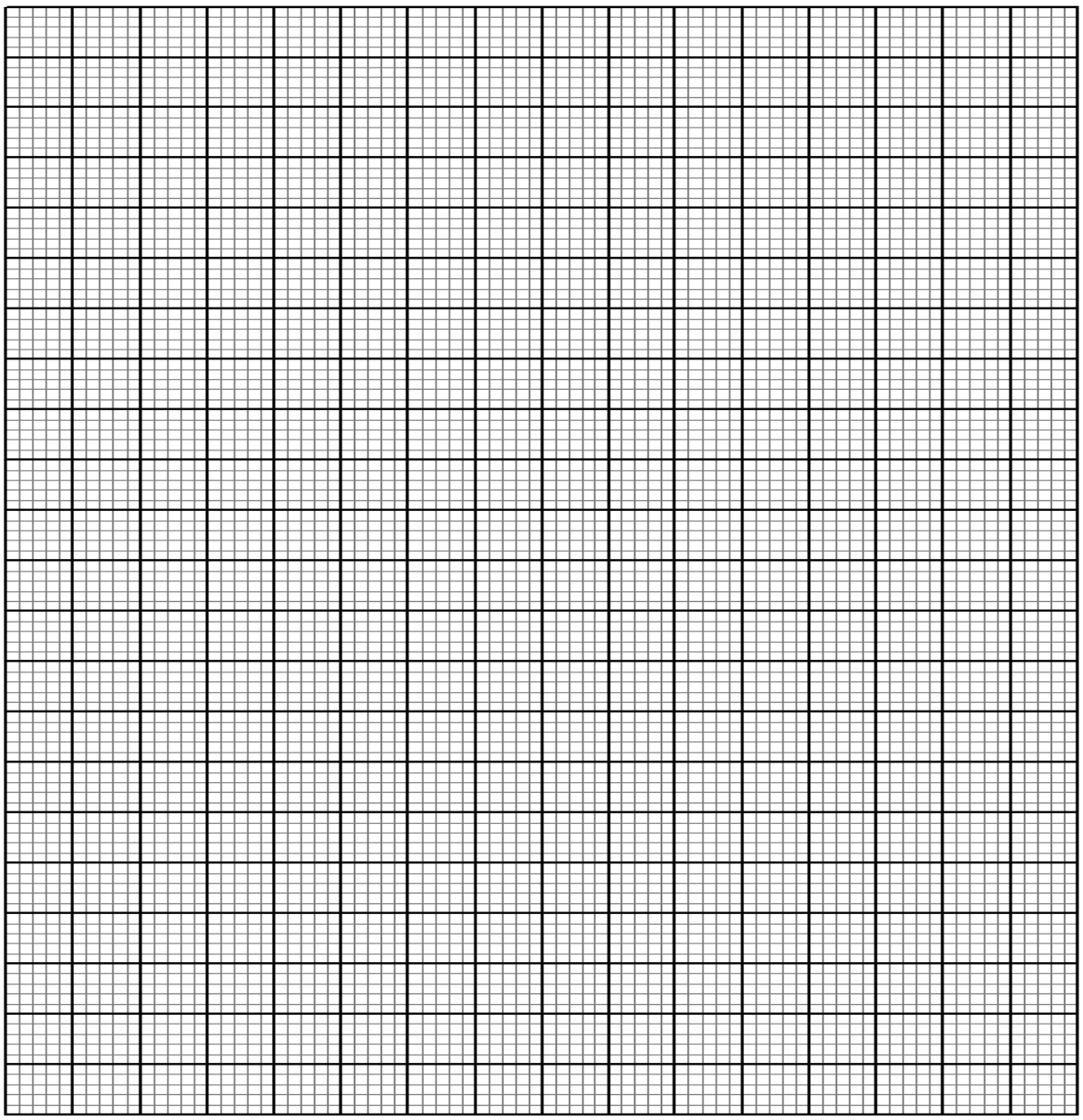
x	-8	-7	-6	-5	-4	-3	-2	-1	0	1	2	3	4
y	76					-9		-5					40

ii) Using the table draw the graph of the function $y = 2x^2 + 5x - 12$. Use the scale of 1cm to 1 unit for x – axis and 1cm for 10units for y-axis. (3mks)

(b) Using the graph drawn above, solve the following equation.

(i) $2x^2 + 5x - 12 = 0$ (2mks)

(ii) $3-7x-3x^2=0$ (3mks)



19. The first three consecutive terms of a geometric progression are $3^{2x+1}, 9^x$ *and* 81 *respectively*.

(a) Calculate the value of x. (3mks)

(b) Find the common ratio of the series (1mk)

(c) Calculate the sum of the first 4 terms of this series. (3mks)

(d) Given that the fifth and the seventh terms of the G.P form the first two consecutive terms of an arithmetic sequence, Calculate the sum of the first 20 terms of the sequence. (3mks)

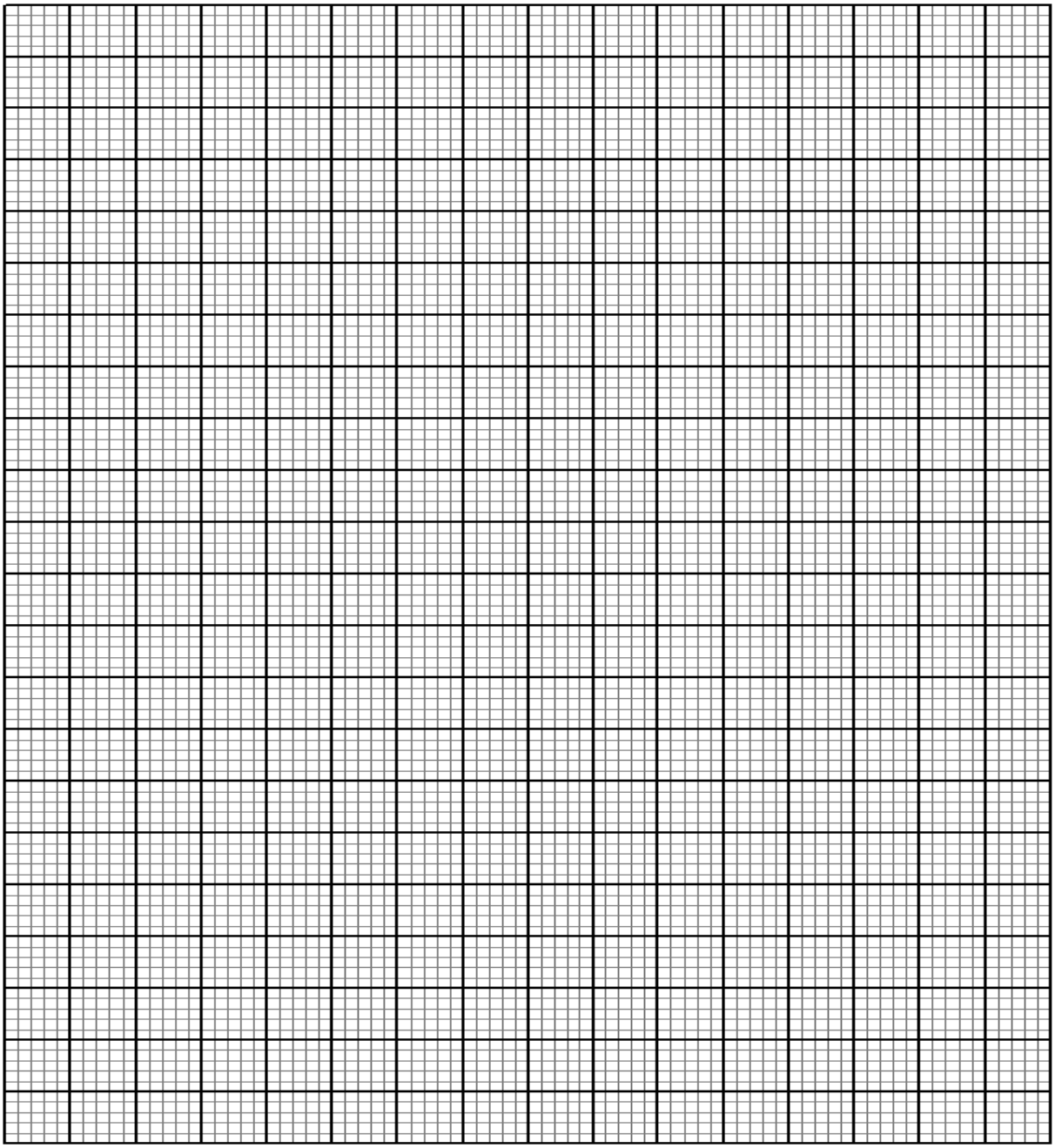
20. The table below shows marks scored by some students in a Maths exam

Marks	30 – 39	40 – 49	50 – 59	60 – 69	70 – 79	80 - 89
No. of candidates	3	17	27	23	8	2

(a) Draw a cumulative frequency curve for the data. (4mks)

(b) Use your graph to find

(i) The median (1mk)
(ii) Quartile deviation (3mks)
(iii) The pass mark if 55 students passed the exam. (2mks)



21. A tank has two inlet taps P and Q and an outlet tap R. When empty, the tank can be filled by tap P alone in 4 ½ hour or by tap Q alone in 3 hours. When full, the tap can be emptied in 2 hours by tap R.

(a) The tank is initially empty. Find how long it would take to fill up the tank.

(i) If tap R is closed and taps P and Q are opened at the same time. (2mks)

(ii) If all the three taps are opened at the same time. (2mks)

(b) The tank is initially empty and the three taps are opened as follows
P at 8.00 a.m
Q at 8.45 a.m
R at 9.00 a.m

(i) Find the fraction of the tank that would be filled by 9.00 a.m (3mks)

(ii) Find the time the tank would be filled up. (3mks)

22. At a rifle contest, the probability of any particular rifle being accurate is $\frac{1}{16}$. A soldier chooses a rifle at random. If the rifle is accurate, the probability of hitting the target is $\frac{4}{5}$. If the rifle is inaccurate the probability of hitting target is $\frac{6}{25}$.

By use of a tree diagram determine the probability that;

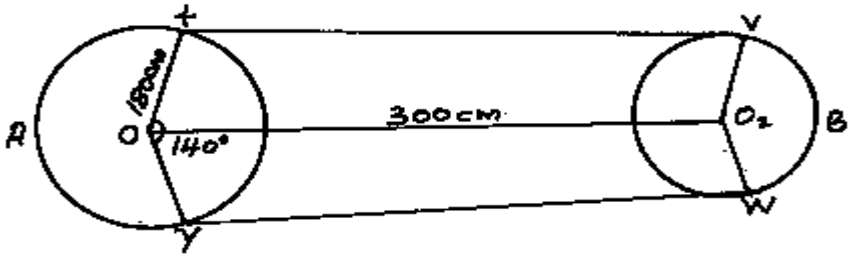
(a) The soldier selecting an accurate rifle and hitting the target in the first shot. (3mks)

(b) The soldier selecting an inaccurate rifle and hitting the target in the first shot. (2mks)

(c) The soldier misses the target in the first shot. (4mks)

(d) the soldier gets the target in the first shot. (1mk)

23. The figure below shows a pulley system where a conveyor belt is tied round the two wheels. The radius of the large wheel is 180cm and the distance between the centres of the wheel is 300cm and $\angle XOY = 140^0$



Determine

(a) Length XV

(b) Length VBW (3mks)

(3mks)

(c) Length XAY

(2mks)

(d) The total length of the conveyor belt

24. The vertices of a triangle ABC are A(3,1) B(0,2) and C(2,-1) is $A^1B^1C^1$ the image of ABC under a reflection on the line $y + x = 0$

(a) State the coordinates of $A^1B^1C^1$ hence draw triangles ABC and $A^1B^1C^1$ on the grid provided. (3mks)

(b) $A^{11}B^{11}C^{11}$ is the image of $A^1B^1C^1$ under positive quarter turn about the origin. Draw $A^{11}B^{11}C^{11}$ and state the coordination of the vertices. (2mks)

(c) $A^{111}B^{111}C^{111}$ is the image of $A^{11}B^{11}C^{11}$ under a shear matrix with y axis invariant and linear scale factor 3.

(d) (i) Write down the shear matrix (1mk)

(ii) Find the coordinates of the vertices of triangle $A^{111}B^{111}C^{111}$. (2mks)

(iii) Find the ratio of area of triangle ABC to that of $A^{111}B^{111}C^{111}$. (2mks)