

Name _____

Index No. _____

Candidate's signature _____

Date _____

Adm no. _____

121/1
MATHEMATICS ALT A
PAPER 1
JULY 2011
2 ½ HOURS

MAKINDU DISTRICT INTER-SECONDARY SCHOOLS EXAMINATIONS
Pre - Kenya Certificate of Secondary Education
MATHEMATICS
PAPER 1
2 ½ HOURS

INSTRUCTIONS TO CANDIDATES

- (a) Write your name and index number in the spaces provided above.
- (b) Sign and write the date of examination in the spaces provided above.
- (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) All answers and working must be written on the question paper in the spaces provided below each question.
- (f) Show all the steps in your calculations, giving your answers at each stage in the spaces below each question.
- (g) Marks may be given for correct working even if the answer is wrong.
- (h) Non-programmable silent electronic calculators and KNEC Mathematical tables may be used except where stated otherwise.
- (i) This paper consists of 18 printed pages.
- (j) Candidates should check the question paper to ascertain that all the pages are printed as indicated and that no questions are missing.

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

This paper consists of 18 printed pages

Turn Over

SECTION 1 (50 marks) Answer *all* the questions in this section in the spaces provided

1. Evaluate $\frac{(-2) \times 7 + (-24) \div (-3)}{3 \times (-2) + 5 \times (-4)}$

(2 marks)

2. The table below shows the number of goals scored in 40 soccer matches during a certain season.

No. of goals	0	1	2	3	4	5	6	7
No. of matches	3	9	6	8	5	5	2	2

Calculate the mean number of goals scored per match.

(3 marks)

3. A cylinder of radius 14cm contains water. A metal solid cone of base radius 7cm and height 18cm is submerged into the water. Find the change in height of the water level in the cylinder.

(3 marks)

4. Two lines L_1 and L_2 intersect at a point K. L_1 passes through the points $(-4, 0)$ and $(0, 6)$. Given that the equation of L_2 is $y = 2x - 2$, find by calculation the co-ordinates of K. (3 marks)

5. Use mathematical tables to evaluate (3 marks)

$$\frac{0.1}{0.0351} + \sqrt{0.498}$$

6. Express the recurring decimal $0.2\dot{5}4$ in the form a/b in its simplest form, where "a and b" are integers (3 marks)

7. Solve for x in the equation

$$9^{(x-3)} \times 81^{(1-x)} = \frac{1}{27^x}$$

(3 marks)

8. Find the number of sides of a polygon whose interior angle is 165° .

(2 marks)

9. Evaluate : $\frac{1 + \sqrt{5}}{2 + \sqrt{5}} + \frac{1 - \sqrt{5}}{2 - \sqrt{5}}$

(3 marks)

10. Find the value of x leaving your answer as a mixed fraction. (3 marks)

$$\text{Log}_4 3 - \frac{1}{2} \text{Log}_4 (2x - 5)^2 = \frac{3}{2}$$

11. A group of 5 men can dig a piece of land in 8 hours. Calculate the time 12 men working at half the rate of the first group would take to complete the same work. (3 marks)

12. The distance between town A and town B is 150km. A car starts from town A at 10.00 a.m and travels at an average speed of 80km/h towards town B. A transit lorry leaves town B at 10.15a.m towards town A at an average speed of 40km/h. At what time did the two vehicles meet? (4 marks)

5.

13. Use a pair of compasses only in this question. Draw a parallelogram ABCD in which $AB = 8\text{cm}$, $BC = 6\text{cm}$ and angle $BAD = 75^\circ$. By construction, determine the perpendicular distance between AB and CD. (4 marks)

14. Find the distance between $P(30^\circ\text{N}, 36^\circ\text{E})$ and $Q(30^\circ\text{N}, 144^\circ\text{W})$ on the surface of the earth in nautical miles.

(i) along the parallel of latitude 30°N . (2 marks)

6.

(ii) over the North Pole.

(2 marks)

15. Find the inequalities that define the region R in the diagram below.

(3 marks)

16. 3 grams of metal A of density 2.7g/cm^3 is mixed with 1.6cm^3 of metal B of density 3.2g/cm^3 .
Determine the density of the mixture.

(4 marks)

SECTION II (50 marks) *Answer **only** five questions in this section.*

17. In a certain company, a salesman is paid a basic salary of sh. 4,500, a house allowance of sh. 1,500 and medical allowance of sh. 500. He is also paid a commission of 2% for sales upto sh. 10,000 and 3% for sales exceeding sh. 10,000. If his gross emoluments at the end of the month were sh. 6,895.

(a) Find his total commission.

(2 marks)

(b) Determine the value of goods he sold during that month.

(8 marks)

8.

18. A car starts from rest and builds up a speed of 40m/s in 1 min 40 seconds. It then travels at this speed for 5 minutes. Brakes are then applied and the car is brought to halt in 2 minutes.

(a) Draw a velocity - time graph to show the journey.

(3 marks)

9.

(b) Use your graph to find:

(i) The initial acceleration.

(2 marks)

(ii) The deceleration when the car is brought to halt.

(2 marks)

(iii) The distance travelled.

(3 marks)

19. In the figure below, AB and AD are tangents to the circle at B and D respectively. DEF is a straight line. Angle FAD = 48° , angle ADF = 42° and angle BDF = 24° .

C B F A E 24° 48° D

Calculate the angles below, giving reasons;

(a) Angle DCE

(2 marks)

10.

(b) Angle BCE

(2 marks)

(c) Angle DCB

(3 marks)

(d) Angle DEB

(3 marks)

20. The diagram below shows a farm whose measurements are shown in a field notebook as in the table below. ($XY = 2000\text{m}$)

	Y	
	1800	100 TO G
200 TO F	1600	
	1200	300 TO E
	900	100 TO D
150 TO C	600	
	300	200 TO B
200 TO A	100	
	X	

(a) Sketch the map of the farm.

(2 marks)

(b) Calculate the area of the farm in hectares.

(8 marks)

12.

21. The diagram below represents a hemisphere mounted on a cylinder to form one solid. If the base radius is 7m and the full height of the solid is 17m, calculate;

(a) The volume of the solid.

(3 marks)

(b) The total surface area of the solid.

(4 marks)

13.

(c) If the density of the material used to make the solid is 800kg/m^3 , calculate the mass of the material used in tonnes.

(3 marks)

22. From town P, a town Q is 60km away on a bearing South 80° East. A third town R is 100km from P on the bearing South 40° West.
A cyclist travelling at 20km/h leaves P for Q. He stays at Q for one hour and then continues to R. He stays at R for $1\frac{1}{2}$ hours and then returns directly to P.

(a) Calculate the distance of Q from R.

(4 marks)

14.

(b) Calculate the bearing of R from Q.

(4 marks)

(c) What is the time taken for the whole round trip.

(2 marks)

15.

23. In a certain mathematical relationship, the values of A and B are found to obey the relationship $B = CA + KA^2$ where C and K are constants. Below is a table of the values of A and B

A	1	2	3	4	5	6
B	3.2	6.75	10.8	15.1	20	25.2

- (a) By drawing a suitable straight line graph, determine the values of C and K. (8 marks)

16.

(b) Hence write the relationship between A and B.

(1 mark)

(c) Determine the value of B when $A = 7$.

(1 mark)

24. A particle moves along a straight line such that its displacement S metres from a given point is $S = t^3 - 5t^2 + 3t + 4$ where t is time in seconds

Find: (a) The displacement of the particle at $t = 5$.

(2 marks)

(b) The velocity of the particle when $t = 5$.

(3 marks)

17.

(c) The values of t when the particle is momentarily at rest.

(3 marks)

(d) The acceleration of the particle when $t = 2$ sec.

(2 marks)

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
MARKING SCHEME

SECTION 1

<p>1. $\frac{(-14) + 8}{(-6) + (-20)}$</p> <p>$^3/_{13}$</p>	<p>M1</p> <p>A1</p>	<p>√ interpretation of BODMAS</p> <p>√ Ans</p>																											
2																													
<p>2.</p> <table border="1" style="margin-left: 20px;"> <thead> <tr> <th>x</th> <th>f</th> <th>fx</th> </tr> </thead> <tbody> <tr><td>0</td><td>3</td><td>0</td></tr> <tr><td>1</td><td>9</td><td>9</td></tr> <tr><td>2</td><td>6</td><td>12</td></tr> <tr><td>3</td><td>8</td><td>24</td></tr> <tr><td>4</td><td>5</td><td>20</td></tr> <tr><td>5</td><td>5</td><td>25</td></tr> <tr><td>6</td><td>2</td><td>12</td></tr> <tr><td>7</td><td>2</td><td>14</td></tr> </tbody> </table> <p style="margin-left: 20px;">$\bar{X} = \frac{\Sigma fx}{\Sigma f} = \frac{116}{40}$</p> <p style="margin-left: 20px;">$= 2.9$</p>	x	f	fx	0	3	0	1	9	9	2	6	12	3	8	24	4	5	20	5	5	25	6	2	12	7	2	14	<p>M1</p> <p>M1</p> <p>A1</p>	<p>for √ fx column</p> <p>√method</p>
x	f	fx																											
0	3	0																											
1	9	9																											
2	6	12																											
3	8	24																											
4	5	20																											
5	5	25																											
6	2	12																											
7	2	14																											
3																													
<p>3. Volume of the cone = $\frac{1}{3} \times \frac{22}{7} \times 7 \times 7 \times 18$</p> <p style="margin-left: 40px;">$= 924\text{cm}^3$</p> <p>Let the change in height be H</p> <p>Volume of water displaced = $\frac{22}{7} \times 14 \times 14 \times H$</p> <p style="margin-left: 40px;">$= 616H\text{cm}^3$</p> <p>∴ $616H = 924$</p> <p style="margin-left: 40px;">$H = \frac{924}{616}$</p> <p style="margin-left: 40px;">$= 1.5\text{cm}$</p>	<p>M1</p> <p>M1</p> <p>A1</p>																												
3																													

<p>4. Slope of L1 = $\frac{6-0}{6+4} = 1.5$</p> <p>Equation of L1 : $\frac{y-6}{x} = \frac{3}{2}$; $2y - 12 = 3x$</p> <p>At K; $y = \frac{3}{2}x + 6$ $2x - 2 = \frac{3}{2}x + 6$</p> <p>$x = 16$ At $x = 16, y = 2(16) - 2 = 30$ $\therefore K (16, 30)$</p>	<p>B1 B1 B1</p>	<p>\checkmark eqn. \checkmark equating</p>
	<p>3</p>	
<p>5. $0.1 \times 28.49 + \sqrt{0.498}$</p> <p>$= 2.849 + 0.7057$</p> <p>$= 3.5547$</p>	<p>B1 B1 B1</p>	<p>for reciprocal from tables $\checkmark \sqrt{\quad}$ from tables \checkmark ans</p>
	<p>03</p>	
<p>6. Let $x = 0.254545454 \dots\dots\dots$ (i) $\therefore 10x = 2.54545454 \dots\dots\dots$ (ii) $\therefore 1000x = 254.54545454 \dots\dots\dots$ (iii)</p> <p>Eqn (iii) – (ii) $990x = 252 \implies x = \frac{252}{990}$</p> <p>$= \frac{14}{55}$</p>	<p>M1 M1 A1</p>	<p>\checkmark multiplication \checkmark subtraction \checkmark ans simplified</p>
	<p>3</p>	
<p>7. $9^{(x-3)} \times 81^{1-x} = \frac{1}{27^x}$</p> <p>$9^{(x-3)} \times 81^{(1-x)} = 27^{-x}$</p> <p>$3^{2(x-3)} \times 3^{4(1-x)} = 3^{3(-x)}$</p> <p>$3^{2x-6} \times 3^{4-4x} = 3^{-3x}$</p> <p>$3^{-2x-2} = 3^{-3x}$ $-2x - 2 = -3x$ $x = 2$</p>	<p>M1 M1 A1</p>	<p>for common base equating the powers</p>
	<p>3</p>	
<p>8. $\frac{180(n-2)}{n} = 165$</p> <p>$360 = 180n - 165n$</p> <p>$n = \frac{360}{15}$</p> <p>$= 24$</p>	<p>M1 A1</p>	<p><u>Alternative method</u> $n = \frac{360}{\text{ext angle}} = \frac{360}{180-165}$ $= \frac{360}{15}$ $n = 24$</p>
	<p>2</p>	

<p>9. $\frac{(2 - \sqrt{5})(1 + \sqrt{5}) + (2 + \sqrt{5})(1 - \sqrt{5})}{(2 + \sqrt{5})(2 - \sqrt{5})}$</p> $\frac{2 + 2\sqrt{5} - \sqrt{5} - 5 + 2 - 2\sqrt{5} + \sqrt{5} - \sqrt{5}}{4 - 5}$ $= 6$	M1	✓ LCM application
	M1	✓ expansion
	A1	
	3	
<p>10. $\text{Log}_4 3 - \frac{1}{2} (2) \text{log}_4^{(2x-5)} = \text{log}_4 4^{3/2}$</p> $\frac{3}{2x-5} = 8$ $3 = 16x - 40$ $x = \frac{43}{16} = 2 \frac{11}{16}$	M1	all in log form
	M1	✓ dropping of logs
	A1	accept $\frac{43}{16}$
	3	
<p>11. Man hrs for first group $5 \times 8 = 40$ Time taken by second group $\frac{5 \times 8 \times 2}{12}$</p> $= 6 \frac{2}{3} \text{ hrs}$	M1	✓ man hours
	M1	✓ time taken (expression)
	A1	accept 6.667
	3	
<p>12. Relative speed = $(80 + 40) \text{ km/h}$ $= 120 \text{ km/h}$ Distance covered by A before 10.15 am $= \frac{15}{60} \times 80 = 20 \text{ km}$</p> <p>Distance between the vehicles at 10.15 am $= 150 - 20 = 130 \text{ km}$ Time taken for vehicles to meet $= \frac{130}{120} = 1 \text{ hr } 05 \text{ mins}$ Time of meeting = $10.15 + 1 \text{ hr } 05 \text{ min}$ $= 11.20 \text{ am}$</p>	M1	for rel speed
	B1	for distance apart
	B1	✓ time taken
	B1	
	4	

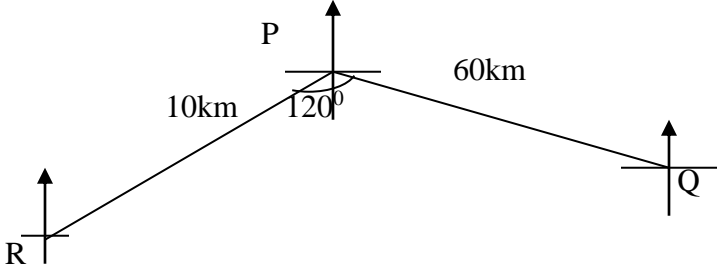
<p>13.</p> <p style="text-align: right;">Perp. Distance = 5.8cm \pm 0.1 75^0</p>	<p>B1 B1 B1 B1</p>	<p>✓ measurement of AB and BC ✓ construction of $\angle BAD = 75^0$ ✓ construction of bisector to AB & CD  ✓ measurement of bisector</p>
	<p>4</p>	
<p>14. (i) $(144 + 36) \times 60 \times \cos 30^0$ $= 180 \times 60 \times \cos 30^0$ $= 9353\text{nm}$</p> <p>(ii) $L = 60 \times 120$ $= 7200\text{nm}$</p>	<p>M1 A1</p> <p>M1 A1</p>	
	<p>4</p>	
<p>15. $L_1 : (4, 0), (0, -3)$ Slope = $\frac{-3}{-4} = \frac{3}{4} = \frac{y+3}{x}$</p> <p>$4y + 12 = 3x \Rightarrow 4y - 3x = -12$ $\Rightarrow 4y - 3x > 1$</p> <p>$L_2 : (0, 4), (5, 0)$ Slope = $\frac{4}{-5} = \frac{-4}{5} = \frac{y}{x-5}$</p> <p>$\rightarrow -4x + 20 = 5y$ $\rightarrow 5y + 4x = 20$ $\rightarrow 5y + 4x \leq 20$</p> <p>$L_3 : x \geq 0, y \geq 0$</p>	<p>B1</p> <p>B1</p> <p>B1</p>	<p>B1</p> <p>✓ both</p>
	<p>3</p>	
<p>16. From $V = M/D$, Metal A : $\frac{3}{2.7} = V = \frac{10\text{cm}^3}{9}$</p>		

<p>Metal B : From $M = DV$ $M = 3.2 \times 1.6 = 5.12\text{g}$ Mixture: Mass = $3 + 5.12 = 8.12\text{g}$ Volume = $\frac{10}{9} + 1.6 = 2.71\text{cm}^3$ Density = $\frac{8.12}{2.71} = 2.996\text{g/cm}^3$</p>	<p>B1 B1 B1 B1</p>	<p>$\sqrt{V, M}$ $\sqrt{\text{mass of mixture}}$ $\sqrt{\text{volume of mixture}}$ $\sqrt{\text{nas}}$</p>
4		
<u>SECTION II</u>		
<p>17. (a) Commission = $6895 - (4500 + 1500 + 500)$ = 395 (b) Commission paid at 2% = $\frac{2}{100} \times 10000$ = sh. 200 Commission paid at 3% = $395 - 200$ Sh 195 Let the value of goods exceeding sh. 1000₀ be x $\frac{3}{100} \times x = 195$ $x = \frac{195 \times 100}{3}$ = sh. 6500 Total value of goods sold = $10,000 + 6,500$ = sh. 16,500</p>	<p>M1 A1 M1 A1 M1 A1 M1 A1 M1 A1</p>	<p>for add & subt for correct value</p>
10		

18. S1 for $\sqrt{\text{scale}}$
P1 for $\sqrt{\text{plotting}}$
L1 for $\sqrt{\text{line}}$

18.	<p>(b) (i) Acceleration = $\frac{\text{change in velocity}}{\text{change in time}}$</p> $= \frac{40 - 0}{100 - 0}$ $= \frac{40}{100}$ $= 0.4 \text{ m/s}^2$ <p>(ii) Acceleration = $\frac{\text{change in velocity}}{\text{change in time}}$</p> $= \frac{40 - 0}{400 - 520}$ $= \frac{40}{-120}$ $= -0.3333 \text{ m/s}^2$ <p>Deceleration = 0.3333 m/s^2</p> <p>(iii) Distance = Area under graph</p> $= \frac{1}{2} (520 + 300) \times 40$ $= \frac{1}{2} \times 820 \times 40$ $= 16400 \text{ m}$ $= 16.4 \text{ km}$	<p>M1</p> <p>A1</p> <p>M1</p> <p>A1</p> <p>M1</p> <p>M1</p> <p>A1</p>	<p>expression</p> <p>Simplifying</p> <p>accept in m</p>
		10	
19.	<p>(a) $\angle DCE = \angle ADE = 42^\circ$ (Angle in the alternate segment)</p> <p>(b) $\angle BCE = \angle BDE = 24^\circ$ (Angles subtended by same chord in the same segment)</p> <p>(c) $\angle DCB$ $= 24 + 42$ $= 66^\circ$ (\angle in alt segment)</p> <p>(d) $\angle DEB = 180^\circ - (24 + 42)$ $= 114^\circ$ (Opposite \angles in cyclic quad.)</p>	<p>B1</p> <p>B1</p> <p>B1</p> <p>B1</p> <p>M1</p> <p>A1</p> <p>B1</p> <p>M1</p> <p>A1</p> <p>B1</p>	<p>\checkmark ans</p> <p>\checkmark reason</p> <p>\checkmark ans</p> <p>\checkmark reason</p> <p>\checkmark reason</p> <p>\checkmark reason</p>
		10	

<p>20. (a) 200 T</p> <p>(b) Area of</p> $P = \frac{1}{2} \times 300 \times 200 = 30,000$ $Q = \frac{1}{2} (200 + 100) 600 = 90,000$ $R = \frac{1}{2} (100 + 300) 300 = 60,000$ $S = \frac{1}{2} (300 + 100) 600 = 120,000$ $T = \frac{1}{2} \times 200 \times 100 = 10,000$ $U = \frac{1}{2} \times 400 \times 200 = 40,000$ $V = \frac{1}{2} \times (150 + 200) 1000 = 175,000$ $W = \frac{1}{2} \times (200 + 150) 500 = 87,500$ $X = \frac{1}{2} \times 100 \times 200 = 10,000$ <p>Total area = 622,500m²</p> <p>Area in hect: $\frac{622,500}{100 \times 100}$ = 62.25 Hect.</p>	<p>B2</p> <p>M1</p> <p>M1</p> <p>M1</p> <p>M1</p> <p>M1</p> <p>A1</p> <p>M1</p> <p>A1</p> <p>10</p>	<p>✓ ketch</p> <p>✓ adding</p> <p>✓ conversion</p>
<p>21. $\frac{22}{7} \times 7 \times 7 \times 10 = 1540\text{m}^3$ $\frac{4}{3} \times \frac{1}{2} \times \frac{22}{7} \times 7^3 = 718.7\text{m}^3$</p> $1540 + 718.7 = 2,258.7\text{m}^3$ <p>(b) $(\frac{22}{7} \times 7^2) + (4 \times \frac{22}{7} \times 7^2 \times \frac{1}{2}) + (\frac{22}{7} \times 7 \times 10 \times 2)$ = 902m²</p> <p>(c) Mass = V x D = 2,258.7 x 800 = $\frac{1,806,960}{1000}$ kg = 1806.96 tonnes</p>	<p>M1</p> <p>M1</p> <p>A1</p> <p>M1M1M1</p> <p>A1</p> <p>M1</p> <p>M1</p> <p>A1</p> <p>10</p>	<p>Each ✓ part 1mk x 3</p>

<p>22.</p>  <p> $P^2 = 100^2 + 60^2 - 2(100)(60) \cos 120$ $P^2 = 13600 - 12000 \cos 120$ $P^2 = 19,600 \text{km}^2$ $P = 140 \text{km}$ </p> <p>(b) $\frac{140}{\sin 120} = \frac{100}{\sin Q}$</p> <p>$\sin Q = \frac{100 \sin 120}{140}$ $= 38.2^\circ$</p> <p>Bearing is $270^\circ - 38.2^\circ = 241.8^\circ$</p> <p>(c) $\frac{60}{20} + 1 + \frac{140}{20} + 1 \frac{1}{2} + \frac{100}{20}$ $= 17 \frac{1}{2} \text{ hours}$</p>	<p>B1</p> <p>M1</p> <p>M1</p> <p>A1</p> <p>M1</p> <p>M1</p> <p>M1</p> <p>A1</p> <p>M1</p> <p>A1</p> <p>10</p>	<p>sketch may be implied in calculation</p> <p>Accept $5 \text{ } 61.8^\circ \text{W}$</p>														
<p>23. (a) $\frac{B}{A} = C + KA$</p> <table border="1" data-bbox="235 1270 901 1375"> <tr> <td>A</td> <td>1</td> <td>2</td> <td>3</td> <td>4</td> <td>5</td> <td>6</td> </tr> <tr> <td>B/A</td> <td>3.2</td> <td>3.375</td> <td>3.6</td> <td>3.775</td> <td>4</td> <td>4.2</td> </tr> </table> <p>(See graph</p> <p>$C = 3 \pm 0.1$</p> <p>$K = \text{gradient} = \frac{4-3}{5-9} = 0.2$</p> <p>(b) $B = 3A + 0.2A^2$</p> <p>(c) $B = 3(7) + 0.2(49) = 30.8$</p>	A	1	2	3	4	5	6	B/A	3.2	3.375	3.6	3.775	4	4.2	<p>B1</p> <p>B2</p> <p>B1</p> <p>B1</p> <p>B1</p>	<p>$\sqrt{\text{eqn}}$ may be implied from table</p> <p>$\sqrt{\text{values}}$ (B1 for $\sqrt{4}$ values)</p> <p>$\sqrt{1}$</p> <p>$\sqrt{1}$</p> <p>$\sqrt{1}$</p>
A	1	2	3	4	5	6										
B/A	3.2	3.375	3.6	3.775	4	4.2										

B/A 5 4 3 2 1 1 2 3 4 5 6 A

S1 √ Scale
P1 √ Plotting
L1 √ Line

<p>24. (a) $S = 5^3 - 5 \times 5^2 + 3 \times 5 + 4$ $= 19\text{m}$</p> <p>(b) $V = \frac{ds}{dt} = 3t^2 - 10t + 3$ $= 3 \times 5^2 - 10 \times 5 + 3$ $= 28\text{m/s}$</p> <p>(c) Momentarily at rest $V = 0$ $3t^2 - 10t + 3 = 0$ $(3t - 1)(t - 3) = 0$ $t = \frac{1}{3}$ or $t = 3$</p> <p>(d) Acceleration when $t = 2$ $A = \frac{dv}{dt} = 6t - 10$ $= 6 \times 2 - 10$ $= 2\text{m/s}^2$</p>	<p>M1 A1</p> <p>M1 M1 A1</p> <p>M1 M1 A1</p> <p>M1 A1</p>	<p>✓ expression equated to zero ✓ factorisation ✓</p> <p>✓ differentiation of velocity to get accel</p> <p>✓ ans</p>
	10	

Name _____ Index No. _____

Candidate's signature _____

Date _____

Adm. No. _____

121/2
MATHEMATICS ALT A
PAPER 2
JULY 2011
2 ½ HOURS

MAKINDU DISTRICT INTER-SECONDARY SCHOOLS EXAMINATIONS
Pre- Kenya Certificate of Secondary Education
MATHEMATICS
PAPER 2
2 ½ HOURS

INSTRUCTIONS TO CANDIDATES

- (a) Write your name and index number in the spaces provided above.
- (b) Sign and write the date of examination in the spaces provided above.
- (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) All answers and working must be written on the question paper in the spaces provided below each question.
- (f) Show all the steps in your calculations, giving your answers at each stage in the spaces below each question.
- (g) Marks may be given for correct working even if the answer is wrong.
- (h) Non-programmable silent electronic calculators and KNEC Mathematical tables may be used except where stated otherwise.
- (i) This paper consists of 20 printed pages.
- (j) Candidates should check the question paper to ascertain that all the pages are printed as indicated and that no questions are missing.

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**

--

This paper consists of 20 printed pages

Turn Over

SECTION I (50 MARKS): Answer all the questions in this section in the spaces provided.

1. Use logarithm tables to evaluate

(4 marks)

$$\left(\frac{1.23 \times 0.0089}{76.54} \right)^{1/3}$$

2. A point (-7, 4) is mapped onto (-5, 7) by a translation. Find the image of (1, 2) under the same translation.

(2 marks)

3. Each child in a family of X children gives the others a birthday present. If in one year 12 presents are given, form an equation in X hence find the number of children in the family.

(3 marks)

4. (a) Write down the first four terms of the expansion $(1 - 2x)^6$. (2 marks)
- (b) Use this expansion to find the value of $(0.98)^6$ correct to 3.s.f. (2 marks)
5. Find the values of x between $0 \leq x < \pi^c$ that satisfy the equation $^{4/3}\sin 3x - ^{2/3}\cos x = 0$ (3 marks)

6. Make Q the subject of the formula below .

(3 marks)

$$R = \sqrt[3]{\frac{Q + 4N}{2Q - 4}}$$

7. The velocity of a particle v m/s moving in a straight line after t seconds is given by $v = 3t^2 - 3t - 6$. Calculate the distance covered by the particle between $t = 1$ and $t = 4$. (3 marks)

8. Find the radius and centre of the circle whose equation is

$$3x^2 + 3y^2 - 6x + 12y + 3 = 0$$

(3 marks)

9. A fundi records the length and the breath of the living room of a house as 5.3m and 3.5m respectively to the nearest 0.1m. Find to the nearest 4 significant figures the percentage error in the calculation of the area of the living room. (3 marks)

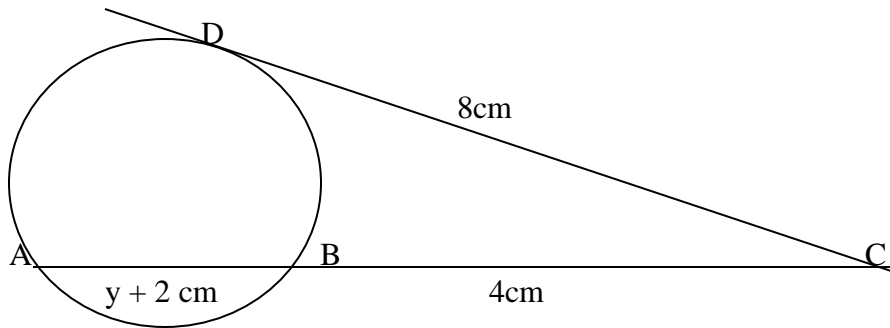
10. An object T of area 20cm^2 is mapped onto its image Q whose area is 80cm^2 by a transformation whose matrix is given by $\begin{pmatrix} x & x \\ 3 & x+3 \end{pmatrix}$. Find the possible values of x. (2 marks)

11. The first and the last terms of an A.P are 2 and 59 respectively. If the sum of the series is 610. Find the number of terms in the series. (3 marks)

12. A triangular plot ABC is such that $AB = 36\text{m}$, $BC = 41\text{m}$ and $AC = 43\text{m}$. Calculate
(a) The area of the plot. (2 marks)

- (b) The acute angle between the edges AB and BC. (2 marks)

13. In the figure below, line DC is a tangent to the circle and line AC cuts the circle at points A and B. Line $DC = 8\text{cm}$, $AB = y + 2\text{ cm}$, and $BC = 4\text{cm}$. Find the value of y . (2 marks)



14. A quantity P is partly constant and partly varies inversely as another quantity q.
Given that $p = 10$ when $q = 1.5$ and $P = 20$ when $q = 1.25$, find the value of P when $q = 0.5$
(4 marks)
15. In the figure below, O is the centre of the circle and $\angle OAD = 25^\circ$. Calculate $\angle BCD$ (4 marks)
A B O C X D
16. Jane has 50 coins whose total value is Ksh. 205. There are twice as many one shilling coins as the five shilling coins. The rest are twenty shilling coins. Find the number of the twenty shilling coins (4 marks)

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

17. In a triangle OAB , $\mathbf{OA} = \mathbf{a}$ and $\mathbf{OB} = \mathbf{b}$. M lies on AB such that $AM : MB = 3 : 5$

(a) Find in terms of \mathbf{a} and \mathbf{b} the vectors;

(i) \mathbf{AB}

(1 mark)

(ii) \mathbf{AM}

(1 mark)

(iii) \mathbf{BM}

(2 marks)

(iv \mathbf{OM}

2 marks)

(b) Point R is on \mathbf{OM} such that $\mathbf{AR} = \frac{-5\mathbf{a}}{8} + \frac{9\mathbf{b}}{40}$. Find the ratio OR : RM.

(4 marks)

18. The table below shows the marks scored by students in a mathematics test.

Marks	30-39	40-49	50-59	60-69	70 -79	80-89
No. of students	6	20	19	20	20	15

(a) Calculate the median mark.

(3 marks)

(b) Using an assumed mean of 62, calculate the mean mark.

(4 marks)

(c) On the grid provided, draw a histogram to represent the information shown.

(3 marks)

19. (a) Complete the table below for the function $y = x^3 + 3x^2 - 2x - 4$ (2 marks)

x	-4	-3	-2	-1	0	1	2
x^3		27				1	
$3x^2$		27				3	
$-2x$		6				-2	
-4		-4				-4	
$y = x^3 + 3x^2 - 2x - 4$		2				-2	

(b) On the grid provided draw the graph of $y = x^3 + 3x^2 - 2x - 4$ for $-4 \leq x \leq 2$

(3 marks

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

(2 marks)

(d) On the same axes, draw the graph of $y = 2x + 2$. Hence estimate the solution
of the equation $x^3 + 3x^2 - 4x - 6 = 0$

(3 marks)

20. A triangle $A(-4, 2)$, $B(-6, 6)$ and $C(-6, 2)$ is enlarged by a scale factor -1 and centre $(-2, 6)$ to produce triangle $A^1B^1C^1$. Triangle $A^1B^1C^1$ is then reflected in the line $y = x$ to give triangle $A^{11}B^{11}C^{11}$.

(a) In the grid provided below, draw triangle ABC , $A^1B^1C^1$ and $A^{11}B^{11}C^{11}$. (6 marks)

(b) If triangle $A^{11}B^{11}C^{11}$ is mapped onto another triangle $A^{111}B^{111}C^{111}$ whose co-ordinates are $A^{111}(0, -2)$, $B^{111}(4, -4)$ and $C^{111}(0, -4)$ by a rotation. Find the centre and the angle of rotation. (4 marks)

21. The monthly income tax rates for the year 2004 were as in the table below.

<u>Monthly taxable Income in Kshs</u>	<u>Tax Rate (Percentage)</u>
1 – 9,860	10%
9,861 – 18,800	15%
18,801 – 27,920	20%
27,921 – 37,040	25%
37,041 and above	30%

Mwelu's monthly earnings in the year 2004 were as follows.

Basic salary	Kshs	20,600
House allowance	Kshs	12,000
Medical allowance	Kshs	2,880
Transport allowance	Kshs.	340

Mwelu was entitled to a tax relief of Kshs. 1,056.

Calculate

(a) Her monthly taxable income, (2 marks)

(b) The monthly tax she pays (6 marks)

(c) He net monthly salary. (2 marks)

22. A drawer contains six grey socks and nine blue ones. One dark morning, two socks were drawn from the drawer one after the other.

(a) Draw a tree diagram to represent all the possible ways in which the socks may have been drawn. (2 marks)

(b) Calculate the probability that
(i) The first sock is grey . (1 mark)

(ii) Both socks are grey. (2 marks)

(iii) A blue sock is drawn followed by a grey one. (2 marks)

(iv) Both socks are of the same colour.

(3 marks)

23. (a) Construct a triangle PQR such that $PQ = 7.5\text{cm}$, the ratio of $\angle QPR : \angle PQR$ is $5 : 3$ and $\angle QRP = 60^\circ$ (4 marks)

(b) Construct the locus of a point S on the same side as R which moves such that $\angle PSQ = 75^\circ$ (3 marks)

(c) Construct the locus of a point T which moves such that its always equidistant from lines PQ and PR and produce it to intersect the locus of S at M. (1 mark)

(d) By dropping a perpendicular from point M onto PQ at N, measure MN. Hence calculate the area of triangle PMQ (2 marks)

24. A company wishes to buy two types of juice packaging machines; electric and manual. A manual machine requires 4 attendants whereas an electric one requires 2. An electric machine fills 300 packets per hour, a manual one can fill 200 packets per hour. At least 3000 packets need to be filled per hour and the number of attendants should not exceed 40.

(a) Write down all the inequalities to describe these conditions and represent them in a graph
(7 marks)

(b) If for every hour it is used an electric machine brings a profit of shs. 200 and a manual one shs.500, determine the number of machines of each type that should be installed in order to maximize the profit per hour. (2 marks)

(c) Find the maximum profit. (1 mark)

121/2
MATHEMATICS ALT A
PAPER 2
JULY 2011

MAKINDU DISTRICT INTER-SECONDARY SCHOOLS EXAMINATIONS
Pre - Kenya Certificate of Secondary Education
MATHEMATICS
PAPER 2

MARKING SCHEME

SECTION 1

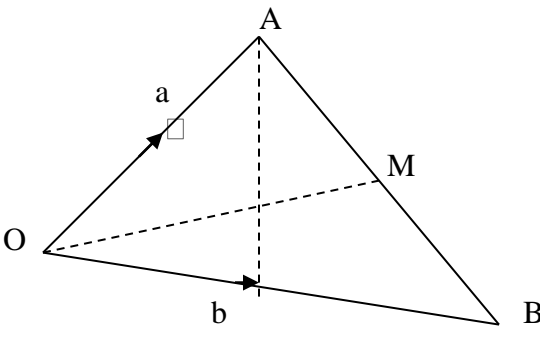
1.	No 1.23 0.0089 76.54 $10^{-2} \times 5.230$ Expression =	Log 0.0899 $\frac{3.9494}{2.0393} +$ $\frac{1.8839}{4.1554} \div 3$ $\frac{6 + 2.1554}{3}$ 2.7185 0.0523	M1 M1 M1 A1	✓ All logs ✓ attempt +, - ✓ (÷ 3) C.A.O
			4	
2.	$\begin{pmatrix} -7 \\ 4 \end{pmatrix} + T = \begin{pmatrix} -5 \\ 7 \end{pmatrix}$ $T = \begin{pmatrix} -5 \\ 7 \end{pmatrix} - \begin{pmatrix} -7 \\ 4 \end{pmatrix}$ $= \begin{pmatrix} 2 \\ 3 \end{pmatrix}$ $\begin{pmatrix} 1 \\ 2 \end{pmatrix} + \begin{pmatrix} 2 \\ 3 \end{pmatrix} = \begin{pmatrix} 3 \\ 5 \end{pmatrix}$ Image of (1, 2) is (3, 5)		M1	
			A1	
			2	
3.	$x(x-1) = 12$ $x^2 - x - 12 = 0$ $(x-4)(x+3) = 0$ $x = 4$		M1 M1 A1	✓ formation of eqn. ✓ factorisation
			3	

This paper consists of 11 printed pages

Turn Over

<p>4. (a) $(1 - 2x)^6 = 1^6 + 6(1)^5(-2x) + 15(1)^4(-2x)^2 + 20(1)^3(-2x)^3$ $= 1 + 6x(-2x) + 15x4x^2 + 20x - 8x^3$ $= 1 - 12x + 60x^2 - 160x^3$</p> <p>(b) $(0.98)^6 = (1 - 0.02)^6$ $2x = 0.02$ $x = 0.01$ $0.98^6 = 1 - 12(0.01) + 60(0.01)^2 - 160(0.01)^3$ $= 1 - 0.12 + 0.006 - 0.00016$ $= 0.886$</p>	<p>M1</p> <p>A1</p> <p>M1</p> <p>A1</p>	<p>√ expands & rem brackets</p> <p>answer simplified</p> <p>substitution of x</p> <p>C.A.O</p>
	4	
<p>5. $\sin 3x = 0.5$ $3x^0 = 30^0, 150^0, 390^0, 510^0$ $= \frac{1}{6}\pi^C, \frac{5}{6}\pi^C, \frac{13}{6}\pi^C, \frac{17}{8}\pi^C$</p> <p>$x = \frac{1}{18}\pi^C$ } $x = \frac{5}{18}\pi^C$ }</p> <p>$x = \frac{13}{18}\pi^C$ } $x = \frac{17}{18}\pi^C$ }</p>	<p>B1</p> <p>B1</p> <p>B1</p>	
	3	
<p>6. $R^3 = \frac{Q + 4N}{2Q - 4}$</p> <p>$2R^3Q - Q = 4N + 4R^3$</p> <p>$Q = \frac{4N + 4R^3}{2R^3 - 1}$</p>	<p>M1</p> <p>M1</p> <p>A1</p>	<p>for cubing</p> <p>For taking Q on one side</p> <p>√ Ans</p>
	3	
<p>7. $S = \int_1^4 (3t^2 - 3t - 6) dt$</p> <p>$= \left[t^3 - \frac{3}{2}t^2 - 6t \right]_1^4$</p> <p>$= (64 - \frac{3}{2} \times 16 - 6 \times 4) - (1 - \frac{3}{2} - 6)$ $= 22.5\text{cm}$</p>	<p>M1</p> <p>M1</p> <p>A1</p>	<p>√ integrating</p> <p>substitution</p> <p>C.A.O</p>
	3	
<p>8. $x^2 + y^2 - 2x + 4y = -\frac{3}{4}$ $x^2 - 2x + (\frac{2}{2})^2 + y^2 + 4y + (\frac{4}{2})^2 = -\frac{3}{4} + (\frac{2}{2})^2 + (\frac{4}{2})^2$ $(x - 1)^2 + (y + 2)^2 = -1 + 1 + 4 = 4$ $(x - 1)^2 + (y + 2)^2 = 2^2$ Centre ; (1, -2) , Radius; 2 units</p>	<p>M1</p> <p>M1</p> <p>A1</p>	<p>√ completion of square</p> <p>√ factors</p> <p>√ centre and radius</p>
	3	

<p>9. Rel error (length) = $\frac{0.05}{5.3} = 0.009434$</p> <p>Rel error (breadth) = $\frac{0.05}{3.5} = 0.01429$</p> <p>Rel error (Area) = $0.009434 + 0.01429 = 0.02372$</p> <p>% error = $0.02372 \times 100 = 2.372\%$</p>	<p>M1</p> <p>M1</p> <p>A1</p>	<p><u>Alternative scheme</u></p> <p>Max area = $5.35 \times 3.55 = 18.99$</p> <p>both $\sqrt{\quad}$</p> <p>Min area = $5.25 \times 3.45 = 18.11$</p> <p>Working area = $5.3 \times 3.5 = 18.55$</p> <p>$\frac{0.44 + 0.44}{2}$</p> <p>$\frac{0.44}{18.55} \times 100 = 2.372\%$</p>
	3	
<p>10. $x(x + 3) - 3x = \frac{80}{20}$</p> <p>$x^2 = 4$</p> <p>$x = +2$</p> <p>or $x = -2$</p>	<p>M1</p> <p>A1</p>	<p>$\sqrt{\quad}$ both values</p>
	2	
<p>11. $S_n = \frac{n}{2} \{2a + (n-1)d\}$</p> <p>$= \frac{n}{2} \{a + a + (n-1)d\}$</p> <p>$= \frac{n}{2} (a + 1)$</p> <p>$\therefore 610 = \frac{n}{2} (2 + 59)$</p> <p>$= \frac{n}{2} \times 61$</p> <p>$610 = \frac{61n}{2}$</p> <p>$n = \frac{610 \times 2}{61} = 20$</p>	<p>M1</p> <p>M1</p> <p>A1</p>	<p>substituting</p> <p>n subject</p> <p>$\sqrt{\quad}$ans</p>
	3	
<p>12. (a) $\sqrt{60(60 - 36)(60 - 41)(60 - 43)} \text{ m}^2$</p> <p>$\sqrt{60(24)(19)(17)} = 682\text{m}^2$</p> <p>(b) $43^2 = 36^2 + 41^2 - 2(36)(41)\cos B$</p> <p>$\cos B = \frac{-1128}{2952} = 0.3821$</p> <p>Acute angle B = $\cos^{-1} 0.3821 = 67.54^\circ$</p>	<p>M1</p> <p>A1</p> <p>M1</p> <p>A1</p>	<p>Accept equivalent ie cosine rule</p> <p>$682 = \frac{1}{2} \times 36 \times 41 \sin B$</p> <p>$\sqrt{\quad}$ans</p>
	4	
<p>13. $4(y + 2) = 64$</p> <p>$y = 14$</p>	<p>M1</p> <p>A1</p>	
	2	

<p>14. $P = C + \frac{K}{q}$ $10 = C + \frac{K}{1.5} \rightarrow 15 = 1.5C + K$</p> <p>$20 = C + \frac{K}{1.25} \rightarrow 25 = 1.25C + K$</p> <p>$1.5C + K = 15$ $\frac{1.25C + K = 25}{0.25C = -10} -$ $C = -40$</p> <p>$1.5(-40) + K = 15$ $-60 + K = 15$ $K = 75$</p> <p>When $q = 0.5$ $P = -40 + \frac{75}{0.5}$ $= -40 + 150$ $= 110$</p>	<p>M1</p> <p>M1</p> <p>A1</p> <p>B1</p>	<p>✓ both eqns</p> <p>✓ attempt to solve simultaneously</p> <p>✓ values C and K</p>
	4	
<p>15. $\angle ADC = 90^\circ$ (Angle subtended by diameter) $\angle ACD = 180 - (90^\circ + 25^\circ)$ $= 65^\circ$</p> <p>$\angle BCD = 2 \times 65^\circ$ $= 130$</p> <p>(AOC is a diameter, so AC \perp BD, AC bisects BD as well as $\angle BCD$)</p>	<p>M1</p> <p>A1</p> <p>B1</p>	
	3	
<p>16. Let five shilling coins = x One shilling coin = 2x Twenty shilling coins = $50 - (2x + x)$ $= 50 - 3x$</p> <p>$\therefore 5x + 2x + 20(50 - 3x) = 205$ $7x + 1000 - 60x = 205$ $53x = 795$ $x = 15$</p> <p>Twenty shilling coins $= 50 - 3(15)$ $= 5$</p>	<p>M1</p> <p>M1</p> <p>A1</p> <p>B1</p>	<p>✓ expression</p> <p>equating</p> <p>✓ value of x</p>
	4	
<p>17. (a)</p> 		

(i) $AB = b - a$

$\square \quad \square \quad \square$

(ii) $AM = \frac{3}{8}(b - a)$

$\square \quad \square \quad \square$

(iii) $BM = \frac{5}{8}BA$

$\square \quad \square$

$BA = a - b$

$\square \quad \square \quad \square$

$BM = \frac{5}{8}(a - b)$

$\square \quad \square \quad \square$

(iv) $OM = OA + AM$

$= a + \frac{3}{8}b - \frac{3}{8}a$

$= \frac{5}{8}a + \frac{3}{8}b$

(b) $OR = OA + AR$

$\square \quad \square \quad \square$

$= a - \frac{5}{8}a + \frac{9}{40}b$

$\square \quad \square \quad \square$

$= \frac{3}{8}a + \frac{9}{40}b$

$\square \quad \square$

$OM : OR = \left\{ \frac{3}{8}a + \frac{9}{40}b \right\} : \left\{ \frac{5}{8}a + \frac{3}{8}b \right\}$

$\square \quad \square \quad \square \quad \square \quad \square \quad \square \quad \square$

$= \frac{3}{8} \left\{ a + \frac{3}{5}b \right\} : \frac{5}{8} \left\{ a + \frac{3}{5}b \right\}$

$\square \quad \square \quad \square \quad \square \quad \square$

$= 3 : 5$

Hence $OR : RM = 3 : 2$

$\square \quad \square$

B1

B1

M1

A1

M1

A1

M1

M1

M1

A1

10

18. (a)

Marks	x	f	cf	t = x - 62	ft
30-39	34.5	6	6	-27.5	-165
40-49	44.5	20	26	-17.5	-350
50-59	54.5	19	45	-7.5	-142.5
60-69	64.5	20	65	2.5	50
70-79	74.5	20	85	12.5	250
80-89	84.5	15	100	22.5	337.5
		$\Sigma f =$ 100			$\Sigma ft = -20$

Median = $L + \left(\frac{n/2 - c.f}{f} \right) c.i$

$= 59.5 + \left(\frac{50.5 - 45}{20} \right) 10$

$= 59.5 + \frac{5.5}{10} \times 10$

$= 59.5 + 2.75$

$= 62.25 \checkmark$

B1

B1

B1

M1

A1

for .CF
for column of t

for column of ft

✓ Substitution

<p>18. (b) Mean mark = assumed mean + mean of t</p> $= 62 + \frac{\Sigma ft}{\Sigma f}$ $= 62 + \frac{-20}{100}$ $= 62 + -0.2$ $= 62 - 0.2$ $= 61.8$	<p>M1</p> <p>A1</p>	<p>✓ Substitution</p>
------------------------------------------------------------------------------------------------------------------------------------------------------	---------------------	-----------------------

(c)

20 18 16 14 12 10 8 6 4 2 0 29.5 39.5 49.5 59.5 69.5 79.5 89.5

S1 ✓ Scale

B1 ✓ Bars

B1 ✓ Shading

10

19.

(b)

-4 -3 -2 -1 1 2 3 4 x y 14 12 10 8 6 4 2 -2 -4 -6 -8 -10 -12 -14
 $y = 2x + 2$ $y = x^3 + 3x^2 - 2x - 4$

S1 Scale

P1 Plotting curve

C1 Smooth curve

19. (a) $y = x^3 + 3x^2 - 2x - 4$

x	-4	-3	-2	-1	0	1	2
y	-12	2	4	0	-4	-2	12

(c) $x = -3.2, x = -1, x = 1.2$

(d) $y = x^3 + 3x^2 - 2x - 4$
 $0 = x^3 + 3x^2 - 4x - 6$
 $y = 2x + 2$

$x = -3.6$

$x = -1$

$x = 1.6$

B2

for all correct values
(B1 for any 4 ✓)

B2

for correct roots
(B1 for any 2 ✓)

B1

for identifying the
linear equation

B2

(for all ✓)
(B1 for any 2 ✓)

10

B1 ✓ Angle of rotation

21.	<p>(a) Total monthly income Shs. (20,600 + 1200 + 2880 + 340) = sh. 35,820</p> <p>(b) 1st 9680 = $\frac{10}{100} \times 9680 = 968$ 2nd 9120 = $\frac{15}{100} \times 9120 = 1368$ 3rd 9120 = $\frac{20}{100} \times 9120 = 1824$ 4th 7900 = $\frac{25}{100} \times 7900 = 1975$</p> <p style="text-align: right;">Total sh. 6,135 - Less relief 1056 Monthly tax paid = sh. 5.079</p> <p>(c) (20,600 + 12,000 + 2,880 + 340) – 5079 = 35,820 – 5079 = sh. 30,741</p>	M1 A1 M1 M1 M1 M1 M1 A1 M1 A1	
		10	
22.	<p>(a)</p> <p>(b) (i) $\frac{6}{15}$ (ii) $\frac{6}{15} \times \frac{5}{14} = \frac{30}{210} = \frac{3}{21}$ (iii) $\frac{9}{15} \times \frac{6}{14} = \frac{54}{210} = \frac{9}{35}$ (iv) P ($\frac{6}{15}$ and $\frac{5}{14}$) or P ($\frac{9}{15}$ and $\frac{8}{14}$) $= \frac{30}{210} + \frac{72}{210}$ $= \frac{17}{35}$</p>	B2 B1 M1A1 M1A1 M1 M1 A1	<p>√ diagram (all) (B1 for 1 branch √)</p> <p>Accept $\frac{102}{210}$</p>
		10	

23.	<p>P S N Q 5 M S R 15° 15°</p> <p>$\angle QPR : \angle PQR = 5 : 3$ $\angle QPR = \frac{5}{8} \times 120 = 75^{\circ}$ $\angle PQR = \frac{3}{8} \times 120 = 45^{\circ}$</p>	<p>B1 B1 B1 B1 B1 B1 B1 B1</p>	<p>for getting angles QPR and PQR constructive 45° constructing 75° ΔPQR Locating angle at centre & \angle at circumference Angles 15° Major arcs</p>
	<p>MN = 4.4cm Area = $\frac{1}{2} \times PQ \times MN$ = $\frac{1}{2} \times 7.5 \times 4.4$ = 16.5cm^2</p>	<p>B1 M1 A1</p>	
		10	
24.	<p>Let x – No. of electrical y – No. of manual</p> <p>(a) $300x + 200y \geq 3000$ Or $3x + 2y \geq 30$ $x + y \leq 40$ $x \geq 0, y \geq 0$</p> <p>(b) $200x + 500y = C = 9000$ $2x + 5y = 90$ (0, 40) ie 0 electrical 40 manual</p> <p>(c) 40 (200) = sh. 8,000</p>	<p>B1 B1 B1 B1 B1 B1</p>	
		10	

B1 ✓ Drawing and shading

$$3x + 2y \geq 30$$

B1 ✓ Drawing and shading

$$x + y \leq 40$$

B1 ✓ Shading

$$x \geq 0 \text{ and } y \geq 0$$

B1 ✓ Drawing

$$2x + 5y = 90$$

50 40 30 20 10 10 20 30 40 50 $y = 0$ $3x + 2y = 30$ $2x + 5y = 90$ $x = 0$