

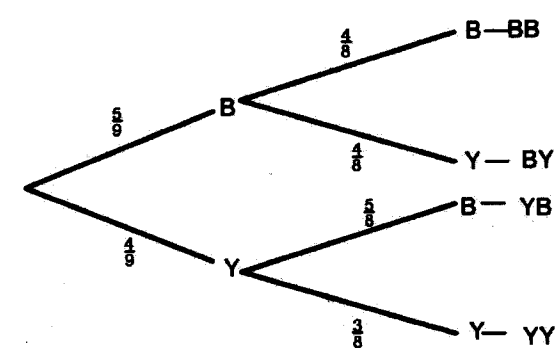
5.2.2 Mathematics Alternative B Paper 2 (122/2)

No	Marking scheme	marks	comments
1.	$\frac{\sqrt{9.61+2.15}}{\sqrt{8.04-7.11}} = \sqrt{\frac{11.76}{0.93}}$ $= 3.556$	M1 A1 2	
2.	$N(P+M) = PM^2$ $PM^2 - NP = NM$ $P = \frac{NM}{M^2 - N}$	M1 M1 A1 3	
3.	$3x^2 - 8x - 3 = 0 \quad x(3x - 8x^2) = 0$ $x = 0 \text{ or } 3x - 8x^2 = 0$ <p>When $3x - 8x^2 = 0$</p> $x = \frac{-3 \pm \sqrt{3^2 - 4 \times 3 \times 0}}{2 \times -8}$ $x = \frac{-3 \pm \sqrt{9}}{-16} = \frac{3}{8}$ $\therefore x = \frac{3}{8} \text{ or } x = 0$	M1 M1 A1 3	
4.	$S_n = \frac{11}{2} \{2 \times 3 + 10 \times 9\}$ $= \frac{11}{2} \{6 + 90\}$ $= 528$	M1 A1 2	

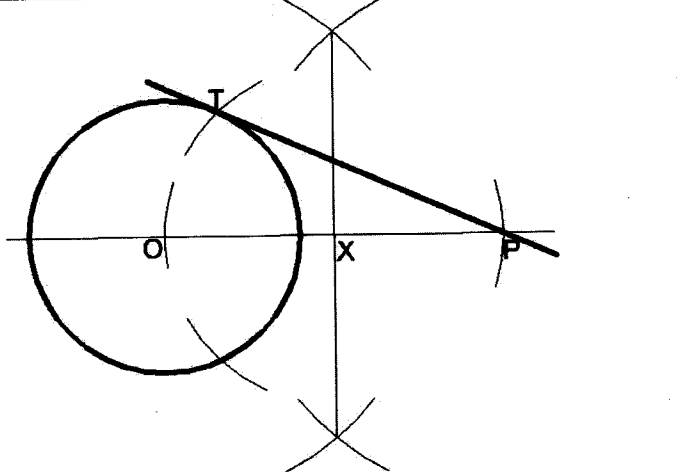
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5(a)	$\text{Area} = 10 + \frac{28}{2}$ $= 24 \text{ cm}^2$	M1 A1	
6	$I = P - A$ $= 796\,800 - 480\,000$ $= \text{Ksh } 316\,800$ $\frac{480\,000 \times R \times 4}{100} = 316\,800$ $R = \frac{316\,800 \times 100}{4 \times 480\,000}$ $= 16.5\%$	M1 M1 A1	
7	<p>Area tiled by 3 people</p> $= 135 \times \frac{3}{4} \times \frac{12}{10}$ $= 121.5 \text{ m}^2$	M1 A1	
8	$AB = \begin{pmatrix} 3 & 2 \\ -1 & -1 \end{pmatrix} \begin{pmatrix} -1 & -2 \\ 5 & 4 \end{pmatrix}$ $= \begin{pmatrix} 7 & 2 \\ -4 & -2 \end{pmatrix}$ $ AB = -14 + 8 = -6$	M1 A1 B1	

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<p>9(a)</p>  <p>(b)</p> $P(YY) = \frac{4}{9} \times \frac{3}{8}$ $= \frac{1}{6}$		<p>B1</p> <p>B1</p> <p>M1</p> <p>A1</p> <p>4</p>	<p>For 1st branch</p> <p>For 2nd branch</p>
<p>10.</p>	<p>Longitude difference</p> <p>= 13 + 28</p> <p>= 41°</p> <p>Time difference = 41 × 4</p> <p>= 164 Minutes</p> <p>= 2 hrs 44 min</p> <p>Local time at B</p> <p>= 1730 + 2 hrs 44 min</p> <p>= 2014 h</p>	<p>B1</p> <p>M1</p> <p>M1</p> <p>A1</p> <p>4</p>	

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11.		B1 B1 B1 3	Constructing circle radius = 2cm Bisecting OP drawing tangent PT																								
12.	<table border="1"> <thead> <tr> <th>x</th> <th>f</th> <th>fx</th> </tr> </thead> <tbody> <tr> <td>16.5</td> <td>2</td> <td>33</td> </tr> <tr> <td>20.5</td> <td>6</td> <td>123</td> </tr> <tr> <td>24.5</td> <td>9</td> <td>220.5</td> </tr> <tr> <td>28.5</td> <td>11</td> <td>313.5</td> </tr> <tr> <td>32.5</td> <td>12</td> <td>390</td> </tr> <tr> <td>36.5</td> <td>7</td> <td>255.5</td> </tr> <tr> <td>40.5</td> <td>3</td> <td>121.5</td> </tr> </tbody> </table> $\bar{x} = \frac{\sum fx}{fx}$ $= \frac{1457}{50}$ $= 29.14 \text{ kg}$	x	f	fx	16.5	2	33	20.5	6	123	24.5	9	220.5	28.5	11	313.5	32.5	12	390	36.5	7	255.5	40.5	3	121.5	 M1 M1 M1 A1 4	For x (mid points) For fx
x	f	fx																									
16.5	2	33																									
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40.5	3	121.5																									

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13. (a)	$(RQ)^2 = 40^2 + 74^2 - 2 \times 74 \times 40 \cos 82^\circ$ $RQ = \sqrt{6252.1}$ $= 79.07$	M1 A1	
(b)	$\frac{79.07}{\sin 82} = \frac{40}{\sin x}$ $\sin x = \frac{40 \sin 82}{79.07} = 0.5010$ $x = 30.07^\circ$	M1 A1	
14.	$\begin{pmatrix} 0 & 1 \\ 1 & 0 \end{pmatrix} \begin{pmatrix} 0 & 1 \\ -1 & 0 \end{pmatrix} = \begin{pmatrix} -1 & 0 \\ 0 & 1 \end{pmatrix}$ $\begin{pmatrix} -1 & 0 \\ 0 & 1 \end{pmatrix} \begin{pmatrix} 1 & 5 & 5 & 1 \\ 1 & 1 & 4 & 3 \end{pmatrix} = \begin{pmatrix} -1 & -5 & -5 & -1 \\ 1 & 1 & 4 & 3 \end{pmatrix}$ <p>Co-ordinates of A'B'C'D' are A'(-1,1), B'(-5,1), C'(-5,4) and D'(-1,3).</p>	M1 M1 A1	or equivalent
15.	$m + n = \begin{pmatrix} -6 \\ 2 \end{pmatrix} + \begin{pmatrix} 18 \\ -7 \end{pmatrix}$ $= \begin{pmatrix} 12 \\ -5 \end{pmatrix}$ $ m + n = \sqrt{12^2 + (-5)^2}$ $= 13$	M1 M1 A1	
		4	
		3	
		3	

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16.	$v = t^2 - 2$ <p>At $t = 2$</p> $V = 4 - 2 = 2$ <p>At $t = 5$</p> $V = 25 - 2$ $= 23$ <p>Rate of change of V</p> $= \frac{23 - 2}{5 - 2}$ $= \frac{21}{3} = 7$	B1	For values of V i.e. 2 and 23
		M1	
		A1	
		3	

17.	(a)	$A = 600\,000 \times 1.1^3$ $= \text{Ksh } 798\,600$	M1		
			A1		
	(b)	(i)	$n = 4$ $r = \frac{10}{2} = 5\%$ $A = 798\,600 \times (1.05)^4$ $= \text{Ksh } 970\,703$		B1
					B1
					M1
					A1
	(b)	(ii)	$I = 970\,703 - 60\,000$ $= \text{Ksh } 370\,703$		M1
					A1
	(c)		$p \times (1.1)^5 - p = 370\,703$ $p[(1.1)^5 - 1] = 370\,703$ $p = \frac{370\,703}{(1.1)^5 - 1}$ $= \text{Ksh } 607\,202$		M1
					A1
10					

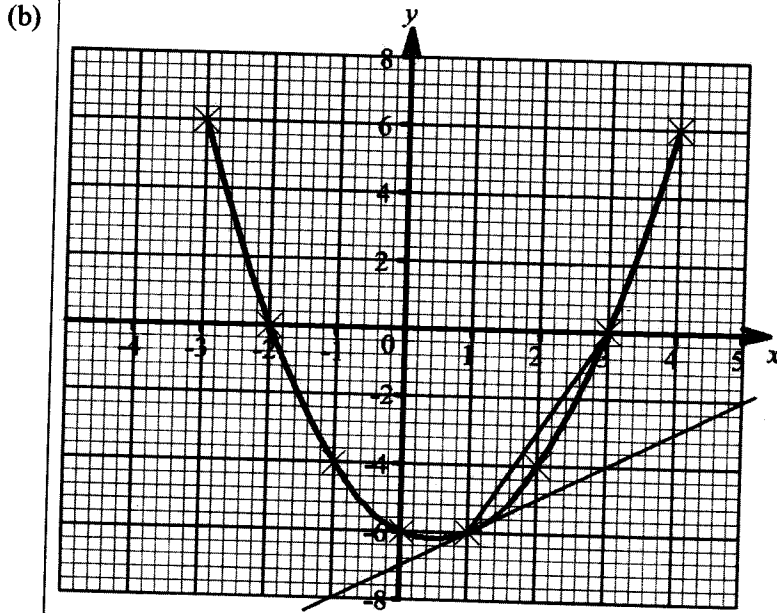
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18.			
(a)	$a + d = 10$ $a + 4d = 28$ $3d = 18$ $d = 6$ $a + d = 10$ $a = 10 - 6$ $a = 4$	M1 A1 B1	
(b)	$S_n = \frac{n}{2} \{2a + (n-1)d\}$ $= \frac{13}{2} \{2 \times 4 + 12 \times 6\}$ $= 520$	M1 A1	
(c)	$\frac{n}{2} \{2 \times 4 + (n-1)6\} = 884$ $\frac{n}{2} (8 + 6n - 6) = 884$ $3n^2 + n - 884 = 0$ $(3n + 52)(n - 17) = 0$ $n = 17$	M1 A1	
(d)	$a = 4$ $a + 2d = 4 + 2 \times 6 = 16$ $a + 10d = 4 + 6 \times 10 = 64$ G.P is 4, 16, 64.....	B1 B1 B1	
		10	

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19.

(a)	x	-3	-2	-1	0	1	2	3	4
	$y = x^2 - x - 6$	6	0	-4	-6	-6	-4	0	6



(c) (i) At $x = 1, y = -6$ and at $x = 3, y = 0$

$$\begin{aligned} \text{Average rate of change} &= \frac{-6}{1-3} \\ &= 3 \end{aligned}$$

(ii) Correct tangent drawn
Instantaneous rate of change

$$\begin{aligned} &= \frac{-6+4}{1-3} \\ &= 1 \end{aligned}$$

B2

All correct
allow B1 for 3
correct

S1

P1

C1

B1

M1

A1

B1

B1

10

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<p>20.</p> <p>(a)</p> <p>(b)</p> <p>(c)</p>	$2a + 3b - c$ $= 2 \begin{pmatrix} 3 \\ 1 \end{pmatrix} + 3 \begin{pmatrix} 9 \\ 5 \end{pmatrix} - \begin{pmatrix} 6 \\ 5 \end{pmatrix}$ $= \begin{pmatrix} 6 \\ 2 \end{pmatrix} + \begin{pmatrix} 27 \\ 15 \end{pmatrix} - \begin{pmatrix} 6 \\ 5 \end{pmatrix}$ $= \begin{pmatrix} 27 \\ 12 \end{pmatrix}$ $m \begin{pmatrix} 3 \\ 1 \end{pmatrix} + n \begin{pmatrix} 6 \\ 5 \end{pmatrix} = 3 \begin{pmatrix} 9 \\ 5 \end{pmatrix}$ $\begin{pmatrix} 3m \\ m \end{pmatrix} + \begin{pmatrix} 6n \\ 5n \end{pmatrix} = \begin{pmatrix} 27 \\ 15 \end{pmatrix}$ $3m + 6n = 27$ $m + 5n = 15$ $3m + 6n = 27$ $\underline{3m + 15n = 45}$ $9n = 18$ $n = 2$ $m = 15 - 10$ $m = 5$ $5c - 2a$ $5 \begin{pmatrix} 6 \\ 5 \end{pmatrix} - 2 \begin{pmatrix} 3 \\ 1 \end{pmatrix} = \begin{pmatrix} 24 \\ 23 \end{pmatrix}$ $\frac{1}{2} \begin{pmatrix} 24 \\ 23 \end{pmatrix} = \begin{pmatrix} 12 \\ 11.5 \end{pmatrix}$ <p>Midpoint (12, 11.5)</p>	<p>M1</p> <p>A1</p> <p>M1</p> <p>M1</p> <p>A1</p> <p>B1</p> <p>M1</p> <p>A1</p> <p>M1</p> <p>A1</p> <p>10</p>	<p style="text-align: center; color: red; font-size: 2em; opacity: 0.5;">Downloaded From: https://atikaschool.org</p>
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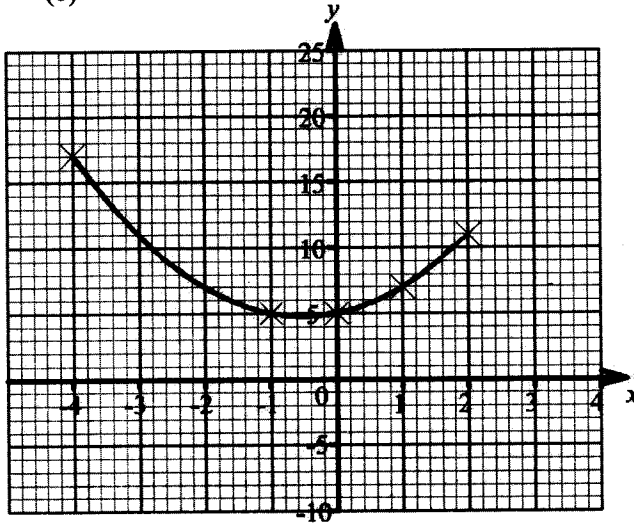
21	<p>(a) (i) (I) Monday</p> $\begin{matrix} & \begin{pmatrix} \text{sugar} & \text{beans} & \text{fruits} \end{pmatrix} \\ \text{Dona} & \begin{pmatrix} 1 & 0 & 3 \end{pmatrix} \\ \text{Sona} & \begin{pmatrix} 2 & 1 & 1 \end{pmatrix} \end{matrix}$ <p>(II) Friday</p> $\begin{matrix} & \begin{pmatrix} \text{Sugar} & \text{Beans} & \text{Fruits} \end{pmatrix} \\ \text{Dona} & \begin{pmatrix} 1 & 2 & 2 \end{pmatrix} \\ \text{Sona} & \begin{pmatrix} 1 & 3 & 2 \end{pmatrix} \end{matrix}$ <p>(ii) Total</p> $\begin{pmatrix} 1 & 0 & 3 \\ 2 & 1 & 1 \end{pmatrix} + \begin{pmatrix} 1 & 2 & 2 \\ 1 & 3 & 2 \end{pmatrix}$ $= \begin{pmatrix} 2 & 2 & 5 \\ 3 & 4 & 3 \end{pmatrix}$ <p>(b) (i)</p> <table style="margin-left: 40px;"> <tr> <td></td> <td style="text-align: center;">L</td> <td style="text-align: center;">M</td> </tr> <tr> <td style="text-align: right;">Sugar</td> <td style="border-left: 1px solid black; border-right: 1px solid black;">100</td> <td style="border-left: 1px solid black; border-right: 1px solid black;">110</td> </tr> <tr> <td style="text-align: right;">Beans</td> <td style="border-left: 1px solid black; border-right: 1px solid black;">70</td> <td style="border-left: 1px solid black; border-right: 1px solid black;">50</td> </tr> <tr> <td style="text-align: right;">Fruits</td> <td style="border-left: 1px solid black; border-right: 1px solid black;">30</td> <td style="border-left: 1px solid black; border-right: 1px solid black;">40</td> </tr> </table> <p>(ii)</p> $\begin{pmatrix} 2 & 2 & 5 \\ 3 & 4 & 3 \end{pmatrix} \begin{pmatrix} 100 & 110 \\ 70 & 50 \\ 30 & 40 \end{pmatrix}$ $= \begin{pmatrix} 490 & 520 \\ 670 & 650 \end{pmatrix}$ <p>Dona would spend Ksh. 490 in shop L and Ksh. 520 in shop M Dona's total expenditure = Sh 1010 Sona would spend Ksh. 670 in shop L and Ksh. 650 in shop M. Sona's total expenditure = sh 1320</p>		L	M	Sugar	100	110	Beans	70	50	Fruits	30	40	<p>B1B1</p> <p>B1B1</p> <p>M1</p> <p>A1</p> <p>B1</p> <p>M1</p> <p>A1</p> <p>B1</p> <p>10</p>	<p style="color: red; font-size: 2em; transform: rotate(-90deg); opacity: 0.5;">Downloaded From: https://atikaschool.org</p>
	L	M													
Sugar	100	110													
Beans	70	50													
Fruits	30	40													

22

(a) $y = x^2 + x + 5$

x	-4	-3	-2	-1	0	1	2
y	17	11	7	5	5	7	11

(b)



(c) Area by trapezium rule

$$\begin{aligned}
 &= \frac{1}{2} \{ (17+11) + 2(11+7+5+5+7) \} \\
 &= \frac{1}{2} \{ 28 + 2 \times 35 \} \\
 &= \frac{1}{2} \times 98 \\
 &= 49 \text{ square units}
 \end{aligned}$$

(d) Percentage error in trapezium rule

$$\begin{aligned}
 &= \frac{|48 - 49|}{48} \times 100\% \\
 &= \frac{1}{48} \times 100\% \\
 &= 2.08\%
 \end{aligned}$$

B2

Allow B1 for at least 4 correct

S1
P1
C1

M1

M1

A1

M1

A1

10

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23.

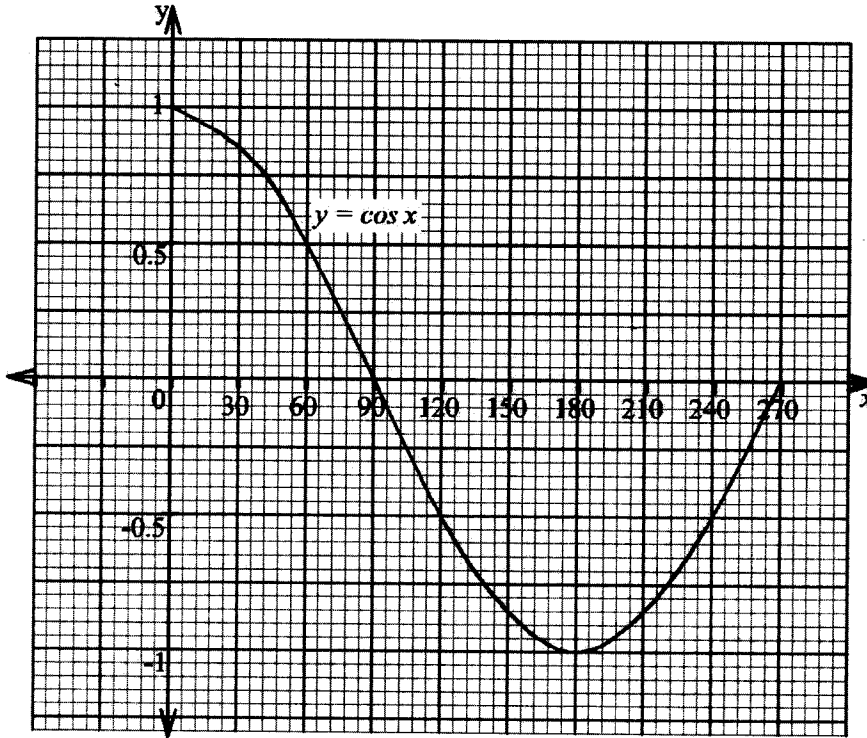
(a)

x°	0	30	60	90	120	150	180	210	240	270
$y = \cos x$	1	0.87	0.5	0	-0.5	-0.87	-1	-0.87	-0.5	0

B2

Allow B1
for at least 4
correct

(b)



S1

P2

C1

(c)(i)

when $y = -0.4$

$$x = 114^\circ \text{ and } 246^\circ$$

B1B1

(ii)

$$4 \cos x = 1$$

$$\cos x = 0.25$$

$$x = 75^\circ$$

M1

A1

10

24. (a)	<p>(i) $P \propto QR$</p> $P = kQR$ $12 = k \times 6 \times 8$ $k = \frac{12}{6 \times 8}$ $k = \frac{1}{4}$ <p>(ii) $P = \frac{1}{4}QR$</p> <p>(iv) $P = \frac{1}{4}QR$</p> $R = \frac{4P}{Q}$ $= \frac{4 \times 28}{8}$ $= 14$	B1	
		M1	
		A1	
		B1	
		M1	
		A1	
(b)	<p>New P</p> $Q_1 = 1.12Q$ $R_1 = 0.9R$ $P_1 = \frac{1}{4}(1.12Q) \times 0.9R$ $= 1.008P$ $\% \text{age} = \frac{1.008P - P}{P} \times 100\%$ $= 0.8\%$	B1	
		M1	
		M1	
		A1	
		10	

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