FORM FOUR TERM ONE EXAM 2017

MARKING SCHEME
MATHEMATICS 2
Paper 1

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MARKING SCHEME

<table>
<tr>
<td>1.</td>
<td>$Working\ area = \frac{22}{7} x\ 3.5\ x\ 3.5$
$= 38.5cm2$
$\max possible\ area = \frac{22}{7} x\ 3.55\ x\ 3.5$
$=$

$39.608cm2$
$\min \quad possible\ area = \frac{22}{7} x\ 3.45x\ 3.45$
$= 37.408cm2$
$absolute\ error = \frac{39.60837.408}{2}$
$= 1.100$
$percentage\ error = \frac{1.100}{38.5} x100\%$
$= 2.857\%$</td>
<td>M1

M1

A1
3</td>
<td>
√absolute error

Percentage error

√accuracy</td>
</tr>
<tr>
<td>2.</td>
<td>$\frac{7.08 + 86.7}{\log 12.45}^{\frac{1}{3}} = \frac{93.78}{1.095}^{\frac{1}{3}}$

<table>
<tr><th>Number</th><th>Std form</th><th>Logarithm</th></tr>
<tr><td>93.78
1.095</td><td>$9.378x10^1$
$1.095x10^0$</td><td>1.9721
0.0394-
1.9327
3</td></tr>
<tr><td>4.408</td><td>$4.408x10^o$</td><td>0.6442</td></tr>
<tr><td></td><td></td><td></td></tr>
</table>

=4.408</td>
<td>

M1

M1

A1</td>
<td>

√ all logs

√subtraction of logs and division

√accuracy</td>
</tr>
<tr>
<td>3.</td>
<td>$A = p(1 - \frac{r}{100})^{\ n}$

$= 3{,}000{,}000(1 - \frac{12}{100})^4$

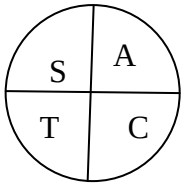
$= 3{,}000{,}000(0.88)^4$
$= Ksh.\ 1{,}799{,}086.08$
$= Ksh.\ 1{,}799{,}000$</td>
<td>
M1

M1

A1
03</td>
<td>√ substitution

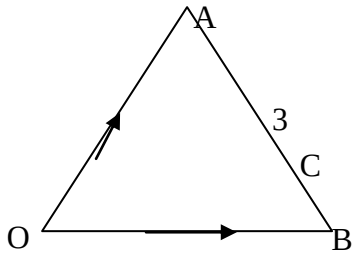
√working

√accurasy</td>
</tr>
<tr>
<td>4</td>
<td>$q = \frac{1 + rh}{1 - ht}$
$q - qht = l + rh$
$rh + qht = q - 1$
$h\ r - qt\ = q - 1$
$h = \frac{q - 1}{r - qt}$</td>
<td>
M1
M1
A1
03</td>
<td>
√ removing the denominator
√factorizing out h
√answer</td>
</tr>
</table>

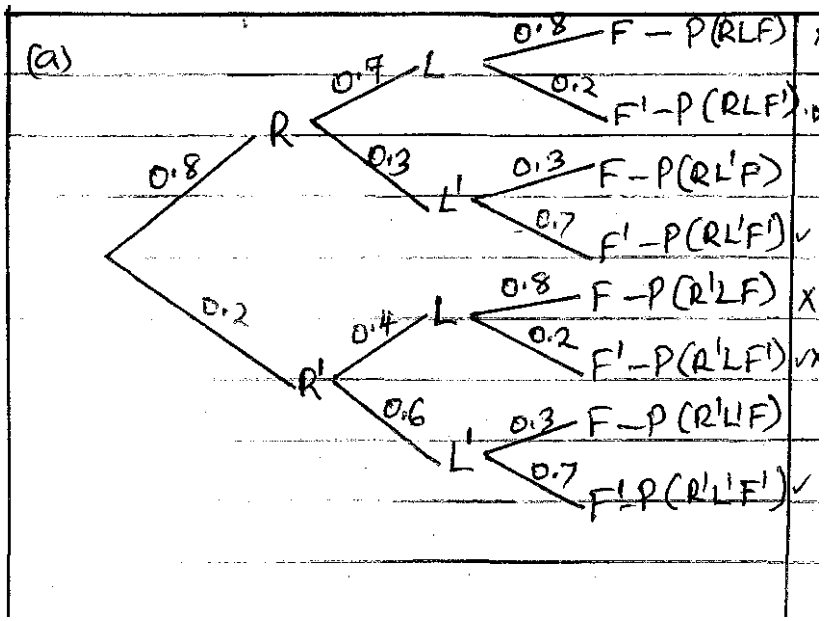
5.	$a\ \ The\ cost\ of\ 1\ kg = \frac{2x120 + 3x100 + 5x80}{2+3+5}$ $= \frac{940}{100}$ $= Ksh. 94$ $b\ \ Selling\ price = \frac{118}{100} x2x94$ $sh. 221.84$	M1 A1 B1	√working √accuracy √accuracy
6.	$A^2 - B = A$ $\begin{matrix}2 & 1 \\ 3 & 4\end{matrix}\ \begin{matrix}2 & 1 \\ 3 & 4\end{matrix} - \begin{matrix}a & b \\ c & d\end{matrix} = \begin{matrix}2 & 1 \\ 3 & 4\end{matrix}$ $\begin{matrix}7 & 6 \\ 18 & 19\end{matrix} - \begin{matrix}a & b \\ c & d\end{matrix} = \begin{matrix}2 & 1 \\ 3 & 4\end{matrix}$ $B = \begin{matrix}a & b \\ c & d\end{matrix} = \begin{matrix}5 & 5 \\ 15 & 15\end{matrix}$	M1 A1	√substitution √answer
7	$\frac{2}{2\ \overline{3+\sqrt{2}}} - \frac{2}{2\ \overline{3-\sqrt{2}}}$ $\frac{2\ 2\ \overline{3} - \overline{2} - 2(2\ \overline{3} + \sqrt{2}}{(2\ \overline{3+\ \overline{2}})(\ \overline{3} - \sqrt{2}}$ $\frac{4\ \overline{3} - 2\ \overline{2} - 4\ \overline{3} - 2\sqrt{2}}{4x3 - 2\ \overline{6} + 2\ \overline{6} - 2}$ $\frac{-4\sqrt{2}}{12-2} = \frac{-4\sqrt{2}}{10}$ $\frac{-2\sqrt{2}}{5}$ $a = -\frac{2}{5}$ $b = 2$	M1 M1 A1	√L.C.M √solving √both a and b
8	$2\cos\ 3t + 60° = -0.5$ $\cos\ 3t + 60° = -0.25$ $cos - 1\ 0.25 = 75.52°$  $second\ quard$ $3t + 60° = 1164.48$ $t = 34.83$	 M1	 √

	$3t + 60 = 524.48$ $t = 154.83$ $third\ quard$ $3t + 60 = 255.52°$ $t = 65.17$ $3t + 60 = 615.52$ $t = 185.17$ $\therefore t = 34.83, 65.17\ and\ 154.83$	M1 M1 A1	 √ √ √all correct

9.	$C = KN + \frac{t}{N}$ $135 = 2K + \frac{t}{2} x\ 2$ $140 = 3K + \frac{t}{3} x\ 3$ $270 = 4k + t$ $\underline{420 = 9k + t}$ $-150 = -5k$ $k = 30$ $t = 150$ $equation; C = 30N + \frac{150}{N}$	M1 M1 A1 B1 04	√substitution √solving of equations √both k and t √correct equation
10	(a) $1 - \frac{x}{3}\ ^{5}$ $1\ 1\ ^{2}(-\frac{x}{3})^{o} + 5\ 1\ ^{4}\ -\frac{x}{3}\ \ ^{1} + 10\ 1\ ^{3}(-\frac{x}{3}\ )^{2} +$ $10\ 1\ (-\frac{x}{3})\ \ ^{3}+5\ 1\ ^{1}\ -x/3\ ^{4} +1^{0}\ (-x/3)\ \ ^{5}$ $1-\frac{5}{3}x+\frac{10}{9}x^{2}-\frac{10}{27}x^{3}+\frac{5x^{4}}{81}-\frac{x^{5}}{243}$ *b* $1 - \frac{x}{3}\ \ ^{5} = (1.01)^{5}$ $(1 - \frac{x}{3}\ )^{5}=(1.01)^{5}$ $1 - \frac{x}{3} = 1.01$ $\frac{x}{3} = -0.01$ $x = -0.03$ $(1.01)^{5}= 1- 5/3\ (-0.03) + 10/9\ (-0.03)^{2}$ $= 1 + 0.05 + 10(0.0001)$ $= 1 + 0.05 + 0.001$ $= 1.051$	M1 A1 M1 A1	√expansion √ accuracy √substitution √accuracy
11	$PQ = 1.2x + 5$ $QR = 1.2x - 2$ $area = \ 1.2x + 5\ \ 1.2x - 2\ \ = 170$ $= 1.44x^{2}2 + 2.4x + 6.0x - 10 = 170$ $= 1.44x^{2} + 3.6x - 180 = 0$	M1	√formation of the equation

	$x = \frac{-3.6 \pm \sqrt{3^2 - 4\ 1.44\ \ 180}}{2 \times 1.44}$ $= \frac{-3.6 \pm \sqrt{12.96^2 + 1036.8}}{2.88}$ $\frac{-3.6 + 32.4}{2.88}$ $x = \frac{28.8}{2.88} = 10$ $or\ x = \frac{-36}{2.88} = -12.5$ $no\ negative\ lengthx = 10$ $area\ of\ big\ rectangle$ $= 17cmx10 = 170cm2$ $area\ of\ small\ rectangle$ $= 15cmx\ 8cm = 120cm2$ $area\ of\ the\ shade\ part$ $= 170cm2 - 120cm2$ $= 150cm2$	A1 M1 A1 4	√both correct √difference accuracy
12	$x^2 + y^2$ +4x-5y=0 $x^2 + 4x + (4/2)^2 + y^2 - 5y + (-5/2)^2 = (4/2) + (-5/2)^2$ $(x+2)^2 + (y - 2.5\ )^2 = 10.25$ $(x+2)^2 + (y-2.5)^2 = 3.202^2$ $centre\ -2,2.5\ ^2$ $radius = 3.02)$	M1 A1 B1	√completing the square √equation √both correct
13.	 $OA = 6\boldsymbol{i} - 2\boldsymbol{j} + 3\boldsymbol{k}$ $OB = 2\boldsymbol{i} + 3\boldsymbol{j} - \boldsymbol{k}$ $AB = -6\boldsymbol{i} + 2\boldsymbol{j} - 3\boldsymbol{k} - 2\boldsymbol{i} + 3\boldsymbol{j} - \boldsymbol{k}$ $= -8i + 5j - 4k$` $\boldsymbol{AC} = \frac{3}{4}\ -8\boldsymbol{i} + 5\boldsymbol{j} - 4\boldsymbol{k}$	B1 B1	√vector AB √vector AC

	$-6\text{i} + \frac{15\boldsymbol{j}}{4} - 3\boldsymbol{k}$		
14.	$AC = \sqrt{24^2 + 10^2} = \sqrt{576+100} = \sqrt{676} = 26$ $\cos\theta = \frac{12}{25.51} = 0.4703$ $<\theta = 61.95°$	B1 M1 A1	√length TV √cos θ √<θ
15.	$A = \frac{1}{2}h\ \ y_0 + y_5 + 2\ \ y_1 + y_2 + y_3 + y_4$ $= \frac{1}{2}x\ 0.2\ \{6.5 + 2.6 + 2(6.2 + 5.2 + 4.3 + 4\}$ $= 0.1(9.1 + 39.4)$ $0.1x48.5$ $= 4.85sq\ units$	M1 M1 A1	√substitution √solving √accuracy
16	$a\ \ Fraction\ filled\ in\ the\ 5\ hours$ $= \frac{1}{3} - \frac{1}{5}\ \ x\ 5 = \frac{5-3}{15}\ \ x5$ $\frac{2}{15}x\ 5 = \frac{2}{3}$ b) $remaining\ fraction = \frac{1}{3}$ $fraction\ filled\ by\ the\ three\ taps\ when\ all\ are\ open\ in\ 1h$ $= \frac{1}{3} + \frac{1}{6} - \frac{1}{5} = \frac{10+5-6}{30}$ $time\ taken\ to\ fill\ the\ remaining\ fraction$ $\frac{1}{3} \div \frac{3}{10}$ $= \frac{1}{3}x\frac{10}{3} = \frac{10}{9} = 1\frac{1}{9}hours$	M1 A1 B1 B1 4	√working √accuracy √accuracy √accuracy
17	$a\ \ i$ $taxable\ income$ $30000 + 12000 + 2500 + 3500$ $= khs.48{,}000$ $ii\ \ Net\ tax$ $first\ slab = \frac{8{,}400}{20}x2 = sh.840$	M1 A1 M1	

	$second\ slab = \frac{9400}{20} x3 = sh.1440$ $third\ slab = \frac{12000}{20} x4 = sh2{,}400$ $fourth\ slab = \frac{6000}{20} x\ 5 = sh\ 1500$ $fifth\ slab = \frac{12000}{20} x\ sh.3600$ $gross\ tax = sh.9780$ $less\ relief = sh.2140$ $net\ tax\ \ PAYE\ \ = sh.8540$ $b\ \ Total\ deductions = 8540 + 250 + 150 + 6000 + 2600$ $= sh.17{,}540$ $net\ salalry = 48{,}000 - 17540$ $= sh.\ ksh.30{,}460$	M1 M1 M1 A1 B1 M1 A1	
18	 $f\ \ b\ \ \ i\ P\ \ RL^1F\ \ = 0.8x0.3x0.3 = 0.072$ $ii\ P\ \ RLF^1\ \ + P\ \ RLF\ \ + P\ \ R^1L^1F^1\ \ + P(R^1L^1F^1$ $= 0.8x0.7x0.2 + 0.8x0.3x0.7 + 0.2x0.4x0.2 + 0.2x0.6x0.7$ $= 0.112 + 0.168 + 0.016 + 0.084$ $= 0.38$ $iii\ P\ RLF\ \ + P\ \ RLF^1\ \ + P\ \ R^1LF\ \ + P\ \ R^1LF^1$ $= 0.8x0.7x0.8 + 0.8x0.7x0.2 + 0.2x0.4x0.8 + 0.2x0.4x0.2$ $= 0.448 + 0.112 + 0.064 + 0.016 = 0.64$ $iv\ P\ \ RLF^1\ \ + P\ \ R^1LF^1$ $= 0.8x0.7x0.2 + 0.2x0.4x0.2$ $= 0.112 + 0.016 = 0.128$	M1 A1 M1 A1 M1 A1 M1 A1 M1 A1 10	√tree diagram √working √accuracy √working √answer √working √accuracy

19.	$a\ modal\ class = 55 - 64$ $modal\ frequency = 11$ $b\quad i\ Mean\ A = 59.5$ 	marks	frequency	Mid pt	d	fd	Fd^2
---	---	---	---	---	---
25-34	4	29.5	-30	-120	3600
35-44	5	39.5	-20	-100	2000
45-54	8	49.5	-10	-80	800
55-64	11	59.5	0	00	000
65-74	9	69.5	10	90	900
75-84	4	97.5	20	80	1600
85-94	1	89.5	30	30	900
	Σf=42		100	Σfd=-100	Σfd=9800
					| $i\ mean = A + \frac{\Sigma fd}{\Sigma f}$ $= 59.5 \pm \frac{100}{42}$ $= 57.12$ $ii\ Variance = \frac{\Sigma fd2}{\Sigma f} - \left(\frac{\Sigma fd}{\Sigma f}\right)^2$ $= \frac{9800}{42} - \left(\frac{-100}{42}\right)^2$ $= 233.333 - 5.669$ $= 227.66$ $iii\ S = \sqrt{variance}$ $= \sqrt{227.66}$ $= 15.089$	B1 B1 B1 B1 M1 A1 M1 M1 A1 B1 10	
20			
21	$a\ axarxar^2 = 64$ $a^3r^3 = 64$ $ar^3 = 64$ $ar = 4$ $r = \frac{4}{a}$ $b\quad i\ a + ar + ar^2 = 14$ $a + a\left(\frac{4}{a}\right) + a\left(\frac{4}{a}\right)^2 = 14$ $a + 4 + \frac{16}{a} = 14$ $a^2 + 4a + 4 = 14a$ $a^2 - 10a + 16 = 0$ $a^2 - 8a - 2a + 16 = 0$ $a\ a-8\ -2\ a-8\ = 0$ $a-2\quad a-8\ = 0$	M1 M1 A1 M1 A1 M1	

	$either\ a-2=0\ a=2$ $or\ a-8=0$ $a=8$ $when\ a=2\ r=\frac{4}{2}=2$ $when\ a=8\ r=\frac{4}{8}=\frac{1}{2}$ 2,4,8,16 … 8,4,2,1 … …	A1 B1 B1 B1 10	
	$ii\ \ First\ sequency-5th\ term=32$ $second\ sequence=5th\ term=\frac{1}{2}$ $product=32x\frac{1}{2}=16$		
22	a P Q R P1 Q1 R1 $-0.6\ \ 0.8\ -5\ \ 10\ \ 15\ \ 1\ \ 6\ \ -5$ $0.8\ \ 0.6\ \ 5\ \ 15\ \ 5\ \ 7\ \ 17\ \ 15$ $P1\ 1,7\ \ Q1\ 6,17\ \ R1\ -5,15$ $c\ \ b\ \ On\ the\ graph\ paper$ $ii\ \ P11\ -1,7\ \ Q11\ -6,17\ \ R11\ 5,15$ $i\ \ On\ the\ graph\ paper$ $ii\ \ Description\ of\ the\ transformation$ $is\ a\ rotation$ $angle\ of\ rotation+30o$ $centre\ of\ rortation\ origin$ P1 Q1 R1 P11 Q11 R11 $a\ \ b\ \ 5\ \ 10\ \ 15\ -1\ \ -6\ \ -5$ $c\ \ d\ \ 5\ \ 15\ \ 5\ \ 7\ \ 17\ \ 15$ $5a+5b=-1$ $10a+15b=-6$ $\underline{10a+10b=-2}$ 5b=3 $5c+5\ 0.6\ =7$ $5c=7-3.0$ $5c=4.0$ $c=0.8$ $the\ matrix\ is\ \begin{pmatrix}0.6 & -0.8b\\ 0.8 & d0.6\end{pmatrix}$	M1 A1 B2 B1 B1 B1 B1 M1 A1 10	
23	$a\ \ A\ \ 70°N,80°W$ $B\ \ 50°S,20°E$ $d\ \ Distances$ $AB=\frac{100}{360}x\ 2\ x\frac{22}{7}x\ 6370\cos 70°=3,804.02km$ $BC=\frac{120}{360}x2\ x\frac{22}{7}x\ 6370$ $=3,804.02km$ $BC=\frac{120}{360}x\ 2\ x\frac{22}{7}x\ 6370$ $=13,346.67km$ $distcane\ ACthrough\ B=$ $=3,804.02+67$ $=17,150.69$ $c\ \ Distance=60°$ $4200=60°$	B1 B1 M1 M1 A1 M1	

	$\theta = 70°$ $co-oridnates\ of\ D$ $D(20°, 80°W$ $d\ \ Longitude\ difference$ $= 80° + 20° = 100°$ $time\ taken = 100x4$ $= 400minutes$ $= 6hours\ 40minutes$ $local\ time\ at\ D$ $= 8.00 + 6h\ 40\ min$ $= 1440h$ $= 2.40pm\ on\ monday$	A1 B1 B1 B1 B1 10	
24.	(a)$3x + 2.5y \leq 600$ $x \leq 100$ $y \geq 80$ $y - 80 \leq 2x$ b 3x+2.5y=600	B1 B1 B1	

X	100	50	0	150
y	120	180	240	60

B1

$x = 100$

x	100	100	100
y	50	100	150

Y=80

x	0	50	100
y	80	80	80

Y=2y+80

x	0	20	40
y	80	120	160

On the graph paper

B1
B1
B1
B1

c 50,100 100,120
$profit = 80x + 60y$
i 80 50 $+ 60$ 100
$= sh.4000 + 6000$
$= sh.10000$
ii 80 100 $+ 60$ 120
$= sh.8000 + 720$
ii 80 100 $+ 60$ 120
$sh.8000 + 7200$
$= sh.15,200$
$material\ P = 100\ materials$
$Q = 120\ materials$

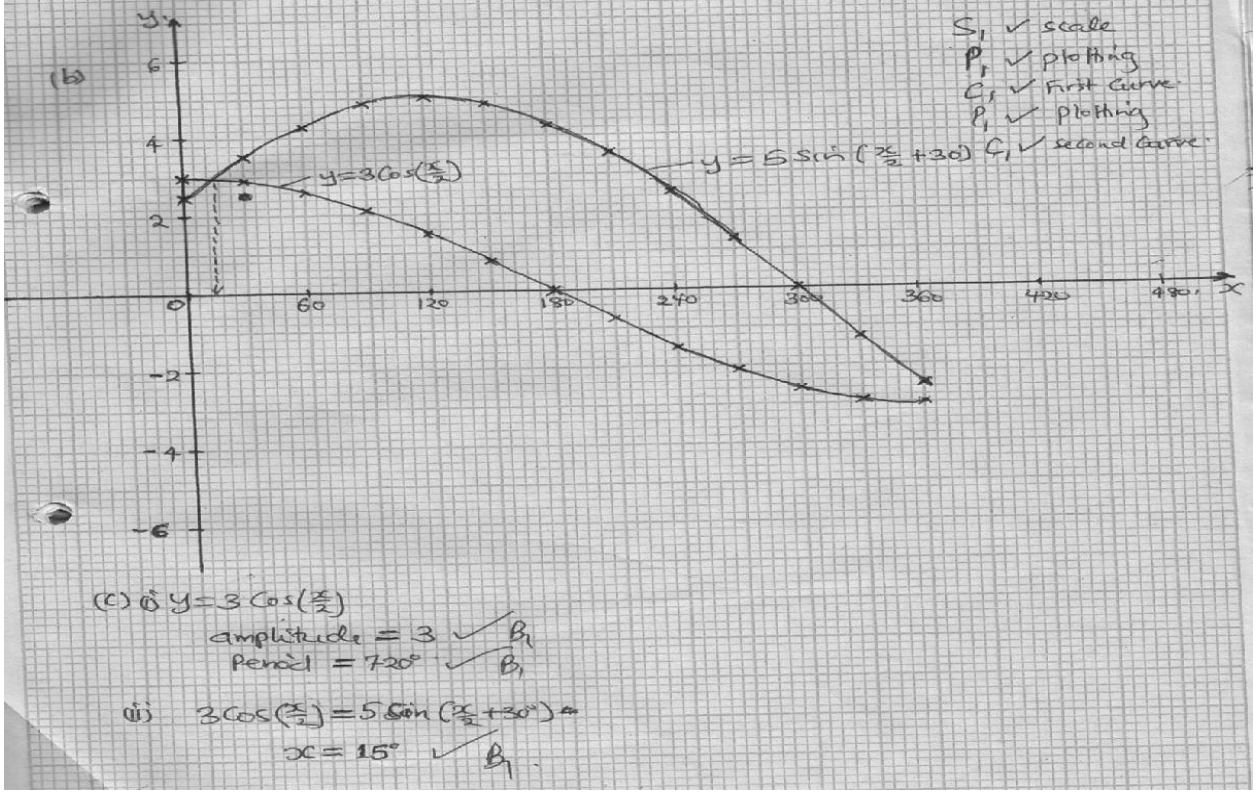
M1

A1
10

20.

x	0	30	60	90	120	150	180	210	240	270	300	330	360	
$3\cos(\frac{x}{2})$	3.00	2.90	2.60	2.12	1.50	0.78	0.00	−0.78	−1.50	−2.12	−2.60	−2.90	−3.00	✓ B_1
$5\sin(\frac{x}{2}+30)$	2.50	3.54	4.33	4.83	5.00	4.83	4.33	3.54	2.50	1.29	0.00	−1.29	−2.50	✓ B_1

(b)



S_1 ✓ scale
P_1 ✓ plotting
C_1 ✓ First curve
P_1 ✓ plotting
C_1 ✓ second curve

(c) (i) $y = 3\cos(\frac{x}{2})$

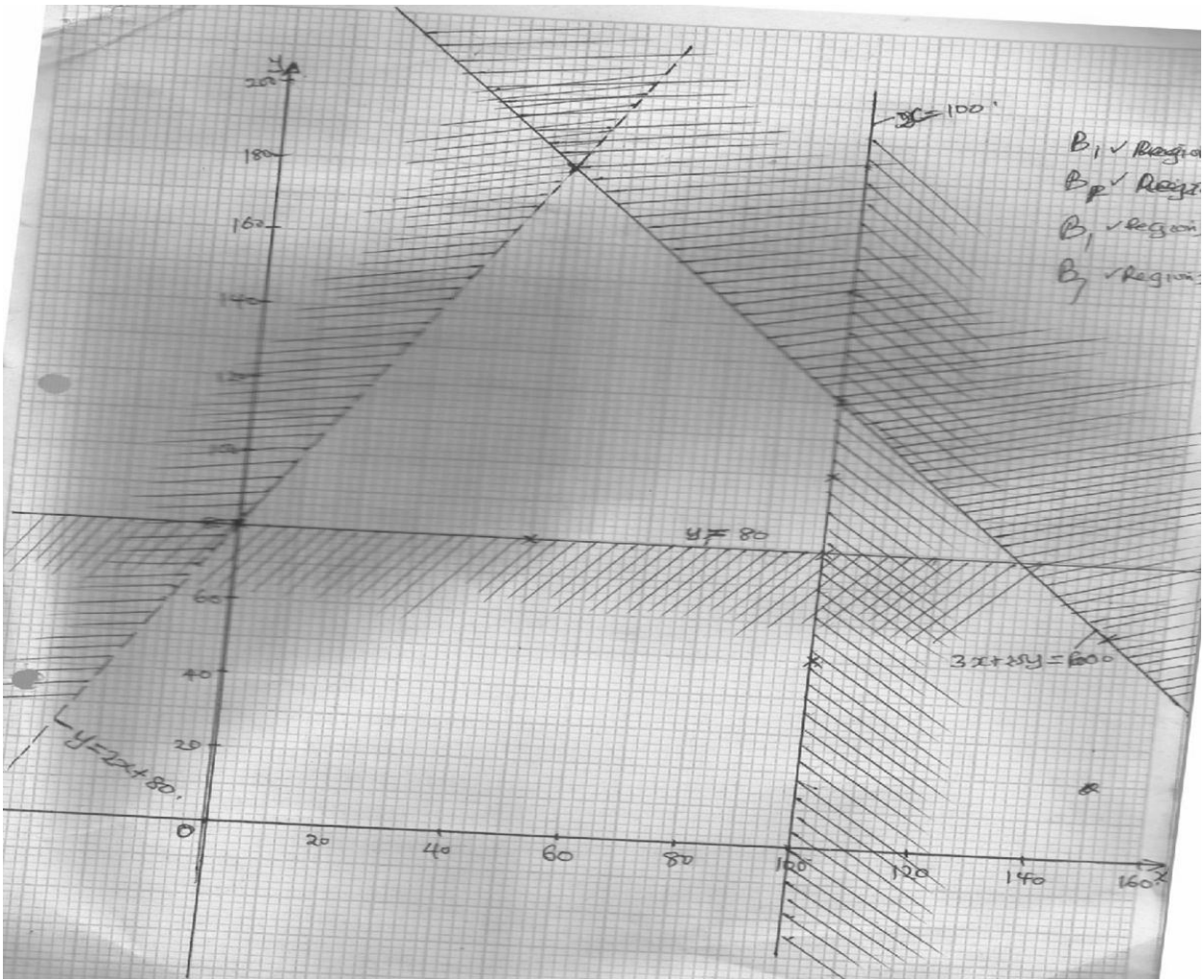
amplitude = 3 ✓ B_1

Period = 720° ✓ B_1

(ii) $3\cos(\frac{x}{2}) = 5\sin(\frac{x}{2}+30°)$

$x = 15°$ ✓ B_1

21.



B_1 ✓ Region
B_1 ✓ Region
B_1 ✓ Region
B_1 ✓ Region