NTIMA, NYAKI AND MUNICIPALITY CLUSTER EVALUATION - 2016

Kenya Certificate of Secondary Education

MATHEMATICS

Paper - **121 / 2**

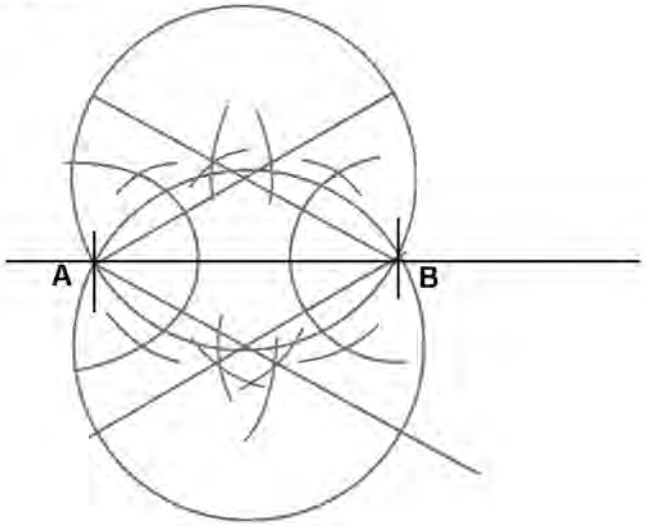
July/August 2016

Marking Scheme

	ANSWERS	MARKS	REMARKS
1.	No | Log 14.21 | 1.1526 + 0.013 | $\bar{2}.1139$ $\bar{1}.2665$ - 212.5 | 2.3274 $\bar{4}.9391$ $\frac{\bar{6}}{3} + \frac{2.9391}{3}$ $10^{-2}\times 9.5433$ | $\bar{2}.9797$ 9.5433×10^{-2}	M1 M1 M1 A1 4	all logs attempt to add and subtract division
2.	Max $_A$ ½ × 8.25 × 6.35 = 26.19375 Min $_A$ ½ × 8.15 × 6.25 = 25.46875 Actual A = ½ × 8.2 × 6.3 = 25.83 A.E in area = ½ (26.19375 - 25.46875) = 0.3625 P.E = $\frac{0.3625}{25.83} \times 100$ = 1.403%	M1 M1 A1 3	
3.		M1	
4.	$B^3 = \frac{2y+3}{4y-5}$ $4B^3y - 5B^3 = 2y + 3$ $4B^3y - 2y = 3 + 5B^3$ $y = \frac{3+5B^3}{4B^3-2}$	M1 A1 3 M1 M1	

	ANSWERS	MARKS	REMARKS
	$\log_4 48 + \log_4 24 - \log_4 x^2 = \log_4 32$ $\frac{48 \times 24}{x^2} = 32$ $36 = x^2$ $x = \pm 6$	A1 3	
5.	$10 = k + 4m$ $15 = k + 9m$ $5m = 5$ $m = 1$ $10 = k + 4$ $k = 6$ $p = 6 + q^2$	M1 A1 B1 3	for both equations for the two constants for the equation
6.		M1 B1B1 3	 1 mark each
7. b)	$\theta + 10 = Cos^{-1}\frac{2}{3}$ $\theta + 10 = 48.19, -48.19$ $\theta = 38.19°, -58.19°$	M1 A1	
8.	$1 - 6(2x) + 15(2x)^2 - 20(2x)^3 + 15(2x)^4 - 6(2x)^5 + (2x)^6$ $1 - 12x + 60x^2 - 160x^3 + 240x^4 - 192x^5 + 64x^6$ $(0.98)^6 = (1 - 0.02)^6$ $2x = 0.02$ $x = 0.01$ $(0.98)^6 = 1 - 12(0.01) + 60(0.01)^2$ $= 1 - 0.12 + 0.006$ $= 0.8860$	M1 A1 4 M1 A1 B1 3	
9.	$x^2 + 6x + 9 + y^2 - 8y + 16 = -9 + 9 + 16$ $(x+3)^2 + (y-4)^2 = 16$ $centre = (-3, 4)$ $Radius = 4 units$	M1 M1	

ANSWERS	MARKS	REMARKS
10. $480,000 \times \frac{100}{96} = Shs\ 500,000$ $500,000 = 800,000\left(1-\frac{r}{100}\right)^5$ $0.625 = \left(1-\frac{r}{100}\right)^5$ $\sqrt[5]{0.025} = 1-\frac{r}{100}$ $0.91028 = 1-\frac{r}{100}$ $\frac{r}{100} = 0.08972$ $r = 8.9$ $= 9\%$	A1 3 M1 M1	
11. $\frac{\sqrt{3}\left(2\sqrt{3}-\sqrt{2}\right)-\sqrt{3}\left(2\sqrt{3}+\sqrt{2}\right)}{\left(2\sqrt{3}+\sqrt{2}\right)\left(2\sqrt{3}-\sqrt{2}\right)}$ $\frac{6-\sqrt{6}-6-\sqrt{6}}{12-2}$ In 1 min B $= -\frac{2\sqrt{6}}{10}$ Remaining $= -\frac{\sqrt{6}}{5}$	A1 3 M1	
12. $\rightarrow \frac{1}{8}\times 2 = \frac{1}{4}$ $\rightarrow \frac{1}{10}$ $1-\frac{7}{20}$ $= \frac{13}{20}$ $A + B\ in\ 1\ \text{min} = \frac{1}{8}+\frac{1}{10}$ $= \frac{9}{40}$ $Time = \frac{13}{20}\div\frac{9}{40}$ $= \frac{13}{20}\times\frac{40}{9}$ $= 2\frac{8}{9}$	M1 A1 3 B1B1	for both Arcs
	B1	for the base angle and A

ANSWERS	MARKS	REMARKS
13. 	3 M1 M1	and B
$AB\begin{pmatrix}4\\-1\\3\end{pmatrix}-\begin{pmatrix}-3\\-2\\-1\end{pmatrix}$	A1 3	
14. $16\times 0.1563\times 10^{2}+12.96\times 10^{-4}$ $250.08+0.0001296$ $=250.0801296$	M1 M1 A1 3	
15. $\begin{pmatrix}7\\1\\4\end{pmatrix}$ $\lvert AB\rvert=\sqrt{7^2+1^2+4^2}$ $=\sqrt{66}$ $=8.124$ $=8.12$	M1 A1 3	
16.	M1	

ANSWERS	MARKS	REMARKS
$\frac{dy}{dx} = 6x + 4$ $= 6 \times 2 + 4$ $= 16$	M1 A1 3	
17.a) $\frac{y - 22}{x - 2} = 16$ $y - 22 = 16(x - 2)$ $y = 16x - 10$	M1 M1	
$8^2 = 12^2 + 10^2 - 2 \times 12 \times 10 Cos\,\theta$ $64 = 144 + 100 - 240 Cos\,\theta$ $-180 = -240 Cos\,\theta$ $Cos\,\theta = 0.75$ $\theta = 41.41°$	M1 A1 M1	
b) Net tax = 11180 - 1162 = shs 11,180 Net income 65480 - 10,018 = shs 55,462	M1 A1	
c) $\frac{17400}{20} \times 2 = 1740$ $\frac{17200}{20} \times 3 = 2580$ Net pay 65480 + 22500 = shs 87,980 $\frac{17200}{20} \times 4 = 3440$ $\frac{13680}{20} \times 5 = 3420$	M1 M1 M1 A1 10	
18. a) Modal class 50 - 59 Modal frequency 12	B1 B1	

ANSWERS	MARKS	REMARKS
b) $\frac{50}{100} \times 45000 = shs 22{,}500$		
$4^{th}\ slab\ \ \frac{17200}{20} \times 5 = 4300$ $5^{th}\ slab\ \ \frac{18980}{20} \times 6 = 5694$ $New\ \ gross\ \ tax\ = shs\ 17\ ,754$		
i) Mean $\frac{6574}{11180} \times 100\ = 58\ .80\ \%$	B1 M1	for fd
ii) Variance	B1	for fd^2

Class	X	f	d=X-A	fd	fd^2
20 - 29	24.5	2	-20	-40	800
30 - 39	34.5	5	-10	-50	500
40 - 49	44.5	10	0	0	0
50 - 59	54.5	12	10	120	1200
60 - 69	64.5	8	20	160	3200
70 - 79	74.5	3	30	90	2700
		$\Sigma f=40$		$\Sigma fd=280$	$\Sigma fd^2=8400$

M1
A1

A1

M1

A1

10

19. a) $\overline{X} = A + \frac{\Sigma fd}{\Sigma f}$ M1

$= 44.5 + \frac{280}{40}$ M1

$= 44.5 + 7$ A1

$= 51.5$

b) P = 10 : 45 am

Longitude difference = 100°

1° = 4min

100° = x

$x = 4 \times 400$

$= 400$ minutes

Time in Q when plane arrived

10 : 45

+ 5 : 00

15 : 45

+ 6 : 40

21 : 85

$= \frac{\Sigma fd^2}{\Sigma f} - \left(\frac{\Sigma fd}{\Sigma f}\right)^2$ M1

$= \frac{8400}{40} - \left(\frac{280}{40}\right)^2$

$= 210 - 49$ A1

$= 161$

$= \sqrt{\text{variance}}$

$= \sqrt{161}$

$= 12.69$ M1

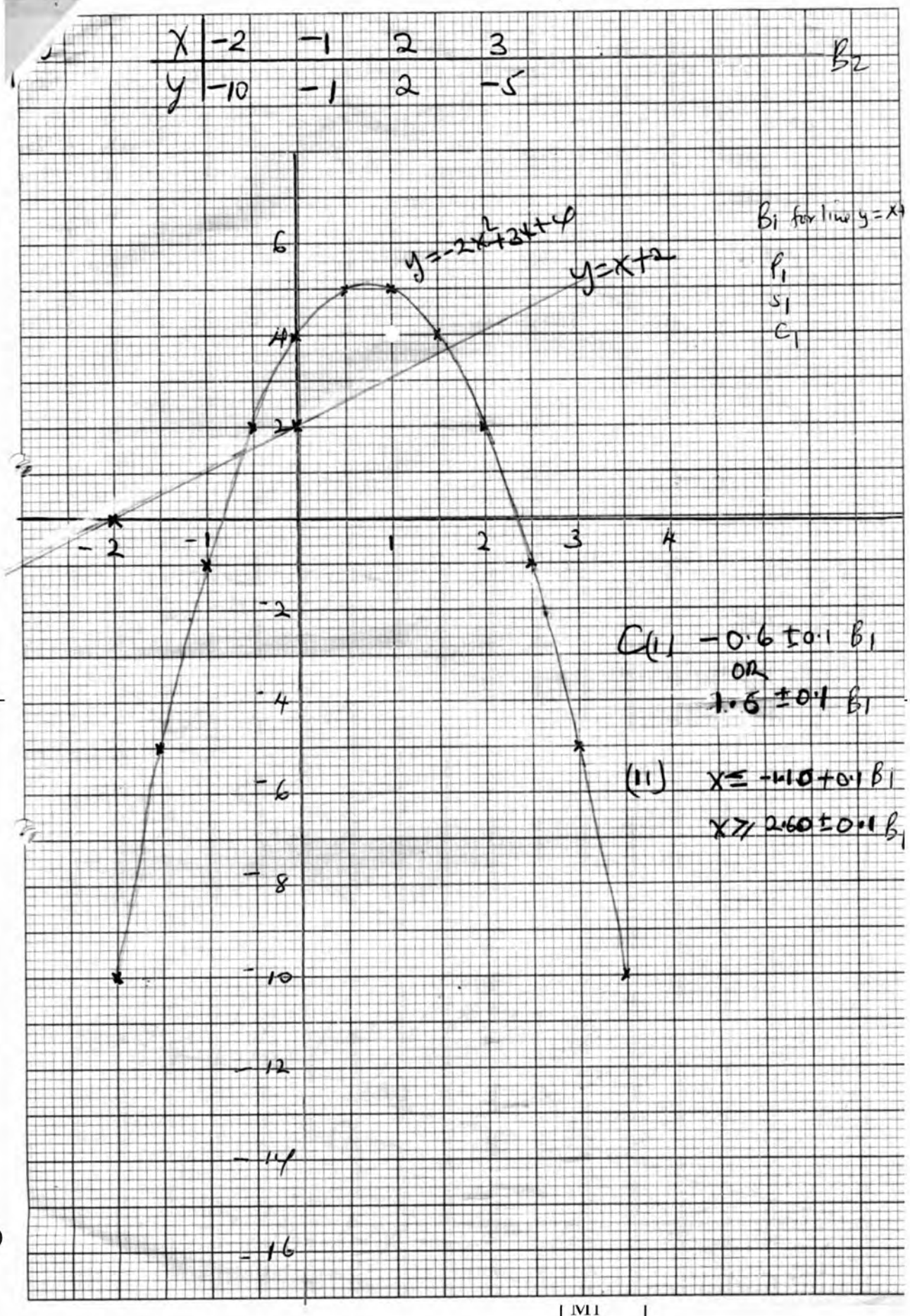
ANSWERS	MARKS	REMARKS
= 22.25(hrs or) 10.25 pm	A1	
c) < difference $45° + 55° = 100°$	B1	
$45 + k = \frac{3000}{60 \times 60 Cos\, 60}$	M1	
$45 + k = 100$		
$k = 55°$	A1	
	10	

20.

$$\frac{100}{360} \times 2 \times \frac{22}{7} \times 6370 Cos\, 60$$

$$= 5561 km$$

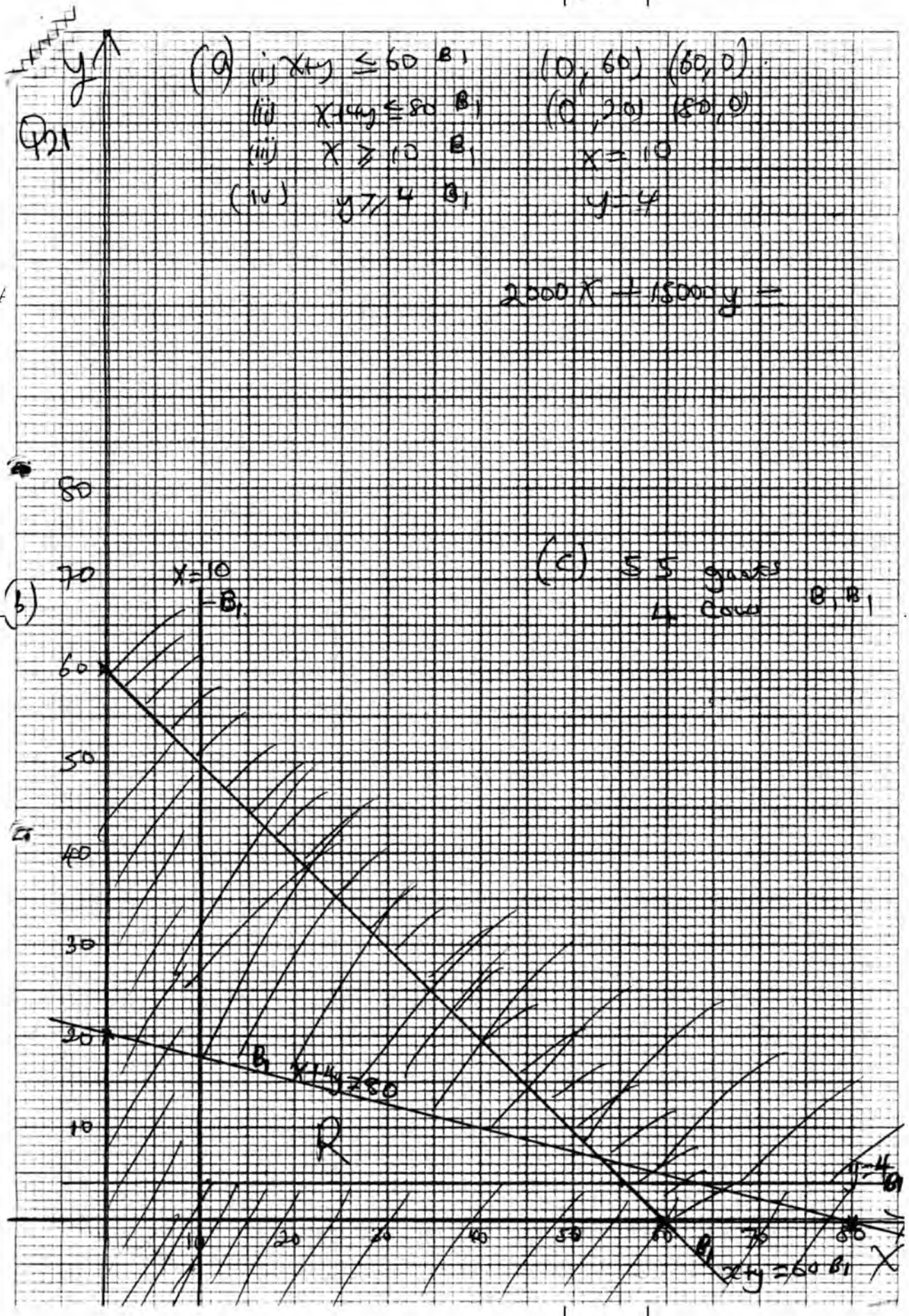
21.



22. a)

A = 11 square units — M1, A1

ANSWERS	MARKS	REMARKS
b)	M1	



ANSWERS	MARKS	REMARKS

x	0	1	2	3	4
y	-3	-4	-3	0	5

$A = \frac{1}{2} \times 1\left[(3+5)+2(4+3+0)\right]$

i) $\int_0^3 (x^2 - 2x - 3)dx + \int_3^4 (x^2 - 2x - 3)dx$ — M1

$\left.\frac{x^3}{3} - x^2 - 3x\right|_0^3 + \left.\frac{x^3}{3} - x^2 - 3x\right|_3^4$ — M1

A1

b) $-9-9-9+\left(\frac{64}{3}-16-12\right)-(9-9-9)$

$-9+\frac{-20}{3}+9$

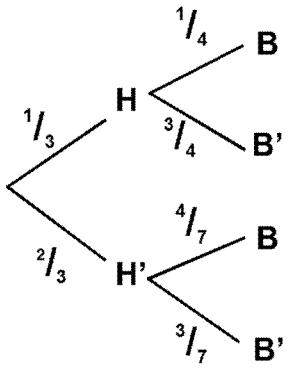
$9+\frac{7}{3}$

i) $\frac{\frac{1}{3}}{\frac{34}{3}} \times 100\%$ — B1

ii) $\frac{1}{3} \times \frac{3}{34} \times 100\%$ — B1

iii) 2.94% — M1

24.a)



M1

A1

10

M1

M1

A1

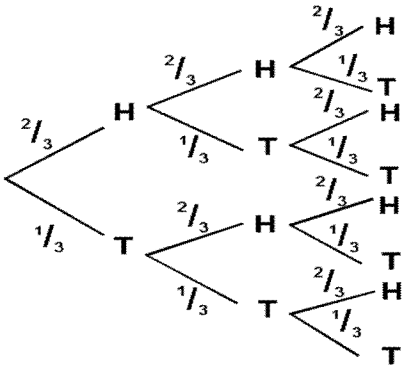
b) $\left(\frac{1}{3} \times \frac{1}{4}\right)+\left(\frac{1}{3} \times \frac{3}{4}\right)+\left(\frac{2}{3} \times \frac{4}{7}\right)$

$\frac{1}{12}+\frac{1}{4}+\frac{8}{21}$

$= \frac{5}{7}$

B1

c) i) $y + 2 = 14 + 2$

ANSWERS	MARKS	REMARKS
$= 16$		
ii) 	M1 M1 A1 M1	
$P(TT) = \frac{1}{3} \times \frac{1}{3} = \frac{1}{9}$		
$P(HTH) = \frac{2}{3} \times \frac{1}{3} \times \frac{2}{3} = \frac{4}{27}$		
$P(HHT) or P(HTH) or P(THH)$ $\left(\frac{2}{3} \times \frac{2}{3} \times \frac{1}{3}\right) + \left(\frac{2}{3} \times \frac{1}{3} \times \frac{2}{3}\right) + \left(\frac{1}{3} \times \frac{2}{3} \times \frac{2}{3}\right)$ $\frac{4}{27} + \frac{4}{27} + \frac{4}{27} = \frac{12}{27}$ $= \frac{4}{9}$	M1 A1 10	

$$\frac{y-2}{y+2} = \frac{y-5}{y-2}$$
$$(y-2)(y-2) = (y-5)(y+2)$$
$$y^2 - 4y + 4 = y^2 - 3y - 10$$
$$-4y + 3y = -10 - 4$$
$$-y = -4$$
$$y = 14$$

$$\frac{y-2}{y+2} = \frac{12}{16}$$
$$= \frac{3}{4}$$

$$ar^2 = 16$$
$$a\left(\tfrac{3}{4}\right)^2 = 16$$
$$a = \frac{16 \times 16}{9} = \frac{256}{9} = 28\frac{4}{9}$$

ANSWERS	MARKS	REMARKS
$s = \frac{a(1-r^n)}{1-r}$ $= \frac{\frac{256}{9}\left(1-\left(\frac{3}{4}\right)^5\right)}{\frac{1}{4}}$ $= \frac{256}{9} \times 4\left(1-\frac{243}{1024}\right)$ $= \frac{256 \times 4}{9} \times \frac{781}{1024}$ $= 86.78$		