MARKING SCHEME 2005 PAPER 2

SOLUTION	MARKS	ALT. METHOD
1. $\frac{243 \times 3^{2y}}{729 \times 3^{3y} \div 3^{(2y-1)}} = 81$		
= $\frac{3^5 \times 3^{2y}}{3^6 \times 3^y \div 3^{2y-1}} = 3^5$	M1	
$\frac{3^{5+2y}}{3^{6+y-(2y-1)}}$		
= $\frac{3^{5+2y}}{3^{7-y}} = 3^5$		
= $3^{-2+3y} = 3^5$	M1	
Hence $3y - 2 = 5$		
$3y = 7$		
$y = {}^7/_3 = 2\,{}^1/_3$	A1	
2. $\frac{\sqrt{63}+\sqrt{72}}{\sqrt{32}+\sqrt{28}} \times \frac{(\sqrt{32}-\sqrt{28})}{(\sqrt{32}-\sqrt{28})}$		
Deno => $32 - \cancel{\sqrt{32}\sqrt{28}} + \cancel{\sqrt{28}\sqrt{32}} - 28$	MI/2	
=> 4		
a i[aJsZ $- \cancel{\sqrt{63}\sqrt{28}} + \sqrt{(72 \times 32)} - \sqrt{72 \times 28}$		
=> $\sqrt{9 \times 7 \times 16 \times 2} - \sqrt{9 \times 7 \times 7 \times 4} + \sqrt{9 \times 4 \times 2 \times 16 \times 2} - \sqrt{9 \times 4 \times 2 \times 7 \times 4}$		
=> $12\sqrt{14} - 42 + 48 - 12\sqrt{14} = 6$		
${}^6/_4 = 1\,{}^1/_2$	A 1/2	
3. Men: /,x45=35		Alternatively:
Wom: /,x45=10	MI	4],(45+x}= (10+x
Let the No. be x		4(45 +x)= 9(10 + x)
Men: /,(45 +x) =3k	MI	180 + 4x = 90 + 9
225 + 5x=315		5x= 90
x= 18	AI	x=18

14. $d \propto {}^{m}/_{r^2}$

$D = {}^{km}/_{r^2}$

$2 = \frac{50k}{5^2}$

$2 = 4k$

$k = ½$

$d = \frac{m}{2r^2}$

$= \frac{5/0}{2r^2}$

$r = 27$

$r = 3$

M1

A1

km ; k = constant

$2 = \frac{50k}{53}$

$k = ½$

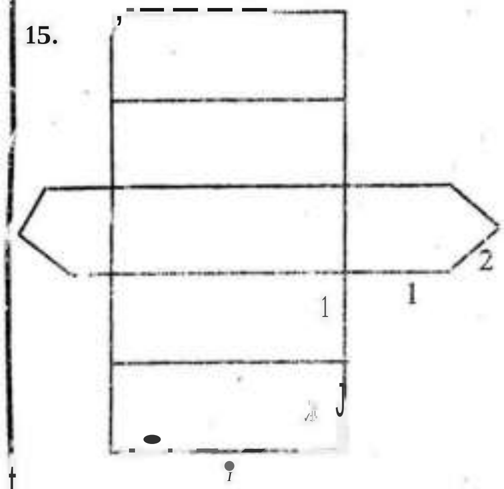
$d = \frac{m}{2r}$

$r = \frac{m}{2ad}$

sub $r = \frac{34}{20}$

$3 = r$

15.



fa

M

At

16. $v = 0$ at max height

$= 29.4 - 9.8t$

$9.8t = 29.4$

$t = 3$

hence $s = 29.4 \times 3 - 4.9 \times 3^2$

$= 44.1$

B1

M1

A1

17. $u,1dx = x^2+2x-3$

at turning points $;/,=0$

$x^2 + 2x - 3 = 0$

$x^2 - x + 5x - 3 = 0$

$x(x-1)+3(x-1)=0$

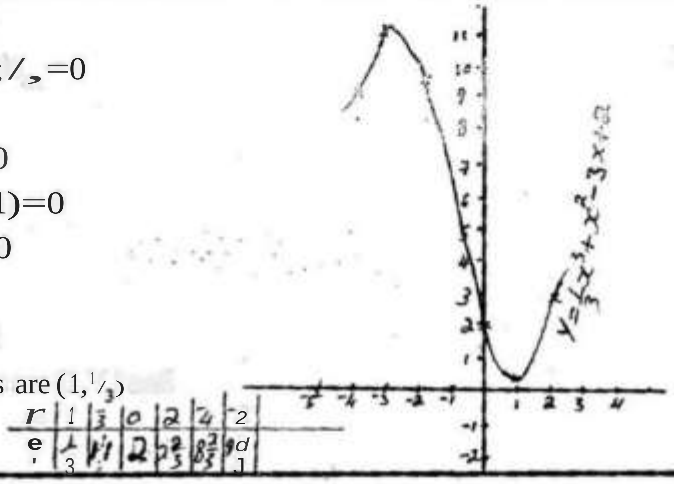
$(x-1)(x+3)=0$

$x = 1$ or -3

Subst $y = ^{1}/_{3}$ or 11

The turning points are $(1, ^{1}/_{3})$

$(-3, 11)$



$$\begin{bmatrix} & \\ & \end{bmatrix}\begin{bmatrix} 2 \\ 4 \end{bmatrix} = \begin{bmatrix} 2c & 2a+4b & 4n+4d \\ & 2c+4d & c+4d \end{bmatrix}$$ B1

$$\begin{bmatrix} & \\ 0 & \end{bmatrix}\begin{bmatrix} 2 & 2a+4b & 4a+4d \\ 2c & 2c+4d & 4c+4d \end{bmatrix} = \begin{bmatrix} 2c & -2c-4d & -4c-4d \\ -2a & -2a-4b & -4a-4d \end{bmatrix}$$ M1

$$\begin{bmatrix} -4 & -4 \\ -10 & -12 \end{bmatrix} = \begin{bmatrix} 2c & -2c-4d & -4c-4d \\ -2a & -2a-4d & -4a-4d \end{bmatrix}$$ M1

$-2c=0 \Rightarrow c=0$ $\quad -4d=4$ $\quad -2a-4b=-10$

$-2a=2 \Rightarrow a=1$ $\quad d=1$ $\quad -2-4b=10$

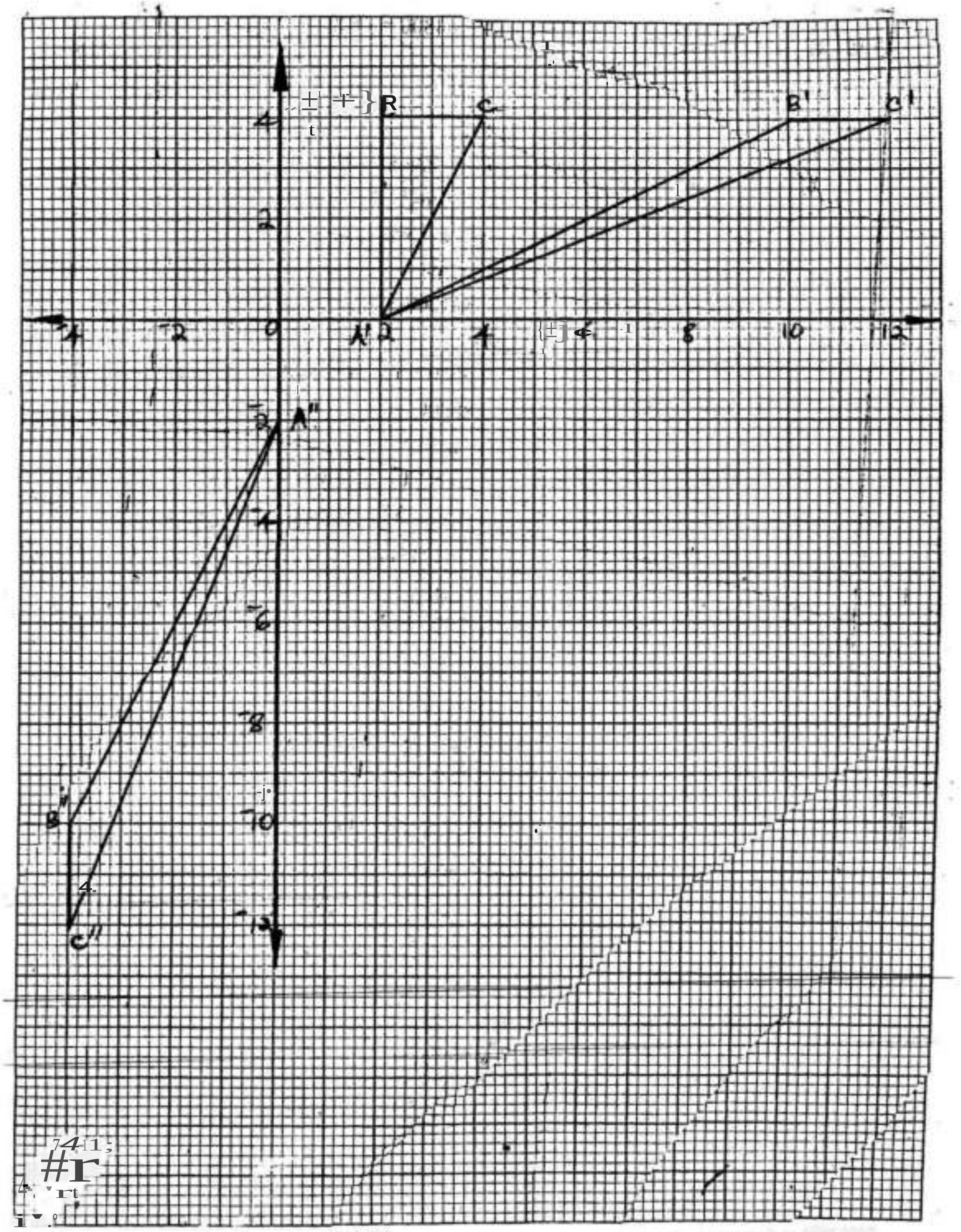
$b=2$ M1

Hence R= $\begin{bmatrix} & b \\ & d \end{bmatrix} = \begin{bmatrix} 1 & 2 \\ 0 & 1 \end{bmatrix}$

b) $$\begin{pmatrix} 1 & 2 \\ 0 & 1 \end{pmatrix}\begin{pmatrix} 2 & 2 & 4 \\ 0 & 4 & 4 \end{pmatrix} = \begin{pmatrix} 2+0 & 2+8 & 4+8 \\ 0+0 & 0+4 & 0+4 \end{pmatrix} = \begin{array}{ccc} A^1 & B^1 & C^1 \\ \hline 2 & 10 & 12 \\ 0 & 4 & 4 \end{array}$$

c) hearx-aXisinvariant and $B(\ ,4) \longrightarrow$ [illegible] or M1

$C(\ ,4) \longrightarrow (12,4)$ A1


B
C
B'
C'
4
2
-4
-2
0
A'
2
4
6
8
10
12
-2
A''
-4
-6
-8
-10
B''
-12
C''

Q 19 a) c.d= 64800 – 60000 = 69604 – 64800 = 4800 Ml

a=60000

nterm =a+(–1)d B1

= 60000 + (n – 1) 400

b) Common ratio = $\frac{64800}{60000}$ = $\frac{69984}{64800}$ = 1.08 MI

nth tern = a where a = 60000 Al

r= 108

= 6000(1.08)

7 term:

Abdi = 6000+ (7 – 1) 4800 Ml

= 88800

Amoit = ar '"

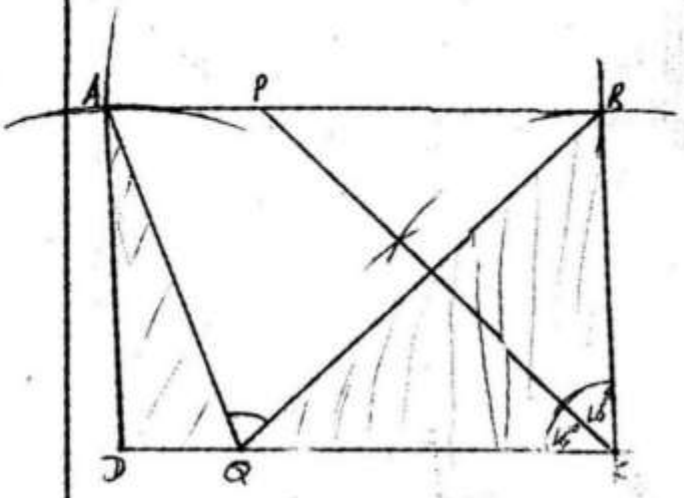
= –0000 (1.08)° Ml

= 5213 BI

Difference = 95213- 88800

= sh 641

20.



' lies on any point
tong cp

Rect
3 mks

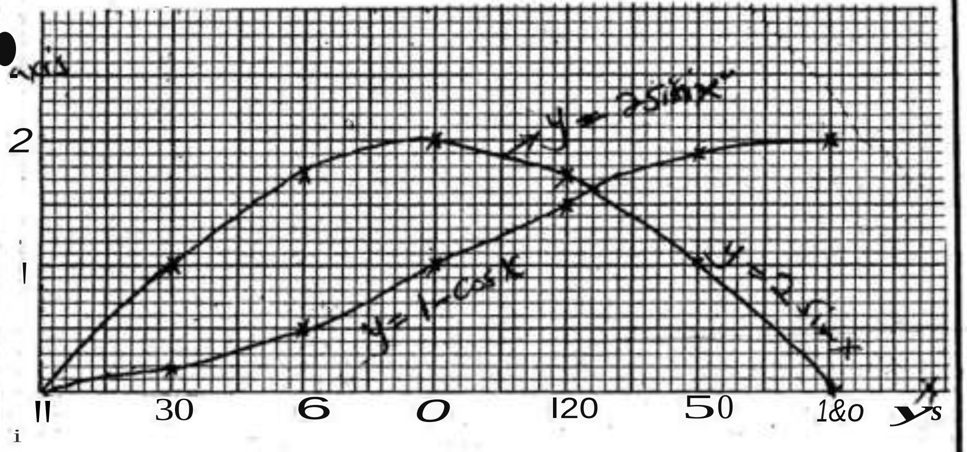
QB < 60°<90° Al

b Qlies on the shaded
region

(drawing
M2
Al

21.

°	0	30	60	90	120	150	180
2sin°	0	1	1.732	2	1.732	1	0
1- cos X	0	0.134	0.5	1	1.5	1.866	2



c i) 129°

ii) $0 < x < 129°$

22

a) $x^2 = y^2 + z -- 2xy \cos x$

$= 40000 + 40000 - 2 \times 40000 \cos 50$

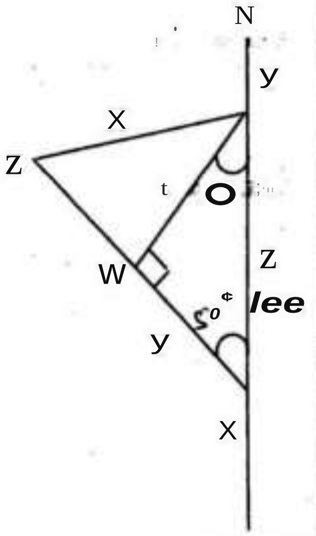
$= 80000 - 51424$

$x^2 = 28576$

$x = 169.04$

$zy = x = 169.04$

sin rule $\frac{y}{\sin y} = \frac{x}{\sin x}$



$\frac{200}{\sin y} = \frac{169}{\sin 50}$

M1

$\sin y = \frac{200 \sin 50}{169}$

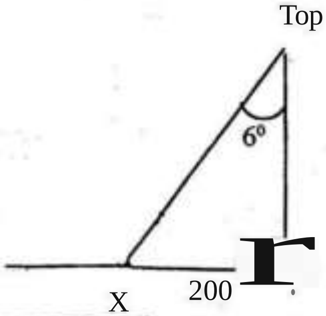
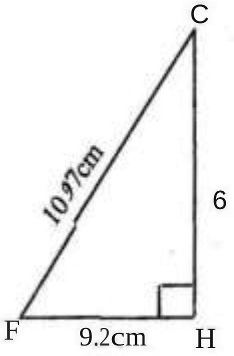
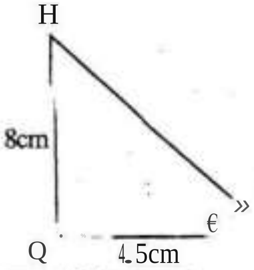
$\sin y = 0.90656$

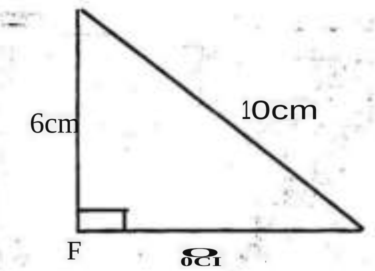
$y = 65°$

bearing z from y = (180 + 65)°

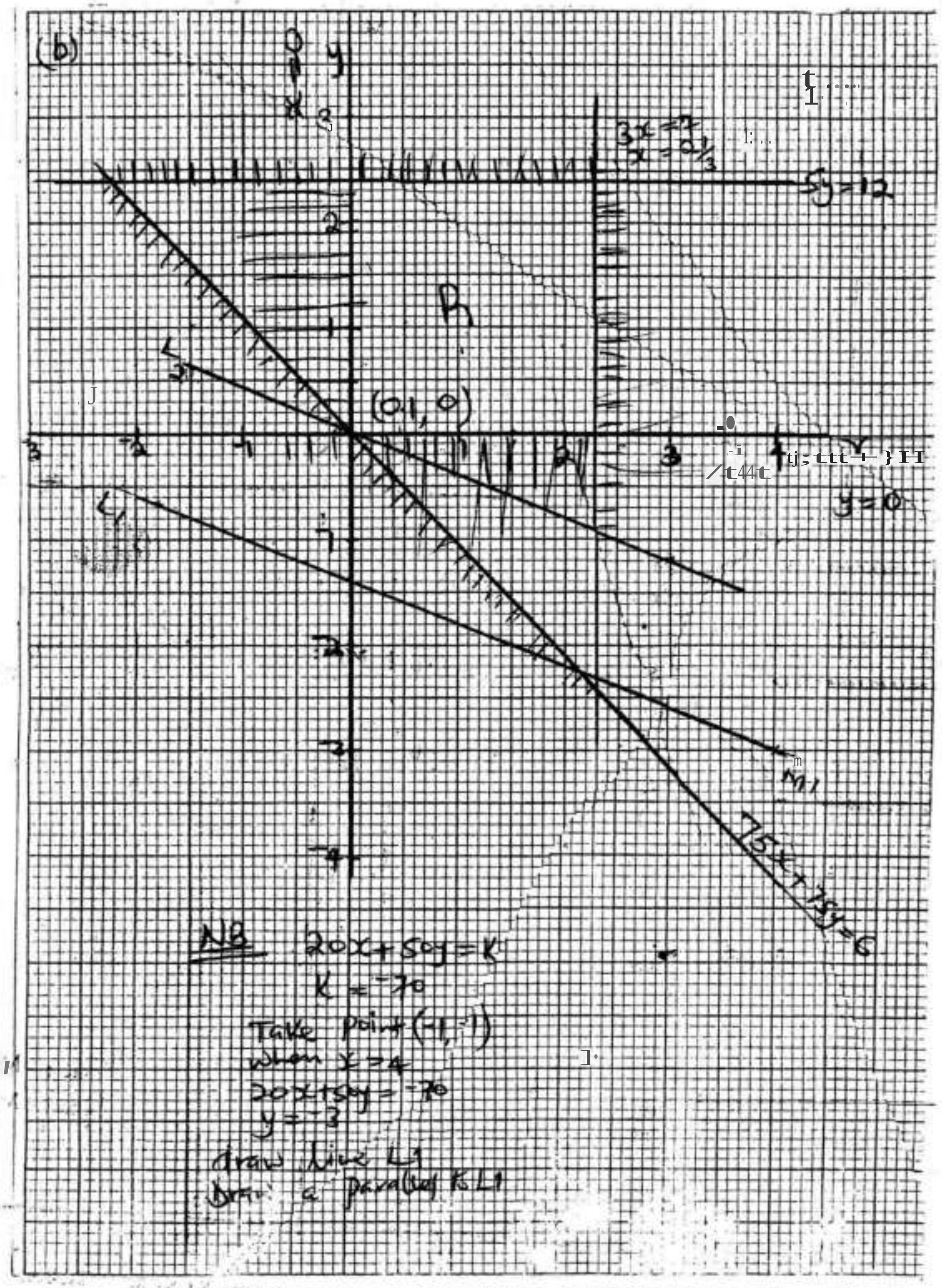
= 245°

A1

b) ''wy = 200 sin 50 sin 90 -t wy=sin 50 x 200 sin 90 = 0.90C56 x 200 **wy = 181/m**	Ml Al
c) TYX=b(right angled triangle) -'XTY=6°(given) therefore XYT=(90--6) =849 Angle of elevation of the top = 84° 	Bl Ml Al
23. PH -_[4.s+@ =_J20.25 +64 =9.2 fe ZJF +he° -J9.27+6 = 10.97cm	AI Al At
b) **i)** tan ~/9.2 tan ~= 0.6522 d 33° 	
ii) tan 9= 8 •ı Al tan 6 1.775 @ = 60.6•° 	B A

c)  Cosine rule 6=10 +8 –2x8x 10cos¢- 36 = 100 + 64 – 160cos ~ 36= 164 – 160 cos cos 6 = 128⁄16 –& = 0.8 = 36.9	M1 A1	iiri t n~=1, =0.75 $= 36^{0}.9^{1}$
24 a) i) =75x+75y26 =25x+25y2 ii) 75x<175 iv) y>o 3x<7 v) x>0 ii) 75y< 180 5y<12 b) See diagram next page c) i) lowest cost= 20x + 50y. at (0.1, O c = 20 x 0.1 + 50 x 0 c=2/=	M1 MI Ml 4mks Al	
ii) Max cost = 20x2.3 50x2.4 e–46 + 120 c= 166/=		Line 1=MI Line 1 =Ml

7



NB $20x + 50y = K$

$K = {}^-70$

Take point $(^-1, ^-1)$

when $x = 4$

$20x + 50y = {}^-70$

$y = {}^-3$

draw line L1

Draw a parallel to L1