1.

Definition of variables:

x: # of ha of red grapes

y: # of ha of white grapes

Definition of the inequalities representing the constraints:

① $x \geq 0$

② $y \geq 0$

③ $x + y \geq 120$

④ $32x + 25y \leq 4000$

⑤ $y \geq \frac{1}{3}(x+y)$

$3y \geq x + y$

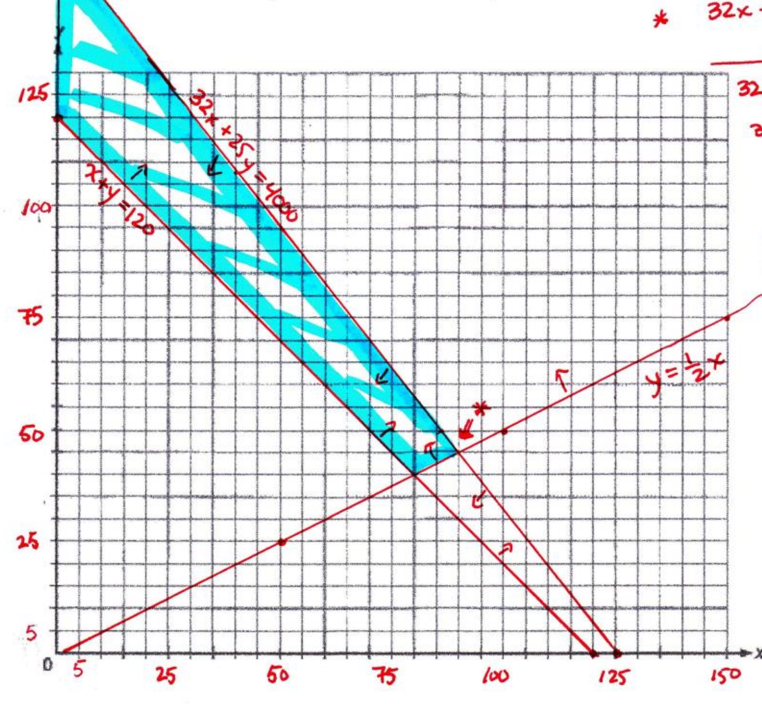
$2y \geq x$ or $y \geq \frac{x}{2}$

Stage 2

Graph representing the feasible regions of the various inequalities;

③

x	y
0	160
125	0



* $32x + 25y = 4000$

$y = \frac{x}{2}$

$32x + \frac{25x}{2} = 4000$

$32 + 12.5x = 4000$

$44.5x = 4000$

$x = \frac{8000}{89}$

$y = \frac{8000}{89}\left(\frac{1}{2}\right)$

$y = \frac{4000}{89}$

$P = 2(3200)x + 125(2500)y$

$P = 6400x + 3125y$

Vertices	$P = 64x + 31.25y$
(0, 120)	\$375 000
(0, 160)	\$500 000
$\left(\frac{8000}{89}, \frac{4000}{89}\right)$	\$715 730.34 ⇐ This point is possible as areas can be split into fractions
(80, 40)	\$637 000

∴ Maximum profit = \$715 730.34

2 Definition of variables:

x: # of French songs

y: # of English songs

Definition of the inequalities representing the constraints:

$x \geq 0$

$y \geq 0$

① $x \geq 2y + 7 \implies 2y \leq x - 7$

$y \leq 0.5x - 3.5$

② $x + y \geq 15$

③ $x + y \leq 25$

①

x	y
7	0
15	4
25	9

②

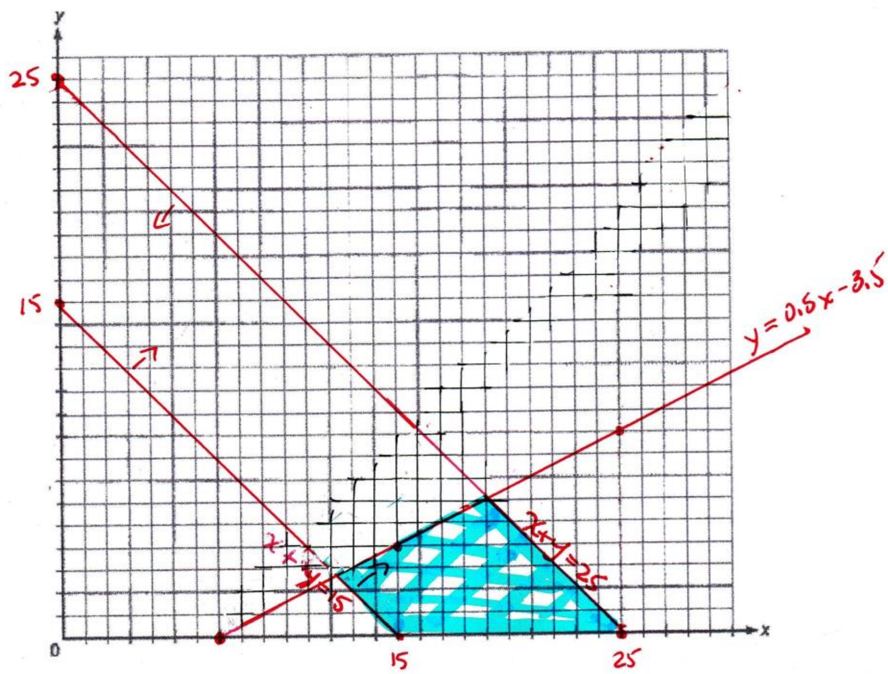
x	y
0	15
15	0

③

x	y
25	0
0	25

Stage 2

Graph representing the feasible regions of the various inequalities:



$x = 2y + 7$

$x + y = 15$

$2y + 7 + y = 15$

$3y + 7 = 15$

$3y = 8$

$y = 8/3$

$x = \frac{16}{3} + \frac{21}{3}$

$x = \frac{37}{3}$

Vertices	T = 3x + 3.5y + 15
(15, 0)	60
(37/3, 8/3)	$61.\bar{3}$
(19, 6)	93
(25, 0)	90

Time = $3x + 3.5y + 15$

max

The maximum length is 93 minutes.

3 Definition of variables:

x: # of individual clients

y: # of small business clients

Definition of the inequalities representing the constraints:

$x \geq 0$

$y \geq 0$

① $2x + y \leq 27$

② $y \leq 3 + x$

①

x	y
0	27
8	11
10	7
13.5	0

②

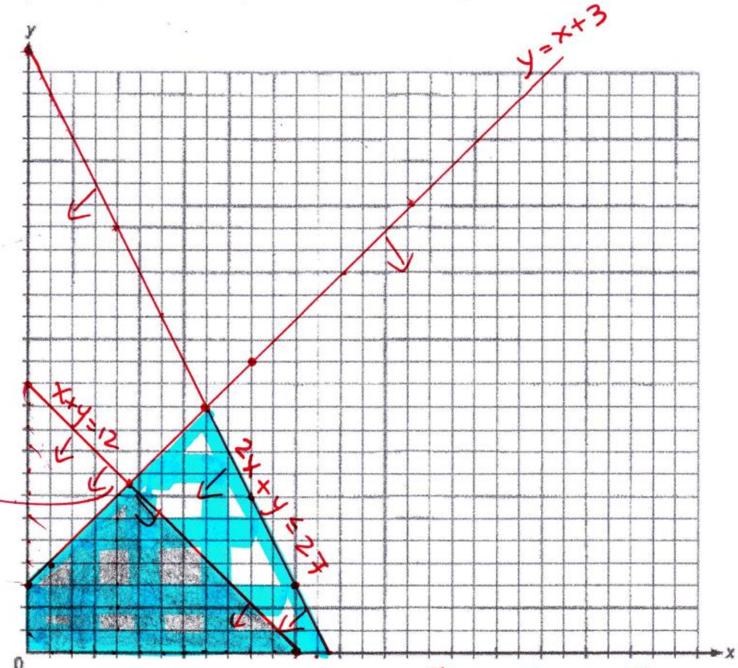
x	y
0	3
10	13
15	18

New constraint

$x + y \leq 12$

Stage 2

Graph representing the feasible regions of the various inequalities:



$y = x + 3$

$x + y = 12$

$x + x + 3 = 12$

$2x = 9$

$x = 4.5$

$y = 7.5$

$50x + 80y = R$

Vertices	R= 50x+80y
(0,0)	\$0
(0,3)	\$240
(8,11)	\$1280 *
(13.5, 0)	\$675

Vertices	R
	\$0
	\$240
(4.5, 7.5)	\$825 ⇒ can't use try (4,7) ⇒ 760 try (5,7) ⇒ \$810
(12, 0)	600

⇒ Her income will decrease by \$470.00

4. Definition of variables:

x: # of wooden joists

y: # of steel beams

Definition of the inequalities representing the constraints:

$x \geq 0$
$y \geq 0$
① $x + y \geq 18$
② $y \geq 8$
③ $x + y \leq 24$

①

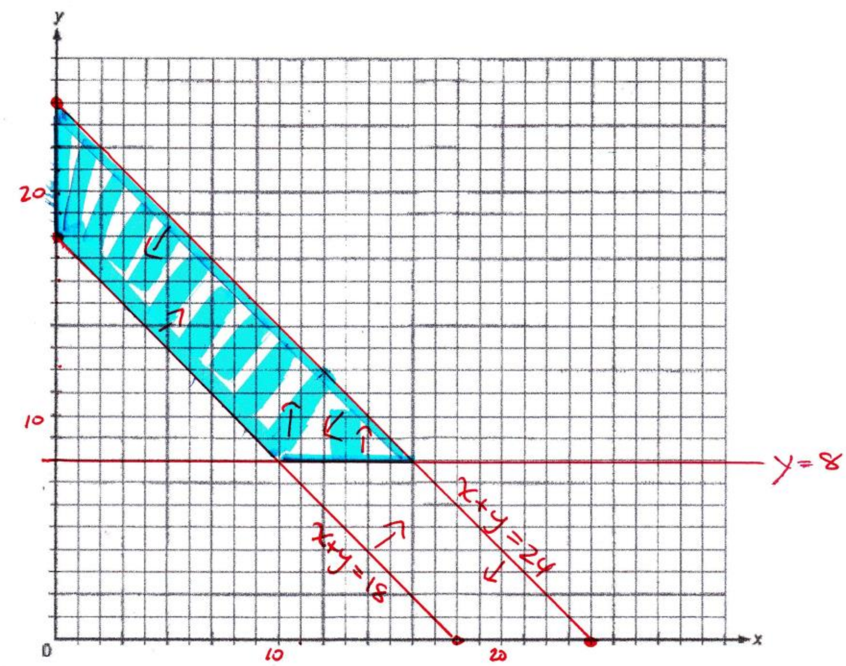
x	y
0	18
18	0

③

x	y
0	24
24	0

Stage 2

Graph representing the feasible regions of the various inequalities:



Vertices	200x + 500y = C
(0,18)	$9000
(0,24)	12 000
(16,8)	7 200
(10,8)	6000

The building owners want to minimise cost

∴ $6 000