Linear Programing

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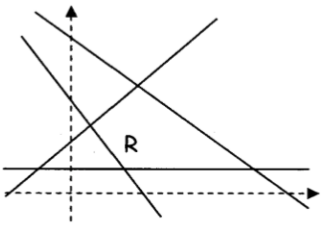
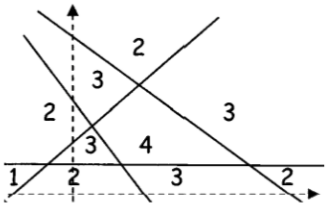
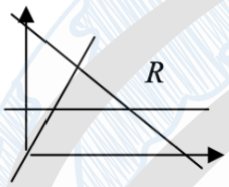
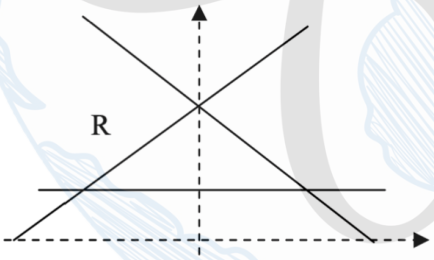
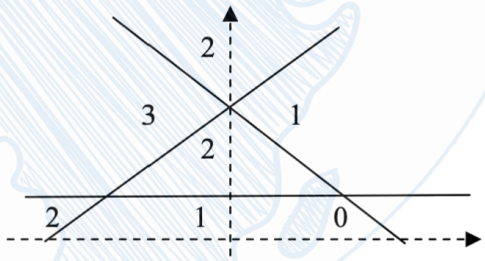
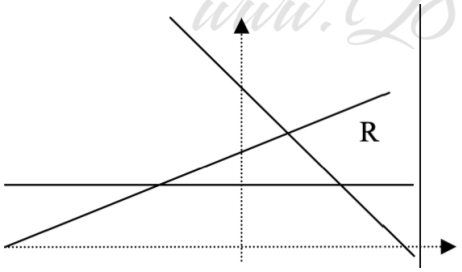
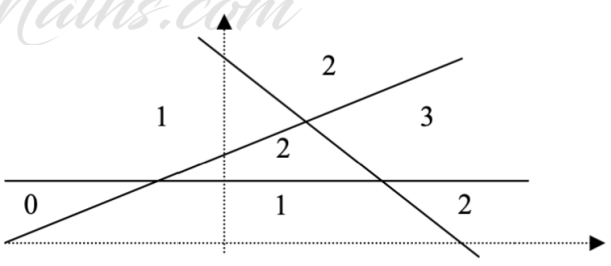
1	**14**		4	Mark the position of the letter R (or the worst unshaded region if R is missing) as follows 	
2	**20**	$x \geqslant 0$ $y \geqslant \frac{1}{2}x$ oe $x + y \leqslant 4$ oe	1 2 2	**L1** x R 0 **L1** y R $\frac{1}{2}x$ **L1** $x + y$ R 4 where R is any one of $= < > \leqslant \geqslant$ **B2** all inequalities correct or **B1** 2 correct	
3	**20**	**(a)**  **(b)**	4 1	**B1** $y = 2$ **single** line thro **B1** (6, 0) and **B1** (0,6) **B1** $y = 2x$ Correct R cao	
4	**22**	$y \geqslant 1,\ x \leqslant 3, y \leqslant x + 5$ oe	5	**B1** y R 1 **B1** x R 3 **B2** y R $x + 5$ or **B1** y R $-x + 5$ where R is any inequality **B1** all 3 inequalities correct	
5	**13**		**3**	Give the mark for R shown in region below 	
6	**14**	$y \leq 5$ $x \geq 2$ $y \geq x$	**4**	**B1** each inequality but accept **any** of the four inequality symbols Final **B1** all 3 symbols correct	
7	**14**		**3**		

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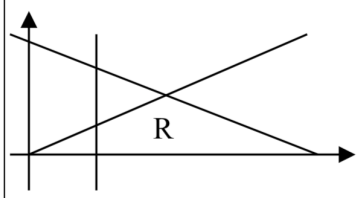
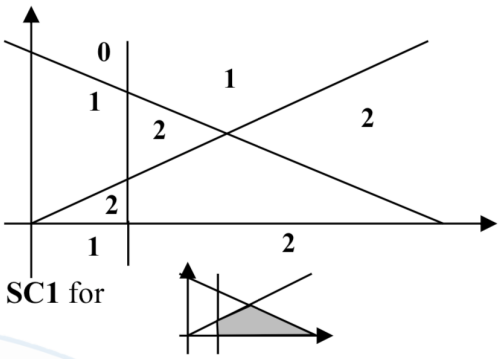
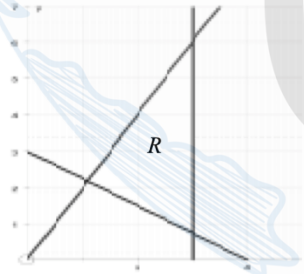
8	**12**		**3**	 **SC1** for	
9	**15**	$y < 8$ $y \geqslant 6 - x$ oe **and** $y \geqslant x + 2$ oe	**1** **3**	**B2** for either $y \geqslant 6 - x$ oe **or** $y \geqslant x + 2$ oe or **SC2** for $y = 6 - x$ oe **and** $y = x + 2$ oe or **SC1** for $y > 6 - x$ or $y = 6 - x$ **or** $y > x + 2$ or $y = x + 2$	
10	**19**	$y < 2$ oe and $x \geqslant -2$ oe $y \geqslant \frac{1}{2}x + 1$ oe and $y \leqslant -x + 3$ oe	**2** **3**	**B1** for either correct **B2** for either $y \geqslant \frac{1}{2}x + 1$ oe or $y \leqslant -x + 3$ oe or **SC2** for $y = \frac{1}{2}x + 1$ oe **and** $y = -x + 3$ oe or **SC1** for $y = \frac{1}{2}x + 1$ oe **or** $y = -x + 3$ oe or **SC4** for $y \leqslant 2$ oe , $x > -2$ oe, $y > \frac{1}{2}x + 1$ oe and $y < -x + 3$ oe	
11	**23**	Correct shading with three ruled accurate solid boundary lines 	**5**	**B2** for $3x + 4y = 12$ line through (0, 3) and (4, 0) or **B1** for a diagonal line through one of these points **B1** for $y = 2x$ line through (0, 0) and (1, 2) or through (1, 2) and (3, 6) **B1** for $x = 3$ line	
12	**20**	$y < 4$ $y \geqslant 3$ $x \geqslant 2$ $y > x$	**4**	**B1** for each correct answer to a maximum of 3 marks. First two may be combined as a single inequality e.g. $3 \leqslant y < 4$ for **B2** After 0 scored **SC1** for use of = signs or incorrect inequality signs in all four equations	
13	**21**	$y \geqslant 0$ and $x \geqslant 1$ oe and $x + y \leqslant 4$ oe	**4**	**SC3** for $y > 0$, $x > 1$ and $x + y < 4$ oe or **B1** for $y \geqslant 0$ **B1** for $x \geqslant 1$ oe and **B2** for $x + y \leqslant 4$ oe or **M1** for grad = –1 soi If **B0** scored for first two **B** marks, **SC1** for $y = 0$ and $x = 1$ or with incorrect inequality sign	

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14	**24**	$y \leqslant -\frac{3}{5}x + 6$ oe $x \geqslant 2$ oe $y > x$ oe final answers	**5**	**SC4** for $y < -\frac{3}{5}x + 6, x > 2, y \geqslant x$ oe or **B3** for $y \leqslant -\frac{3}{5}x + 6$ oe or **B2** for $y = -\frac{3}{5}x + 6$ oe or **B1** for gradient $= -\frac{3}{5}$ oe soi and **B2** for $x \geqslant 2$ and $y > x$ oe or **B1** for either $x \geqslant 2$ or $y > x$ oe or for $x = 2$ and $y = x$ with incorrect inequalities
15	21	$y \geqslant 1.5$ oe $y \geqslant \frac{3}{4}x$ oe $y < -\frac{1}{2}x + 3$ oe	**4**	**SC3** for $y > 1.5$ oe and $y > \frac{3}{4}x$ oe and $y \leqslant -\frac{1}{2}x + 3$ oe or **B3** for any two correct inequalities or **B1** for $y \geqslant 1.5$ oe and **B2** for $y \geqslant \frac{3}{4}x$ oe **or** $y < -\frac{1}{2}x + 3$ oe or $y = \frac{3}{4}x$ oe **and** $y = -\frac{1}{2}x + 3$ oe or with incorrect inequality signs or **B1** for $y = \frac{3}{4}x$ oe OR $y = -\frac{1}{2}x + 3$ oe or with incorrect
16	19	$y > 2$ oe final answer $y \geqslant 3 - x$ oe final answer	**3**	**B1** for $y > 2$ oe final answer **B2** for $y \geqslant 3 - x$ oe final answer or **B1** for $y = 3 - x$ oe soi or **SC2** for $y \geqslant 2$ oe **and** $y > 3 - x$ oe final answer

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