Linear Programming 2 Answers

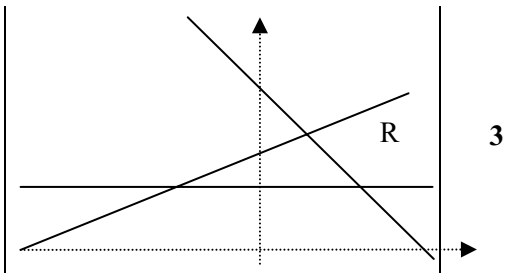
1)

(a)	$x \geqslant 3 \qquad y \geqslant 2$	1, 1	
(b)	$x + y \leqslant 9$	1	
(c)	$6x + 14y \leqslant 84$	1	
(d)	$x = 3 \quad y = 2$	1, 1	Accept clear and freehand lines long enough to define the correct quadrilateral
	$x + y = 9$	2	SC1 for line through (0, 9) or (9, 0)
	Line from (0, 6) to (14, 0)	2	B1 for through (0, 6) or (14, 0)
	Correct quadrilateral unshaded or clearly indicated	1	
(e)	\$ 70	2	B1 for considering (7, 2)

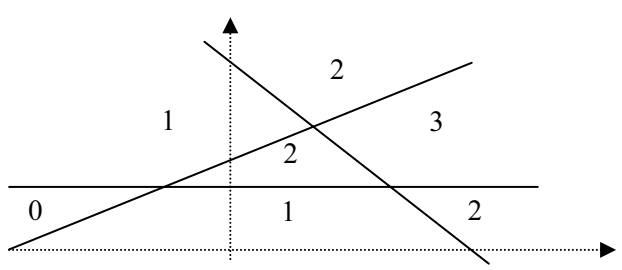
2)

2, 3, 4, 5	3	M2 for $1 < n \leq 5$ seen (M1 for $1 < n$ or $n \leq 5$) Allow $2 \leq n < 6$ in M2 or M1 case If 0, B2 for 3 correct with no extras or 4 correct with 1 extra.

3)



3



4)

(a) (i)	$x > 4$	**1**	
(ii)	$y > 9$	**1**	
(iii)	$x + y < 20$	**1**	
(b)	$5x + 10y < 170$ seen	**1**	
(c) (i)	$x = 4$ ruled	**1**	Each line long enough to enclose their region
	$y = 9$ ruled	**1**	Condone good freehand or dotted $y = 9$ must be **between** 8.8 and 9.2
	$x + y = 20$ ruled	**2**	**B1** for gradient = – 1 or y intercept = 20 or x intercept = 20. Exclude lines parallel to either axis.
	$x + 2y = 34$ ruled	**2**	**B1** for y intercept = 17 or x intercept = 34. Exclude lines parallel to either axis.
	Correct region indicated cao	**1**	**Dependent** on all 6 marks for the 4 lines.
(ii)	145 cao (from 11, 9) www 2	**2**	**M1** for using $5x + 10y$ when $x + y = 20$ and integers (x, y) is in their region

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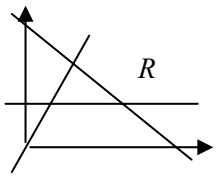
5)	**(a)** 	4	**B1** $y = 2$ **single** line thro **B1** (6, 0) and **B1** (0,6) **B1** $y = 2x$
	(b)	1	Correct *R* cao

6)	$y \leq 5$ $x \geq 2$ $y \geq x$	**4**	**B1** each inequality but accept **any** of the four inequality symbols Final **B1** all 3 symbols correct

7)	**(a)** **(i)**	There are up to 5 large coaches oe	**1**	E.g. can't hire more than 5 large coaches The maximum is 5 large coaches The large coaches are less than or equal to 5
	(ii)	$50x + 30y \geq 300$ oe	**E2**	No errors Allow in words provided clear e.g. 50 in large coaches and 30 in small coaches must equal 300 seats or more **M1** for associating 50 with *x* or large coaches and 30 with *y* or small coaches
	(b)			Freehand lines –1 pen once. All lines must be long enough to make full boundary of their region accept dashed or solid lines
		$x = 5$ ruled	**L1**	
		$x + y = 10$ ruled	**L1**	
		$5x + 3y = 30$ ruled	**L2**	**L1** for ruled line with intercepts at (0, 10) or (6, 0) within 2mm by eye at intercepts (extend if line is short)
		Correct region indicated cao	**R1**	Allow if slight inaccuracy(s) in diagonal lines Allow any clear indication of region
	(c) **(i)**	5 2	**1** **1**	After 5 and 2 in working ignore attempts to calculate costs
	(ii)	2950	**1ft**	ft their 5 × 450 + their 2 × 350 provided positive integers

Linear Programming 2 Answers

8)	**(a)**	$20x + 10y \geq 200$	**1**	In **(a)**, **(b)** −1 once for wrong symbol
	(b)	$x + y \leq 15, y \geq 3, y \leq x$	**3**	**B1** for each
	(c)			All lines long enough to make full boundary of region, accept dashed or solid lines, 2 mm acc at intercepts
		$2x + y = 20$ ruled	**B2**	**B1** for ruled line through (10, 0) or (0, 20)
		$x + y = 15$ ruled	**B1**	
		$y = x$ ruled	**B1**	
		$y = 3$ ruled	**B1**	−1 once, freehand
		Quadrilateral identified	**R1**	Allow if slight inaccuracy(s) in diagonal lines Allow any clear indication of region
	(d)	**(i)** 47 cao	**1**	
		(ii) 7, 6 cao	**2**	**M1** for any $5x + 2y$ in their region evaluated to equal their 47