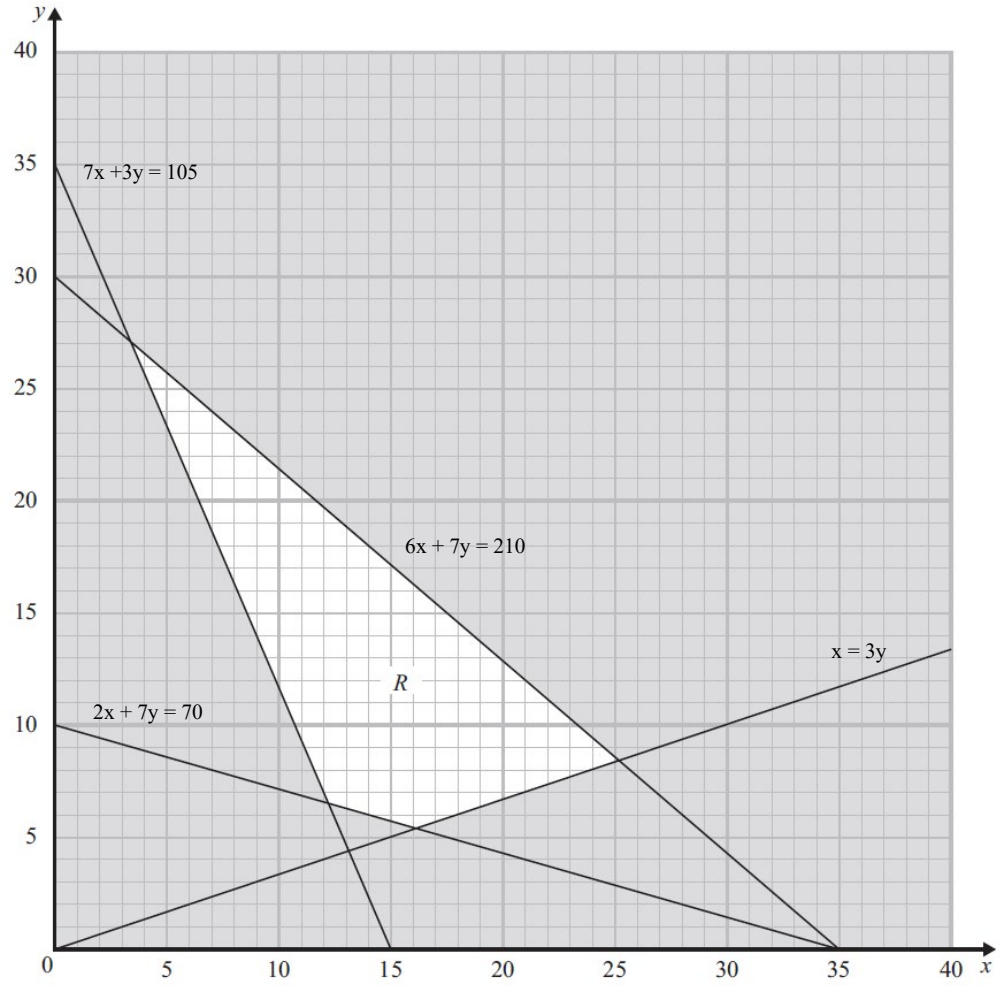
Question Number	Scheme	Marks
8. (a)	$z = 100 - x - y$ $(P =)\ 5x + y + 10(100 - x - y)$ $(P =)\ 1000 - 5x - 9y$ Maximising $1000 - 5x - 9y$ is equivalent to minimising $5x + 9y$	M1 A1 A1 **(3)**
(b)		B1 B1 dB1 **(3)**
(c)	$2x + 7y = 70 \quad \Rightarrow x = \frac{525}{43}\ y = \frac{280}{43} \quad C = \frac{5145}{43} = 119\frac{28}{43}\ 119.7$ $7x + 3y = 105 \quad (12.2,\ 6.5)$ $2x + 7y = 70 \quad \Rightarrow x = \frac{210}{13}\ y = \frac{70}{13} \quad C = \frac{1680}{13} = 129\frac{3}{13}\ 129.2$ $x = 3y \quad (16.2,\ 5.4)$ Optimum point $x = 12\frac{9}{43}\ y = 6\frac{22}{43}$	M1 A1 dM1 A1 **(4)**

(d)		$2x + 7y \geqslant 70$	$7x + 3y \geqslant 105$	$5x + 9y$	dM1
	(12, 7)	73 Y	105 Y	123	
	(13, 6)	68 N	109 Y	(119)	A1
	(13, 7)	75 Y	112 Y	128	
	$x = 12$ $y = 7$ $z = 81$ $P = 877$				A1 A1 **(4)**
					14 marks

	Notes for Question 8	
a1M1	Rearranges given information and substitutes for z in the objective function	
a1A1	Correct simplified expression for objective function	
a2A1	Correct statement that maximising a negative expression is equivalent to minimising the positive expression (Note M1 A0 A1 is possible if an error with the constant is seen)	
b1B1	Draws any two lines correctly (lines should be solid not dashed) (lines must be long enough to fully define the feasible region) (lines must be within half small square of (35, 0) (0, 10), (15, 0) (0, 35), (35, 0) (0, 30) and (0, 0) (30, 10) (extended if necessary))	
b2B1	Draws all four lines correctly	
b3dB1	Feasible region identified by shading and labelled R – dependent on both previous B marks	
c1M1	Solves $2x + 7y = 70$ with $7x + 3y = 105$ and $3y = x$ to obtain two pairs of coordinates (note ignore any attempts to calculate the coordinates of the other two vertices) (may be using calculators so accept coordinates seen to 1 dp with no working (12.2, 6.5) (16.2, 5.4))	
c1A1	Correct exact coordinates for at least one vertex	
c2dM1	At least two sets of coordinates substituted into the objective function (dependent on previous M mark)	
c2A1	Correct values for the objective function at both vertices (exact or 1 dp) and exact optimum point stated – do not accept decimal approximation	
d1dM1	Tests integer solutions in both the correct inequalities close to the correct optimum point (only one needed if point is rejected) (at least two of (12, 7) (13, 6) and (13, 7)) (dependent on both M marks in (c)) (accept e.g. Y/N for each inequality without values explicitly stated)	
d1A1	Correct minimum point identified (12, 7) with no incorrect working seen in (d)	
d2A1	Correct values for x, y and z stated with no incorrect working seen in (d)	
d3A1	Correct value for P with no incorrect working seen in (d)	

	Special Case for (c) and (d) – Incorrect feasible region *R* in part (b) (which may either be choosing a region other than *R* from the correct graph or by drawing an incorrect line such as *y* = 3*x* instead of *x* = 3*y*) **Max M1 A0 M1 A0 M0 A0 A0 A0**	
	Note these are method marks only and there is no requirement to check for accuracy other than sight of the correct equations being used in their calculations	
c1dM1	Solves at least two pairs of the correct equations to obtain two pairs of coordinates for the vertices of their feasible region (dependent on scoring at least one mark in (b))	
c1A1	Not available	
c2ddM1	Their coordinates substituted into the objective function (dependent on previous M mark)	
c2A1	Not available	
d1dM1	Not available	
d1A1	Not available	
d2A1	Not available	
d3A3	Not available	