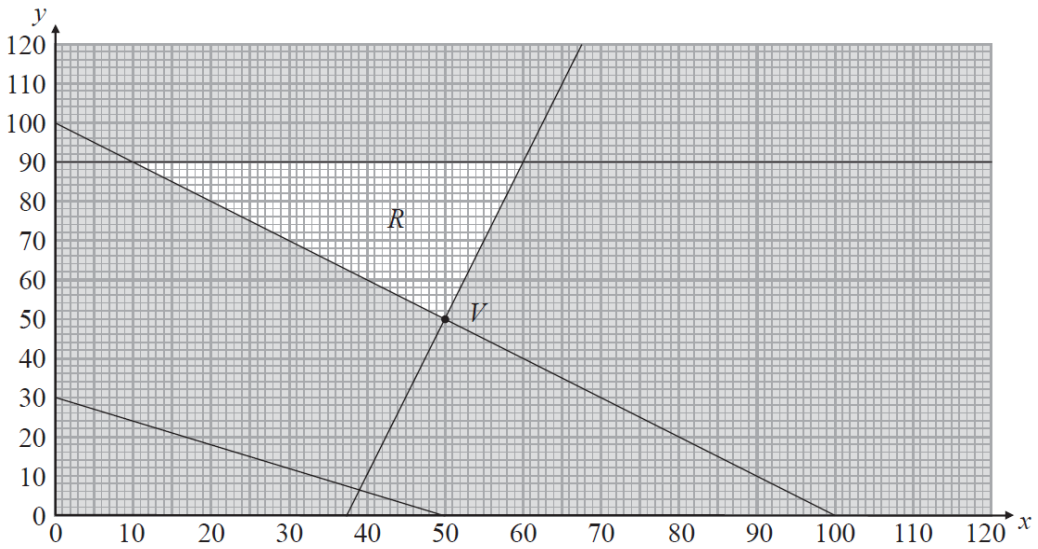
Question Number	Scheme	Marks
5. (a)	$5y \le 3z$	M1 A1 **(2)**
(b)	The total number of shirts must be at least 250	B1
	At most 20% of all the shirts should be small	M1 A1 **(3)**
(c)	(Minimise) $6x+10y+15z$	B1 **(1)**
(d)(i)	$z=150 \Rightarrow x+y \ge 100$	M1
	$y \le 90$	
	$4x-y \le 150$	A1
(d)(ii)		B1 B1 B1 B1 **(6)**
(e)	Correct objective line	B1
	V correctly labelled	B1 **(2)**
(f)	50 small and 50 medium shirts	B1
	Cost = £3050	B1 **(2)**
(g)	$x=50, y=75 \Rightarrow z \ge 125$ therefore minimum number of large shirts is 125	M1
	This leads to a cost of £2925 which is less than the cost in (f)	A1 **(2)**
		18 marks

Notes for Question 5

a1M1: Correct method: $5y \square 3z$ where $\square$ is any inequality or equals. An exact equivalent answer (with or without integer coefficients) can score M1 **or** M1 for $3y \le 5z$ only

a1A1: CAO (or equivalent e.g. $k(5y \le 3z)$ where k is any positive integer only)

b1B1: CAO oe e.g. the minimum number of shirts is 250 is fine for this mark (note that they must imply that the total number (and not one particular brand of shirt) is **at least** 250)

b1M1: Three of 'at most', '20%', 'all' and 'small' (allow equivalents e.g. fifth or 0.2 for 20%) allow those who imply 'all' provided that it is clear that they aren't talking about one particular brand only

b1A1: CAO (o.e. e.g. the number of small shirts is less than or equal to a fifth of the total number of shirts, the number of small shirts is at most 20% of all the shirts sold) – give bod of these that clearly imply 'all' provided that they aren't talking about only one particular brand. Do not allow statements which contain use of 0.2 or $\frac{1}{5}$ for this mark, e.g. the number of small shirts is at most 0.2 of all the shirts is A0

Question Number	Scheme	Marks

c1B1: Expression correct (or $600x+1000y+1500z$)
di1M1: Eliminating z from all **their** inequalities by using the substitution $z = 150$ – accept unsimplified (e.g. $x+y+150\geq 250, x\leq 0.2(x+y+150)$ and **their** $5y\leq 3(150)$)
di1A1: CAO e.g. $x+y\geq 100, 4x\leq y+150, 5y\leq 450$ (oe) - all constraints must be correct with integer coefficients but allow positive multiplies – ignore $x\geq 0, y\geq 0$ but any other additional constraints is A0 – allow recovery in this part if $y\leq 90$ (oe) seen in **(d)** even if their $5y\leq 3z$ is incorrect in **(a)**

In **(d)**, lines must be long enough to define the correct feasible region and would pass through one small square of the points stated:

$x+y=100$ must pass within one small square of its intersection with the axes – (0, 100) and (100, 0)
$y=90$ must pass within one small square of its intersection with the y-axis and (60, 90)
$4x-y=150$ must pass within one small square of (37.5, 0) and (60, 90)

dii1B1: Any one line correctly drawn
dii2B1: Any two lines correctly drawn
dii3B1: All three lines correctly drawn
dii4B1: Region, R, correctly labelled – not just implied by shading – dependent on scoring the three previous B marks in this part

e1B1: Drawing the correct objective line on the graph with gradient of –0.6. Line must be correct to within one small square if extended from axis to axis. If line is shorter than (0, 6) to (10, 0) then B0
e2B1: V correctly labelled – note that this mark is dependent on the correct feasible region in **(d)** (so must have scored at least B1B1B1B0) and the previous B mark in **(e)**

f1B1: CAO – must be in context (50 small and 50 medium and not for $x = y = 50$) note that this mark is dependent on the correct feasible region in **(d)** (so must have scored at least B1B1B1B0 in **(d)**) and the first B mark (for a correct objective line) in **(e)**
f2B1: CAO (3050) – units not required - note that this mark is dependent on the correct feasible region in **(d)** (so must have scored at least B1B1B1B0 in **(d)**) and the first B mark (for a correct objective line) in **(e)** – condone if stated/seen in **(g)**

g1M1: Substitute to obtain the correct value for z of 125 (accept $z\geq 125$ or $>$) – if no method allow 125 seen but M0 if 125 found but a different value of z stated and subsequently used
g1A1: Correct cost (2925) and dependent on the final B mark in **(f)**