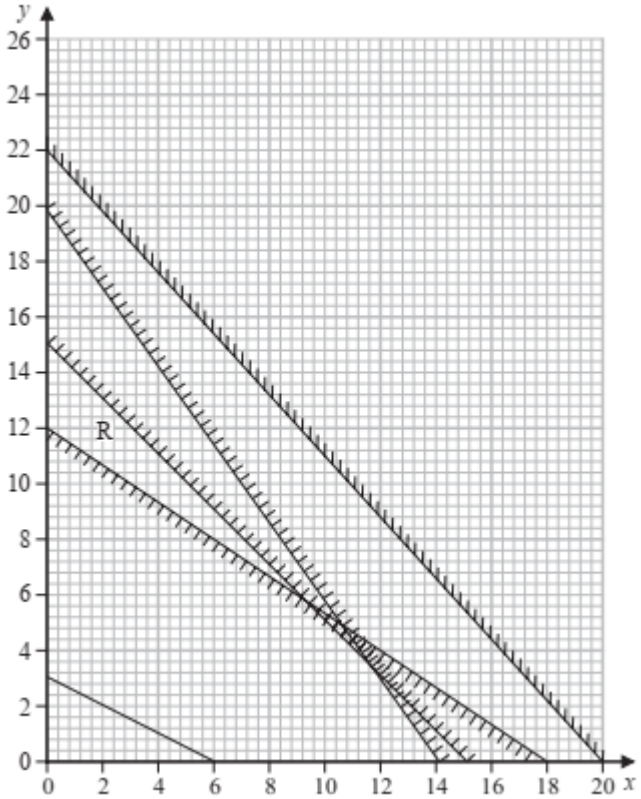
Question number	Scheme	Marks
6. (a)	Minimise (P =) $300x + 400y + 400z$	B1
	Subject to:	
	$275x + 200y + 100z \leqslant 5500$ ($\Rightarrow 11x + 8y + 4z \leqslant 220$)	B1
	$5x + 2y + 3z \leqslant 70$	B1
	$\frac{x}{15} + \frac{y}{20} + \frac{z}{30} \leqslant 1 \Rightarrow 4x + 3y + 2z \leqslant 60$	M1 A1
	$x + y + z \geqslant 18$ $(x, y, z \geqslant 0)$	B1 **(6)**
(b)	e.g Martin makes apple cakes and chocolate cakes in the ratio of 2:1 e.g. for every one chocolate cake that Martin makes he has to make 2 apple cakes (assuming that he makes chocolate/apple cakes) e.g. Martin should make twice as many apple cakes as chocolate cakes e.g. The number of apple cakes that Martin makes should be double the number of chocolate cakes he makes	B1 **(1)**
(c)		B1 B1 B1 B1 **(4)**
(d)	Drawing an objective line accept reciprocal gradient	M1
	Correct objective line	A1
	Martin should make 9 carrot cakes, 6 apple cakes and 3 chocolate cakes	A1
	Minimum amount of sugar is 6300 grams (or 6.3 kg)	A1 **(4)**
(e)	Martin has 1525 grams of flour remaining	B1
	Martin also has 4 eggs remaining	B1 **(2)**
		(17 marks)

Notes on Question 6

a1B1: CAO – expression correct ($300x + 400y + 400z$ or $0.3x + 0.4y + 0.4z$ **only**) and 'minimise' or 'min' but not 'minimum'. ISW if either of these two expressions are seen and then 'simplified'

a2B1: CAO ($275x + 200y + 100z \leqslant 5500$) oe but must be four terms only with integer coefficients e.g. $11x + 8y \leqslant 220 - 4z$

a3B1: CAO ($5x + 2y + 3z \leqslant 70$) oe but must be four terms only with integer coefficents

a1M1: Correct method $\frac{x}{15} + \frac{y}{20} + \frac{z}{30} \bullet 1$ where $\bullet$ is any inequality symbol or =

a1A1: CAO ($4x + 3y + 2z \leqslant 60$) oe must be four terms only with integer coefficients

a4B1: CAO ($x + y + z \geqslant 18$) oe must be four terms only with integer coefficients

b1B1: CAO but give bod if intention is correct. Some correct examples include:

- (Martin makes) apple (cakes) and chocolate (cakes) in the ratio of 2:1
- For every one chocolate (cake that Martin makes he has to) make 2 apple (cakes)
- (Martin should make) twice as many apple (cakes) as chocolate (cakes)
- The number of apple cakes (that Martin makes should be) double the number of chocolate cakes (he makes)

Please check these carefully for those candidates that imply incorrectly that Martin should make two chocolate cakes for every one apple cake. Furthermore, do not condone an answer that implies an inequality (e.g. use of words such as, 'at least', 'at most', etc.)

The lines in **(c)** must define the correct FR **and if extended** would pass within a small square of their point of intersection with the axes

c1B1: Any two lines correctly drawn
c2B1: Any three lines correctly drawn
c3B1: All four lines correctly drawn
c4B1: Correct *R* labelled – not just implied by shading – dependent on scoring the first three marks in this part **and all four lines being drawn from axis to axis (within one small square)**

d1M1: Drawing the correct objective line (gradient –0.5) or its reciprocal (gradient –2) on the graph. Line must be correct to within one small square if extended from axis to axis. If line is shorter than (0, 1) to (2, 0) (or for the reciprocal (0, 2) to (1, 0)) then M0
d1A1: Correct objective line – same condition that the line must be correct to within one small square if extended from axis to axis and be no shorter than the line from (0, 1) to (2, 0)

The final 4 marks are all dependent on the first three B marks in (c), the first two marks in part (d) and they must not have implied an incorrect *R* in (c) (but give bod if region not labelled in (c) or if the lines did not go axis to axis in (c) as this was penalised with the final mark in (c))

d2A1: CAO (in context) – as a minimuim accept 9 carrot, 6 apple and 3 chocolate
d3A1: CAO (6300 or 6.3) – no units required but if stated then must be correct – so 6300 kg is A0

e1B1: CAO (1525 (grams) or 1.525 (kg) of flour) – no units required but if stated then must be correct – so 1525 kg is A0
e2B1: CAO 4 (eggs)

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