Question	Scheme	Marks
2(a)	$2x+2y=350$	B1
		(1)
(b)	E.g. $xy=7350,\ \ x\times y=7350$	B1
		(1)
(c)	$x(175-x)=7350$ or $(175-y)y=7350$	M1
	E.g. $x^2-175x+7350=0\Rightarrow\left(x-70\right)\left(x-105\right)=0\Rightarrow x=...$	dM1
	x = 70 or 105	A1
	$(x>y\Rightarrow)x=105, y=70$	A1
		(4)
		(6 marks)

Notes:

Ignore labelling and mark all parts together.
Ignore any units given whether correct or incorrect.

(a)

B1: Correct equation. Accept any correct equation e.g. $2\left(x+y\right)=350,\ x+y=175$

(b)

B1: Correct equation. Accept any correct equation e.g. $y=\frac{7350}{x}$

(c)

M1: Substitutes for x or y into either of their equations to produce a 2 or 3 term quadratic equation in one variable. Note that terms do not need to be collected for this mark so e.g. $x(175-x)=7350$ or $(175-y)y=7350$ oe is acceptable for this mark.

Condone slips when substituting if the intention is clear e.g. substituting for $2x$ rather than x: $x(350-2x)=7350$

(Note, if substituting $x=\frac{7350}{y}$ into $2x+2y=350$ they will need to multiply through by y to score this mark. Condone slips but must produce a 2 or 3 term quadratic equation.)

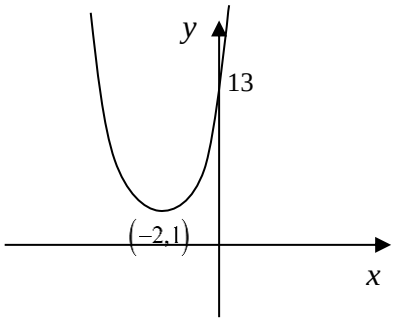
dM1: Depends on the first method mark. Solves their 3 term quadratic equation, any suitable means such as formula or by calculator (may be implied by correct values for their quadratic).

A1: Correct **simplified** roots of the quadratic. Do not be concerned about which is x and y for this mark so just look for the values 70 and 105. It is possible that candidates may only select the larger value for x (105) or the smaller value for y (70) **but** if both roots are found they must both be correct.

A1: Both x and y correct and correctly assigned and all previous marks scored.

Special Case:

Candidates who use Trial and Improvement in part (c) or guess the correct answers with no quadratic formed allow a special case of M1M1A0A0. If the values are the wrong way round or both sets of answers are offered then score special case of M1M0A0A0.

Question	Scheme		Marks
3(a)	$a = 3$		**B1**
	$b = \pm 2$		**M1**
	$3x^2 + 12x + 13 = 3\left(x + 2\right)^2 + 1$ or $a = 3,\ b = 2,\ c = 1$		**A1**
			(3)
(b)		Correct U shape with minimum in second quadrant	**B1**
		Intercept 13 on y-axis.	**B1**
		Vertex at $\left(-2,1\right)$	**B1ft**
			(3)
			(6 marks)

Notes:

(a)

B1: Correct value for a stated or shown by working.

M1: Obtains $b = \pm 2$. Allow unsimplified e.g. $b = \pm\frac{4}{2}, \pm\frac{12}{6}$. May be implied by e.g. $3\left(x \pm 2\right)^2 + ...$

A1: Fully correct expression or correct values.

Note that there are various methods e.g. $ax^2 + bx + c = a\left(x + \frac{b}{2a}\right)^2 + c - \frac{b^2}{4a} \Rightarrow 3x^2 + 12x + 13 = ...$

or $a\left(x + b\right)^2 + c = ax^2 + 2abx + ab^2 + c \Rightarrow a = 3,\ 2ab = 12, ab^2 + c = 13 \Rightarrow b, c = ...$

(b)

<u>There must be a sketch to score marks in (b)</u>

<u>Labelling on the sketch takes precedence</u>

Treat part (b) as Hence, or otherwise, i.e. part (a) may be incorrect but full marks are available in part (b) for a correct sketch of $y = 3x^2 + 12x + 13$

B1: Correct U shape with minimum point in the second quadrant but **not** on the x-axis. Do not allow a clear V shape.

B1: Correct y intercept labelled or stated. Allow as just 13 or (0, 13) or (13, 0) as long as it is in the correct position. If stated away from the sketch it must be as (0, 13) and correspond to the sketch. Their curve must at least touch at (0, 13). Any other intercepts can be ignored.

B1ft: Correct vertex labelled in some way, or follow through their b and c i.e. $x = –b$ and $y = c$. Must be a turning point but could be a maximum or a minimum. Allow the labelling as shown or as $x =.., y = …$ or as the ordinates shown on the axes. It must correspond to the sketch. If stated away from the sketch it must be correct or correct follow through and correspond to the sketch.