Question Number	Scheme	Marks
8(a)	$m = \dfrac{18-0}{2--3}$	M1
	$y-18 = \dfrac{18}{5}(x-2)$ or e.g. $y = \dfrac{18}{5}(x+3)$ or $18 = \dfrac{18}{5}(2)+c \Rightarrow c = ...$ or e.g. $0 = \dfrac{18}{5}(-3)+c \Rightarrow c = ...$	dM1
	$y = \dfrac{18}{5}x + \dfrac{54}{5}$	A1
		(3)
(b)	Examples: $y = ax^2 + bx - 6$ $y = (x+3)(px+q)$ $y = ax^2 + bx + c, (0,-6), (2, 18), (-3, 0) \Rightarrow a = ...$ or $b = ...$ or $c = ...$ NB $a = \dfrac{14}{5}$, $b = \dfrac{32}{5}$, $c = -6$	M1
	Full method to find all constants. E.g. Solves $9a-3b-6=0$ and $4a+2b-6=18 \Rightarrow a = ..., b = ...$	dM1
	Either $a = \dfrac{14}{5}$ or $b = \dfrac{32}{5}$ $y = \dfrac{14}{5}x^2 + \dfrac{32}{5}x - 6$	A1 A1
		(4)
(c)	$\dfrac{14}{5}x^2 + \dfrac{32}{5}x - 6 < y < \dfrac{18}{5}x + \dfrac{54}{5}, \quad x < 0$	M1 A1ft
		(2)
		(9 marks)

Notes

(a)

M1: Attempts gradient = $\dfrac{18-0}{2--3}$.

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Alternatively solves two simultaneous equations, e.g. $18 = 2m + c$ and $0 = -3m + c$ to find m or c.

dM1: Full attempt at equation of the line using (–3, 0) or (2, 18) with values correctly placed.

If they use $y = mx + c$ they must proceed as far as finding a value for c.

If they use e.g. $\dfrac{y}{18-0} = \dfrac{x+3}{2--3}$ both M's can be scored together.

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A1: $y = \dfrac{18}{5}x + \dfrac{54}{5}$ o.e.

(b)

M1: Uses a method that finds one of the unknowns leaving an equation in two unknowns.

- States equation is $y = ax^2 + bx - 6$ (the most common)
- States equation is $y = (x+3)(px+q),\ p \neq 1$ or e.g. $y = a(x+3)(x+b)$
- States equation is $y = ax^2 + bx + c$ and uses all 3 coordinates to find one unknown

dM1: Uses all three coordinates to find all three unknowns. Condone slips with substitution provided the intention is clear.

A1: Two correct unknowns found.

A1: Correct **<u>equation</u>**. E.g $y = \frac{14}{5}x^2 + \frac{32}{5}x - 6$ or $y = (x+3)\left(\frac{14}{5}x - 2\right)$ or $y = \frac{14}{5}(x+3)\left(x - \frac{5}{7}\right)$

but not e.g. $C = \ldots$

Note that attempts at e.g. $y = x^2 + bx - 6$ score no marks as there are insufficient unknowns.

(c)

M1: Uses two of the three required inequalities. Two may be combined as seen in the scheme. Accept „ $\leftrightarrow <$. Follow through on their equations for l and C.

$"\frac{14}{5}x^2 + \frac{32}{5}x - 6" < y < "\frac{18}{5}x + \frac{54}{5}"$ would count as 2 correct inequalities.

Do **not** allow inequalities in terms of R e.g. $\frac{14}{5}x^2 + \frac{32}{5}x - 6 < R < \frac{18}{5}x + \frac{54}{5}$

A1ft: Correct definition of R using their equations for l and C.

E.g. $y \ldots \frac{14}{5}x^2 + \frac{32}{5}x - 6, y \text{„} \frac{18}{5}x + \frac{54}{5}, \quad x \text{„} 0$ with inequalities used consistently.

If applying ft, their equations must be appropriate e.g. $y = mx + c,\ m, c \neq 0$ for l and a 3 term quadratic expression for C.

If they have a lower limit of -3 on the restriction on x e.g. $-3 \text{„} x \text{„} 0$ this is fine as long as it is consistent. If their lower limit is less than -3 then the left hand inequality can be strict or non-strict i.e. consistency is not required.

This mark should be withheld if any extra incorrect inequalities are given e.g. if they impose an extra restriction on y vertically then $-\frac{338}{35} \text{„} y \text{„} \frac{54}{5}$ would be correct (for correct (a) and (b)) but anything narrower than this would not.

Question Number	Scheme	Marks
9(a)	$\left(CQ^2 =\right)0.5^2+1.84^2-2\times0.5\times1.84\cos0.8$	M1
	(Radius =) $CQ=1.534\,\text{m}$	A1
		(2)
(b)	$\dfrac{\sin PCQ}{0.5}=\dfrac{\sin 0.8}{"1.534"}$ or $0.5^2="1.534"^2+1.84^2-2\times"1.534"\times1.84\cos PCQ$	M1
	$\Rightarrow \sin PCQ=\dfrac{0.5\sin0.8}{"1.534"}\left(=0.233....\right)\Rightarrow PCQ=0.236*$ or $\cos PCQ=\dfrac{"1.534"^2+1.84^2-0.5^2}{2\times"1.534"\times1.84}\left(=0.972...\right)\Rightarrow PCQ=0.236*$	A1*
		(2)
(c)	$\dfrac{1}{2}r^2\theta=\dfrac{1}{2}\times"1.534"^2\times\left(2\pi-0.236\right)$ oe e.g. $\pi"1.534"^2-\dfrac{1}{2}\times"1.534"^2\times0.236$ (= 7.114…) OR $\dfrac{1}{2}ab\sin C=\dfrac{1}{2}\times0.5\times1.84\sin\left(0.8\right)$ or $\dfrac{1}{2}\times"1.534"\times1.84\sin\left(0.236\right)\left(=0.3299...\right)$	M1
	Attempts $\dfrac{1}{2}r^2\theta=\dfrac{1}{2}\times"1.534"^2\times\left(2\pi-0.236\right)$ **AND** $\dfrac{1}{2}ab\sin C=\dfrac{1}{2}\times0.5\times1.84\sin\left(0.8\right)$ **AND** adds	dM1
	(awrt) 7.4 (m^2)	A1
		(3)
(d)	Attempts $r\theta="1.534"\times\left(2\pi-0.236\right)\left(=9.276...\right)$	M1
	Perimeter = $"1.534"\times\left(2\pi-0.236\right)+0.5+\left(1.84-1.534\right)=10.1$ (m)	A1
		(2)
		(9 marks)

Notes

It is acceptable in this question to work in degrees and convert if necessary.

NB 0.8 radians is 45.8366…° and angle *PCQ* is 13.5205…°

Note that there will be other valid methods – if in doubt use review.

See right angled triangle methods for (a) and (b) at the end of the MS

(a)

M1: Writes down the correct rhs for the cosine rule.

Allow e.g. $\cos0.8=\dfrac{0.5^2+1.84^2-CQ^2}{2\times0.5\times1.84}$

A1: $CQ=1.534$ This value only i.e. not awrt.

(b)

M1: A correct sine rule statement following through on their *CQ* which may appear as $\sin PCQ=\dfrac{0.5\sin0.8}{1.534}$ and would also count as the intermediate step below.