Question Number	Scheme	Marks
5(a)	$\angle BOD = \pi - 2\times 0.7 = 1.742*$	B1*
		(1)
(b)	Area of $BOD = \frac{1}{2}\times 3^2 \sin 1.742 \quad (= \text{awrt } 4.43)$	M1
	Area of R is: $\frac{1}{2}\times 3^2 \times 1.742 - \frac{1}{2}\times 3^2 \sin 1.742$ or $\frac{1}{2}\times \pi \times 3^2 - \frac{1}{2}\times 3^2 \sin 1.742 - 2\times \frac{1}{2}\times 3^2 \times 0.7$	dM1
	= awrt 3.4 (m^2)	A1
		(3)
(c)	$BD = \sqrt{3^2+3^2-2\times 3\times 3\cos 1.742} \qquad (= \text{awrt } 4.59)$ or $BD = 2\times 3\sin\left(\frac{1.742}{2}\right)$ or $BD = 2\times 3\cos 0.7$ or $BD = \frac{3\sin 1.742}{\sin\left(\frac{\pi - 1.742}{2}\right)}$ or arc $BCD = 3\times 1.742 \quad (= 5.226)$	M1
	Perimeter of R is: $3\times 1.742 + "BD"$	dM1
	= awrt 9.8 (m)	A1
		(3)
		Total 7

They may work in degrees which is acceptable

(a)

B1*: Correct working to achieve 1.742 (or better). Alternatively, they may use $\angle BOD$ and add this to 2×0.7 to achieve π. They must write a minimal conclusion that $\angle BOD = 1.742$

May work in degrees: $180 - 2\times\frac{0.7}{\pi}\times 180 = \text{awrt } 99.8° \Rightarrow \frac{\text{awrt } 99.8}{180}\times\pi = 1.742$

(b)

M1: Correct strategy for the area of triangle BOD using $\angle BOD = 1.742$. May be implied by awrt 4.43

May work in degrees (1.742 radians as awrt 99.8)

eg. $\frac{1}{2}\times 3^2 \sin 99.8$

dM1: Applies a correct method for the area of *R*. The values embedded is sufficient. May also work in degrees correctly. It is dependent on the previous method mark.

eg. $\pi \times 3^2 \times \frac{99.8}{360} - \frac{1}{2} \times 3^2 \sin 99.8$

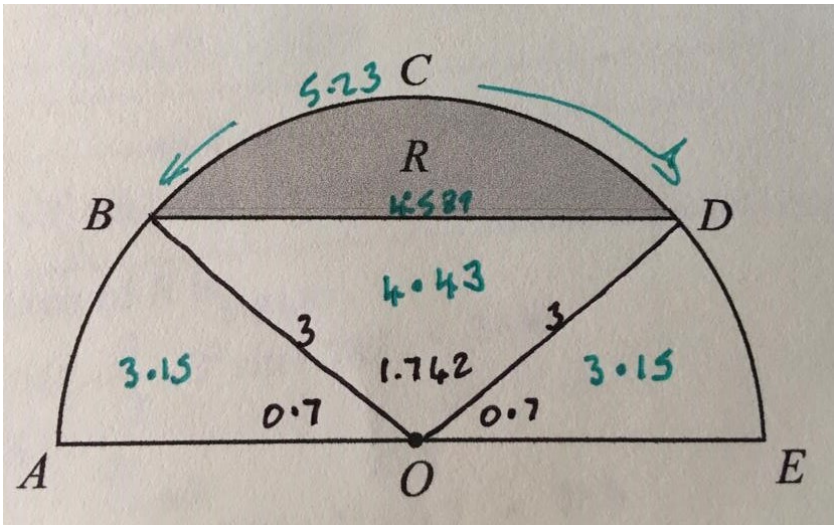
A1: awrt 3.4 (m^2) Do not isw if they add or subtract other areas.

(c)

M1: Correct method for the length of *BD* which may be implied by awrt 4.59
OR a correct method for the length of arc *BCD* (= 5.226)
May work in degrees (Take 1.742 in radians as awrt 99.8).

dM1: Applies a fully correct method to find the perimeter of *R* by adding the length of arc *BCD* to their *BD*. **The methods to find both of these must be correct**.
It is dependent on the previous method mark.

A1: awrt 9.8 (m) Do not isw.



Question Number	Scheme	Marks
6(a)(i)	$x=4 \Rightarrow \mathrm{f}'(4)=\dfrac{(4+3)^2}{4\sqrt{4}}=\dfrac{49}{8}$ (6.125)	B1
(ii)	$y-20="\dfrac{49}{8}"(x-4)$	M1A1ft
	$49x-8y-36=0$	A1
		(4)
(b)	$\mathrm{f}'(x)=\dfrac{(x+3)^2}{x\sqrt{x}}=\dfrac{x^2+6x+9}{x\sqrt{x}}$ $=\dfrac{x^2}{x\sqrt{x}}+\dfrac{6x}{x\sqrt{x}}+\dfrac{9}{x\sqrt{x}}=\ldots$	M1
	$=x^{\frac{1}{2}}+6x^{-\frac{1}{2}}+9x^{-\frac{3}{2}}$	A1
	$\left(\mathrm{f}(x)=\right)\dfrac{2}{3}x^{\frac{3}{2}}+12x^{\frac{1}{2}}-18x^{-\frac{1}{2}}+c$	dM1 A1A1
	$20=\dfrac{2}{3}(4)^{\frac{3}{2}}+12(4)^{\frac{1}{2}}-18(4)^{-\frac{1}{2}}+c \Rightarrow c=\ldots$	M1
	$\left(\mathrm{f}(x)=\right)\dfrac{2}{3}x^{\frac{3}{2}}+12x^{\frac{1}{2}}-18x^{-\frac{1}{2}}-\dfrac{1}{3}$	A1
		(7)
		Total 11

(a)(i)

B1: Correct value

(ii)

M1: Correct straight line method using $y = 20$ and $x = 4$ with their f'(4) as $(y-20)="\dfrac{49}{8}"(x-4)$

allowing a sign error in one of the brackets.
If they use $y=mx+c$ they must proceed as far as $c=\ldots$
Using a perpendicular gradient is M0.

A1ft: Correct equation in any form following through on their f'(4)

A1: Correct equation in the required form where all terms are on one side of an equation (allow any integer multiple)