Question	Answer	Marks	Guidance
1(b)	Equation of *their* perpendicular bisector soi: $y+2=-\frac{1}{4}\left(x-\frac{1}{4}\right)$ or $y=-\frac{1}{4}x-\frac{31}{16}$ oe, isw	**M3**	**FT** *their* midpoint and perpendicular gradient from correct use of *their* $(-1.5,\ -9)$ and *their* $(2,\ 5)$ **M1 FT** for midpoint: $\left(\frac{their(-1.5)+their2}{2},\frac{their(-9)+their5}{2}\right)$ or $(0.25,\ -2)$ **M1 FT** for perpendicular gradient: $m_{\perp}=\frac{-1}{\frac{their(-9)-their5}{their(-1.5)-their2}}$ oe or $-\frac{1}{4}$ OR **M1 FT** *their*$(-1.5,\ -9)$ and *their* $(2,\ 5)$ for $(x-2)^2+(y-5)^2=(x+1.5)^2+(y+9)^2$ soi **M1 FT** *their*$(-1.5,\ -9)$ and *their* $(2,\ 5)$ for expanding $x^2+y^2-4x-10y+29=$ $x^2+y^2+3x+18y+83.25$ soi
	$\frac{961}{128}$ isw or 7.51 or 7.507 to 7.508 oe cao	**A2**	not from wrong coordinates **A1** for sight or use of e.g. $\left(-\frac{31}{4},0\right)$ and $\left(0,-\frac{31}{16}\right)$ nfww or $x=-\frac{31}{4}$ and $y=-\frac{31}{16}$ nfww or $x=\frac{31}{4}$ and $y=\frac{31}{16}$ nfww

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Question	Answer	Marks	Guidance
2(a)	Complete and correct method e.g.: $\pi - 2\sin^{-1}\left(\frac{1}{3}\right)$ or $\pi - \cos^{-1}\left(\frac{7}{9}\right)$ or $3.142 - 0.6796...$ oe or $2\cos^{-1}\left(\frac{2}{6}\right)$ or $2 \times 1.2309\ldots$oe or $\cos^{-1}\left(\frac{36+36-128}{2(6)(6)}\right)$ or $\cos^{-1}\left(-\frac{7}{9}\right)$ oe	**M2**	**M1** for a correct useful angle or implicit calculation for angle AOB e.g. angle $BOC = 2\sin^{-1}\left(\frac{1}{3}\right)$ or $0.6796\ldots$ or $\cos^{-1}\left(\frac{36+36-16}{2(6)(6)}\right)$ or $\cos^{-1}\left(\frac{7}{9}\right)$ or half angle $BOC = \sin^{-1}\left(\frac{1}{3}\right)$ or $0.339\ldots$ or half angle $AOB = \cos^{-1}\left(\frac{2}{6}\right)$ or $\sin^{-1}\left(\frac{4\sqrt{2}}{6}\right)$ or $1.230\ldots$ or $128 = 36 + 36 - 2(6)(6)\cos AOB$ oe
	2.46 or 2.461 to 2.462[…]	**A1**	
2(b)(i)	$6 \times$ *their* 2.46 soi	**M1**	**FT** *their* 2.46 providing it is less than 2π
	37.5 or 37.52 to 37.55	**A1**	

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Question	Answer	Marks	Guidance
2(b)(ii)	$\frac{1}{2}\times 6^2\times their2.46$ or $\left[2\times\frac{1}{2}\times\right]\left(6^2\times their2.46\right)$ OR $\frac{1}{2}\times 6^2\times their0.68[0]$ or $\left[2\times\frac{1}{2}\times\right]\left(6^2\times their0.68[0]\right)$	**M1**	**FT** *their* 2.46 providing it is less than 2π
	Correct plan e.g. : 2 sectors + 2 triangles $\left[2\times\frac{1}{2}\times\right]\left(6^2\times their2.46\right)+\left[2\times\frac{1}{2}\times\right]\left(6^2\times\sin theirBOC\right)$ or $\left[2\times\frac{1}{2}\times\right]\left(6^2\times their2.46\right)+\left[2\times\frac{1}{2}\times\right]\left(6^2\times\sin their2.46\right)$ or $\left[2\times\frac{1}{2}\right]\left(6^2\times their2.46\right)+\left(\frac{1}{2}\times 4\times theirAB\right)$ oe or 2 segments + 1 rectangle $\left[2\times\frac{1}{2}\times\right]6^2\left(their2.46-\sin their2.46\right)+4\times theirAB$ oe OR whole circle radius 6 – 2 segments cut off by AD and BC $\pi\times 6^2-\left[2\times\frac{1}{2}\times\right]6^2\left(theirBOC-\sin theirBOC\right)$	**M1**	**dep** previous **M1**
	111 or 111.2 to 111.3	**A1**	
3	$2^{10}+10\times 2^9\times\frac{3}{x^2}+45\times 2^8\times\left(\frac{3}{x^2}\right)^2$ oe, soi and $1-8x^2+16x^4$ soi	**B3**	**B2** for $2^{10}+10\times 2^9\times\frac{3}{x^2}+45\times 2^8\times\left(\frac{3}{x^2}\right)^2$ oe, soi or **B1** for two correct terms in $2^{10}+10\times 2^9\times\frac{3}{x^2}+45\times 2^8\times\left(\frac{3}{x^2}\right)^2$ oe, soi **B1** for $1-8x^2+16x^4$
	$2^{10}+their15360\times their(-8)+their103680\times their16$	**M2**	**FT** *their* expansions for **M2** or **M1** **M1 FT** for any two correct terms in this sum
	1 537 024	**A1**	

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