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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Question	Answer	Marks	Guidance
4(a)	$e^y = mx^3 + c$ soi	**B1**	
	Correct method to find m e.g. $\frac{13.5-0.5}{1-7.5}$ or $13 = -6.5m$ OR $m = -2$ soi	**M1**	
	Correct method to find c e.g. $13.5 = their(-2)\ [1] + c$ oe or $0.5 = their(-2)\ (7.5) + c$ oe or $0.5 = 7.5(13.5 - c) + c$ oe OR $c = 15.5$ soi	**M1**	
	$y = \ln\left(15.5 - 2x^3\right)$ mark final answer	**A1**	
4(b)	$x < \sqrt[3]{7.75}$ oe, nfww	**2**	**M1 FT** for $15.5 - 2x^3 > 0$ oe, soi; **FT** $a + bx^3 > 0$ from $y = \ln\left(a + bx^3\right)$
5(a)	665 280	**B1**	
5(b)	30 240	**2**	**M1** for $3 \times 10 \times 9 \times 8 \times 7 \times 2$ oe
5(c)	26 880	**2**	**B1** for a final answer of 13 440 or **M1** for $2 \times 3 \times 4 \times 8 \times 7 \times 5 \times 4$ oe
6	All through this question allow correctly written vectors in **i j** form but, incorrectly written column vectors e.g. $\begin{pmatrix} 10\mathbf{i} \\ -24\mathbf{j} \end{pmatrix}$ do not earn full marks unless the correct form is recovered		
6(a)	$\begin{pmatrix} 10 \\ -24 \end{pmatrix}$ oe, isw	**2**	**B1** for the magnitude of the direction vector is 13 soi or **M1** for $\sqrt{5^2 + (-12)^2}$ oe or **M1** for $\begin{pmatrix} 26\cos 1.18 \\ -26\sin 1.18 \end{pmatrix}$ oe
6(b)	$\begin{pmatrix} 3 \\ 6 \end{pmatrix} + t\begin{pmatrix} 10 \\ -24 \end{pmatrix}$ oe, isw	**2**	**M1 FT** for $\begin{pmatrix} 3 \\ 6 \end{pmatrix} + t\left(their\begin{pmatrix} 10 \\ -24 \end{pmatrix}\right)$ **FT** *their* velocity vector

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