| Question | Answer | Marks | Partial Marks |
|---|---|---|---|
| 5(b) | **Alternative method 2:** | | |
| | Using product of roots:<br>$\frac{1}{5}n(n+1) = -\left(\frac{-2}{5}\right)$ oe | **(M1)** | |
| | $n = -2$ as the only valid solution | **(A1)** | |
| | Using sum of roots and/or sum of products of pairs of roots, solves to find $a$ or $b$:<br>$\frac{1}{5} + n + n + 1 = -\frac{a}{5}$ oe and/or<br>$\frac{1}{5}(n) + n(n+1) + \frac{1}{5}(n+1) = \frac{b}{5}$ | **(M1)** | |
| | $a = 14$ or $b = 7$ | **(A1)** | |
| | $5x^3 + 14x^2 + 7x - 2$<br>or $a = 14$ and $b = 7$ following $n = -2$ | **(A1)** | |
| | | | If 0 scored for any method,<br>**SC3** for<br>$5\left(\frac{1}{5}\right)^3 + a\left(\frac{1}{5}\right)^2 + b\left(\frac{1}{5}\right) - 2 = 0$ oe<br>**and**<br>$5n^3 + an^2 + bn - 2 = 0$ oe or<br>$5(n+1)^3 + a(n+1)^2 + b(n+1) - 2 = 0$ oe<br>leading to $a = 14$, $b = 7$ with $n = -1$ or $n$ not stated<br><br>or **SC1** for $5\left(\frac{1}{5}\right)^3 + a\left(\frac{1}{5}\right)^2 + b\left(\frac{1}{5}\right) - 2 = 0$ oe or<br>$5n^3 + an^2 + bn - 2 = 0$ oe or<br>or $5(n+1)^3 + a(n+1)^2 + b(n+1) - 2 = 0$ oe |
| 6(a)(i) | $1 + 21x + 189x^2 + 945x^3$ | **B2** | **B1** for three out of the four terms correct or for a correct answer seen then spoilt<br><br>If 0 scored then **SC1** for $1, 21x, 189x^2, 945x^3$ seen but not summed |
| 6(a)(ii) | $1 + 21(0.01) + 189(0.01)^2 + 945(0.01)^3$<br>or 1 + 0.21 + 0.0189 + 0.000945 oe<br><br>leading to 1.229[845 = 1.23] cao | **B2** | **M1** for use of $x = 0.01$ oe in *their* expansion seen or implied by<br>e.g. $1 + 21(0.01) + 189(0.01)^2 + 945(0.01)^3$<br>or 1 + 0.21 + 0.0189 + 0.000945<br>OR<br>1.229845 without working or from working that is not fully correct |

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|---|---|---|---|
| 6(b) | ${}^{15}C_{12} \times \left(\frac{x^4}{2}\right)^3 \times \left(\frac{2}{x}\right)^{12}$ oe | **M1** | |
| | 232960 | **A1** | |
| 7(a) | Uses a valid Pythagorean identity to write in terms of a single trig ratio<br>e.g. $1 + \tan^2\theta = \tan\theta + 3$ | **B1** | |
| | Rearranges and factorises/solves<br>e.g. $\tan^2\theta - \tan\theta - 2 = 0$<br>$(\tan\theta - 2)(\tan\theta + 1) = 0$ | **M1** | |
| | $\tan\theta = 2 \quad \tan\theta = -1$ soi | **A1** | |
| | 1.11, –2.03, $-\frac{\pi}{4}$, $\frac{3\pi}{4}$ and no extras in range cao | **A2** | **A1** for any 3 correct, ignoring extras |
| 7(b) | Use of $\tan\phi = \frac{\sin\phi}{\cos\phi}$ in a correct expression or correct working | **M1** | |
| | Use of $1 - \cos^2\phi = \sin^2\phi$ in a correct expression or correct working | **M1** | |
| | Completion with $\frac{1}{\cos\phi} = \sec\phi$ | **A1** | nfww |
| 7(c) | $\cot x = [-]\sqrt{\text{cosec}^2 x - 1}$ soi<br>or $\sin x = -\frac{8}{17}$ and $\tan x = -\frac{8}{15}$ soi<br>or $\sin x = -\frac{8}{17}$ and $\cos x = \frac{15}{17}$ soi<br>or $\frac{1}{\tan\left(\sin^{-1}\left(-\frac{8}{17}\right)\right)}$ | **M1** | |
| | $-\frac{15}{8}$ or –1.875 cao, isw | **A1** | |