| Question | Answer | Marks | Guidance |
|---|---|---|---|
| 10 | Equation of normal $y = -x + 3$ soi | **2** | **M1** for a correct attempt to obtain an equation of the normal using calculus and perpendicular gradient |
| | $-x+3=x^2-9x+18$<br>or $x^2-9x+18=0$ | **M1** | |
| | $x = 3$ [or 5] | **A1** | |
| | $\int_3^5\left[(-x+3)-(x^2-9x+18)\right]dx$<br>$\pm\left[\left(\frac{-x^2}{2}+3x\right)-\left(\frac{x^3}{3}-\frac{9x^2}{2}+18x\right)\right]_3^5$<br>or $\pm\left[-\frac{x^3}{3}+4x^2-15x\right]_3^5$ | **4** | **M1** for attempt to subtract and integrate<br>Allow if order is reversed<br>**FT** on *their* normal equation for **M1**<br>**A1** for $\frac{x^3}{3}-\frac{9x^2}{2}+18x$ soi<br>**A1** for $\frac{-x^2}{2}+3x$ soi<br>Ignore limits at this stage |
| | $\pm\left(-\frac{125}{3}+100-75-(-9+36-45)\right)$ oe | **2** | **M1 dep** for attempt to use *their* limits<br>Allow one arithmetic error for **M1**<br>May include area of triangle rather than area using the normal |
| | $\frac{4}{3}$ | **A1** | Curve – line gives $-\frac{4}{3}$,<br>final answer must be $\frac{4}{3}$ |
| | **Alternative method** | | |
| | $x^2-9x+18=0$ | **(M1)** | |
| | $x = 3$ [or 5] | **(A1)** | |
| | $\int_3^5\left[(x^2-9x+18)\right]dx$<br>$=\left[\frac{x^3}{3}-\frac{9x^2}{2}+18x\right]_3^5$ | **(3)** | **M1** for attempt to integrate<br>**A1** for one term correct soi<br>Ignore limits at this stage |
| | $\pm\left(\frac{125}{3}-\frac{225}{2}+90-(9-\frac{81}{2}+54)\right)$ soi | **(2)** | **M1 dep** for attempt to use *their* limits<br>Allow one arithmetic error for **M1** |
| | Area of triangle $= \frac{1}{2}\times 2\times 2$ | **(2)** | **M1** for a complete method |
| | Shaded area $= \frac{10}{3} - 2 = \frac{4}{3}$ | **(2)** | **M1** for a difference between *their* areas<br>Must be positive for **A1** |

© Cambridge University Press & Assessment 2025

| Question | Answer | Marks | Guidance |
|---|---|---|---|
| 11(a) | $\frac{n!}{(n-4)!} = \frac{(2n)!}{6(2n-3)!}$ | **B1** | |
| | $n(n-1)(n-2)(n-3) = \frac{2n(2n-1)(2n-2)}{6}$ | **2** | **Dep** on previous **B1**<br>**B1** for simplification of one side |
| | e.g. $3(n-2)(n-3) = 2(2n-1)$<br>$3n^2 - 19n + 20 = 0$ **AG** | **B1** | **Dep** on all previous **B** marks<br>With sufficient detail shown |
| 11(b) | $(3n-4)(n-5) = 0$<br>$n = 5$ only | **2** | **M1** for attempt to solve the given equation |
| 12 | $\overrightarrow{AB} = \begin{pmatrix}7\\4\end{pmatrix} - \begin{pmatrix}1\\7\end{pmatrix} \quad \left[= \begin{pmatrix}6\\-3\end{pmatrix}\right]$ | **M1** | |
| | $\overrightarrow{AC} = k\begin{pmatrix}1\\2\end{pmatrix} - \begin{pmatrix}1\\7\end{pmatrix} \quad \left[= \begin{pmatrix}k-1\\2k-7\end{pmatrix}\right]$ | **M1** | |
| | Use of $\overrightarrow{AB}$ // $\overrightarrow{AC}$ or $\overrightarrow{AC} = m\overrightarrow{AB}$<br>to obtain either $\frac{k-1}{6} = \frac{2k-7}{-3}$<br>or $k-1 = 6m$ and $2k-7 = -3m$ oe | **M1** | Form equation without vectors<br>**FT** *their* $\overrightarrow{AB}$ and $\overrightarrow{AC}$ |
| | $k = 3$ | **A1** | |
| | $\overrightarrow{AC} = \begin{pmatrix}3-1\\2\times3-7\end{pmatrix} = \begin{pmatrix}2\\-1\end{pmatrix}$<br>or $m = \frac{1}{3}$ | **M1** | Substitute *their k* into *their* $\overrightarrow{AC}$ |
| | $AC : AB = 1 : 3$ or $\frac{1}{3}$ | **A1** | |

© Cambridge University Press & Assessment 2025