Question 1 **(25 marks)**

When Conor rings Ciara's house, the probability that Ciara answers the phone is $\frac{1}{5}$.

(a) Conor rings Ciara's house once every day for 7 consecutive days. Find the probability that she will answer the phone on the 2nd, 4th, and 6th days but not on the other days.

(b) Find the probability that she will answer the phone for the 4th time on the 7th day.

(c) Conor rings her house once every day for n days. Write, in terms of n, the probability that Ciara will answer the phone at least once.

(d) Find the minimum value of n for which the probability that Ciara will answer the phone at least once is greater than 99%.

Q1	Model Solution – 25 Marks	Marking Notes
(a)	$$\frac{4}{5} \times \frac{1}{5} \times \frac{4}{5} \times \frac{1}{5} \times \frac{4}{5} \times \frac{1}{5} \times \frac{4}{5} = \frac{256}{78125}$$ **or** $$= 0 \cdot 0032768$$	**Scale 10C (0, 4, 5, 10)** *Low Partial Credit:* • $\frac{4}{5}$ • $\left(\frac{1}{5}\right)^3$ *High Partial Credit:* • $\frac{4}{5} \times \frac{1}{5} \times \frac{4}{5} \times \frac{1}{5} \times \frac{4}{5} \times \frac{1}{5} \times \frac{4}{5}$ in any order
(b)	$$\binom{6}{3}\left(\frac{1}{5}\right)^3\left(\frac{4}{5}\right)^3\left(\frac{1}{5}\right)$$ $$= \frac{1280}{78125} \textbf{ or } \frac{256}{15625}$$ **or** $0 \cdot 016384$	**Scale 5D (0, 2, 3, 4, 5)** *Low Partial Credit:* • $\binom{6}{3}$ or $\left(\frac{1}{5}\right)^3$ or $\left(\frac{4}{5}\right)^3$ • $\frac{1}{5}$ for last day *Mid Partial Credit:* • $\binom{6}{3}\left(\frac{1}{5}\right)^3\left(\frac{4}{5}\right)^3$ and stops or continues • $\binom{7}{4}\left(\frac{1}{5}\right)^4\left(\frac{4}{5}\right)^3$ and continues *High Partial Credit:* • $\binom{6}{3}\left(\frac{1}{5}\right)^3\left(\frac{4}{5}\right)^3\left(\frac{1}{5}\right)$

(c)	$$1 - \left(\frac{4}{5}\right)^n$$	**Scale 5B (0, 3, 5)** *Partial Credit:* • 1 or $\left(\frac{4}{5}\right)^n$ • any correct term from the expansion
(d)	$$1 - \left(\frac{4}{5}\right)^n > 0{\cdot}99$$ $$\left(\frac{4}{5}\right)^n < 0{\cdot}01$$ $$\left(\frac{4}{5}\right)^{20{\cdot}6377} \approx 0{\cdot}01000000517$$ $$n = 21$$	**Scale 5C (0, 2, 4, 5)** *Low Partial Credit:* • Ans **(c)** $> 0{\cdot}99$ *High Partial Credit:* • viable solution to inequality • $n = 20{\cdot}6377$ and stops