Day 285	A Level Maths: B Tier 10-a-day

1 A sports club has 260 junior members, 300 senior members and 320 veteran members.
A stratified sample of size 44 is taken. Find the number selected from each group.

2 A ship moves with constant velocity $(4\mathbf{i} - \mathbf{j})$ m s^{-1}. At time t = 0 its position vector relative to a fixed origin O is $(5\mathbf{i} + 7\mathbf{j})$ m.
Find (a) its position vector when t = 2, (b) the value of t when it crosses the line through O in the direction of $\mathbf{i}$.

3 Solve $\tan^2 x + 4 \tan x + 3 = 0$ for $0 \leq x \leq 360°$, giving answers to 1 d.p. where necessary.

4 A curve has equation $y = \frac{-2}{x - 3} - 1$.
(a) Write down the asymptotes.
(b) Find where the curve crosses the axes.

5 $\mathbf{a} = \begin{pmatrix} 5 \\ 2 \\ 4 \end{pmatrix}$ and $\mathbf{b} = \begin{pmatrix} 5 \\ -4 \\ 2 \end{pmatrix}$.
Find the angle between a and b, to 1 d.p.

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6 A particle of mass 4 kg is acted on by forces ($\mathbf{i} - \mathbf{j}$) N and $\mathbf{P}$ N only. Its acceleration is ($3\mathbf{i} - 2\mathbf{j}$) m s^{-2}. Find $\mathbf{P}$, and its magnitude to 3 significant figures.	
7 A sequence is defined by $u_{n+1} = \frac{u_n - 1}{u_n + 1}$, $u_1 = \frac{1}{2}$. (a) Show that the sequence is periodic, stating the period. (b) Find u_{30} and $\sum_{r=1}^{30} u_r$.	
8 Given that each attempt at a task succeeds independently with probability 0.3, find the least number of attempts needed for the probability of at least one success to exceed 0.9.	
9 Solve the simultaneous equations $2x + y = -10$ $x^2 + y^2 = 25$	
10 Use integration by parts to find the exact value of $\int_1^3 \ln x \, dx$.	