Day 154	A Level Maths: C Tier 10-a-day
1 The velocity of a boat is $(-12\mathbf{i} + 5\mathbf{j})$ m s^{-1}, where $\mathbf{i}$ and $\mathbf{j}$ are perpendicular unit vectors. (a) Find the speed. (b) Find the acute angle between the direction of motion and the line of $\mathbf{i}$. Give 1 d.p.	
2 Solve $\cos x = -\frac{\sqrt{3}}{2}$ for $-180° \leq x \leq 180°$.	
3 Sketch $y = -(x + 4)(x - 1)(x - 2)$. Write down the coordinates of the points where the curve meets the axes.	
4 A light plank rests on a pivot. A child of mass 45 kg sits 2.5 m from the pivot on one side. Where must a child of mass 25 kg sit on the other side for the plank to balance horizontally?	
5 Prove, by considering the possible remainders, that the square of any integer is of the form $3k$ or $3k + 1$.	

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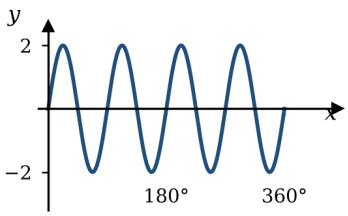
6 Use $u = x^2 + 1$ to evaluate

$\int_0^2 2x(x^2 + 1)^3 \, dx$.

7 M(−3, 6) is the midpoint of the line segment AB.
A is the point (−4, 5). Find the coordinates of B.

8 $X \sim B(30, p)$. H_0: $p = 0.2$, H_1: $p > 0.2$.
Find the critical region for a test at the 1% significance level.

9 The diagram shows the graph of $y = a \sin bx$ for $0° \leq x \leq 360°$, where a and b are positive integers.
Find a and b.



10 A bag has 6 red and 2 blue counters. Two are taken at random without replacement.
Find the probability that at least one of them is red.