Day 300 **A Level Maths: A Tier 10-a-day**

1 A sector of a circle of radius 9 cm has perimeter 23.4 cm.
Find (a) the angle of the sector in radians, (b) the area of the sector.

2 The 3rd term of an arithmetic sequence is 11 and the 6th term is 29.
Find the first term and common difference, and the sum of the first 30 terms.

3 A particle of mass 5 kg is acted on by forces $F_1 = (23\mathbf{i} - 25\mathbf{j})$ N and F_2. Its acceleration is $(3\mathbf{i} - 2\mathbf{j})$ m s^{-2}. Find (a) F_2, (b) the angle between F_2 and $\mathbf{i}$, to 1 d.p.

4 Solve $\cos 2x - 3\sin x = 1$
for $-180° \leq x \leq 180°$.

5 The table summarises the length, l mm, of leaves of 51 items.
Use linear interpolation to estimate the upper quartile.

Class	Frequency
$20 \leq l < 25$	9
$25 \leq l < 30$	12
$30 \leq l < 35$	10
$35 \leq l < 40$	11
$40 \leq l < 45$	9

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6 $f(x) = x^3 + 4x^2 + 2x - 1$. (a) Show that $(x + 1)$ is a factor of $f(x)$. (b) Solve $f(x) = 0$, giving surds in simplest form.	
7 5% of people have a disease. The screening test is positive for 96% of those who have it and for 10% of those who do not. (a) Find the probability that a person tests positive. (b) Given a positive test, find the probability that the person has the disease (3 s.f.).	
8 A curve has equation $4x^2 + 2xy + y^2 = 108$. Find the coordinates of the points where the tangent is parallel to the x-axis.	
9 $f(x) = \frac{11x - 5}{(1 - 2x)(1 - 3x)}$. (a) Express $f(x)$ in partial fractions. (b) Hence expand $f(x)$ up to x^2. (c) State the range of x for which the expansion is valid.	
10 Particle A (6 kg) lies on a rough table, $\mu = 0.1$, joined by a light string over a smooth pulley to particle B (8 kg), 0.8 m above the floor. Released from rest; B lands without rebounding. Find (a) the acceleration of A before B lands, (b) the further distance A moves. Take $g = 9.8$. Give answers to 3 s.f. if not exact.	