Day 91	A Level Maths: A Tier 10-a-day
1 The 4th term of an arithmetic sequence is 17 and the 10th term is 11. Find the first term and common difference, and the sum of the first 12 terms.	
2 A car costs £12000 new. Its value falls by 20% each year, so after t years its value is £V. (a) Write down V in terms of t. (b) Find, to 3 s.f., the time when the value is £4000.	
3 The curve y = f(x) has a minimum point at (2, −4). Find the coordinates of the corresponding point on: (a) $y = f(\frac{x}{2})$ (b) y = f(x + 4) (c) y = f(−x)	
4 A ball is thrown vertically upwards at 39.2 m s^{-1} from a point h m above horizontal ground, and hits the ground 10 s later. Find (a) h, (b) the greatest height above the ground. Take g = 9.8.	
5 P(B) = 0.45, P(A) = 0.25 and P(A | B) = 0.45. (a) Find P(A ∩ B) and P(A ∪ B). (b) Find P(B | A). (c) Determine whether A and B are independent.	

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6 Use the substitution u = cos x to find the exact value of

$\int_0^{\frac{\pi}{2}} \sin x \cos^3 x \, dx$.

7 The circle $x^2 + y^2 + 6x - 4y - 12 = 0$ passes through P(−6, 6).

(a) Find the equation of the tangent at P, in the form ax + by = c.

(b) Find the coordinates of the point where this tangent crosses the x-axis.

8 The times in seconds of two groups: group X has n = 10, mean 48, sd 7;
group Y has n = 20, mean 66, sd 2.
Find the mean and standard deviation of all 30 values (3 s.f. for the sd).

9 A uniform ladder AB (5 m, 30 kg) rests with A on rough ground, $\mu = 0.2$, and B against a smooth wall, B being 3 m above the ground. A man of mass 75 kg climbs the ladder. How far along the ladder from A can he climb before it slips?

10 The circle has centre O and radius 10 cm.

Angle AOB = $\frac{\pi}{2}$.

Find the exact area and the exact perimeter of the shaded segment.

