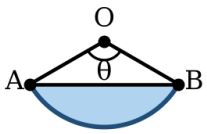
Day 182	A Level Maths: A Tier 10-a-day
1 A ball is projected from the ground at 39.2 m s^{-1} at angle α above the horizontal, $\tan \alpha = \frac{4}{3}$. At time T s, while in flight, it is moving perpendicular to its initial direction. Find (a) T, (b) the height of the ball then. Take g = 9.8.	
2 The curve y = f(x) has a maximum point at (−2, 3). Find the coordinates of the corresponding point on: (a) y = f(−x) (b) y = f(x) + 5 (c) y = −f(x)	
3 A cyclist passes P with speed 5 m s^{-1} and accelerates uniformly. She travels 110 m in the next 10 s, reaching Q. Find (a) her acceleration, (b) her speed at Q, (c) her speed at the midpoint of PQ. Give answers to 3 s.f. if not exact.	
4 The volume of a cube of edge x cm is increasing at 27 $cm^3 s^{-1}$. Find the rate of increase of its total surface area when x = 5.	
5 The curve with equation $y = 2x^2 + 6x + 1$ is transformed by a stretch, scale factor 2, parallel to the y-axis, followed by a stretch, scale factor 3, parallel to the x-axis. Find the equation of the image curve.	

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6 The circle has centre O and radius 20 cm.

Angle AOB = $\frac{2\pi}{3}$.

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



7 $X \sim N(\mu, \sigma^2)$, with $P(X < 46) = 0.1587$ and $P(X > 51) = 0.0668$.

Find μ and σ.

8 Solve $x(\sqrt{7} - 3) = -5 + 4\sqrt{7}$, writing x in the form $p + q\sqrt{7}$.

9 The mean fill volume of bottles (ml) is normally distributed with standard deviation 8; it was previously 85.

A random sample of 64 has mean 82.5.

Test, at the 5% level, whether the mean has changed.

10 A sector of a circle has arc length 8 cm and area 16 cm^2.

Find the radius of the circle and the angle of the sector, in radians.