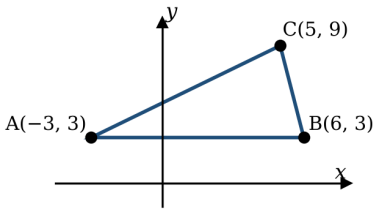
Day 242 **A Level Maths: A Tier 10-a-day**

1 A cyclist passes P with speed 6 m s^{-1} and accelerates uniformly. She travels 80 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.

2 The curve y = f(x) has a maximum point at (−3, 2).
Find the coordinates of the corresponding point on:
(a) y = 2f(x)
(b) y = −f(x)
(c) y = f(−x)

3 A systematic sample is taken from a numbered list of 585 items.
The 6th item chosen is number 80 and the 8th item chosen is number 110.
Find the sampling interval, the number of the first item chosen and the size of the sample.

4 The diagram shows triangle ABC.
(a) Find the equation of the line through C perpendicular to AB.
(b) Hence find the coordinates of D, the foot of the perpendicular from C to AB, and the area of triangle ABC.



5 A ball is projected horizontally at 6 m s^{-1} from a point 19.6 m above horizontal ground. Find (a) the horizontal distance to the landing point, (b) the speed and direction (angle below the horizontal, 1 d.p.) on landing. Take g = 9.8.
Give answers to 3 s.f. if not exact.

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6 A curve has equation $-2x^2 - xy + 3y^2 + 4y = 16$. Show that P(−2, 2) lies on the curve and find the equation of the tangent at P in the form ax + by + c = 0 with integer a, b, c.	
7 Solve $x(\sqrt{2} - 1) = -1 + 2\sqrt{2}$, writing x in the form $p + q\sqrt{2}$.	
8 The line l has equation $\mathbf{r} = \begin{pmatrix} 13 \\ -3 \\ -1 \end{pmatrix} + t\begin{pmatrix} -3 \\ 0 \\ 0 \end{pmatrix}$. Find the coordinates of the foot of the perpendicular from P(4, −2, 2) to l, and the exact distance from P to l.	
9 A curve has equation $2x^2 + 2xy + 3y^2 = 10$. Find the coordinates of the points where the tangent is parallel to the x-axis.	
10 X ~ B(22, p). H_0: p = 0.5 is tested against H_1: p < 0.5 using a 5% significance level. (a) Find the critical region. (b) State the probability of a Type I error. (c) Find the probability of a Type II error when p = 0.4 (3 s.f.).	