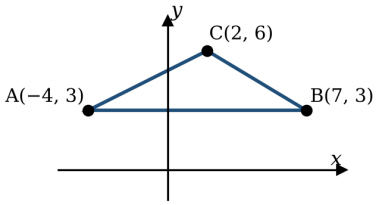
Day 255 **A Level Maths: A Tier 10-a-day**

1 A driver at constant speed sees a hazard 44.8 m ahead. After a reaction time of 0.8 s she brakes with deceleration 4 m s^{-2} and stops exactly at the hazard. Find (a) her initial speed, (b) the total time from seeing the hazard to stopping.

2 $f(x) = 2x^2 + 20x + 45$.
(a) Write f(x) in the form $a(x + p)^2 + q$.
(b) State the minimum value of f(x) and the value of x at which it occurs.
(c) Solve f(x) = 0, giving surds in simplest form.

3 A sector of a circle of radius 8 cm has angle 240°.
Find, in terms of π, the arc length, the area and the perimeter of the sector.

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 For small x (in radians), use the small angle approximations to find the value that

$$\frac{\sin 4x \tan 3x}{1 - \cos 2x}$$

approaches as $x \to 0$.

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6 $X \sim B(35, p)$. 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 $p = 0.3$ (3 s.f.).	
7 A curve has parametric equations $x = 4\sin t$, $y = 5\cos 2t$. Find $\frac{dy}{dx}$ in terms of t and the exact equation of the tangent at the point where $t = \frac{\pi}{4}$, in the form $y = mx + c$.	
8 A 900 kg car tows a 200 kg trailer by a light tow-bar on a horizontal road. Driving force 830 N; resistances 400 N (car), 100 N (trailer). Find (a) the acceleration and the tow-bar tension. At 10 m s^{-1} the tow-bar breaks. (b) How far does the trailer then travel?	
9 Eggs are defective with probability 0.15, independently. A tray of 8 eggs is rejected if it has at least 2 defective. From 9 such trays, find the probability that exactly 2 are rejected (3 s.f.).	
10 Prove by contradiction that there are no integers m and n such that $10m + 15n = 107$.	