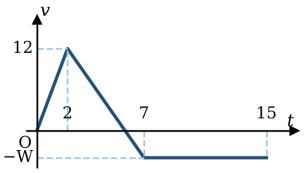
Day 334	A Level Maths: S Tier 10-a-day

1 A circle has its centre in the first quadrant and touches both the x-axis and the y-axis. It passes through the point (6, 12).
Find the two possible equations of the circle.

2 The diagram shows the velocity-time graph of a particle P moving on a straight line (velocity in m s^{-1}, time in s). At time 15 s, P is back at its starting point.
Find (a) the value of W, (b) the greatest distance of P from its starting point.



3 A data set has lower quartile 21 and upper quartile 36. An outlier is a value more than 1.5 × IQR beyond the nearest quartile.
(a) Find the range of values that are not outliers.
(b) 15 observations have mean 27. The largest is 63, an outlier, and it is removed. Find the new mean.

4 A drink cools according to $\theta = 10 + Ae^{-kt}$, where θ °C is the temperature after t minutes. Initially $\theta = 100$, and after 10 minutes $\theta = 55$.
Find A and k, then find when $\theta = 36$ (3 s.f.).

5 A car of mass 1500 kg tows a trailer of mass 500 kg along a horizontal road, with driving force 2800 N. Resistances are 700 N on the car and 500 N on the trailer.
(a) Find the tension in the tow bar. At 6 m s^{-1} the tow bar breaks. (b) Find the distance between car and trailer when the trailer stops.

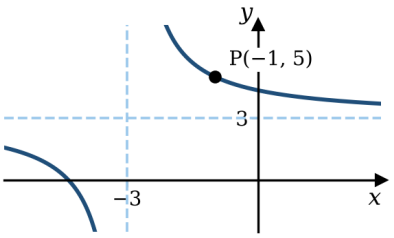
Day 334	A Level Maths: S Tier 10-a-day

6 The curve C has equation $x^3 + xy^2 = 40$.
Find the equation of the normal to C at the point (2, 4),
in the form $ax + by + c = 0$ with integers a, b, c.

7 Given that $\sqrt{6}$ is irrational, prove by contradiction that $\sqrt{3} + \sqrt{2}$ is irrational.

8 The line l has equation $\mathbf{r} = \begin{pmatrix} 6 \\ 3 \\ -4 \end{pmatrix} + t\begin{pmatrix} -1 \\ 1 \\ 1 \end{pmatrix}$.
The point P has coordinates $(7, 5, -2)$.
Find the coordinates of the foot F of the perpendicular from P to l, and the exact distance PF.

9 The diagram shows the curve C, its asymptotes (dashed) and a point P. C has equation $y = \frac{a}{x + p} + q$. Find a, p and q.



10 The pdf of X is $f(x) = \frac{k}{x^2}$ for $1 \leq x \leq 8$, and 0 otherwise.
(a) Find k.
(b) Find the median of X.
(c) Find E(X), to 3 significant figures.