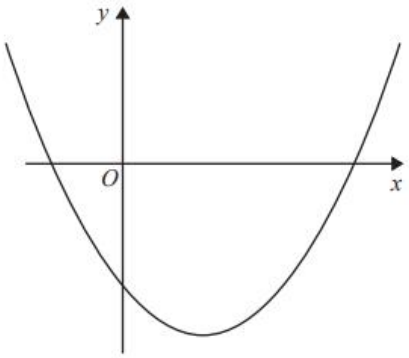
GCSE Maths Exam Question Coordinates – Graphs – Turning points

17 Here is a sketch of a curve.



The equation of the curve is $y = x^2 + ax + b$ where a and b are integers.

The points $(0, -5)$ and $(5, 0)$ lie on the curve.

Find the coordinates of the turning point of the curve.

Given the equation of a curve or a line and some coordinates, substitute the given coordinates into the equation.

The point $(0, -5)$ shows that $-5 = 0^2 + a \times 0 + b$ so $b = -5$

The point $(5,0)$ then gives $0 = 5^2 + a \times 5 - 5$.

That is $0 = 25 + 5a - 5 \Rightarrow$

$0 = 20 + 5a \Rightarrow$

$-20 = 5a \Rightarrow$

$a = -4$

The equation of the curve is $y = x^2 - 4x - 5$

This can be factorised to give $y = (x + 1)(x - 5)$

$y = 0$ when $x = -1$ or $x = 5$

The $x$coordinate of the turning point is the midpoint of the two roots.

$$x = \frac{-1 + 5}{2} = 2$$

The y coordinate is $2^2 - 4 \times 2 - 5 = -9$

The coordinates of the turning point are $(2, -9)$

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Alternatively you could use the fact that the line of symmetry

of the curve with equation $y = ax^2 + bx + c$ is $x = -\frac{b}{2a}$