

# Mathematical Problem Solving

## GCSE example

### Solution to example 10

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Five numbers are arranged in order from least to greatest:

$$x, x^3, x^4, x^2, x^0$$

Where does  $-x^{-1}$  belong in the list above?

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$x^0 = 1$  so the greatest value in the list is 1 on the right-hand side

For  $x$  to be less than this  $x < 1$

For  $x^2 > x$ ,  $x < 0$  since for values in  $0 < x < 1$ ,  $x^2 < x$

For  $x^3 > x$ ,  $-1 < x < 0$  since e.g.  $\left(-\frac{1}{2}\right)^3 > -\frac{1}{2}$  (it's closer to 0)

If  $-1 < x < 0$ ,  $x^4 < x^2$  so we now know that  $-1 < x < 0$

Trying a value out will indicate where  $-x^{-1}$  will lie. If  $x = -\frac{1}{2}$ ,  $-x^{-1} = -\left(-\frac{1}{2}\right)^{-1} = -(-2) = 2$

$-x^{-1}$  will lie to the right of all of the values in the list.