# Transformers

Teacher notes

## Why use this resource?

This resource offers students an opportunity to think more deeply about how graphs of functions are related to one another and encourages them to think about transformations when comparing similar graphs.

Students may have encountered transformations of graphs previously but will often think of these as a set of rules to be remembered and applied. This resource asks students to think backwards, starting with a pair of graphs and then trying to describe transformations, encouraging them to recognise that there is often more than one way to describe a transformation.

A number of interesting questions that can be asked about these cards are suggested in the Problem section of the resource. These encourage students to think carefully about how function notation can be used to describe transformations of graphs.

## Preparation

For both parts of this resource it is helpful to have sets of the cards printed and cut out.

Mini whiteboards can be useful for students to sketch transformations.

The cards for this problem are movable and can be used on an interactive whiteboard.

This problem can be tackled with prior knowledge of transformations of objects. Students do not need to be familiar or confident with notation for transformations of graphs in order to engage with the problem and indeed this resource can be used to develop this in students who have not encountered transformations of graphs previously.

## Possible approaches

You may want to allow students to suggest ways in which the cards could be sorted, before guiding them to think more specifically about transformations.

For the main problem you might want students to work through each of the questions or you might want them to focus on just one question and repeat it several times with different cards.

We would also strongly encourage the use of graphing software such as Desmos to allow students to self-check and adapt their notation.

On Desmos you can graph a function for example, $f(x) = x^2$, and then transformations of this by using notation $y = -f(x)$, $y = f(x+2)$, etc.

## Key questions

**Warm-up:**

- Could you sort the cards another way?
- Did you modify your categories at any point? What made you do so?
- Were there any cards that were problematic? Why?
- How did you use the blank cards, K and L?
- Try to describe in words how the blue and pink graphs could be related. Are there any other cards where the graphs are related in a similar way?

**Problem:**

You will find a lot of good questions to pose in the Things you might have noticed page of the resource (look out for the 'chalk boxes'!).

## Possible extension

It might be interesting to challenge students to try to identify some of the functions on the cards and to then identify the components of the equations that relate to the transformations that have taken place. Allowing students access to Desmos can help them to identify some of the less familiar functions, or at least attempt to produce something that looks very similar.

It is also worth noting that the functions on card I feature in the resource Name that graph, which is one of a series of similar problems in which students can be encouraged to apply their thinking about transformations to identify equations of quadratic graphs.