

Four Fours: Combined Transformations

The Maths Habit **ANSWERS**

Sort the 16 cards into **four groups of four** that have the same effect as one single transformation. Write the letters in each group, then the single transformation. Rotations are about (0, 0) unless another centre is given.

A reflect in $x = 1$ then reflect in $x = 3$	B reflect in $y = -x$ then rotate 180°	C rotate 90° clockwise then rotate 180°	D reflect in $y = x$ then reflect in the x axis	1 D G J O = rotation 90° clockwise	
E translate by $\begin{pmatrix} 0 \\ 2 \end{pmatrix}$ then rotate 90° anticlockwise about (1, 1)	F translate by $\begin{pmatrix} 1 \\ 3 \end{pmatrix}$ then translate by $\begin{pmatrix} 3 \\ -3 \end{pmatrix}$	G rotate 90° clockwise about (0, 2) then translate by $\begin{pmatrix} 2 \\ -2 \end{pmatrix}$	H rotate 90° anticlockwise then reflect in the y axis		2 C E L N = rotation 90° anticlockwise
I rotate 180° then rotate 180° about (2, 0)	J rotate 180° then rotate 90° anticlockwise	K reflect in the x axis then rotate 90° anticlockwise	L reflect in $y = x$ then reflect in the y axis		
M reflect in $y = x + 2$ then translate by $\begin{pmatrix} 2 \\ -2 \end{pmatrix}$	N reflect in the x axis then reflect in $y = x$	O reflect in the y axis then reflect in $y = x$	P rotate 90° clockwise then rotate 90° anticlockwise about (2, 2)		4 A F I P = translation by $\begin{pmatrix} 4 \\ 0 \end{pmatrix}$

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I rotate 180° then rotate 180° about (2, 0)	J rotate 180° then rotate 90° anticlockwise	K reflect in the x axis then rotate 90° anticlockwise	L reflect in $y = x$ then reflect in the y axis		
M reflect in $y = x + 2$ then translate by $\begin{pmatrix} 2 \\ -2 \end{pmatrix}$	N reflect in the x axis then reflect in $y = x$	O reflect in the y axis then reflect in $y = x$	P rotate 90° clockwise then rotate 90° anticlockwise about (2, 2)		4 A F I P = translation by $\begin{pmatrix} 4 \\ 0 \end{pmatrix}$