

a Translate (2, 1) by $\begin{pmatrix} 3 \\ 1 \end{pmatrix}$, then by $\begin{pmatrix} -1 \\ 2 \end{pmatrix}$. Give the new point. $(4, 4)$ two translations in turn	b Translate by $\begin{pmatrix} 3 \\ 1 \end{pmatrix}$, then by $\begin{pmatrix} -1 \\ 2 \end{pmatrix}$. Write this as one vector. $\begin{pmatrix} 2 \\ 3 \end{pmatrix}$ two translations make one	c Reflect (3, 1) in the x axis, then in the y axis. Give the new point. $(-3, -1)$ two reflections in turn	d Reflect in the x axis, then in the y axis. Describe this as one transformation. $\text{rotation } 180^\circ \text{ about } (0, 0)$ perpendicular mirrors: a half turn
e Reflect (2, 5) in $x = 1$, then in $x = 4$. Give the new point. $(8, 5)$ reflections in parallel lines	f Reflect in $x = 1$, then in $x = 4$. Describe this as one transformation. $\text{translation } \begin{pmatrix} 6 \\ 0 \end{pmatrix}$ parallel mirrors make a translation	g Reflect in $x = 4$, then in $x = 1$. Describe this as one transformation. $\text{translation } \begin{pmatrix} -6 \\ 0 \end{pmatrix}$ the order of the mirrors matters	h Rotate (3, 1) 90° clockwise about (0, 0), then reflect in $y = 0$. $(1, 3)$ a rotation then a reflection
i Rotate 90° clockwise about (0, 0), then reflect in $y = 0$. Describe this as one. $\text{reflection in } y = x$ a rotation and a reflection as one	j Find the invariant point of a 90° rotation about (2, 3). $(2, 3)$ the centre of a rotation is invariant	k The mirror line is $y = 3$. Find the invariant point with $x = 5$. $(5, 3)$ points on a mirror line are invariant	l Reflect in the x axis, then in the y axis. Find every invariant point. $(0, 0) \text{ only}$ invariant points of two reflections

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