MJC/2011/P1/10(a)

State a sequence of transformations which transform the graph of $x^2 + y^2 = 1$ to the graph of $(x-1)^2 + y^2 = 4$. [3]

10	**Curve Sketching and Transformations of Graphs**
(a)	$x^2 + y^2 = 1$ $\downarrow$ Replace x by $\frac{x}{2}$ $\left(\frac{x}{2}\right)^2 + y^2 = 1$ $\downarrow$ Replace x by $x-1$ $\left(\frac{x-1}{2}\right)^2 + y^2 = 1$ $\downarrow$ Replace y by $\frac{y}{2}$ $\left(\frac{x-1}{2}\right)^2 + \left(\frac{y}{2}\right)^2 = 1$ $\Rightarrow (x-1)^2 + y^2 = 4$ The transformations are scaling parallel to x-axis with a scale factor 2, followed by a translation of 1 units in the direction of x-axis and scaling parallel to y-axis with a scale factor 2. Alternative Solution $x^2 + y^2 = 1$ $\downarrow$ Replace x by $x-\frac{1}{2}$ $\left(x-\frac{1}{2}\right)^2 + y^2 = 1$ $\downarrow$ Replace x by $\frac{x}{2}$ $\left(\frac{x}{2}-\frac{1}{2}\right)^2 + y^2 = 1$ $\downarrow$ Replace y by $\frac{y}{2}$

	$\left(\frac{x-1}{2}\right)^2+\left(\frac{y}{2}\right)^2=1$ $\Rightarrow (x-1)^2+y^2=4$ The transformations are translation of $\frac{1}{2}$ units in the direction of x-axis, followed by scaling parallel to x-axis with a scale factor 2 and scaling parallel to y-axis with a scale factor 2.