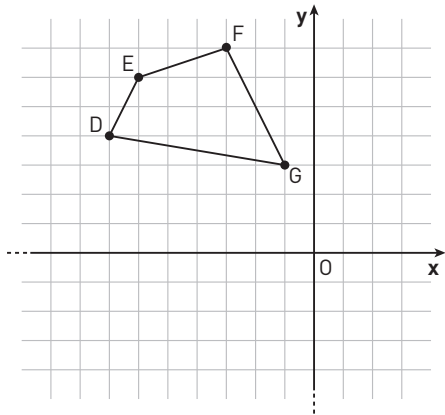**YOU & MATHS** If quadrilateral *DEFG* ($D(-7, 4)$, $E(-6, 6)$, $F(-3, 7)$, $G(-1, 3)$) is dilated with a scale factor of 2 using center of dilation $(-5, 9)$, give the coordinates of each of the vertices of the image *D'E'F'G'*.
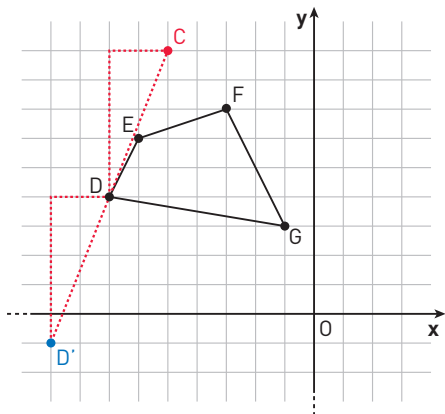
(USA *University of Houston: High School Mathematics Contest*, 2005)

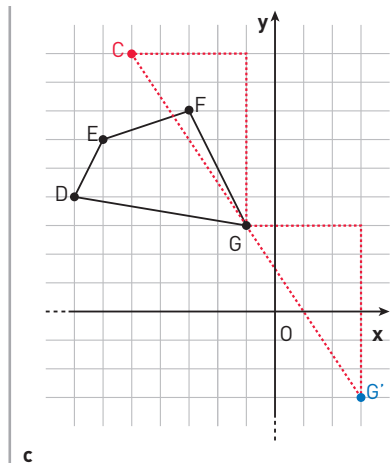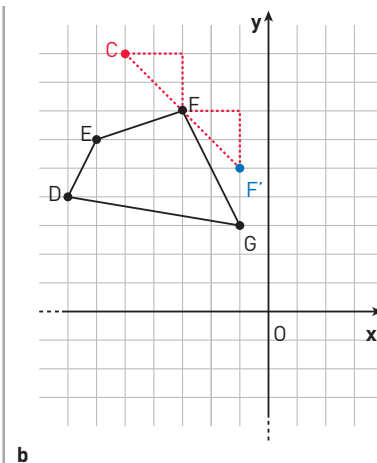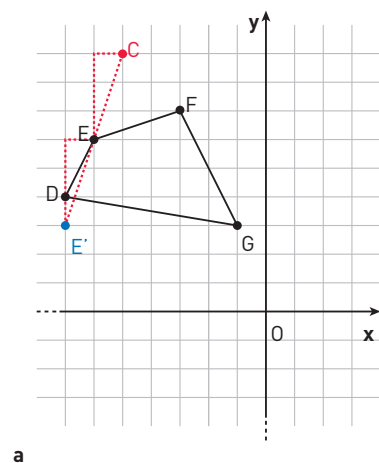First of all, let us draw quadrilateral *DEFG* on the Cartesian plane.

The scale factor of this dilation is positive and greater than 1, so that means that the transformation maps the points onto corresponding points in the same direction and that the resulting figure will be larger than the original one.

Let us work out first the dilation of point *D*. The new point *D'* will have to be in the same direction as point *D* with respect to centre *C* and *CD'* needs to be twice as long as *CD*, because the scale factor is 2. In order to get the right length of *CD'*, we can use the "triangle trick": since we want *CD* and *DD'* to have the same length, we can construct a right triangle with hypotenuse *CD* and then copy it below so that it has hypotenuse *DD'*, as we can see in the following figure.

We can repeat a similar procedure to find points *E'* (figure **a**), *F'* (figure **b**) and *G'* (figure **c**).

a   **b**   **c**

The resulting final figure is the one of the drawing below and its vertices have coordinates $D'(-9, -1)$, $E'(-7, 3)$, $F'(-1, 5)$ and $G'(3, -3)$.