

Matrices – Q17: Transformations [Problem/E](2/6/21)

(i) Plot the image of the unit square under the transformation represented by the matrix $\begin{pmatrix} 5 & 1 \\ 2 & 3 \end{pmatrix}$

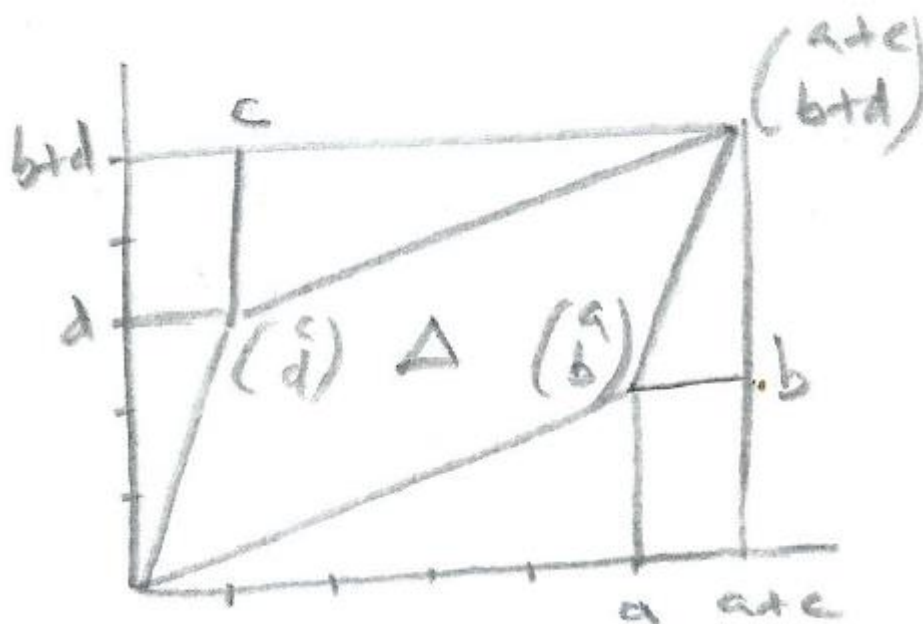
(ii) Use (i), but with more general labels, to show that the area scale factor for the transformation $\begin{pmatrix} a & c \\ b & d \end{pmatrix}$ is $ad - bc$.

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Solution

(ii)



$$\Delta = (a+c)(b+d) - 2\left(\frac{1}{2}cd + bc + \frac{1}{2}ab\right)$$

$$= ab + ad + cb + cd - cd - 2bc - ab$$

$$= ad - bc$$