Assignment I (ICSE Class 10 2018)

Gautam Singh (CS21BTECH11018)

***Abstract*—This document contains the solution to problem 5 (c) asked on the ICSE Class 10 Mathematics Paper in 2018.**

Problem 5. (c) Use graph paper for this question (Take 2 cm = 1 unit along both x and y axis). ABCD is a quadrilateral whose vertices are A(2,2), B(2,−2), C(0,−1) and D(0,1).

(i) Reflect quadrilateral ABCD on the *y*-axis and name it as A'B'CD.
(ii) Write down the coordinates of A' and B'.
(iii) Name two points which are invariant under the above reflection.
(iv) Name the polygon A'B'CD.

Solution:

(i) The plot of quadrilateral ABCD after reflection on the *y*-axis is as shown:

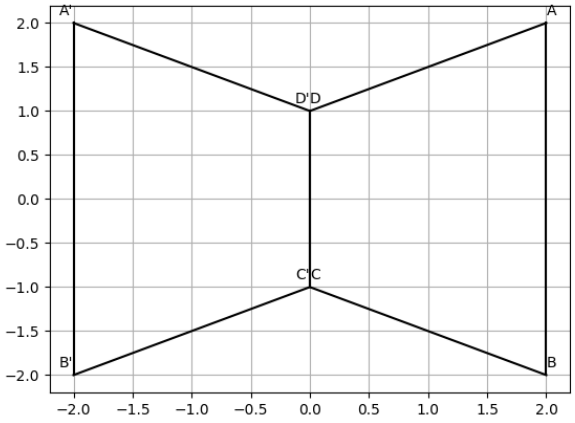

Fig. 1: Plot of points A, B, C, D and their reflections in the y-axis.

(ii) We represent the co-ordinates of points A, B, C, and D as column vectors to find their reflections. Note that the reflection matrix for the given situation is

$$\mathbf{R} = \begin{pmatrix} -1 & 0 \\ 0 & 1 \end{pmatrix} \tag{1}$$

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$$\mathbf{A'} = \mathbf{RA} = \begin{pmatrix} -1 & 0 \\ 0 & 1 \end{pmatrix}\begin{pmatrix} 2 \\ 2 \end{pmatrix} = \begin{pmatrix} -2 \\ 2 \end{pmatrix}, \tag{2}$$

$$\mathbf{B'} = \mathbf{RB} = \begin{pmatrix} -1 & 0 \\ 0 & 1 \end{pmatrix}\begin{pmatrix} 2 \\ -2 \end{pmatrix} = \begin{pmatrix} -2 \\ -2 \end{pmatrix}, \tag{3}$$

$$\mathbf{C'} = \mathbf{RC} = \begin{pmatrix} -1 & 0 \\ 0 & 1 \end{pmatrix}\begin{pmatrix} 0 \\ -1 \end{pmatrix} = \begin{pmatrix} 0 \\ -1 \end{pmatrix}, \tag{4}$$

$$\mathbf{D'} = \mathbf{RD} = \begin{pmatrix} -1 & 0 \\ 0 & 1 \end{pmatrix}\begin{pmatrix} 0 \\ 1 \end{pmatrix} = \begin{pmatrix} 0 \\ 1 \end{pmatrix}. \tag{5}$$

The coordinates of A' and B' are (−2,2) and (−2,−2) respectively.

(iii) The two points which are invariant under reflection are C(0,−1) and D(0,1).
(iv) The polygon A'B'CD is an isosceles trapezium.