

# Assignment 1 ICSE 2019 10

Mannem Charan(AI21BTECH11019)

## 1 QUESTION 5C

Use a graph sheet for this question. (Take 1cm = 1unit along both x and y axis.)

- Plot the following points: A(0,5), B(3,0), C(1,0) and D(1,-5)
- Reflect the points B, C and D on the y axis and name them as B',C' and D' respectively.
- Write down the coordinates of B, C' and D'.
- Join the points A, B, C, D, D', C', B', A in order and give a name to the closed figure ABCDD'C'B'.

SOLUTION:

1.1. First we will plot the points A, B, C and D which is shown in the Fig 5.1 in the plot section.

1.2. Now to get points of reflections of

$$\mathbf{B} = \begin{pmatrix} 3 \\ 0 \end{pmatrix} \quad (1.2.1)$$

$$\mathbf{C} = \begin{pmatrix} 1 \\ 0 \end{pmatrix} \quad (1.2.2)$$

$$\mathbf{D} = \begin{pmatrix} 1 \\ -5 \end{pmatrix} \quad (1.2.3)$$

about y axis, we will use the below equation

$$\mathbf{R} = \mathbf{P} + 2 \frac{c - \mathbf{n}^\top \mathbf{P}}{\|\mathbf{n}\|^2} \mathbf{n} \quad (1.2.4)$$

where R is the point of reflection of P about a plane

$$\mathbf{n}^\top \mathbf{x} = c \quad (1.2.5)$$

1.3. For y axis ,

$$\mathbf{n} = \begin{pmatrix} 1 \\ 0 \end{pmatrix} \quad (1.3.1)$$

$$c = 0 \quad (1.3.2)$$

1.4. Let us call the points of reflection of B,C,D on yaxis as B',C',D' then

$$\mathbf{B}' = \mathbf{B} + 2 \frac{c - \mathbf{n}^\top \mathbf{B}}{\|\mathbf{n}\|^2} \mathbf{n} \quad (1.4.1)$$

$$= \begin{pmatrix} 3 \\ 0 \end{pmatrix} + 2 \frac{0 - (1 \ 0) \begin{pmatrix} 3 \\ 0 \end{pmatrix}}{\left\| \begin{pmatrix} 1 \\ 0 \end{pmatrix} \right\|^2} \begin{pmatrix} 1 \\ 0 \end{pmatrix} \quad (1.4.2)$$

$$= \begin{pmatrix} 3 \\ 0 \end{pmatrix} - \begin{pmatrix} 6 \\ 0 \end{pmatrix} \quad (1.4.3)$$

$$= \begin{pmatrix} -3 \\ 0 \end{pmatrix} \quad (1.4.4)$$

Similarly substituting C and D in the above equation gives us,

$$\mathbf{C}' = \begin{pmatrix} -1 \\ 0 \end{pmatrix} \quad \mathbf{D}' = \begin{pmatrix} -1 \\ -5 \end{pmatrix}. \quad (1.4.5)$$

1.5. Now joining these points in the order of A, B, C, D, D', C', B', A which gives us a 7 sided polygon. We will call it as 'ARROW HEAD'.

PLOT:

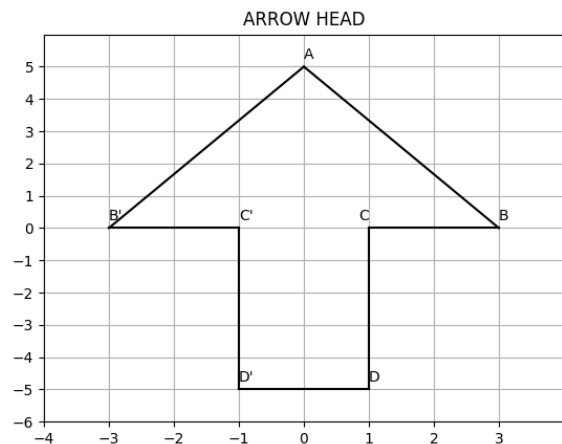


Fig. 5.1. Arrow Head