# Quiz 7

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***Abstract*—This document contains the solution of the question from NCERT 11th standard chapter 10 exercise 10.4 problem 21**

## 1 Exercise 10.4

1) Find the equation of line which is equidistant from parallel lines $9x + 6y - 7 = 0$ and $3x + 2y + 6 = 0$.

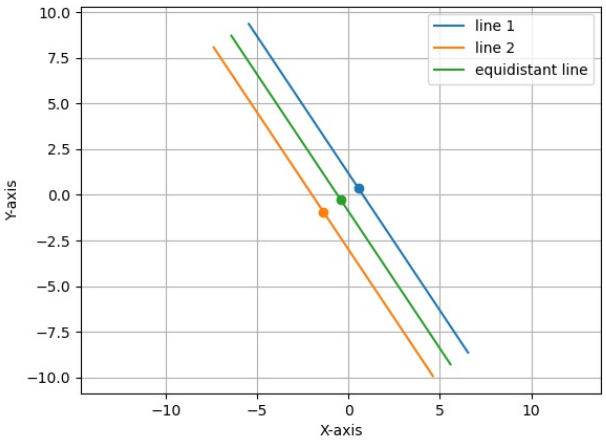


Fig. 1: Triangle ABC

Equation of line 1 is,

$$\begin{pmatrix}9 & 6\end{pmatrix}\mathbf{x} = 7 \tag{1.0.1}$$

$$\begin{pmatrix}3 & 2\end{pmatrix}\mathbf{x} = \frac{7}{3} \tag{1.0.2}$$

Equation of line 2 is,

$$\begin{pmatrix}3 & 2\end{pmatrix}\mathbf{x} = -6 \tag{1.0.3}$$

The equation of the equidistant line will be of the form,

$$\begin{pmatrix}3 & 2\end{pmatrix}\mathbf{x} = c \tag{1.0.4}$$

If,

$$\mathbf{n}^\top\mathbf{x} = c_1 \tag{1.0.5}$$

$$\mathbf{n}^\top\mathbf{x} = c_2 \tag{1.0.6}$$

are two parallel lines then the distance between these two lines is,

$$d = \frac{|c_1 - c_2|}{\|\mathbf{n}\|} \tag{1.0.7}$$

We need to find c such that,

$$\frac{|c - c_1|}{\|\mathbf{n}\|} = \frac{|c - c_2|}{\|\mathbf{n}\|} \tag{1.0.8}$$

where,

$$\mathbf{n} = \begin{pmatrix}3\\2\end{pmatrix} \tag{1.0.9}$$

$$\frac{|c - c_1|}{\|\mathbf{n}\|} = \frac{|c - c_2|}{\|\mathbf{n}\|} \tag{1.0.10}$$

$$\left|c - \frac{7}{3}\right| = |c - (-6)| \tag{1.0.11}$$

$$\frac{7}{3} - c = c + 6 \tag{1.0.12}$$

$$2c = \frac{7}{3} - 6 = \frac{-11}{3} \tag{1.0.13}$$

$$c = \frac{-11}{6} \tag{1.0.14}$$

Hence, the equation of the line that is equidistant to parallel lines,

$$\begin{pmatrix}9 & 6\end{pmatrix}\mathbf{x} = 7 \tag{1.0.15}$$

$$\begin{pmatrix}3 & 2\end{pmatrix}\mathbf{x} = -6 \tag{1.0.16}$$

is,

$$\begin{pmatrix}3 & 2\end{pmatrix}\mathbf{x} = -\frac{11}{6} \tag{1.0.17}$$