

# Equation of Line

## 1 11<sup>th</sup> Maths - Chapter 10

This is Problem-12 from Exercise 10.2

1. Find the equation of a line that cuts off equal intercepts on the coordinate axes and passes through the point  $(2, 3)$ .

**Solution:** Let  $\mathbf{P}(a, 0)$ , and  $\mathbf{Q}(0, a)$  be the 2 points on x and y-axes respectively having  $a$  as the intercept on both the axes. We know that the the direction vector  $\mathbf{m}$  of the line joining two points  $\mathbf{P}, \mathbf{Q}$  is given by

$$\mathbf{m} = \mathbf{P} - \mathbf{Q} \quad (1)$$

$$= \begin{pmatrix} a \\ 0 \end{pmatrix} - \begin{pmatrix} 0 \\ a \end{pmatrix} = a \begin{pmatrix} 1 \\ -1 \end{pmatrix} \equiv \begin{pmatrix} 1 \\ -1 \end{pmatrix} \quad (2)$$

$\Rightarrow$  The normal vector  $\mathbf{n}$  to the line is given as

$$\mathbf{n} = \begin{pmatrix} 1 \\ 1 \end{pmatrix} \quad (3)$$

The equation of a line with normal vector  $\mathbf{n}$  and passing through a point  $\mathbf{A}(2, 3)$  is given by

$$\mathbf{n}^T (\mathbf{x} - \mathbf{A}) = 0 \quad (4)$$

$$(1 \ 1) \left( \mathbf{x} - \begin{pmatrix} 2 \\ 3 \end{pmatrix} \right) = 0 \quad (5)$$

$$(1 \ 1) \mathbf{x} - 5 = 0 \quad (6)$$

$$(1 \ 1) \mathbf{x} = 5 \quad (7)$$

The line segment is as shown in Figure 1

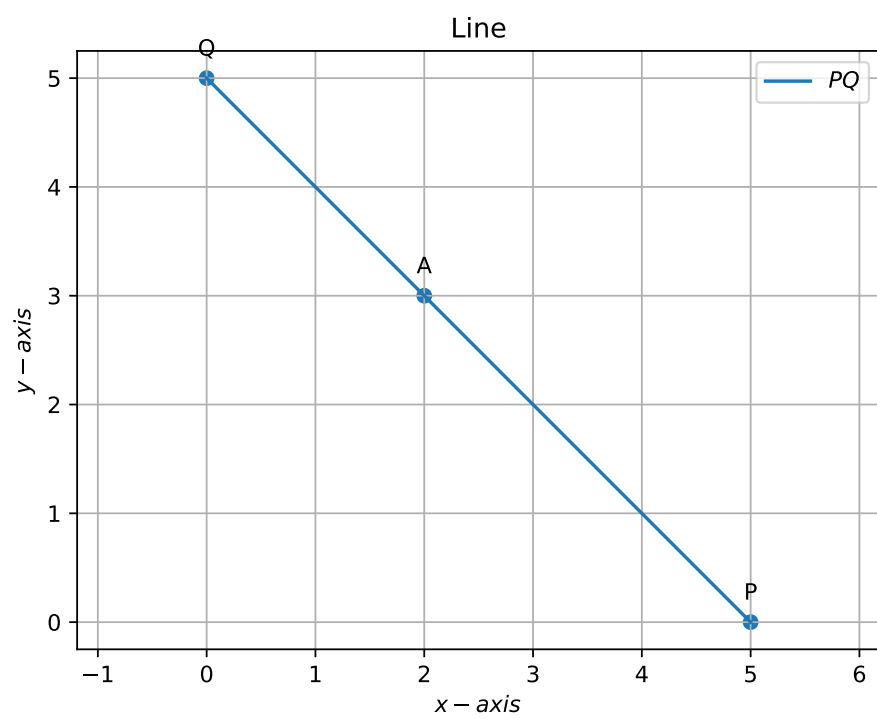


Figure 1