A long straight wire in the horizontal plane carries a current of 50 A in north to south direction. Give the magnitude and direction of B at a point 2.5 m east of the wire.

Current in the wire, I = 50 A

A point is 2.5 m away from the East of the wire.

∴ Magnitude of the distance of the point from the wire, r = 2.5 m.

Magnitude of the magnetic field at that point is given by the relation,

$$|\vec{B}| = \frac{\mu_0}{4\pi}\frac{2l}{r}$$

Where,

$\mu_0 =$ Permeability of free space

$= 4\pi \times 10^{-7}$ T m A^{-1}

$$|\vec{B}| = \frac{4\pi \times 10^{-7}}{4\pi} \times \frac{2 \times 50}{2.5} = 4 \times 10^{-6}\ T$$

The point is located normal to the wire length at a distance of 2.5 m. The direction of the current in the wire is vertically downward. Hence, according to the Maxwell's right hand thumb rule, the direction of the magnetic field at the given point is vertically upward.