Teacher notes
Topic D

$F = BIL$ comes from $F = qvB$.

A wire of cross sectional area A contains n free electrons per unit volume. The wire is at right angles to a magnetic field B.

$I = Anqv$

Force on one electron is $F = qvB$.

Number of electrons in length L of the wire is ALn and so total charge is $ALnq$.

Hence force is $F = ALnqvB$.

But the current in the wire is $I = Anqv$. This means the magnetic force on a length L of the wire is $F = BIL$.