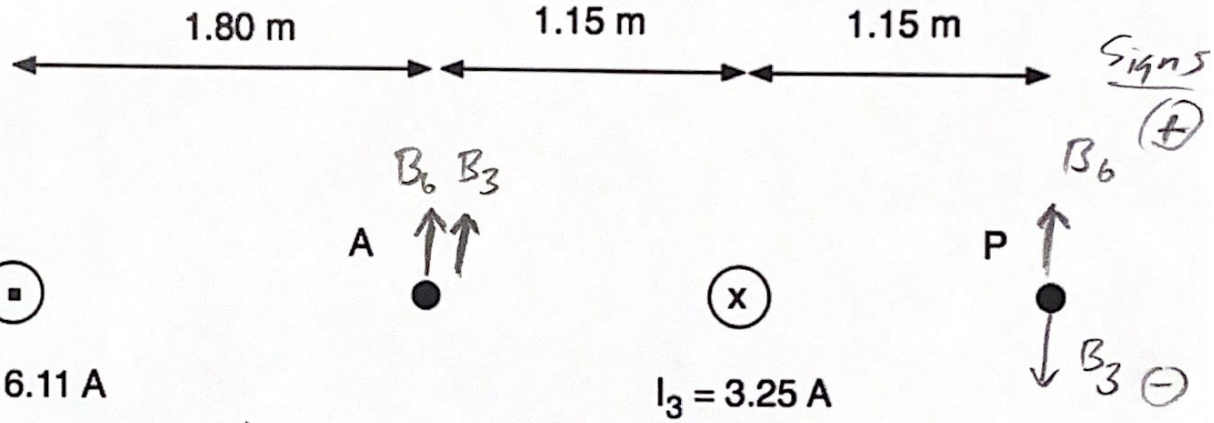
Quiz 21.2C

Wires I_6 and I_3 are parallel with currents pointing in opposite directions as shown below.

a) Find the magnitude and direction of the total magnetic field at point A.
b) Find the magnitude and direction of the total magnetic field at point P.
c) Suppose a long straight wire I_4 is perpendicular to the page and carries a current of 4.20 Amps into the page, and it passes through the plane of the page at point P. What is the magnitude and direction of the magnetic force felt by a 1.00 meter length of this wire?
d) Suppose a proton is passing through point P, moving at a rate of 3.85×10^6 m/s in a direction 27.0° below +x. What is the magnitude and direction of the magnetic force on this proton (wire I_4 is no longer present)?



(20) a) $B_A = \frac{+(2\times10^{-7})(6.11)}{1.80} + \frac{(2\times10^{-7})(3.25)}{1.15} = \boxed{1.24\times10^{-6}\ T,\ \uparrow}$

(20) b) $B_P = +\frac{(2\times10^{-7})(6.11)}{4.10} - \frac{(2\times10^{-7})(3.25)}{1.15} = -2.67\times10^{-7}\ T$

or $\boxed{2.67\times10^{-7}\ T,\ \downarrow}$

(30) c) F_B ← ⊗ I_4 ↓ B_{TOT}

$F_B = (1.00)(4.20)(2.67\times10^{-7})\sin 90$

$= \boxed{1.12\times10^{-6}\ N,\ \leftarrow}$

(30) d) F_B ⊗ $v_\perp$ 27° 63° $\vec{V}$ B_{TOT}

$F_B = (1.6\times10^{-19})(3.85\times10^{6})(2.67\times10^{-7})\sin 63^\circ$

$= \boxed{1.47\times10^{-19}\ N,\ \otimes}$