\[ \frac{d\mathbf{B}}{4\pi} = \frac{\mu_0 I dx}{r} \quad \frac{\mu_0 I d\sin \theta}{r} \]

Remember:

\[ B = \frac{\mu_0 I}{2\pi r} \]

for a long, straight current carrying conductor

\[ \mu_0 = 4\pi \times 10^{-7} \text{ Wb/A} \cdot \text{m}; \quad \sin 30^\circ = \cos 60^\circ = 1/2; \quad \sin 60^\circ = \cos 30^\circ = \sqrt{3}/2; \quad \sin 45^\circ = \cos 45^\circ = \sqrt{2}/2 \]

Correct answers have correct electrical units and 3 significant figures.

Two long, straight, parallel wires, 0.100 m apart carry equal 4.00-A currents in the same direction, as shown in the figure.

A. What is the magnitude of the magnetic field at point P1, midway between the wires?

\[ 2.20 \text{ T} \]

B. What is the direction of the magnetic field at P1? (to the left, to the right, upward, downward or no field)

\[ \text{No field} \]

C. What is the magnitude of the magnetic field at Point P2, 0.200 m to the right of the right-hand wire?

\[ B = \frac{\mu_0 I}{2\pi r} \Rightarrow B(P_2) = \frac{\mu_0 I}{2\pi (0.2 \text{ m})} + \frac{\mu_0 I}{2\pi (0.3 \text{ m})} \]

\[ B = \left( \frac{4\pi \times 10^{-7} \text{ Wb/A} \cdot \text{m}}{2\pi} \right) (4 \text{ A}) \left( \frac{1}{0.2 \text{ m}} + \frac{1}{0.3 \text{ m}} \right) = 6.67 \times 10^{-1} \text{T} \]

D. What is the direction of the magnetic field at P2? (to the left, to the right, upward, downward or no field)

\[ \text{Upward} \]