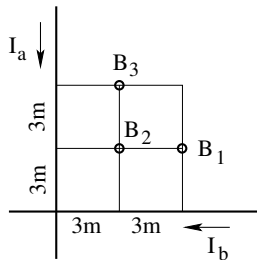


## Unit Exam III: Problem #1 (Fall '14)



Consider two infinitely long, straight wires with currents  $I_a = 7\text{A}$ ,  $I_b = 9\text{A}$  in the directions shown.

Find direction (in/out) and magnitude of the magnetic fields  $\mathbf{B}_1$ ,  $\mathbf{B}_2$ ,  $\mathbf{B}_3$  at the points marked in the graph.

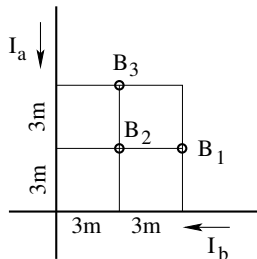


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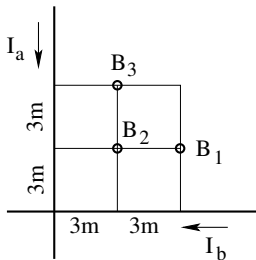
### Solution:

- Convention used: out = positive, in = negative
- $B_1 = \frac{\mu_0}{2\pi} \left( \frac{7\text{A}}{6\text{m}} - \frac{9\text{A}}{3\text{m}} \right) = -0.367\mu\text{T (in)}.$



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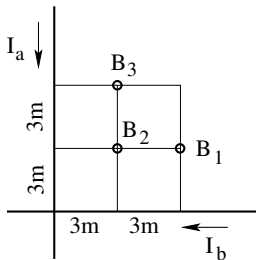
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- $B_2 = \frac{\mu_0}{2\pi} \left( \frac{7\text{A}}{3\text{m}} - \frac{9\text{A}}{3\text{m}} \right) = -0.133\mu\text{T (in)}.$



Consider two infinitely long, straight wires with currents  $I_a = 7\text{A}$ ,  $I_b = 9\text{A}$  in the directions shown.

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### Solution:

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- $B_1 = \frac{\mu_0}{2\pi} \left( \frac{7\text{A}}{6\text{m}} - \frac{9\text{A}}{3\text{m}} \right) = -0.367\mu\text{T (in)}.$
- $B_2 = \frac{\mu_0}{2\pi} \left( \frac{7\text{A}}{3\text{m}} - \frac{9\text{A}}{3\text{m}} \right) = -0.133\mu\text{T (in)}.$
- $B_3 = \frac{\mu_0}{2\pi} \left( \frac{7\text{A}}{3\text{m}} - \frac{9\text{A}}{6\text{m}} \right) = +0.167\mu\text{T (out)}.$