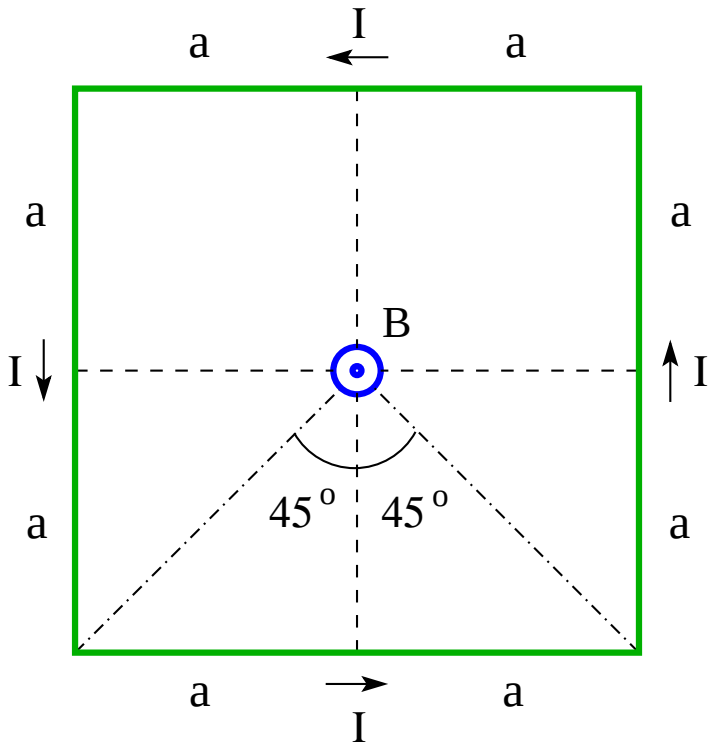
Magnetic Field at Center of Square-Shaped Wire

Consider a current-carrying wire bent into the shape of a square with side $2a$.
Find direction and magnitude of the magnetic field generated at the center of the square.



$$B = 4\frac{\mu_0}{4\pi}\frac{I}{a}\Big[\sin(45°) - \sin(-45°)\Big] = \frac{\sqrt{2}\mu_0 I}{\pi a}.$$