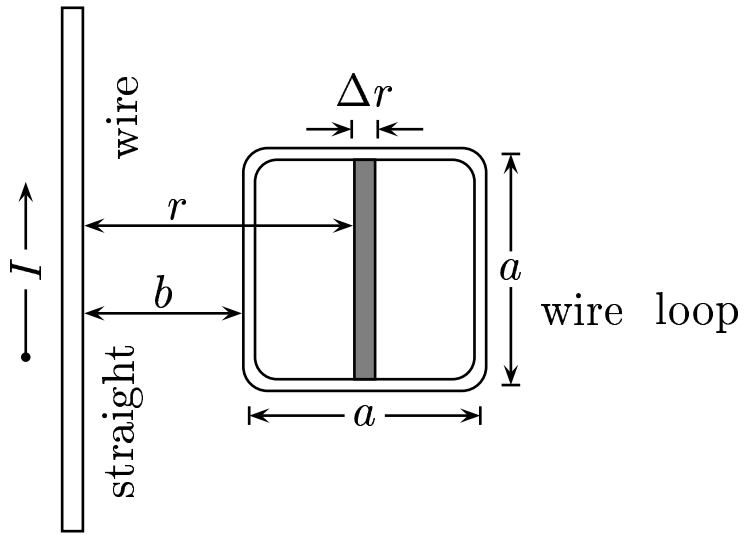
Consider the flux due to a current I in a long wire.



Find the flux ϕ through the square area shown in the sketch.

A) $\phi = \dfrac{\mu_0 I a}{2\pi} \ln \dfrac{a+b}{b}$

B) $\phi = \dfrac{\mu_0 I}{2\pi b} a^2$

C) $\phi = \dfrac{\mu_0 I}{2\pi (a+b)} a^2$

$$B = \frac{\mu_0 I}{2 \pi r}$$

$$\phi = \int_b^{a+b} B \, a \, dr = \frac{\mu_o I \, a}{2 \pi} \int_a^{a+b} \frac{dr}{r} = \frac{\mu_0 I \, a}{2 \pi} \ln \frac{a+b}{b}$$

Answer A.

30.03-03˙Flux˙Through˙a˙Square 2006-9-14