Easy to verify $\frac{(x-a)^2}{(d-a)(b-a)}+\frac{(x-b)^2}{(a-b)(c-b)}=1$, ie $\frac{AI^2}{DA\cdot BA}+\frac{BI^2}{AB\cdot CB}=1$. the same way $\frac{BI^2}{AB\cdot CB}+\frac{CI^2}{BC\cdot DC}=\frac{CI^2}{BC\cdot DC}+\frac{DI^2}{CD\cdot AD}=\frac{DI^2}{CD\cdot AD}+\frac{AI^2}{DA\cdot BA}=1$.