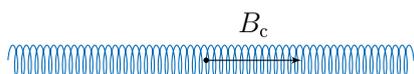## Hint 1

The magnetic field in the center of a long solenoid is determined by the winding density of the coils n and the current strength I:

$$B_c = \mu_0 n I$$

Thus, if the dimensions of the solenoid satisfy the condition $l \gg R$, then the induction of the magnetic field in its center practically does not depend on its size.

Let's find the value of the magnetic field induction B_0 in the end of a long solenoid. To do this, imagine that we add to its end exactly the same long solenoid so that the directions of the currents are the same.
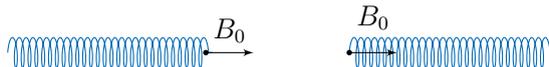
In this case, the directions of the magnetic fields at the intersection of the solenoids are in one direction and equal to B_0, and in total they give the field of one infinite solenoid B_c. Thus:

$$B_0 = \frac{B_c}{2}$$

We also draw your attention to the fact that when the key is closed, the initial length of the wires is already quite large.