Hint 2

IMPORTANT! The next task is both a hint and an alternative to the main task. Three important points:

1. You can continue to send the solution to the main problem.
2. At any moment before the final deadline you can start to solve the Alternative problem. If you do so, at the beginning of the solution write: *I am doing the Alternative problem!* In this case a penalty coefficient for the Alternative problem is

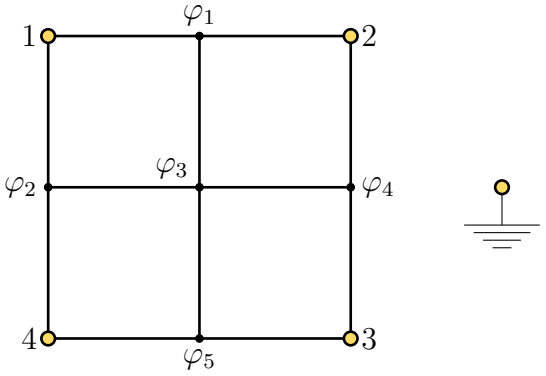
$$0{,}7 \cdot \sum_i \frac{k_i \cdot p_i}{10},$$

where p_i is a point for the problem item, and k_i is a penalty coefficient for the corresponding problem's item at the moment of moving to the Alternative problem. In other words, maximal points for the alternative problem equals to the maximal points you can gain at the moment of moving to the alternative one multiplied by 0,7. Also, we remind you that a penalty coefficient can't be less than 0,1. Solutions of the main problems from that moment will not be checked. Be careful!

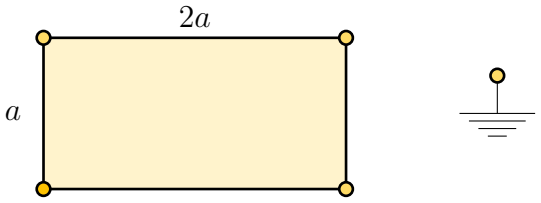
3. The task consists of several items. The penalty multiplier earned **before** is applied to all points. In the future, each item is evaluated as a separate task. If you send a solution without any item, this item's solution is considered as Incorrect. For more information about scoring points for composite tasks, see the rules of the Cup.

Alternative problem

1. *(5 points)* Four ideal sources with EMF $\mathscr{E}_i$ are connected with the negative pole to a point with zero potential (ground), and with the positive pole to the i-th corner of the square grid (see Figure). Each segment of the circuit has a resistance of R. The EMF values of the sources are $\mathscr{E}_1 = \mathscr{E}$, $\mathscr{E}_2 = 2\mathscr{E}$, $\mathscr{E}_3 = 4\mathscr{E}$ and $\mathscr{E}_4 = 7\mathscr{E}$. Find the potentials φ_1, φ_2, φ_3, φ_4 and φ_5 of all nodes.



2. *(3 points)* Three vertices of a thin metal rectangular plate are grounded. An ideal EMF source is connected to the fourth vertex so that its potential becomes $\mathscr{E}$. Find the potential in the center of the plate if its dimensions are a and $2a$.



3. *(2 points)* A solid conductive plate shaped like a regular triangle is connected to ideal EMF sources. The potentials of the plate vertices are φ_1, φ_2, φ_3. Find the potential of the center of the plate.